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IBM-7090 Programs to Compile and Modify
A Nuclear Data Tape

R. G. Herrmann
T. A. Hoffman
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A. Wilcox

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GENERAL ELECTRIC

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IBM-7090 PROGRAMS TO COMPILE AND
MODIFY A NUCLEAR DATA TAPE

R. G. Herrmann
T. A. Hoffman
F. D. Wenstrup
A. Wilcox

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ABSTRACT

The Reactor Nuclear Data Tape Programs, as described in this report, were designed to compile and/or modify a nuclear data library tape from basic nuclear cross-section input. It is intended that this cross-section library tape will be utilized to provide up-to-date nuclear data for various reactor codes.

Program RNDP was designed to compile an initial tape from certain minimal input data, or to add or delete complete blocks of data from an existing tape.

Program RNDM was designed to compile and add to an existing tape macroscopic cross section data consisting of mixtures of microscopic cross sections available on the tape.

Program RNDC was designed to modify and copy an existing tape, or to compile a new tape from sets of binary cards punched by Program RNDP.

These programs were written using the FORTRAN-II system of automatic coding for the IBM-7090.

ACKNOWLEDGMENT

The original specifications for Programs RNDP, RNDM, and RNDC were prepared by P. G. Fischer and J. R. Cooper.

TABLE OF CONTENTS

	<u>Page</u>
1.0 Introduction	7
2.0 Reactor Nuclear Data Preparation Program	15
2.1 General Information.	15
2.2 Data Requirements	17
2.3 Equations	20
2.4 Subroutine Descriptions.	25
2.5 Program Flow Charts.	31
2.6 Program Diagnostics.	31
2.7 Program Input Forms.	35
2.8 Program Source Deck Listing.	80
2.9 Program Mnemonic Glossary	.141
3.0 Reactor Nuclear Data Macroscopic Program	.148
3.1 General Information.	.148
3.2 Equations and Data Requirements.	.148
3.3 Description of Subroutines Unique to this Program	.149
3.4 Program Flow Chart	.150
3.5 Program Diagnostics.	.152
3.6 Program Input Forms.	.154
3.7 Program Source Deck Listing.	.157
3.8 Program Mnemonic Glossary	.197
4.0 Reactor Nuclear Data Copy and Correct Program.	.201
4.1 General Information.	.201
4.2 Description of Subroutines Unique to this Program	.201
4.3 Program Flow Chart	.205
4.4 Program Diagnostics.	.206
4.5 Program Input Forms.	.209
4.6 Program Source Deck Listing.	.228
4.7 Program Mnemonic Glossary	.263
Appendix A - Sample Problem	.265
A1 - Sample Problem Input	.265
A2 - Sample Problem Output	.277
Appendix B - DIP Input Subroutine	.302

LIST OF FIGURES

	<u>Page</u>
Fig. 1.1 - Reactor Nuclear Data Tape Format	8
Fig. 1.2 - Reactor Nuclear Data Tape Index Record	8
Fig. 1.3 - Reactor Nuclear Data Tape Second Record	9
Fig. 1.4 - Reactor Nuclear Data Tape Material Data Block	10
Fig. 1.5 - Material Data Block Record 1	11
Fig. 1.6 - Material Data Block Record 2	12
Fig. 1.7 - Material Data Block Record 3	12
Fig. 1.8 - Material Data Block Record 4	12
Fig. 1.9 - Material Data Block Record 5	13
Fig. 1.10- Reactor Nuclear Data Tape Spectral Data Block	13
Fig. 1.11- Reactor Nuclear Data Tape Final Record	14
Fig. 2.1 - Logic for Calculation of $\sigma_{s,i}, \sigma_{A,i}, (v\sigma_f)_i$ [or $\Sigma_{s,i}, \Sigma_{A,i}, (v\Sigma_f)_i$]	22
Fig. 2.2 - Logic for Calculation of $(\xi\sigma_s)_i, \sigma_{TR,i}, (\xi_1\sigma_{s1})_i$ [or $(\xi\Sigma_s)_i, \Sigma_{TR,i}, (\xi_1\Sigma_{s1})_i$]	23
Fig. 2.3 - Logic for Calculation of Density Factor (DF)	24
Fig. 2.4 - Flow Chart of Control Routine	32
Fig. 2.5 - Flow Chart of DATACT Control Routine	33
Fig. 2.6 - Flow Chart of INPTDB Subroutine	34
Fig. 3.1 - Program Gross Flow Chart	151
Fig. 4.1 - Flow Chart of Control Routine	205
Fig. 4.2 - Macroscopic-Constituent Index (Final Record)	212

1.0 INTRODUCTION

The Reactor Nuclear Data Tape programs compile and/or modify a nuclear data library tape to be used by reactor analysis codes as an input source of cross section data. The data tape energy lattice is flexible, allowing up to a maximum of thirty-two epithermal levels and ten thermal temperature levels. Thermal scattering-transfer data coupling the thermal and near-thermal levels, are limited to a maximum five-by-five matrix. Resonance data may be given at two-hundred energy points maximum.

The format of the overall Reactor Nuclear Data Tape (RNDT) is illustrated in Figure 1.1. The first logical[†] record of the tape can be considered a table of contents for the whole tape. Each data block is described in this first record, Figure 1.2, by four words: two words of binary-coded Hollerith information giving the designation, one word giving the material code number in floating point, and one integer word giving the logical record number on the tape of the first record of the data block.

The energy and lethargy lattices and a set of $1/v$ factors constitute the second record on the tape as shown in Figure 1.3.

The "Data Blocks" shown in Figure 1.1 may contain two different types of data. The first type, Figure 1.4, is material cross-section data having a data-block code number less than 500.0, and a maximum of five records within the block. The first record, Figure 1.5, will always be present for each of these types of blocks. The second, third, fourth, and fifth records, Figures 1.6 through 1.9, will appear only for those materials for which such data are available or necessary.

The second type of data block, Figure 1.10, having a data-block code number equal to or greater than 500.0, requires only one record on the tape.

The final record on the tape, illustrated in Figure 1.11, contains a table listing the microscopic constituents of each macroscopic cross-section data block present on the tape. The final record always appears in full, one thousand words, as the last record on the tape, even though no macroscopic cross-section data are available from the tape. In that case, the final record would contain all zeros. It should be noted that the fixed length of the final record limits the number of macroscopic material data blocks and/or the number of microscopic constituents. After the final record, a single end-of-file is written to indicate the end of all data.

These programs were written in the FORTRAN-II system of automatic coding and assembled on the IBM-7090. Binary tapes, such as the Reactor Nuclear Data Tape, compiled and written in FORTRAN language should generally be used only in conjunction with other programs written in the same system, because of the tape structure in terms of 128 or less words per physical record.

[†]Unless specifically stated, all references to tape record imply logical rather than physical tape records.

Fig. 1.1 - Reactor Nuclear Data Tape Format

RNDT Name		1 Word
Date of Tape Manufacture		2 Words
Number of Epithermal Levels		1 Word
Index Information for Data Block 1	Identification	2 Words
	Code Number	1 Word
	Record Number of First Record in Data Block	1 Word
⋮		
Index Information for Data Block 499	Identification	2 Words
	Code Number	1 Word
	Record Number of First Record in Data Block	1 Word
End of Record		

Fig. 1.2 - Reactor Nuclear Data Tape Index Record

NOTE: Index information for nonexistent data blocks will contain zeros.

Record Number	1 Word
Energy (E) Level Structure	42 Words Maximum (Includes the thermal levels)
Lethargy (U) Level Structure	42 Words Maximum (Includes the thermal levels)
Energy (E) Group Structure	33 Words Maximum
Lethargy (U) Group Structure	33 Words Maximum
1/v Factors	32 Words Maximum
End of Record	

Fig. 1.3 - Reactor Nuclear Data Tape Second Record

NOTE: Group m extends from E_{m-1} and U_{m-1} on the high-energy end to E_m and U_m on the low-energy end.

Date	

Data-Block Code Number	

Material Cross Sections	Record 1

Material Density Factor	

Thermal Transfer Matrices	

Index Information for Records 2, 3, 4, 5	
End of Record	
$\sigma_{s0}(m/m')$ or $\Sigma_{s0}(m/m')$ Matrix	Record 2 (optional)
End of Record	
$\sigma_{s1}(m/m')$ or $\Sigma_{s1}(m/m')$ Matrix	Record 3 (optional)
End of Record	
Resonance Data	Record 4 (optional)
End of Record	
$\sigma_{n,\gamma}(m/m')$ or $\Sigma_{n,\gamma}(m/m')$ Matrix	Record 5 (optional)
End of Record	

Fig. 1.4 - Reactor Nuclear Data Tape Material Data Block

Record Number	1 Word
Date	2 Words
Code Number	1 Word
σ_s or Σ_s	42 Words Maximum
$\xi\sigma_s$ or $\xi\Sigma_s$	42 Words Maximum
σ_{tr} or Σ_{tr}	42 Words Maximum
σ_a or Σ_a	42 Words Maximum
$\xi_1\sigma_{s1}$ or $\xi_1\Sigma_{s1}$	42 Words Maximum
$\nu\sigma_f$ or $\nu\Sigma_f$	42 Words Maximum
Density Factor (A/N_0 or ρ)	1 Word
$\sigma(k/k')$ or $\Sigma(k/k')$ $k = 1,6$ $k' = 1,5$	300 Words Maximum
MO_{MIN} MO_{MAX} $M'O_{MAX}$	3 Words
ML_{MIN} ML_{MAX} $M'l_{MAX}$	3 Words
Number of Resonances (NRES)	1 Word
$M\Gamma_{MIN}$ $M\Gamma_{MAX}$ $M'\Gamma_{MAX}$	3 Words
Total Number of Words in Data Block Following First Record	1 Word
End of Record	

Fig. 1.5 - Material Data Block Record 1

NOTE: A value of zero for MO_{MIN} , ML_{MIN} , NRES, or $M\Gamma_{MIN}$ indicates that records 2, 3, 4, or 5 respectively do not exist on the tape.

Record Number	1 Word
$\sigma_{so}(m/m')$ or $\Sigma_{so}(m/m')$	
$m = MO_{MIN}, MO_{MAX}$	925 Words Maximum
$m' = MO_{MIN}, M'O_{MAX}$	
End of Record	

Fig. 1.6 - Material Data Block Record 2

Record Number	1 Word
$\sigma_{s1}(m/m')$ or $\Sigma_{s1}(m/m')$	
$m = Ml_{MIN}, Ml_{MAX}$	925 Words Maximum
$m' = Ml_{MIN}, M'l_{MAX}$	
End of Record	

Fig. 1.7 - Material Data Block Record 3

Record Number	1 Word
Resonance Energy E_0	200 Words Maximum
Resonance Integral I_0	200 Words Maximum
Peak Cross Section σ_0	200 Words Maximum
Doppler Temperature Coefficient R	200 Words Maximum
$\eta = \frac{\nu \Gamma_f}{\Gamma_\gamma + \Gamma_f}$	200 Words Maximum
End of Record	

Fig. 1.8 - Material Data Block Record 4

Record Number	1 Word
$\sigma_{n,\gamma}(m/m')$ or $\Sigma_{n,\gamma}(m/m')$ $m = M\Gamma_{MIN}, M\Gamma_{MAX}$ $m' = M\Gamma_{MIN}, M'\Gamma_{MAX}$	925 Words Maximum
End of Record	

Fig. 1.9 - Material Data Block Record 5

Record Number	1 Word
Date	2 Words
Data-Block Code Number	1 Word
Source Spectrum S	42 Words Maximum
Delay Fraction β	1 Word
Mean Life t_m	1 Word
End of Record	

Fig. 1.10 - Reactor Nuclear Data Tape
Spectral Data Block

Fig. 1.11 - Reactor Nuclear Data
Tape Final Record

2.0 REACTOR NUCLEAR DATA PREPARATION PROGRAM

2.1 General Information

Program RNDP has two main functions which are the initial compilation of a nuclear data tape from decimal card data, and the revision of an existing data tape by the addition, deletion, or relocation of complete data blocks. In addition, the program has a restart capability for confining an initial compilation or revision of a tape if it is interrupted by a DIP[†]-type data error while processing the decimal data. Such a feature is a necessity when large quantities of decimal data are to be processed. Printing and punching is automatic for some records; for others it will occur if code numbers are specified.

For both tape revision and initial compilation of a tape, an attempt is made to manufacture two new tapes, denoted by the mnemonics MTAPE and NTAPE. In case one of these fails to process, the compilation of the other will continue. If both fail, the program is stopped.

All card input to program RNDP, except the column binary cards punched by subroutine DIPERR^{††} for restart purposes, is read in by subroutine DIP; hence, the input format must conform to DIP conventions.

2.1.1 Initial Tape Manufacture

The input requirements and equations needed for the initial compilation of a tape are given in the next section. A new tape must be manufactured whenever any changes not indicated in section 2.1.2 are made.

2.1.2 Revision of an Existing Tape

An existing data tape can be revised by program RNDP in any of the three ways indicated above. In all such cases, the level structure of added data blocks must conform to that of the existing tape. The equations in section 2.3 are still applicable for calculations involving the index record and data blocks.

In tape revision, the index record is first corrected to reflect any additions, deletions, or relocations. Once this record is updated, it serves as a guide for the remaining tape structure. It is possible to modify a data block (so long as the level structure is not changed) without changing its code number or designation code by simultaneous deletion and addition. Its code number must be included in the NBDEL list and the revised data block must be supplied as card data. The final record is the last to be updated. The constituent tables are constructed on the basis of the final tape structure as indicated by the updated index record.

[†]DIP is a flexible format, decimal input, FORTRAN library routine. For convenience, the subroutine writeup is included as Appendix B.

^{††}Individual program subroutines are discussed in greater detail in section 2.4.

In addition to both MTAPE and NTAPE, tape revision requires an existing tape (ITAPE). If relocation of data blocks is requested, an intermediate tape (KTAPE) is needed for the temporary storage of these blocks.

2.1.3 Restart after a DIP Error

If a DIP error is encountered in the input-specified index record data or in the data for the second record, no attempt is made to preserve the machine setup and memory status. However, if a DIP error occurs while reading-in data-block information, a transfer is made to subroutine DIPERR to punch out all the information in core which is needed to continue the compilation of the tape on a subsequent run. This punched card output is labeled "RERUN", and on the next attempt, should be inserted in place of all the data preceding the first record of the data block in which the error occurred. At the time of an interruption due to such an error, an on-line comment is printed, requesting the machine operator to save all tapes which are being used in the compilation; that is, MTAPE and NTAPE, ITAPE in case of tape revision, and KTAPE in case of relocation.

2.1.4 Printing and Punching

The following rules govern printing:

- (1) The index record and final record are printed each time a tape is made, whether an initial compilation or a revision.
- (2) All data blocks added to the tape are printed, whether specified or not.
- (3) The second record and all other data blocks are printed if their code number is given in the PCODE list. (The code number for the second record is 2×10^{-6} .)

Thus, in the case of an initial compilation, all records are printed automatically except the second; for tape revision, the only records printed automatically are the index record, final record, and added data blocks.

If either MTAPE or NTAPE (or both) fails to process, a suitable comment is printed. Additionally, in the case of a DIP-type error in a data block, its code number is printed. Mention is also made of the deletion or modification of any constituents of macroscopic data blocks.

The following rules govern punching:

- (1) Except for two decimal cards punched in DIPERR for a rerun case, all punching is in absolute-column binary-card format.
- (2) The index record is always punched, followed by a transfer card.
- (3) The second record, all data blocks, and the final record are punched if their code numbers are given in the PUNCOD list (2×10^{-6} for second record, 0 for final record). The second and final record, if punched, are followed by a transfer card. Each complete data block is followed by a one transfer card, regardless of how many records it contains.

- (4) All punched data, except for the two decimal cards for a re-run, are acceptable to subroutine ACBIP. All punched data, except rerun data, are also acceptable to program RNDC.

2.2 Data Requirements

2.2.1 Index Record

Tape Name	- supplied as input
Date of Manufacture	- supplied as input
Number of Levels	- supplied as input
Index Groups	
a - 2-Word Identification	- supplied as input with cross-section or spectral data block
b - Data-Block Code Number	- supplied as input with cross-section or spectral data block
c - Physical Record Number or First Record in Data Block	- calculated from block number (NB) supplied as input with cross-section or spectral data block. See Eq. (2.1).

2.2.2 Record 2

Record Number	- always equal to 2
EL_1	- supplied as input
UL_1	- supplied as input
EG_m	- supplied as input
UG_m	- supplied as input
FV_m	- supplied as input

2.2.3 Location of Data Blocks on Tape

The position of each Data Block will be determined by the block number (NB) which is supplied as input.

2.2.4 Cross-Section Data Blocks

Record 1

The logic for calculating σ_s , σ_a , $v\sigma_f$, $\xi\sigma_s$, $\xi_1\sigma_{s1}$, σ_{tr} , and DF appears in Figures 2.1, 2.2, and 2.3. In general, provision has been made for internally generating as much of the data as possible. Thus, for example, ξ , the average logarithmic energy decrement is required as input only where the total scattering is not simply isotropic elastic scattering.

Record Number (NIR)	- calculated with Eq. (2.1) with j = block number (NB)
---------------------	--

Date of Block Entry	- supplied as input
$BCODE_j$	- supplied as input with index record
σ_{si} or Σ_{si} (see Fig. 2.1)	- a - supplied as input b - calculated with Eq. (2.6)
$(\xi\sigma_s)_i$ or $(\xi\Sigma_s)_i$ (see Fig. 2.2)	- a - supplied as input b - calculated with Eq. (2.7) c - calculated with Eqs. (2.7) and (2.8)
σ_{tri} or Σ_{tri} (see Fig. 2.2)	- a - supplied as input b - calculated with Eq. (2.9) c - calculated with Eqs. (2.9) and (2.10)
σ_{ai} or Σ_{ai} (see Fig. 2.1)	- a - supplied as input b - calculated with Eq. (2.11) c - calculated with Eq. (2.12) d - calculated with Eq. (2.13) e - calculated with Eqs. (2.13) and (2.14)
$(\xi_1\sigma_{s1})_i$ or $(\xi_1\Sigma_{s1})_i$ (see Fig. 2.2)	- a - supplied as input b - calculated with Eq. (2.15) c - calculated with Eqs. (2.15) and (2.16) d - calculated with Eqs. (2.15) and (2.17) e - calculated with Eqs. (2.15), (2.16), and (2.17)
$(v\sigma_f)_i$ or $(v\Sigma_f)_i$ (see Fig. 2.1)	- a - supplied as input b - calculated with Eq. (2.18) c - calculated with Eqs. (2.18) and (2.19)
$DF(A/N_o$ or $\rho)$ (see Fig. 2.3)	- a - calculated with Eq. (2.20) b - calculated with Eq. (2.21)
$\sigma_s(k k')$ or $\Sigma_s(k k')$	- supplied as input
$MO_{MIN}(M'O_{MIN})$	- supplied as input
MO_{MAX}	- supplied as input
$M'O_{MAX}$	- supplied as input
MI_{MIN}	- supplied as input
MI_{MAX}	- supplied as input
$M'l_{MAX}$	- supplied as input
NRES	- supplied as input
$MT_{MIN}(M'\Gamma_{MIN})$	- supplied as input
MT_{MAX}	- supplied as input
$M'\Gamma_{MAX}$	- supplied as input
NW	- calculated with Eq. (2.22)

Record 2

Record Number (N2R)	- calculated with Eq. (2.2) with j = NB
$\sigma_{SO}(m/m')$ or $\Sigma_{SO}(m/m')$	- supplied as input

Record 3

Record Number (N3R)	- calculated with Eq. (2.3) with j = NB
$\sigma_{s_1}(m/m')$ or $\Sigma_{s_1}(m/m')$	- supplied as input

Record 4

Record Number (N4R)	- calculated with Eq. (2.4) with j = NB
E_{ol}	- supplied as input
I_{ol}	- a - supplied as input b - calculated with Eqs. (2.23), (2.24), (2.25), and (2.26)
σ_{ol}	- a - supplied as input b - calculated with Eq. (2.27)
R_l	- a - supplied as input b - calculated with Eq. (2.28)
η_l	- a - supplied as input b - calculated with Eq. (2.29)

Record 5

Record Number (NSR)	- calculated with Eq. (2.5) with j = NB
$\sigma_{n,\gamma}$ (m/m')	- supplied as input

2.2.5 Spectral Data Blocks

Record Number (NLR)	- calculated with Eq. (2.1) with j = block number (NB)
Date of Block Entry	- supplied as input
S_1	- supplied as input
β	- supplied as input
t_m	- supplied as input

2.2.6 Final Record

Record Number (NLR)	- calculated with Eq. (2.1) with j = J + 1
Code Number of Macroscopic Block D	- supplied as input

Number of Microscopic Constituents - supplied as input
 Weight Fraction of Constituent - supplied as input

2.3 Equations

The following equations are used in the calculation of cross-section data, as indicated in section 1.2.

$$NLR = NLR_{j-1} + 5 - (\delta_{MO_{MIN},0} + \delta_{ML_{MIN},0} + \delta_{NRES,0} + \delta_{M_{MIN},0})_{j-1} \quad (2.1)$$

($NLR_0 = 2$)

$$N2R_j = NLR_j + 1 \quad (2.2)$$

$$N3R_j = NLR_j + 2 - (\delta_{MO_{MIN},0})_j \quad (2.3)$$

$$N4R_j = NLR_j + 3 - (\delta_{MO_{MIN},0} + \delta_{ML_{MIN},0})_j \quad (2.4)$$

$$N5R_j = NLR_j + 4 - (\delta_{MO_{MIN},0} + \delta_{ML_{MIN},0} + \delta_{NRES,0})_j \quad (2.5)$$

$$\sigma_{s1} = \sigma_{t1} - \sigma_{a1} \quad (2.6)$$

$$(\xi\sigma_s)_1 = \xi_1 \times \sigma_{s1} \quad (2.7)$$

$$\xi_1 = 1 + \frac{(A/AN - 1)^2}{2(A/AN)} \ln [(A/AN - 1)/(A/AN + 1)] \quad (2.8)$$

$$\sigma_{tr1} = B_1 \times \sigma_{s1} \quad (2.9)$$

$$B_1 = 1 - 2/3(A/AN) \quad (2.10)$$

$$\sigma_{a1} = \sigma_{t1} - \sigma_{s1} \quad (2.11)$$

$$\sigma_{a1} = FV_1 \times \sigma_{a(2200m/s)} \quad (2.12)$$

$$\sigma_{a1} = (\nu\sigma_f)_1 / \eta_1 \quad (2.13)$$

$$\eta_1 = A_2 + (B_2 + C_2 \times (EL_1)^{D_2}) \ln EL_1 \quad (2.14)$$

$$(\xi_1 \sigma_{s1})_1 = \xi_{11} \times \sigma_{s11} \quad (2.15)$$

$$\sigma_{sl1} = \sigma_{s1} - \sigma_{tr1} \quad (2.16)$$

$$\xi_{11} = \frac{5}{3} - (A/AN)^2 + \frac{(A/AN + 2)(A/AN - 1)^2}{2} \times \ln [(A/AN + 1)/(A/AN - 1)]^2 \quad (2.17)$$

$$(\nu\sigma_f)_1 = \nu_1 \times \sigma_{f1} \quad (2.18)$$

$$\nu_1 = A_1 + B_1 E + C_1 E^{D_1} \quad (2.19)$$

$$DF_j = \rho_j \quad (2.20)$$

$$DF_j = A_j/N_0 \quad (2.21)$$

$$\begin{aligned} NW_j = & [(MO_{MAX} - MO_{MIN} + 1) \times (M'O_{MAX} - M'O_{MIN} + 1)]_j \\ & + [(ML_{MAX} - ML_{MIN} + 1) \times (M'L_{MAX} - M'L_{MIN} + 1)]_j \\ & + [5 \times NRES]_j + [(MT_{MAX} - MT_{MIN} + 1) \times (M'\Gamma_{MAX} - M'\Gamma_{MIN} + 1)]_j \\ & + [2 \times (4 - \delta_{MO_{MIN},0} - \delta_{ML_{MIN},0} - \delta_{NRES,0} - \delta_{MT_{MIN},0})] \end{aligned} \quad (2.22)$$

$$I_0 = \frac{Q^2 2\pi^2 \lambda_0^2 g}{E_0} (\Gamma_\gamma + \Gamma_f) \Gamma_n \quad (2.23)$$

$$Q = (A + AN)/A \quad (2.24)$$

$$\lambda_0 = 4.5517359 \times 10^{-10} / \sqrt{E_0} \quad (2.25)$$

$$\Gamma = \Gamma_n + \Gamma_\gamma + \Gamma_f \quad (2.26)$$

$$\sigma_0 = \frac{2E_0 I_0}{\pi\Gamma} \quad (2.27)$$

$$R = \frac{4 \cdot AN \cdot Q \cdot E_0 \cdot k}{A\Gamma^2} \quad (2.28)$$

$$\eta = \frac{\nu \Gamma_f}{\Gamma_\gamma + \Gamma_f} \quad \text{NOTE: Use Eq. (2.19) to evaluate } \nu. \quad (2.29)$$

FIGURE 2.1

LOGIC FOR CALCULATION OF σ_{B1} , σ_{A1} , $(v\sigma_f)_1$ [or Σ_{B1} , Σ_{A1} , $(v\Sigma_f)_1$]

FIGURE 2.2

LOGIC FOR CALCULATION OF $(\xi\sigma_B)_1$, σ_{TR1} , $(\xi_1\sigma_{s1})_1$ [or $(\xi\sigma_B)_1$, σ_{TR1} , $(\xi_1\sigma_{s1})_1$]

FIGURE 2.3

LOGIC FOR CALCULATION OF DENSITY FACTOR (DF)

2.4 Subroutine Descriptions

2.4.1 Control Routine

This routine directs the overall flow of the program beginning with the initialization subroutine INIT. For a rerun case, control is passed to subroutine TRYØVR to restore machine setup and status as it existed at the time of the DIP error interruption, followed by a transfer to the subsidiary control routine DATACT. In a normal case, control is passed to subroutine INDXNT to compile the index record for a new tape or to INDXRV to update this record from the old tape. This is followed by a transfer to NMTPRC to write this record on the new tapes, to WRINDX for printing output, to REC2 for compiling or copying the second record, and then to DATACT. From DATACT, control is to FINREC for compiling or updating the final record.

2.4.2 Subroutine ERØR(N)

This subroutine contains all the anticipated error stops in program RNDP. The error type is indicated by the argument N and is readily obtained from the program listing. A list of the absolute locations of these stops is given in a later section of the report.

ERØR is used by the following subroutines: TAPECK, INIT, INDXRV, REC2, NMTPRC, KTAPRC, and DIPERR.

2.4.3 Subroutine TAPECK (LØC, NWØRD, NØTAPE)

TAPECK is used for reading a single record of NWØRD words from tape NØTAPE into storage beginning at location LØC. If the tape cannot be read, sense light 2 is turned on in subroutine (TSB), and the condition is diagnosed by the interrogation of this sense light upon return.

TAPECK is used by INDXRV, REC2, DATACT, KTAPRC, TRNSDB, and FINREC.

2.4.4 Subroutine INIT

INIT has four functions: (1) It assigns values to those program parameters which, although they cannot be regarded as absolute constants, are expected to be changed too infrequently to warrant inclusion as input. Included are tape assignments, thermal levels, and control parameters related to dimension specifications. (2) It reads in the first record of data. (3) Table sizes are calculated on the basis of preassigned parameters and input data. Included in this category are the calculation of the number of words for the second record and the number of words in the first record of a material data block. (4) The input is checked to see if any dimensions are exceeded or if there is an inconsistency between the input and the format of the existing tape.

INIT is reached only from the control routine.

2.4.5 Subroutine INDXNT

INDXNT is reached only from the control routine and then only if NEWTAP = 1. It compiles the index record on the basis of the information given in the first record of card input.

2.4.6 Subroutine INDXRV

This subroutine revises the index record to reflect any deletions, additions, or relocations indicated in the first record of card input. It is instructive to consider an example at this point. Suppose that the existing tape contains the seven data blocks A, B, C, D, E, F, G and the revised tape is to contain the nine data blocks A, H, G, I, D, J, F, K, B in the indicated order. The tape formats are then as follows:

<u>Existing Tape</u>	<u>Revised Tape</u>
Index Record	Index Record
Record 2	Record 2
Data Block A	Data Block A
Data Block B	Data Block H
Data Block C	Data Block G
Data Block D	Data Block I
Data Block E	Data Block D
Data Block F	Data Block J
Data Block G	Data Block F
Final Record	Data Block K
	Data Block B
	Final Record

The required revision may be effected as follows:

- (1) Delete blocks C and E to give the data-block sequence ABDFG.
- (2) Add block H at position 2 to yield the sequence AHBD FG.
 Add block I at position 3 to yield the sequence AHIBDFG.
 Add block J at position 6 to yield the sequence AHIBDJFG.
 Add block K at position 8 to yield the sequence AHIBDJFKG.
- (3) Relocate block G to position 3 to give the sequence AHGIBDJFK.
 Relocate block B to position 9 to give the sequence AHGIDJFKB.

The important point to remember is that the sequence of operations when revising the index record is always deletion, addition, and relocation. Additions are made on the basis of the index record structure after all deletions have been made; relocations are made on the basis of the structure after both deletions and additions have occurred.

The exact sequence of operation within INDXRV is as follows:

- (1) The index record is read from the old tape into array NBL.
- (2) A check is made for the attempted deletion of a non-existent data block--also for the attempted deletion and relocation of the same data block. If either of these inconsistencies is present, a transfer is made to ERROR.
- (3) Blocks to be relocated, if any, are placed on the intermediate (K) tape in the same sequence in which they appear on the old tape. A list is concurrently compiled in array NRRDB of the physical-record number on this tape of the initial record of such data blocks. The corresponding code numbers are stored in array RL/CRC. These lists will be used in the subsidiary control routine DATACT for tape positioning.
- (4) The index record, as it appeared on the old tape, is transferred to array NB2 if either deletion or addition is to occur.
- (5) Deletion is effected by simply failing to copy the index-record information for the deleted blocks into the new index record. The record numbers of subsequent data blocks are updated to reflect this change, the resultant index record being stored in array NBL.
- (6) If deletion has occurred, the index record is transferred from array NBL to NB2. Addition is effected by inserting the data-block information at the appropriate position with an updating of subsequent record numbers.
- (7) Relocation occurs in four steps:
 - (a) For each data block, the record number is replaced by the actual number of records in that data block.
 - (b) The information for data blocks to be relocated is placed in the lower region of array NB6, and for data blocks which are not to be relocated into the upper region of NB6, the order in both cases being as they occurred on the index record after deletions and additions.
 - (c) The index data for those blocks to be relocated are inserted at the appropriate position among those not to be relocated.
 - (d) The record numbers are calculated.

INDXRV is reached only from the control routine.

2.4.7 Subroutine REC2

If NEWTAP = 0, the second record is simply copied from the existing tape. If NEWTAP = 1, it is compiled from the second record of input data. In the former case, the energy levels and $1/v$ factors are copied into blocks EL and FV for future use.

This subroutine is reached only from the control routine.

2.4.8 Subroutine DATACT

DATACT is a secondary-level control routine which directs the flow of data blocks from both the existing and intermediate tapes and card input to the new tapes. A copy of the index record (in array NBS) is examined to ascertain the medium from which each data block can be obtained, that is, ITAPE, KTAPE, or card input. The following sequence of operations is applied to each data block represented in the index record:

- (1) If NEWTAP = 0, the block is immediately read in as card input; otherwise, the data block will be read in as card input if its code number is contained in the list of blocks added. This is done by means of subroutine INPTDB.
- (2) If the data block is not added as input, the list of relocated blocks is scanned to see if it is on the intermediate tape. If so, this tape is positioned by means of the information in arrays NRRDB and RI/CRC and the data block transferred to the new tape by means of TRNSDB.
- (3) If the data block is neither one being added nor one being relocated, it must be present on the old tape. Succeeding data blocks are thus checked on this tape until the one in question is found. It is then transferred to the new tape by means of TRNSDB.

DATACT is reached only from the control routine.

2.4.9 Subroutine INPTDB

This subroutine processes each new data block, receiving control only from DATACT. Its functions are as follows:

- (1) Check to see if this is a spectral or material data block. If it is a spectral block, the spectral data is read in and the record set up, written on the new tapes, and printed. Punching will be done if requested.
- (2) For a material data block, the data is read in and processed according to the special flow charts (Figs. 2.1, 2.2, 2.3). The remainder of the first record for the data block is compiled from information in storage, using subroutine DIMEN to calculate table sizes. This record is then written on the new tapes and printed and is punched if desired.
- (3) The SIGSO and SIGSI records, if present, are read in, written on the new tapes, printed, and punched if requested.
- (4) The resonance record, if present, is read in, tables completed and the record written on the new tapes, printed, and punched if requested.
- (5) The SIGNG record is processed as were the SIGSO and SIGSI records.

2.4.10 Subroutine NMTPRC (NW)

This subroutine controls the writing of a record of length NW words on the new tapes, MTAPE and NTAPE. In case either tape should fail, its mnemonic is set to zero and a comment to this effect printed. Thus, the mnemonics MTAPE and NTAPE are used both as tape designations

and as code words. If only one tape fails, the other continues to be written; if both fail, control is transferred to ERØR after a printed comment.

NMTPRC is used by the control routine as well as the subroutines NMTPRC, INPTDB, TRNSDB, and FINREC.

2.4.11 Subroutine KTAPRC (NW)

KTAPRC transfers a record of NW words from the existing tape to the intermediate tape using array NB2 for temporary storage. It is used only in the subroutine INDXRV.

2.4.12 Subroutine DIMEN (LØC)

This routine calculates the number of words in the SIGSO, SIGS1, resonance, and SIGNG records, denoting these by N1, N2, N3, N4. The indices are stored sequentially in array MATDIM. LØC is the location of these indices when calling the routine.

DIMEN is used by INDXRV, DATACT, INPTDB, and TRNSDB.

2.4.13 Subroutine TRNSDB (ITAPI)

TRNSDB is used to transfer a complete data block from ITAPI (either ITAPE or KTAPE) to the new tapes and will initiate the printing and/or punching of the data block if requested. This routine is used only by the routine DATACT.

2.4.14 Subroutine WRINDX

WRINDX is used to print and punch the index record and transfer the index record from array NBL to NB6 for future reference. It is entered only from the control routine.

2.4.15 Subroutine WRSECR

WRSECR prints the second record if the code number 0.000002 is listed in the PCØDE table and punches this record if the PUNCØD table contains the same number. WRSECR is reached only through subroutine REC2.

2.4.16 Subroutine WRSPDB (NG)

This subroutine is used to print and punch a spectral data block. When WRSPDB is entered from INPTDB, the argument NG is set to 1 so that printing is automatic. If NG = 0, as when entered from TRNSDB, a check is made for the presence of the code number in the PCØDE list. In either case, a check is made of the PUNCØD list for punching. No other subroutines use WRSPDB.

2.4.17 Subroutine WRRECl (NG, PTCØDE, PNCØDE)

WRRECl is used to print the first record of a material data block. NG is used in exactly the same fashion as in WRSPDB. PTCØDE is

set to 1 if this data block is printed and to 0 if not--similarly for PNCODE with regard to punching. These two code words will be used in WRREC2, WRREC3, WRREC4, WRREC5 (denoted by II3 and II4) to avoid another check for printing and punching.

This routine is used in INPTDB and TRNSDB.

2.4.18 Subroutine WRREC2 (II3,II4)

WRREC2 prints the SIGSO record of a material data block if II3 = 1, using subroutine RC235. This record is punched if II4 = 1. WRREC2 is called by INPTDB and TRNSDB.

2.4.19 Subroutine WRREC3 (II3,II4)

WRREC3 prints the SIGS1 record of a material data block if II3 = 1, using subroutine RC235. This record is punched if II4 = 1. WRREC3 is called by INPTDB and TRNSDB.

2.4.20 Subroutine WRREC4 (II3,II4)

WRREC4 prints the resonance record of a material data block if II3 = 1 and punches if II4 = 1. This subroutine is called by INPTDB and TRNSDB.

2.4.21 Subroutine WRREC5 (II3,II4)

WRREC5 prints the SIGNG record of a material data block if II3 = 1, using subroutine RC235. This record is punched if II4 = 1. WRREC5 is called by INPTDB and TRNSDB.

2.4.22 Subroutine RC235 (M1,M2,NW,NG)

RC235 is used by subroutines WRREC2, WRREC3, and WRREC5 to set up the output format and perform the printing. The formats are identical for each of the three routines, only the page headings being different. The arguments have the following meanings, indicated in order, for these three routines: (1) M1 = M₀MIN, M₁MIN, M₁MIN, (2) N2 = M₀MAX, M₁MAX, M₁MAX, (3) NW = N1, N2, N4, (4) NG = 0, 1, 2. The quantities N1, N2, and N4 are the number of words in the SIGSO, SIGS1, and SIGNG records as calculated in DIMEN.

2.4.23 Subroutine FINREC

FINREC compiles the final record, assigning a record number and initializing the remainder of the record to zero in the case of a new tape. For a revised tape, this subroutine reads in the final record from the old tape, corrects the record number, and updates the record information to reflect any deletions or relocations of macroscopic blocks. If there are no macroscopic data blocks on the revised tape, a comment is printed to that effect; otherwise, for each macroscopic block, the constituents are listed together with their weight fractions. Also, if the constituent of any macroscopic block has been deleted, a comment to this effect is printed. This record is then punched if

requested, an end of file written, all tapes rewound, and a return is executed to the control routine.

It should be noted that if a macroscopic constituent is not present on the revised tape, the designation code is not available.

2.4.24 Subroutine DIPERR

If a DIP-type error is encountered in a given record of data-block input, a provision has been made to permit continuing the compilation of the new data tapes in a subsequent restart case. This is accomplished by means of DIPERR which punches on binary cards the necessary restart information and prints on-line the comment to save all tapes involved in the present run. Tape compilation can then be continued in a subsequent run by remounting the same tapes. The punched cards labeled "rerun", replace all the decimal-card data preceding the input for the data block in which the DIP error occurred.

This routine is entered only from INPTDB, and its only exit is to ERROR.

2.4.25 Subroutine TRYVR

This subroutine is a companion to DIPERR in the sense that, while DIPERR is used to preserve all necessary data for rerunning a case in which compilation was interrupted by a DIP error within a data block, TRYVR is used to read in this data and reposition all tapes to their setting when interrupted. Subroutine TRYVR is entered from the control routine.

2.5 Program Flow Charts

The program flow charts are Figs. 2.4, 2.5, and 2.6. They are shown on pages 32, 33, and 34.

2.6 Program Diagnostics

<u>External Formula Number[†]</u>	<u>Error</u>
2022	DIP error in first record of input data
2023	DIP error in data for record 2
2024	DIP error in data for spectral-data block
2025	DIP error in data for record 1 of a material-data block
2026	DIP error in σ_{80} record of a material-data block
2027	DIP error in σ_{81} record of a material-data block

[†]When an error occurs, a printed comment giving the external (source program) formula number of the statement at which the library subroutine ERROR was entered.

FIG. 2 4 - FLOW CHART OF CONTROL ROUTINE

FIG. 2.5 - FLOW CHART OF DATACT CONTROL ROUTINE

FIG. 2.6 - FLOW CHART OF INPTDB SUBROUTINE

<u>External Formula Number</u>	<u>Error</u>
2028	DIP error in resonance record of a material data block
2029	DIP error in σ_n, γ record of a material data block
2030	ITAPE could not be read
2031	KTAPE could not be read
2032	Both MTAPE and NTAPE failed to compile
2033	KTAPE failed to compile
2034	Dimensions in MOMIN table are too large
2035	Too many levels
2036	Attempt made to delete non-existent data block
2037	Attempt made to relocate deleted data block
2038	Attempt made to relocate non-existent data block

2.7 Program Input Forms

This section contains the program input forms. They are shown on the following pages.

REACTOR NUCLEAR DATA PROGRAM

Index Data

5NAMTAP, 3,		/	/
	NAME OF TAPE (Must use 6 characters)	MONTH (2 characters)	DAY (2 characters)
			YEAR (2 characters)

4NLEV,	
	Number of Epithermal Levels

4NEWTAP,		, NBA,		, NBD,	
	0 → Revising old tape 1 → Making new tape		Number Data Blocks to be added		Number Data Blocks to be deleted

3NBDEL,		,		,		,		,	
	Code numbers of Data Blocks to be deleted. (Enter only if NBD > 0)								

4NPSN,	
	Number Blocks to be Relocated

Use This Page Only If NBA > 0 Or NPSN > 0

Index Data

(Enter blocks to be added followed by blocks to be relocated)

	Data Block Designation (12 characters)		Data Block Code No.		Data Block Position
5BNAM, 2,		3BCØDE,		4NBPSN,	
N ₁ *					
E28406, 2,		3BCØDE, 4=,		4NBPSN, 4=,	
N ₂					
E28402, 2,		3BCØDE, 8=,		4NBPSN, 8=,	
N ₃					
E28398, 2,		3BCØDE, 12=,		4NBPSN, 12=,	
N ₄					
E28394, 2,		3BCØDE, 16=,		4NBPSN, 16=,	
N ₅					
E28390, 2,		3BCØDE, 20=,		4NBPSN, 20=,	
N ₆					
E28386, 2,		3BCØDE, 24=,		4NBPSN, 24=,	
N ₇					
E28382, 2,		3BCØDE, 28=,		4NBPSN, 28=,	

*N_j = (Location of BNAM) - 4j

Use This Page Only If NBA > 0

39

Index Data

	Minimum M in $\sigma_{SO}(M/M')$	Maximum M in $\sigma_{SO}(M/M')$	Maximum M' in $\sigma_{SO}(M/M')$	Minimum M in $\sigma_{SL}(M/M')$	Maximum M in $\sigma_{SL}(M/M')$	Maximum M' in $\sigma_{SL}(M/M')$	Number of Resonances	Minimum M in $\sigma_{n,\gamma}(M/M')$	Maximum M in $\sigma_{n,\gamma}(M/M')$	Maximum M' in $\sigma_{n,\gamma}(M/M')$
4MOMIN,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 10=,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 20=,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 30=,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 40=,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 50=,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 60=,	,	,	,	,	,	,	,	,	,	,
4MOMIN, 70=,	,	,	,	,	,	,	,	,	,	,

RNDP

RNDP

4NØPRNT,		, NØPUN,	
	Number of blocks to be printed out.		Number of blocks to be punched out.

NOTE: The program will always print and punch the first record and print the final record.

Code Numbers of Blocks To Be Printed

3PCØDE	,		,		,		,		,
①	,		,		,		,		,
①	,		,		,		,		,
①	,		,		,		,		,

Code Numbers of Blocks To Be Punched

$$\left[\begin{array}{l} 2 \times 10^{-6} = \text{Record 2} \\ 0 = \text{Final Record} \end{array} \right]$$

3PUNCØD	,		,		,		,		,
①	,		,		,		,		,
①	,		,		,		,		,
①	,		,		,		,		,
= END,		0	,						

This Must Be Last Card of Index Data

Use This Page Only If NEWTAP = 1

Record 2 Input

Level Energies

	Level 1	2	3	4	5
3EL	,	,	,	,	,
	6	7	8	9	10
3EL, 5=	,	,	,	,	,
	11	12	13	14	15
3EL, 10=	,	,	,	,	,
	16	17	18	19	20
3EL, 15=	,	,	,	,	,
	21	22	23	24	25
3EL, 20=	,	,	,	,	,
	26	27	28	29	30
3EL, 25=	,	,	,	,	,
	31	32	33	34	
3EL, 30=	,	,	,	,	

RNDP

Use This Page Only If NEWTAP = 1

Record 2 Input

Level Lethargies

	Level 1	2	3	4	5
3UL	,	,	,	,	,
	6	7	8	9	10
3UL, 5=	,	,	,	,	,
	11	12	13	14	15
3UL, 10=	,	,	,	,	,
	16	17	18	19	20
3UL, 15=	,	,	,	,	,
	21	22	23	24	25
3UL, 20=	,	,	,	,	,
	26	27	28	29	30
3UL, 25=	,	,	,	,	,
	31	32	33	34	
3UL, 30=	,	,	,	,	

RNDP

Use This Page Only If NEWTAP = 1

Record 2 Input

Group Boundary Energies

	Upper 1	Lower 1	Lower 2	Lower 3	Lower 4
3EG	,	,	,	,	,
	5	6	7	8	9
3EG, 5=	,	,	,	,	,
	10	11	12	13	14
3EG, 10=	,	,	,	,	,
	15	16	17	18	19
3EG, 15=	,	,	,	,	,
	20	21	22	23	24
3EG, 20=	,	,	,	,	,

Group Boundary Lethargies

	Lower 1	Upper 1	Upper 2	Upper 3	Upper 4
3UG	,	,	,	,	,
	5	6	7	8	9
3UG, 5=	,	,	,	,	,
	10	11	12	13	14
3UG, 10=	,	,	,	,	,
	15	16	17	18	19
3UG, 15=	,	,	,	,	,
	20	21	22	23	24
3UG, 20=	,	,	,	,	,

RNDP

Use This Page Only If NEWTAP = 1

Record 2 Input

Group 1/v Factors

(= 1.0 at 2200m/sec)

	Group 1	2	3	4	5
3FV	,	,	,	,	,

	6	7	8	9	10
3FV, 5=	,	,	,	,	,

	11	12	13	14	15
3FV, 10=	,	,	,	,	,

	16	17	18	19	20
3FV, 15=	,	,	,	,	,

	21	22	23	24
3FV, 20=	,	,	,	,

= END,	0	,
--------	---	---

RNDP

Cross-Section Data-Block Input

5BDATE,2,	/	/
	Month (2 char.)	Day (2 char.) Year (2 char.)

Atomic Weight	
3AW,	,

Density (gm/cm ³)	
3DEN,	,

σ_A (2200 m/sec)	
3A2200,	,

4NDATA,	,
= 0 → Perform calculations to complete data	
= 1 → Use data entered only	

Cross Section Input

Coefficients For Calculating ν

$$\nu_i = A1 + B1EL_i + C1EL_i^{D1}$$

3A1,		, B1,		, C1,		, D1,	
------	--	-------	--	-------	--	-------	--

Coefficients For Calculating η

$$\eta = A2 + (B2 + C2EL_i^{D2}) \ln EL_i$$

3A2,		, B2,		, C2,		, D2,	
------	--	-------	--	-------	--	-------	--

RNDP

Cross Section Input

σ_{s_1}

	Level 1	2	3	4	5
3S	,	,	,	,	,
	6	7	8	9	10
3S, 5=	,	,	,	,	,
	11	12	13	14	15
3S, 10=	,	,	,	,	,
	16	17	18	19	20
3S, 15=	,	,	,	,	,
	21	22	23	24	25
3S, 20=	,	,	,	,	,
	26	27	28	29	30
3S, 25=	,	,	,	,	,
	31	32	33	34	
3S, 30=	,	,	,	,	

RNDP

Cross Section Input

$\epsilon \sigma_{s_i}$

Level 1	2	3	4	5
3XIS	,	,	,	,
6	7	8	9	10
3XIS, 5=	,	,	,	,
11	12	13	14	15
3XIS, 10=	,	,	,	,
16	17	18	19	20
3XIS, 15=	,	,	,	,
21	22	23	24	25
3XIS, 20=	,	,	,	,
26	27	28	29	30
3XIS, 25=	,	,	,	,
31	32	33	34	
3XIS, 30=	,	,	,	,

RNDP

Cross Section Input

σ_{TR_1}

Level 1	2	3	4	5
3TR, ,	,	,	,	,
6	7	8	9	10
3TR, 5=	,	,	,	,
11	12	13	14	15
3TR, 10=	,	,	,	,
16	17	18	19	20
3TR, 15=	,	,	,	,
21	22	23	24	25
3TR, 20=	,	,	,	,
26	27	28	29	30
3TR, 25=	,	,	,	,
31	32	33	34	
3TR, 30=	,	,	,	,

RNDP

Cross Section Input

σ_{A_1}

	Level 1	2	3	4	5
3A	,	,	,	,	,
	6	7	8	9	10
3A, 5=	,	,	,	,	,
	11	12	13	14	15
3A, 10=	,	,	,	,	,
	16	17	18	19	20
3A, 15=	,	,	,	,	,
	21	22	23	24	25
3A, 20=	,	,	,	,	,
	26	27	28	29	30
3A, 25=	,	,	,	,	,
	31	32	33	34	
3A, 30=	,	,	,	,	

RNDP

Cross Section Input

$$(\epsilon_1 \sigma_{s1})_1$$

	Level 1	2	3	4	5
3XIS1	,	,	,	,	,
	6	7	8	9	10
3XIS1, 5=	,	,	,	,	,
	11	12	13	14	15
3XIS1, 10=	,	,	,	,	,
	16	17	18	19	20
3XIS1, 15=	,	,	,	,	,
	21	22	23	24	25
3XIS1, 20=	,	,	,	,	,
	26	27	28	29	30
3XIS1, 25=	,	,	,	,	,
	31	32	33	34	
3XIS1, 30=	,	,	,	,	

RNDP

Cross Section Input

$\nu\sigma_{F_1}$

	Level 1	2	3	4	5
3FNU	,	,	,	,	,
	6	7	8	9	10
3FNU, 5=	,	,	,	,	,
	11	12	13	14	15
3FNU, 10=	,	,	,	,	,
	16	17	18	19	20
3FNU, 15=	,	,	,	,	,
	21	22	23	24	25
3FNU, 20=	,	,	,	,	,
	26	27	28	29	30
3FNU, 25=	,	,	,	,	,
	31	32	33	34	
3FNU, 30=	,	,	,	,	,

RNDP

Cross Section Input

σ_{F_1}

	Level 1	2	3	4	5
3F	,	,	,	,	,
	6	7	8	9	10
3F, 5=	,	,	,	,	,
	11	12	13	14	15
3F, 10=	,	,	,	,	,
	16	17	18	19	20
3F, 15=	,	,	,	,	,
	21	22	23	24	25
3F, 20=	,	,	,	,	,
	26	27	28	29	30
3F, 25=	,	,	,	,	,
	31	32	33	34	
3F, 30=	,	,	,	,	

RNDP

Cross Section Input

$(\sigma_{sl})_1$

	Level 1	2	3	4	5
3S1	,	,	,	,	,
	6	7	8	9	10
3S1, 5=	,	,	,	,	,
	11	12	13	14	15
3S1, 10=	,	,	,	,	,
	16	17	18	19	20
3S1, 15=	,	,	,	,	,
	21	22	23	24	25
3S1, 20=	,	,	,	,	,
	26	27	28	29	30
3S1, 25=	,	,	,	,	,
	31	32	33	34	
3S1, 30=	,	,	,	,	

RNDP

Cross Section Input σ_{T1}

	Level 1	2	3	4	5
3T	,	,	,	,	,
	6	7	8	9	10
3T, 5=	,	,	,	,	,
	11	12	13	14	15
3T, 10=	,	,	,	,	,
	16	17	18	19	20
3T, 15=	,	,	,	,	,
	21	22	23	24	25
3T, 20=	,	,	,	,	,
	26	27	28	29	30
3T, 25=	,	,	,	,	,
	31	32	33	34	
3T, 30=	,	,	,	,	

RNDP

Cross Section Input

ξ_i

	Level 1	2	3	4	5
3X	,	,	,	,	,
	6	7	8	9	10
3X, 5=	,	,	,	,	,
	11	12	13	14	15
3X, 10=	,	,	,	,	,
	16	17	18	19	20
3X, 15=	,	,	,	,	,
	21	22	23	24	25
3X, 20=	,	,	,	,	,
	26	27	28	29	30
3X, 25=	,	,	,	,	,
	31	32	33	34	
3X, 30=	,	,	,	,	

RNDP

Cross Section Input ξ_{1_1}

	Level	1	2	3	4	5
3X1	,		,		,	
		6	7	8	9	10
3X1, 5=	,		,		,	
		11	12	13	14	15
3X1, 10=	,		,		,	
		16	17	18	19	20
3X1, 15=	,		,		,	
		21	22	23	24	25
3X1, 20=	,		,		,	
		26	27	28	29	30
3X1, 25=	,		,		,	
		31	32	33	34	
3X1, 30=	,		,		,	

RNDP

Cross Section Input

$$B_1 = (1 - \bar{\mu}_0)_1$$

	Level 1	2	3	4	5
3B	,	,	,	,	,
	6	7	8	9	10
3B, 5=	,	,	,	,	,
	11	12	13	14	15
3B, 10=	,	,	,	,	,
	16	17	18	19	20
3B, 15=	,	,	,	,	,
	21	22	23	24	25
3B, 20=	,	,	,	,	,
	26	27	28	29	30
3B, 25=	,	,	,	,	,
	31	32	33	34	
3B, 30=	,	,	,	,	

RNDP

Cross Section Input

v_1

	Level 1		2		3		4		5	
3PNU	,		,		,		,		,	
		6		7		8		9		10
3PNU, 5=	,		,		,		,		,	
		11		12		13		14		15
3PNU, 10=	,		,		,		,		,	
		16		17		18		19		20
3PNU, 15=	,		,		,		,		,	
		21		22		23		24		25
3PNU, 20=	,		,		,		,		,	
		26		27		28		29		30
3PNU, 25=	,		,		,		,		,	
		31		32		33		34		
3PNU, 30=	,		,		,		,		,	

RNDP

Cross Section Input

η_1

	Level	1	2	3	4	5
3ETA	,	,	,	,	,	,
		6	7	8	9	10
3ETA, 5=	,	,	,	,	,	,
		11	12	13	14	15
3ETA, 10=	,	,	,	,	,	,
		16	17	18	19	20
3ETA, 15=	,	,	,	,	,	,
		21	22	23	24	25
3ETA, 20=	,	,	,	,	,	,
		26	27	28	29	30
3ETA, 25=	,	,	,	,	,	,
		31	32	33	34	
3ETA, 30=	,	,	,	,	,	

RNDP

Cross Section Input

Thermal Transfer Matrix

4500°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
3TS4500	, 4500.0	,	,	,	,

	$\sigma_s(i/i')$				
	21/21	21/22	21/23	21/24	21/25
3TS4500, 5=	,	,	,	,	,
	22/21	22/22	22/23	22/24	22/25
3TS4500, 10=	,	,	,	,	,
	23/21	23/22	23/23	23/24	23/25
3TS4500, 15=	,	,	,	,	,
	24/21	24/22	24/23	24/24	24/25
3TS4500, 20=	,	,	,	,	,
	25/21	25/22	25/23	25/24	25/25
3TS4500, 25=	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

4000°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
3TS4000	,	4000.0	,	,	,

$\sigma_s(i/i')$

	21/21	21/22	21/23	21/24	21/26
3TS4000, 5=	,	,	,	,	,

	22/21	22/22	22/23	22/24	22/26
3TS4000, 10=	,	,	,	,	,

	23/21	23/22	23/23	23/24	23/26
3TS4000, 15=	,	,	,	,	,

	24/21	24/22	24/23	24/24	24/26
3TS4000, 20=	,	,	,	,	,

	26/21	26/22	26/23	26/24	26/26
3TS4000, 25=	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

3500°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
3TS3500	,	3500.0	,		,

$\sigma_s(i/i')$

	21/21	21/22	21/23	21/24	21/27
3TS3500, 5=	,		,		,

	22/21	22/22	22/23	22/24	22/27
3TS3500, 10=	,		,		,

	23/21	23/22	23/23	23/24	23/27
3TS3500, 15=	,		,		,

	24/21	24/22	24/23	24/24	24/27
3TS3500, 20=	,		,		,

	27/21	27/22	27/23	27/24	27/27
3TS3500, 25=	,		,		,

RNDP

Cross Section Input

Thermal Transfer Matrix

3000°F

		σ_S	σ_{TR}	σ_A	$\nu\sigma_F$
3TS3000	,	3000.0	,	,	,

$\sigma_S(i/i')$

	21/21	21/22	21/23	21/24	21/28
3TS3000, 5=	,	,	,	,	,

	22/21	22/22	22/23	22/24	22/28
3TS3000, 10=	,	,	,	,	,

	23/21	23/22	23/23	23/24	23/28
3TS3000, 15=	,	,	,	,	,

	24/21	24/22	24/23	24/24	24/28
3TS3000, 20=	,	,	,	,	,

	28/21	28/22	28/23	28/24	28/28
3TS3000, 25=	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

2500°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
TS2500	,	2500.0	,	,	,

$\sigma_s(1/i')$					
	21/21	21/22	21/23	21/24	21/29
3TS2500, 5=	,	,	,	,	,

		22/21	22/22	22/23	22/24	22/29
3TS2500, 10=	,	,	,	,	,	,

		23/21	23/22	23/23	23/24	23/29
3TS2500, 15=	,	,	,	,	,	,

		24/21	24/22	24/23	24/24	24/29
3TS2500, 20=	,	,	,	,	,	,

		29/21	29/22	29/23	29/24	29/29
3TS2500, 25=	,	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

2000°F

		σ_S	σ_{TR}	σ_A	$\nu\sigma_F$
3TS2000	, 2000.0	,	,	,	,

$\sigma_S(i/i')$

	21/21	21/22	21/23	21/24	21/30
3TS2000, 5=	,	,	,	,	,
	22/21	22/22	22/23	22/24	22/30
3TS2000, 10=	,	,	,	,	,
	23/21	23/22	23/23	23/24	23/30
3TS2000, 15=	,	,	,	,	,
	24/21	24/22	24/23	24/24	24/30
3TS2000, 20=	,	,	,	,	,
	30/21	30/22	30/23	30/24	30/30
3TS2000, 25=	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

1500°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
3TS1500	, 1500.0	,	,	,	,

$\sigma_s(i/i')$

	21/21	21/22	21/23	21/24	21/31
3TS1500, 5=	,	,	,	,	,
	22/21	22/22	22/23	22/24	22/31
3TS1500, 10=	,	,	,	,	,
	23/21	23/22	23/23	23/24	23/31
3TS1500, 15=	,	,	,	,	,
	24/21	24/22	24/23	24/24	24/31
3TS1500, 20=	,	,	,	,	,
	31/21	31/22	31/23	31/24	31/31
3TS1500, 25=	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

1000°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
3TS1000	, 1000.0	,	,	,	,

$\sigma_s(i/i')$

	21/21	21/22	21/23	21/24	21/32
3TS1000, 5=	,	,	,	,	,

	22/21	22/22	22/23	22/24	22/32
3TS1000, 10=	,	,	,	,	,

	23/21	23/22	23/23	23/24	23/32
3TS1000, 15=	,	,	,	,	,

	24/21	24/22	24/23	24/24	24/32
3TS1000, 20=	,	,	,	,	,

	32/21	32/22	32/23	32/24	32/32
3TS1000, 25=	,	,	,	,	,

Cross Section Input

Thermal Transfer Matrix

500°F

		σ_s	σ_{TR}	σ_A	$\nu\sigma_F$
3TS500	,	500.0	,	,	,

$\sigma_s(i/i')$

	21/21	21/22	21/23	21/24	21/33
3TS500, 5=	,	,	,	,	,

	22/21	22/22	22/23	22/24	22/33
3TS500, 10=	,	,	,	,	,

	23/21	23/22	23/23	23/24	23/33
3TS500, 15=	,	,	,	,	,

	24/21	24/22	24/23	24/24	24/33
3TS500, 20=	,	,	,	,	,

	33/21	33/22	33/23	33/24	33/33
3TS500, 25=	,	,	,	,	,

RNDP

Cross Section Input

Thermal Transfer Matrix

68°F

		σ_s	σ_{TR}	σ_A	$v\sigma_F$
3TS68	,	68.0	,	,	,

$\sigma_s(i/i')$

	21/21	21/22	21/23	21/24	21/34
3TS68, 5=	,	,	,	,	,

	22/21	22/22	22/23	22/24	22/34
3TS68, 10=	,	,	,	,	,

	23/21	23/22	23/23	23/24	23/34
3TS68, 15=	,	,	,	,	,

	24/21	24/22	24/23	24/24	24/34
3TS68, 20=	,	,	,	,	,

	34/21	34/22	34/23	34/24	34/34
3TS68, 25=	,	,	,	,	,

RNDP

= END,	0	,
--------	---	---

70

$$\begin{array}{c} \sigma_{SO}(MO_{MIN}/M'O_{MIN}), \sigma_{SO}(MO_{MIN}/M'O_{MIN} + 1), \dots \sigma_{SO}(MO_{MIN}/M'O_{MAX}), \\ \sigma_{SO}(MO_{MIN} + 1/M'O_{MIN}), \sigma_{SO}(MO_{MIN} + 1/M'O_{MIN} + 1) \dots \sigma_{SO}(MO_{MIN} + 1/M'O_{MAX}), \\ \vdots \\ \vdots \\ \vdots \\ \sigma_{SO}(MO_{MAX}/M'O_{MIN}), \sigma_{SO}(MO_{MAX}/M'O_{MIN} + 1), \dots \sigma_{SO}(MO_{MAX}/M'O_{MAX}) \end{array}$$
[illegible]

RNDP

```
= END ,          0          ,
```

Cross Section Input
 Scattering Transfer Matrix
 $\sigma_{sl}(m/m')$

The data should be ordered as shown below.

$$\begin{aligned} &\sigma_{sl}(M_{MIN}/M'_{MIN}), \sigma_{sl}(M_{MIN}/M'_{MIN} + 1), \dots \sigma_{sl}(M_{MIN}/M'_{MAX}), \\ &\sigma_{sl}(M_{MIN} + 1/M'_{MIN}), \sigma_{sl}(M_{MIN} + 1/M'_{MIN} + 1), \dots \sigma_{sl}(M_{MIN} + 1/M'_{MAX}), \\ &\sigma_{sl}(M_{MAX}/M'_{MIN}), \sigma_{sl}(M_{MAX}/M'_{MIN} + 1), \dots \sigma_{sl}(M_{MAX}/M'_{MAX}) \end{aligned}$$

3SIGSL	,		,		,		,		,		,
①	,		,		,		,		,		,
①	,		,		,		,		,		,
①	,		,		,		,		,		,
①	,		,		,		,		,		,
①	,		,		,		,		,		,
①	,		,		,		,		,		,

The table above is limited to 625 entries

= END ,	0	,
---------	---	---

RANDP

Cross Section Input

Resonance Data

Resonance Energies

	Res. 1	2	3	4	5
3EO	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

Resonance Integrals

	Res. 1	2	3	4	5
3RIO	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

RNDP

Cross Section Input

Resonance Data

	Res. 1		2	Γ_N	3	4	5
3GN	,	,	,	,	,	,	,
6	7	8	9	10	11		
①	,	,	,	,	,	,	,
12	13	14	15	16	17		
①	,	,	,	,	,	,	,
18	19	20	21	22	23		
①	,	,	,	,	,	,	,
24	25	26	27	28	29		
①	,	,	,	,	,	,	,

The table above is limited to 200 entries

	Res. 1		2	Γ_γ	3	4	5
3GG	,	,	,	,	,	,	,
6	7	8	9	10	11		
①	,	,	,	,	,	,	,
12	13	14	15	16	17		
①	,	,	,	,	,	,	,
18	19	20	21	22	23		
①	,	,	,	,	,	,	,
24	25	26	27	28	29		
①	,	,	,	,	,	,	,

The table above is limited to 200 entries

RNDP

Cross Section Input

Resonance Data

Γ_F

	Res. 1	2	3	4	5
3GF	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

Statistical Weighting Factor, g,

	Res. 1	2	3	4	5
3G	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

RNDP

Cross Section Input

Resonance Data

Peak Cross Sections

	Res. 1	2	3	4	5
3PO	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

Doppler Temperature Coefficients

	Res. 1	2	3	4	5
3R	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

RNDP

Cross Section Input

Resonance Data

$$\eta = \frac{\Gamma_F}{\Gamma_\gamma + \Gamma_F}$$

	Res. 1	2	3	4	5
3ETAR	,	,	,	,	,
6	7	8	9	10	11
①	,	,	,	,	,
12	13	14	15	16	17
①	,	,	,	,	,
18	19	20	21	22	23
①	,	,	,	,	,
24	25	26	27	28	29
①	,	,	,	,	,

The table above is limited to 200 entries

= END ,	0 ,
---------	-----

RNDP

n,γ Transfer Matrix

The data should be ordered as shown below

$$\sigma_{n,\gamma}^{(M'G_{\text{MAX}}/M'G_{\text{MIN}})}, \sigma_{n,\gamma}^{(M'G_{\text{MAX}}/M'G_{\text{MIN}} + 1)}, \dots, \sigma_{n,\gamma}^{(M'G_{\text{MAX}}/M'G_{\text{MAX}})}$$

[illegible]

The table above is limited to 680 entries

= END ,	0
---------	---

RINDIP

RNDP

Spectral Data Block Input

5BDATE,2,	/	/
	Month	Day
	(2 char.)	(2 char.)
		Year
		(2 char.)

	B	$t_M = 1/\lambda$
	(delay fraction)	(mean life)
3BETA,	,	TM,
		,

Spectral Data Block Input

Level Spectral Values

	Level 1	2	3	4	5
3SØR	,	,	,	,	,
	6	7	8	9	10
3SØR, 5=	,	,	,	,	,
	11	12	13	14	15
3SØR, 10=	,	,	,	,	,
	16	17	18	19	20
3SØR, 15=	,	,	,	,	,
	21	22	23	24	25
3SØR, 20=	,	,	,	,	,
	26	27	28	29	30
3SØR, 25=	,	,	,	,	,
	31	32	33	34	
3SØR, 30=	,	,	,	,	

= END ,	0	,
---------	---	---

RNDP

2.8 Program Source Deck Listing

```

C      CONTROL BLOCK
C
COMMON  NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN
C
EQUIVALENCE  (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)
C
EQUIVALENCE  (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)
C
DIMENSION  NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),PCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)
C
1 CALL INIT
  IF (RERUN) 11,12,11
11 CALL TRYOVR
  GO TO 5
12 IF (NEWTAP) 2,3,2
C   SET UP INDEX RECORD FOR NEW TAPE
2 CALL INDXT
  GO TO 4
C   REVISE OLD INDEX RECORD
3 CALL INDXRV
C   WRITE INDEX RECORD ON MTAPE, NTAPE
4 CALL NMTPRC (NWINDX)
C   WRITE AND PUNCH INDEX RECORD
  CALL WRINDX
C   COMPILE RECORD 2
  CALL REC2

```



```
C DATA BLOCK CONTROL ROUTINE
  5 CALL DATACT
C COMPILE FINAL RECORD
  CALL FINREC
  CALL EXIT
  END (0,0,0)
```

SUBROUTINE ERROR (N)

```

      THIS ROUTINE IS INTENDED TO PROVIDE AN ABSOLUTE LOCATION OF
C     1STOPS RESULTING FROM DIFFERENT TYPES OF ERRORS INDICATED BELOW.
C     2AS THE REASSEMBLY OF THE CONTROL ROUTINE IS NOT ANTICIPATED. THE
C     3OBJECT DECK FOR THIS ROUTINE MAY BE PLACED IMMEDIATELY BEHIND
C     4THE DECK FOR THE CONTROL ROUTINE TO GIVE THE DESIRED ABSOLUTE
C     5LIST OF STOPS. AS OF THIS ASSEMBLY, THE FOLLOWING STOPS ARE
C     6OBTAINABLE - THE REMAINDER MAY BE OBTAINED BY USING
C     7THE APPROPRIATE ARGUMENT.
C
C     2000 IF (N-1) 2021,2022,2001
C     2001 IF (N-3) 2023,2024,2002
C     2002 IF (N-5) 2025,2026,2003
C     2003 IF (N-7) 2027,2028,2004
C     2004 IF (N-9) 2029,2030,2005
C     2005 IF (N-11) 2031,2032,2006
C     2006 IF (N-13) 2033,2034,2007
C     2007 IF (N-15) 2035,2036,2008
C     2008 IF (N-17) 2037,2038,2009
C     2009 IF (N-19) 2039,2040,2040
C     2021 CALL EXIT
C     DIP ERROR FIRST RECORD (INIT ROUTINE)
C     2022 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN DATA FOR RECORD 2 (REC2 ROUTINE)
C     2023 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN SPECTRAL DATA RECORD (INPTDB ROUTINE - STATEMENT 2402
C     2024 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN DATA FOR RECORD 1 OF CROSS SECTION DATA
C     1BLOCK (INPTDB ROUTINE - STATEMENT 2403)
C     2025 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN DATA FOR SIGS0 RECORD (INPTDB ROUTINE -
C     1STATEMENT 3031)
C     2026 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN DATA FOR SIGS1 RECORD (INPTDB ROUTINE -
C     1STATEMENT 3071)
C     2027 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN RESONANCE DATA (INPTDB ROUTINE STATEMENT 31120)
C     2028 CALL ERRORA
C     CALL EXIT
C     DIP ERROR IN DATA FOR SIGNG RECORD (INPTDB ROUTINE -
C     1STATEMENT 3151)
C     2029 CALL ERRORA
C     CALL EXIT
C     ITAPE COULD NOT BE READ
C     2030 CALL ERRORA
C     CALL EXIT
C     KTAPE COULD NOT BE READ
C     2031 CALL ERRORA

```

```
CALL EXIT
C_____ BOTH MTAPE AND NTAPE FAILED TO COMPILE
2032 CALL ERRORA
CALL EXIT
C_____ KTAPE FAILED TO COMPILE
2033 CALL ERRORA
CALL EXIT
C_____ DIMENSIONS IN MOMIN TABLE TOO LARGE
2034 CALL ERRORA
CALL EXIT
C_____ TOO MANY LEVELS
2035 CALL ERRORA
CALL EXIT
C_____ ATTEMPTED TO DELETE NON-EXISTENT DATA BLOCK
2036 CALL ERRORA
CALL EXIT
C_____ ATTEMPTED TO RELOCATE DELETED BLOCK
2037 CALL ERRORA
CALL EXIT
C_____ ATTEMPTED TO RELOCATE NON-EXISTENT DATA BLOCK
2038 CALL ERRORA
CALL EXIT
2039 CALL ERRORA
CALL EXIT
2040 RETURN
END (0,0,0)
```

SUBROUTINE TAPECK (LOC,NWORD,NOTAPE)

READ TAPE (ITAPE OR KTAPE) MAXIMUM OF 5 TIMES

COMMON NB1

EQUIVALENCE (NB1(15679),ITAPE)

DIMENSION LOC(1)

1002 READ TAPE NOTAPE, (LOC(J),J = 1,NWORD)

1003 IF (SENSE LIGHT 2) 1008, 1011

1008 IF (NOTAPE - ITAPE) 1010,1009,1010

1009 CALL EROR (9)

1010 CALL EROR (10)

1011 RETURN

END (0,0,0)

SUBROUTINE INIT

C

C

READ IN DATA RECORD 1 AND INITIALIZE

C

```

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDSM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,
5NWSGS0,NWSGS1,NWRES,NWSGNG,MAXLEV

```

C

```

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

```

C

```

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RI0),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

```

C

```

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RI0(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

```

C

```

THERM(1) = 4500.0
THERM(2) = 4000.0
THERM(3) = 3500.0
THERM(4) = 3000.0
THERM(5) = 2500.0
THERM(6) = 2000.0
THERM(7) = 1500.0
THERM(8) = 1000.0
THERM(9) = 500.0
THERM(10) = 68.0

```

C

```

NO. THERMAL GROUPS,NO. WORDS ON INDEX AND FINAL RECORDS
NTHGRP = 10

```

```

NWINDX = 2000

```

```

NWFR = 1000

```

C

```

SET UP CROSS SECTION DATA BLOCK MAXIMUM DIMENSIONS

```

```

MAXLEV = 45

```

```

NWSGS0 = 626

```

```

      NWSGS1 = 626
      NWRES = 1001
      NWSGNG = 681
C     INITIAL KTAPE POSITION
      NWR = 0
C     INDEXES FOR REGIONS OF NB1,NB2 TO BE BLANKED OUT IN INPTDB
      IDMB11 = 1098
      IDMB12 = 2100
      IDMB21 = 1006
      IDMB22 = 2050
C     TAPE ASSIGNMENTS
      LTAPE = 3
      MTAPE = 6
      NTAPE = 7
      ITAPE = 8
      KTAPE = 9
C     NEUTRON MASS IN ATOMIC MASS UNITS
      AN = 1.008986
C     INITIALIZE CODE WORDS
      RERUN = 0.0
      J = 1
      NRRDB(J-1) = 0
C
      REWIND MTAPE
      REWIND NTAPE
      CALL NOPAGE
100  IF (SENSE LIGHT1) 101,101
C     READ IN FIRST RECORD OF DATA
101  READ DIP  NAMTAP,NLEV,NEWTAP,NBA,NBD,NBDEL,NPSN,BNAM,BCODE,NBPSN,
      IMOMIN,NOPRNT,NOPUN,PCODE,PUNCOD,RERUN,BDATE,END
      IF (SENSE LIGHT 1) 102,103
102  CALL EROR (1)
103  IF (RERUN) 1045,104,1045
C     SET UP HEADING FOR INDEX RECORD
104  NB1(1) = NAMTAP(1)
      NB1(2) = NAMTAP(2)
      NB1(3) = NAMTAP(3)
      NB1(4) = NLEV
C
      NLEV1 = NLEV + 1
C     TOTAL LEVELS = NO. EPITHERMAL + NO. THERMAL
      NTLEV = NLEV + NTHGRP
C     NO WORDS - RECORD 2, CROSS-SECTION DATA BLOCK RECORD 1, SPECTRAL
C     DATA BLOCK
      NWRC2 = 2*NTLEV + 3*NLEV 3
      NWDBR1 = 6*NTLEV + 30*NTHGRP + 16
      NSPECT = NTLEV 6
C     MAXDB = MAX. NO. OF DATA BLOCKS, OTHERS ARE ASSOCIATED CONSTANTS
      MAXDB2 = (NWINDX)/4
      MAXDB1 = MAXDB2 - 1
      MAXDB = MAXDB2 2
      MAXDBM = MAXDB2 - 3
      GO TO 111
C     CHECK DATA FOR ERRORS
1045 DO 108 J = 1,NBA

```

```
      IF ((MOMIN(10*J-8)-MOMIN(10*J-9))*(MOMIN(10*J-7)-MOMIN(10*J-9))  
1- NWSGSQ + 1) 105,105,109  
105 IF ((MOMIN(10*J-5)-MOMIN(10*J-6))*(MOMIN(10*J-4)-MOMIN(10*J-6))  
1- NWSGS1 + 1) 106,106,109  
106 IF (5*MOMIN(10*J-3) - NWRES + 1) 107,107,109  
107 IF ((MOMIN(10*J-1)-MOMIN(10*J-2))*(MOMIN(10*J)-MOMIN(10*J-2))  
1-NWSGNG + 1) 108,108,109  
108 CONTINUE  
      IF (NLEV - MAXLEV) 111,111,110  
109 CALL EROR (13)  
110 CALL EROR (14)  
111 RETURN  
      END (0,0,0)
```

SUBROUTINE INDXT

C
: SET UP INDEX RECORD FOR NEW TAPE
C

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

C
EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

C
EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

C
DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

C
120 NB1(8) = 3

C SET UP LOOP

DO 131 I = 1,MAXDB1

IF (I-NBA) 1201,1201,130

C SEARCH FOR INFO FOR DATA BLOCK I

1201 DO 1202 J = 1,NBA

IF (I - NBPSN(4*J-3)) 1202,1203,1202

1202 CONTINUE

C CALCULATE NUMBER OF RECORDS IN DATA BLOCK I

1203 K = 1

IF (MOMIN(10*J 9)) 122,123,122

122 K = K+1

123 IF (MOMIN(10*J 6)) 124,125,124

124 K = K+1

125 IF (MOMIN(10*J 3)) 126,127,126

126 K = K+1

127 IF (MOMIN(10*J 2)) 128,129,128

128 K = K+1

C STORE INFO FOR DATA BLOCK I IN INDEX RECORD

129 FB1(4*I+1) = BNAM(4*I-3)

FB1(4*I+2) = BNAM(4*I-2)

FB1(4*I+3) = BCODE(4*I-3)

NB1(4*I+8) = NB1(4*I+4) K

GO TO 131

C STORE REMAINDER ZEROS

130 NB1(4*I+1) = 0

NB1(4*I+2) = 0

NB1(4*I+3) = 0

NB1(4*I+8) = 0

131 CONTINUE

132 RETURN

END (0,0,0)

SUBROUTINE INDXRV

REVISE THE OLD INDEX RECORD

```

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,NCODOT,
5FB3,NB4

```

```

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

```

```

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

```

```

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)
DIMENSION FB3(500),NB4(500)

```

REWIND ITAPE

READ IN OLD INDEX RECORD

CALL TAPECK (NB1,NWINDX,ITAPE)

DO 13999 L = 1,MAXDB

FB3(L) = FB1(4*L+3)

13999 NB4(L) = NB1(4*L+4)

C CHECK FOR EXISTENCE OF BLOCKS TO BE DELETED, RELOCATED

IF (NBD) 14000,14007,14000

14000 K = 1

DO 14005 I=1,MAXDB

IF (NB1(4*I+3)) 14001,14006,14001

14001 DO 14004 L = 1,NBD

IF (NB1(4*I+3) NBDEL(L)) 14004,14002,14004

14002 IF (K=NBD) 14003,14007,14007

14003 K = K+1

```

GO TO 14005
14004 CONTINUE
14005 CONTINUE
14006 CALL EROR(15)
14007 IF (NPSN) 14008,1410,14008
14008 K = 1
      DO 14017 I = 1,MAXDB
      IF (NB1(4*I+3)) 14009,14018,14009
14009 DO 14014 L1= 1,NPSN
      L = NBA + L1
      IF (FB1(4*I+3) BCODE(4*L 3)) 14014,14010,14014
14010 IF (NBD) 14011,14015,14011
14011 DO 14012 M = 1,NBD
      IF (NB1(4*I+3) NBDEL(M)) 14012,14013,14012
14012 CONTINUE
      GO TO 14015
14013 CALL EROR (16)
14014 CONTINUE
      GO TO 14017
14015 IF (K-NPSN) 14016,14100,14100
14016 K = K+1
14017 CONTINUE
14018 CALL EROR (17)
C      RELOCATE DATE BLOCKS ON ITAPE BY FIRST PLACING ON KTAPE
      IF (NPSN) 14100,1410,14100
14100 READ TAPE ITAPE
      REWIND KTAPE
      K = 1
      DO 14116 I = 1,MAXDB
      N = NB1(4*I+8) NB1(4*I 4)
      J1 = NBA + 1
      J2 = NBA + NPSN
      DO 14101 L = J1,J2
      IF (FB1(4*I+3) BCODE(4*L-3)) 14101,14102,14101
14101 CONTINUE
      GO TO 14113
C      RELOCATE - CHECK TO SEE IF SPECTRAL OR CROSS SECTION DATA
14102 IF (FB1(4*I+3) 500.0) 14104,14103,14103
C      SPECTRAL
14103 CALL KTAPRC (NSPECT)
      GO TO 14116
C      CROSS-SECTION
14104 CALL KTAPRC (NWDBR1)
      CALL DIMEN (NB2)
      IF (N1) 14105,14106,14105
14105 CALL KTAPRC (N1)
14106 IF (N2) 14107,14108,14107
14107 CALL KTAPRC (N2)
14108 IF (N3) 14109,14110,14109
14109 CALL KTAPRC (N3)
14110 IF (N4) 14111,14112,14111
14111 CALL KTAPRC (N4)
C      COPY INTO THE NRRDB REGION THE PHYSICAL RECORD NUMBER OF THE
C      RELOCATED BLOCKSNOW ON THE KTAPE. THIS INFO WILL BE USED IN
C      SUBROUTINE DATACT FOR TAPE POSITIONING.

```

```

14112 NRRDB(K) = N + NRRDB(K-1)
C   STORE CODE NUMBER OF THIS BLOCK IN RLOCRC REGION
      RLOCRC(K) = FB1(4*I+3)
      K = K+1
      IF (K-NPSN) 14116,14116,1410
14113 IF (N) 14116,14116,14114
14114 DO 14115 M = 1,N
14115 READ TAPE ITAPE
14116 CONTINUE
C   WRITE INDEX DATA IN NB2 BLOCK
      1410 N = NBA + NBD
14117 IF (N) 14120,14120,14118
14118 DO 14119 I = 1,NWINDX
14119 NB2(I) = NB1(I)
C   SET UP RECORD NUMBER FOR THE FIRST DATA BLOCK
      NB1(8) = 3
C   CHECK FOR DELETING
14120 IF (NBD) 1411,150,1411
C
C   DELETION LOOP
C
      1411 K = 1
      DO 144 I = 1,MAXDB
C   CHECK FOR DELETING THIS BLOCK
      J = I-K
      DO 142 L = 1,NBD
      IF (NB2(4*I+3) NBDEL(L)) 142,147,142
      142 CONTINUE
C   DO NOT DELETE THIS BLOCK
      NB1(4*J+5) = NB2(4*I+1)
      NB1(4*J+6) = NB2(4*I+2)
      NB1(4*J+7) = NB2(4*I+3)
C   IS REST OF INDEX INFO ZEROS
      IF (NB2(4*I+8)) 143,145,143
C   UPDATE RECORD NUMBER
      143 NB1(4*J+12) = NB1(4*J+8) NB2(4*I 8) - NB2(4*I+4)
      144 CONTINUE
      GO TO 146
C   SET INFO TO ZERO
      145 NB1(4*J+12) = 0
      146 NB1(4*J+9) = 0
      NB1(4*J+10) = 0
      NB1(4*J+11) = 0
C   CHECK FOR TERMINATION OF LOOP
      IF (J-MAXDBM+NBA) 1465,150,1465
      1465 J = J+1
      GO TO 145
C   DELETE THIS BLOCK
      147 K = K+1
      GO TO 144
C
C   ADD TO INDEX RECORD
C
C   CHECK FOR ADDING
      150 IF (NBA) 151,175,151

```

```

C      ADD    IF DELETED SOME BLOCKS, RESTORE UPDATED INFO TO NB2
151 IF (NBD) 153,155,153
153 DO 154 J = 1,NWINDX
154 NB2(J) = NB1(J)
C      ADDITION LOOP
155 K = 1
      DO 168 I = 1,MAXDB
C      CHECK FOR ADDING AT THIS POSITION
      J = I-K
      DO 156 L = 1,NBA
      IF (I - NBPSN(4*L-3)) 156,157,156
156 CONTINUE
      GO TO 166
C      ADD AT THIS POSITION
157 FB1(4*I+1) = BNAM(4*L-3)
      FB1(4*I+2) = BNAM(4*L-2)
      FB1(4*I+3) = BCODE(4*L-3)
C      CALCULATE THE TOTAL NUMBER OF RECORDS IN THE ADDED DATA BLOCK
      M = 0
      IF (MOMIN(10*L 9)) 158,159,158
158 M = M+1
159 IF (MOMIN(10*L 6)) 160,161,160
160 M = M+1
161 IF (MOMIN(10*L 3)) 162,163,162
162 M = M+1
163 IF (MOMIN(10*L 2)) 164,165,164
164 M = M+1
C      UPDATE RECORD NUMBER
165 NB1(4*I+8) = NB1(4*I+4) M + 1
      K = K+1
      GO TO 168
C      COPY OLD INDEX INFO AND UPDATE THE RECORD NUMBER
166 NB1(4*I+1) = NB2(4*J+5)
      NB1(4*I+2) = NB2(4*J+6)
      NB1(4*I+3) = NB2(4*J+7)
C      IS REST OF INDEX RECORD ZEROS
      IF (NB2(4*J+12)) 167,169,167
167 NB1(4*I+8) = NB1(4*I+4) NB2(4*J+12) - NB2(4*J+8)
168 CONTINUE
C      SET INFO TO ZERO
169 NB1(4*I+8) = 0
170 NB1(4*I+5) = 0
      NB1(4*I+6) = 0
      NB1(4*I+7) = 0
C      CHECK FOR TERMINATION OF LOOP
      IF (I-MAXDB) 171,175,175
171 I = I+1
      GO TO 169
C
C      RELOCATE INDEX RECORD INFO.
C
C
C      CHECK FOR RELOCATION
175 IF (NPSN) 179,208,179
C      RELOCATE

```

```

C   SET INDEX FOR STORING RELOCATION INFO IN LOWER NB6 REGION
179 NG = MAXDB2 - NPSN
C   RELOCATION LOOP
    K = 1
    DO 200 I = 1,MAXDB
C   CALCULATE THE NUMBER OF RECORDS FOR THIS DATA BLOCK
    N = NB1(4*I+8)  NB1(4*I 4)
C   CHECK FOR RELOCATING THIS DATA BLOCK
    J = NBA+1
    J1 = NBA+NPSN
    DO 180 L = J,J1
    IF (FB1(4*I+3)  BCODE(4*L-3)) 180,194,180
180 CONTINUE
    GO TO 195
C   STORE INDEX INFO IN LOWER NB6 REGION
194 M = NG + K
    NB6(4*M+1) = NB1(4*I+1)
    NB6(4*M+2) = NB1(4*I+2)
    NB6(4*M+3) = NB1(4*I+3)
    NB6(4*M+4) = N
    K = K+1
    GO TO 200
C   DO NOT RELOCATE THIS BLOCK - COPY INDEX INFO INTO UPPER NB6
195 L = I-K+1
    NB6(4*L+1) = NB1(4*I+1)
    NB6(4*L+2) = NB1(4*I+2)
    NB6(4*L+3) = NB1(4*I+3)
    NB6(4*L+4) = N
    200 CONTINUE
C
C   INDEX INFO FOR RELOCATED RECORDS ARE NOW IN LOWER NB6 REGION
C   AND FOR NON-RELOCATED BLOCKS IN UPPER NB6.  RECORD NUMBERS
C   ARE REPLACED BY ACTUAL NUMBER OF OF RECORDS IN THE DATA BLOCK.
C   NEW INDEX RECORD IS COMPILED BY FIRST COMBINING THE INFO IN
C   THESE TWO REGIONS OF NB6 INTO NB2, KEEPING THE ACTUAL NUMBER
C   OF RECORDS IN THE DATA BLOCK IN PLACE OF THE RECORD NUMBER.
C
    K = 1
    DO 204 I = 1,MAXDB1
    DO 201 L = 1,NPSN
    NA = NBA + L
    IF (I - NBPSN(4*NA-3)) 201,202,201
201 CONTINUE
    GO TO 203
202 DO 2021 J = 1,NPSN
    L = NG + J
    IF (BCODE(4*NA 3) - FB6(4*L+3)) 2021,2022,2021
2021 CONTINUE
2022 NB2(4*I+1) = NB6(4*L+1)
    NB2(4*I+2) = NB6(4*L+2)
    NB2(4*I+3) = NB6(4*L+3)
    NB2(4*I+4) = NB6(4*L+4)
    K = K+1
    GO TO 204
203 M = I-K+1

```

```
NB2(4*I+1) = NB6(4*M+1)
NB2(4*I+2) = NB6(4*M+2)
NB2(4*I+3) = NB6(4*M+3)
NB2(4*I+4) = NB6(4*M+4)
204 CONTINUE
NB1(8) = 3
C NOW CALCULATE AND STORE THE RECORD NUMBER
DO 207 I = 1,MAXDB1
NB1(4*I+1) = NB2(4*I+1)
NB1(4*I+2) = NB2(4*I+2)
NB1(4*I+3) = NB2(4*I+3)
IF (NB2(4*I+4)) 205,206,205
205 NB1(4*I+8) = NB1(4*I+4) NB2(4*I+4)
GO TO 207
206 NB1(4*I+8) = 0
207 CONTINUE
REWIND KTAPE
C POSITION ITAPE FOR THE FIRST DATA BLOCK
REWIND ITAPE
READ TAPE ITAPE
C
208 RETURN
END (0,0,0)
```

SUBROUTINE REC2

SET UP RECORD 2

```

COMMON  NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

```

```

EQUIVALENCE  (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

```

```

EQUIVALENCE  (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

```

```

DIMENSION  NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

```

```

CHECK TO SEE IF THIS IS A NEW OR A REVISED TAPE

```

```

210 IF (NEWTAP) 212,211,212

```

```

REVISED - READ DATA FROM OLD TAPE

```

```

211 CALL TAPECK (NB1,NWRC2,ITAPE)

```

```

GO TO 215

```

```

NEW READ CARD INPUT

```

```

212 READ DIP EL,UL,EG,UG,FV,END

```

```

IF (SENSE LIGHT 1) 2121,2122

```

```

2121 CALL EROR (2)

```

```

2122 NB1(1) = 2

```

```

SET UP EL,UL,EG,UG,FV INFO IN NB1 REGION

```

```

I1 = NTLEV+1

```

```

DO 213 I = 1,NTLEV

```

```

FB1(I+1) = EL(I)

```

```

NA = I + I1

```

```

213 FB1(NA) = UL(I)

```

```

I1 = 2*I1 - 1

```

```

I2 = I1 + NLEV1

```



```

      I3 = I2 + NLEV1
      DO 214 I = 1,NLEV1
      NA = I + I1
      FB1(NA) = EG(I)
      NA = I + I2
      FB1(NA) = UG(I)
      NA = I + I3
214  FB1(NA) = FV(I)
C    SET UP NUMBER OF WORDS IN THIS RECORD
C    WRITE NEW TAPES - PRINT OUT RECORD 2 IF REQUESTED
      215 CALL NMTPRC (NWRC2)
      216 CALL WRSECR
      217 IF (NEWTAP) 220,218,220
C    RETAIN EL,FV DATA
      218 DO 219 I = 1,NTLEV
      ENERGY(I) = FB1(I+1)
      J = I + NTLEV 1
      219 FV(I) = FB1(J)
      220 RETURN
      END (0,0,0)

```

SUBROUTINE DATACT

DATA BLOCK CONTROL ROUTINE

```

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,NCODOT,
5FB3,NB4

```

```

C
EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

```

```

C
EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

```

```

C
DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)
DIMENSION FB3(500),NB4(500)

```

```

C IF THIS IS A RERUN CASE, REESTABLISH INDEX I VALUE

```

```

220 IF (RERUN) 2202,2201,2202

```

```

2201 NA = 1

```

```

C SET ITAPE INDEX

```

```

NCODOT = 0

```

```

READ TAPE ITAPE

```

```

READ TAPE ITAPE

```

```

GO TO 2203

```

```

2202 NA = I

```

```

2203 DO 23985 I = NA,MAXDB2

```

```

C IF CODE NUMBER IS ZERO, THIS IS END OF DATA BLOCKS

```

```

IF (NB6(4*I+3)) 221,23987,221

```

```

C FIRST CHECK TO SEE WHERE DATA BLOCK I IS LOCATED -

```

```

1 THAT IS, AS NEW CARD DATA, ON THE KTAPE, OR ON THE

```

```

2 ITAPE.

```

```

221 IF (NEWTAP) 240,222,240
222 IF (NBA) 223,225,223
C CHECK FOR ADDED DATA BLOCK
223 DO 224 I1 = 1,NBA
    IF (I - NBPSN(4*I1-3)) 224,240,224
224 CONTINUE
C
225 IF (NPSN) 226,228,226
C CHECK FOR RELOCATED DATA BLOCK
226 DO 227 I1 = 1,NPSN
    NA = I1 + NBA
    IF (I - NBPSN(4*NA-3)) 227,2395,227
227 CONTINUE
C
C DATA BLOCK MUST BE ON OLD TAPE
C
C READ IN NEXT DATA BLOCK FROM ITAPE
228 NCODOT = NCODOT + 1
C CHECK TO SEE IF ONE DESIRED
    IF (FB3(NCODOT)-FB6(4*I+3)) 229,231,229
C NO, SKIP OVER
229 I1 = NB4(NCODOT+1)-NB4(NCODOT)
    DO 230 I2=1,I1
230 READ TAPE ITAPE
    GO TO 228
C YES, READ IN FIRST RECORD
231 IF (FB6(4*I+3) 500.0) 233,232,232
232 CALL TAPECK(NB1,NSPECT,ITAPE)
    GO TO 234
233 CALL TAPECK(NB1,NWDBR1,ITAPE)
C TRANSFER REMAINDER OF BLOCK
234 CALL TRNSDB(ITAPE)
    GO TO 23974
C
C READ DATA FROM INTERMEDIATE TAPE
C
2395 DO 23951 I1 = 1,NPSN
C FIND PHYSICAL RECORD NUMBER OF THIS DATA BLOCK ON KTAPE.
    IF (FB6(4*I+3) RLOCRC(I1)) 23951,23952,23951
23951 CONTINUE
C CHECK RECORD NUMBER AGAINST CURRENT TAPE
C 1POSITION TO SEE IF WE NEED TO BACKSPACE OR FORWARD SPACE
23952 IF (NRRDB(I1)-NWR) 23957,23957,23953
C FORWARD SPACE OR DO NOT MOVE KTAPE
23953 N = NRRDB(I1-1) - NWR
    IF (N) 23956,23956,23954
23954 DO 23955 I2 = 1,N
23955 READ TAPE KTAPE
23956 GO TO 23960
C BACKSPACE
23957 N = NWR - NRRDB(I1-1)
23958 DO 23959 I2 = 1,N
23959 BACKSPACE KTAPE
C UPDATE NWR FOR PRESENT KTAPE POSITION
23960 NWR = NRRDB(I1)

```

```
23971 CALL TAPECK (NB1,NWDBR1,KTAPE)
C CALL TRNSDB TO TRANSFER DATA BLOCK FROM KTAPE TO M,N TAPES
23973 CALL TRNSDB (KTAPE)
23974 DO 23975 I1 = 1,NOPUN
      IF (PUNCOD(I1) FB6(4*I 3)) 23975,23976,23975
23975 CONTINUE
      GO TO 23985
23976 CALL PUNACB (0,0,0)
23985 CONTINUE
23987 RETURN
C
C USE CARD INPUT
C
240 CALL INPTDB
      GO TO 23976
      END (0,0,0)
```

SUBROUTINE INPTDB

 SET UP DATA BLOCK FROM CARD INPUT

 COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
 1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
 2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
 3NWR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
 4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN

 EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
 1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
 2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
 31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
 4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
 5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
 6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
 7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
 8),B),(NB1(1650),PNU),(NB1(1695),ETA)

 EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
 100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
 21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
 3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
 42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
 5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

 DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
 1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
 2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
 30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
 4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
 5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
 600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
 700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
 800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

 BLANK OUT REGIONS OF NB1,NB2

DO 240 J = IDMB11,IDMB12

240 NB1(J) = 0

DO 2401 J = IDMB21,IDMB22

2401 NB2(J) = 0

 CHECK FOR SPECTRAL OR CROSS SECTION DATA

IF (FB6(4*I+3) 500.0) 2403,2402,2402

 SPECTRAL - READ IN DATA

2402 READ DIP BDATE,BETA,TM,SOR,END

IF (SENSE LIGHT 1) 24021,24022

24021 CALL DIPERR (3)

24022 GO TO 320

 CROSS - SECTION - READ IN FIRST RECORD

 2403 READ DIP BDATE,AW,DEN,A2200,NDATA,A1,B1,C1,D1,A2,B2,C2,D2,S,XIS,
 1TR,A,XIS1,FNU,F,S1,T,X,X1,B,PNU,ETA,NCON,CONNO,WGT,TS4500,TS4000,T
 2S3500,TS3000,TS2500,TS2000,TS1500,TS1000,TS500,TS68,END

IF (SENSE LIGHT 1) 24031,24032

24031 CALL DIPERR (4)

```

C
C FOLLOW FLOW IN FIG. 2.1.2.2
C
24032 IF (NDATA) 274,241,274
241 DO 273 J = 1,NTLEV
    IF (F(J)) 243,242,243
242 IF (FNU(J)) 246,252,246
243 IF (PNU(J)) 245,244,245
244 PNU(J) = A1 + B1*ENERGY(J) + C1*(ENERGY(J))**D1
245 FNU(J) = PNU(J)*F(J)
246 IF (A(J)) 257,247,257
247 IF (T(J)) 248,249,248
248 IF (S(J)) 255,249,255
249 IF (ETA(J)) 251,250,251
250 ETA(J) = A2 + (B2 + C2*(ENERGY(J))**D2)*LOGF(ENERGY(J))
251 A(J) = FNU(J)/ETA(J)
    GO TO 257
252 IF (A(J)) 257,253,257
253 IF (S(J)) 254,256,254
254 IF (T(J)) 255,256,255
255 A(J) = T(J) - S(J)
    GO TO 260
256 A(J) = FV(J)*A2200
    GO TO 258
257 IF (S(J)) 260,258,260
258 IF (T(J)) 259,260,259
259 S(J) = T(J) - A(J)
260 IF (XIS(J)) 264,261,264
261 IF (X(J)) 263,262,263
262 X(J) = 1.0 + (((AW/AN) - 1.0)**2)/(2.0*(AW/AN))*LOGF
    1(((AW/AN) - 1.0)/((AW/AN) + 1.0))
263 XIS(J) = X(J)*S(J)
264 IF (TR(J)) 268,265,268
265 IF (B(J)) 267,266,267
266 B(J) = 1.0 - (2.0*AN)/(3.0*AW)
267 TR(J) = B(J)*S(J)
268 IF (XIS1(J)) 274,269,274
269 IF (S1(J)) 271,270,271
270 S1(J) = S(J) - TR(J)
271 IF (X1(J)) 273,272,273
272 IF (AW-1.01)2721,2725,2725
2721 X1(J) = -0.6666667
    GO TO 273
2725 X1(J) = 1.6666667 - (AW/AN)**2 + (((AW/AN)+2.0)*((AW/AN)-1.0)**2
    1/2.0)*LOGF(((AW/AN)+1.0)/((AW/AN)-1.0))
273 XIS1(J) = X1(J)*S1(J)
C
C SET UP FORMAT FOR RECORD 1 FROM THIS DATA IN NB1 REGION
C
274 NB1(1) = NB6(4*I+4)
    FB1(2) = BDATE(1)
    FB1(3) = BDATE(2)
    NB1(4) = NB6(4*I+3)
    I1 = 4+NTLEV
    I2 = I1+NTLEV

```

```

      I3 = I2+NTLEV
      I4 = I3+NTLEV
      I5 = I4+NTLEV
      I6 = I5+NTLEV+1
      DO 275 J = 1,NTLEV
      FB1(J+4) = S(J)
      NA = I1 + J
      FB1(NA) = XIS(J)
      NA = I2 + J
      FB1(NA) = TR(J)
      NA = I3 + J
      FB1(NA) = A(J)
      NA = I4 + J
      FB1(NA) = XIS1(J)
      NA = I5 + J
275  FB1(NA) = FNU(J)
C    FOLLOW FLOW IN FIG. 2.3
      IF (DEN) 276,277,276
      276 FB1(I6) = DEN
      GO TO 278
      277 FB1(I6) = AW/.60247
C    ADD DATA FOR SIGS0,SIGS1,NRES,SING TO THIS RECORD
      278 DO 279 I1 = 1,NBA
      IF (BCODE(4*I1 3)-FB6(4*I+3)) 279,280,279
      279 CONTINUE
      280 I2 = 10*(I1-1)
      I3 = NWDBR1-11
      DO 281 I1 = 1,10
      NA = I1 + I3
      NB = I1 + I2
      281 NB1(NA) = MOMIN(NB)
C
      DO 282 J = 1,30
      NA = I6 + J
      282 FB1(NA) = TS4500(J)
      I6 = I6+30
      DO 283 J = 1,30
      NA = I6 + J
      283 FB1(NA) = TS4000(J)
      I6 = I6+30
      DO 284 J = 1,30
      NA = I6 + J
      284 FB1(NA) = TS3500(J)
      I6 = I6+30
      DO 285 J = 1,30
      NA = I6 + J
      285 FB1(NA) = TS3000(J)
      I6 = I6+30
      DO 286 J = 1,30
      NA = I6 + J
      286 FB1(NA) = TS2500(J)
      I6 = I6+30
      DO 287 J = 1,30
      NA = I6 + J
      287 FB1(NA) = TS2000(J)

```

```

      I6 = I6+30
      DO 288 J = 1,30
      NA = I6 + J
288   FB1(NA) = TS1500(J)
      I6 = I6+30
      DO 289 J = 1,30
      NA = I6 + J
289   FB1(NA) = TS1000(J)
      I6 = I6+30
      DO 290 J = 1,30
      NA = I6 + J
290   FB1(NA) = TS500(J)
      I6 = I6+30
      DO 291 J = 1,30
      NA = I6 + J
291   FB1(NA) = TS68(J)
C     COMPUTE NUMBER OF WORDS IN REMAINDER OF DATA BLOCK
      CALL DIMEN (NB1)
292   IF (N1) 294,293,294
293   NB1(NWDBR1) = 0
      GO TO 2941
294   NB1(NWDBR1) = N1+1
2941  IF (N2) 295,296,295
295   NB1(NWDBR1) = NB1(NWDBR1) + N2 + 1
296   IF (N3) 297,298,297
297   NB1(NWDBR1) = NB1(NWDBR1) + N3 + 1
298   IF (N4) 299,300,299
299   NB1(NWDBR1) = NB1(NWDBR1) + N4 + 1
C     WRITE FIRST RECORD ON N,M TAPES AND ON OUTPUT TAPE
300   CALL NMTPRC (NWDBR1)
      CALL WRREC1 (1,PTCODE,PNCODE)
C
302   IF (N1) 303,306,303
C     READ IN, CALCULATE RECORD NUMBER, WRITE M,N TAPES AND PRINT
C     1FOR SIGS0 RECORD
303   DO 3031 J = 1,N1
3031  SIGS0(J) = 0.0
      READ DIP SIGS0,END
      IF (SENSE LIGHT 1) 3032,3033
3032  CALL DIPERR (3)
3033  NB1(1) = NB1(1) + 1
      I1 = N1 - 1
      DO 304 J = 1,I1
304   FB1(J+1) = SIGS0(J)
      CALL NMTPRC (N1)
305   CALL WRREC2 (PTCODE,PNCODE)
C
306   IF (N2) 307,310,307
C     READ IN, CALCULATE RECORD NUMBER, WRITE M,N TAPES AND PRINT
C     1FOR SIGS1 RECORD
307   DO 3071 J = 1,N2
3071  SIGS1(J) = 0.0
      READ DIP SIGS1,END
      IF (SENSE LIGHT 1) 3072,3073
3072  CALL DIPERR (6)

```



```

3073 NB1(1) = NB1(1) + 1
      I1 = N2 - 1
      DO 308 J = 1,I1
308 FB1(J+1) = SIGS1(J)
      CALL NMTPRC (N2)
309 CALL WRREC3 (PTCODE,PNCODE)
C
310 IF (N3) 311,314,311
C READ IN, PERFORM NECESSARY CALCULATIONS, COMPUTE RECORD NUMBER,
C 1WRITE M,N TAPES AND PRINT FOR RESONANCE DATA
311 DO 31100 J = 1,NRES
      RIO(J) = 0.0
      GN(J) = 0.0
      GG(J) = 0.0
      GF(J) = 0.0
      G(J) = 0.0
      PO(J) = 0.0
      R(J) = 0.0
31100 ETAR(J) = 0.0
      READ DIP E0,RIO,GN,GG,GF,G,PO,R,ETAR,END
      IF (SENSE LIGHT 1) 31101,31102
31101 CALL DIPERR (7)
31102 NB1(1) = NB1(1) + 1
      I2 = NRES+1
      I3 = NRES+I2
      I4 = NRES+I3
      I5 = NRES+I4
      DO 3121 J = 1,NRES
      FB1(J+1) = E0(J)
      ZQ = 1.0 + AN/AW
      ZG = GN(J) + GG(J) + GF(J)
      IF (RIO(J)) 3112,3111,3112
3111 RIO(J) = (4.0896285E+06*ZQ*ZQ*G(J)*(GG(J)+GF(J))*GN(J))/
      1(E0(J)*E0(J)*ZG)
3112 NA = J + I2
      FB1(NA) = RIO(J)
      IF (PO(J)) 3114,3113,3114
3113 PO(J) = (E0(J)*RIO(J))/(1.5707963*ZG)
3114 NA = J + I3
      FB1(NA) = PO(J)
      IF (R(J)) 3116,3115,3116
3115 R(J) = (3.44656E-4*AN*ZQ*E0(J))/(AW*ZG*ZG)
3116 NA = J + I4
      FB1(NA) = R(J)
      IF (ETAR(J)) 312,3117,312
3117 ETAR(J) = ((A1 B1*E0(J) C1*E0(J)**D1)*GF(J))/(GG(J) GF(J))
312 NA = J + I5
3121 FB1(NA) = ETAR(J)
      CALL NMTPRC (N3)
313 CALL WRREC4 (PTCODE,PNCODE)
C
314 IF (N4) 315,318,315
C READ IN, CALCULATE RECORD NUMBER, WRITE M,N TAPES AND PRINT
C 1FOR SIGNG RECORD
315 DO 3151 J = 1,N4

```

```

3151 SIGNG(J) = 0.0
      READ DIP, SIGNG,END
      IF (SENSE LIGHT 1) 3152,3153
3152 CALL DIPERR (8)
3153 NB1(1) = NB1(1) + 1
      I1 = N4 - 1
      DO 316 J = 1,I1
316  FB1(J+1) = SIGNG(J)
      CALL NMTPRC (N4)
317  CALL WRREC5 (PTCODE,PNCODE)
318  GO TO 323
C
C      SET UP SPECTRAL DATA BLOCK FROM CARD INPUT,
C      1COMPUTE RECORD NUMBER, WRITE N,M TAPES, PRINT
C
320  NB1(1) = NB6(4*I+4)
      FB1(2) = BDATE(1)
      FB1(3) = BDATE(2)
      NB1(4) = NB6(4*I+3)
      DO 321 J = 1,NTLEV
321  FB1(J+4) = SOR(J)
      FB1(NTLEV+5) = BETA
      FB1(NTLEV+6) = TM
      CALL NMTPRC (NSPECT)
322  CALL WRSPDB (1)
323  RETURN
      END (0,0,0)

```

SUBROUTINE NMTPRC (NW)

WRITE RECORD ON DATA TAPES

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(1
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(1
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

THIS ROUTINE IS USED FOR ALL TAPE WRITING.

MTAPE

600 IF (MTAPE) 601,610,601

601 CONTINUE

602 WRITE TAPE MTAPE, (NB1(I2),I2=1,NW)

IF (SENSE LIGHT 2) 607, 610

607 IF (NTAPE) 608,620,608

608 WRITE OUTPUT TAPE LTAPE, 609, MTAPE,NTAPE

609 FORMAT (1H130H2

1SS/37H

MTAPE = 0

DATA TAPEI3,18H FAILED TO PROCE
COMPILATION OF TAPEI3,14H WILL CONTINUE)

NTAPE

610 IF (NTAPE) 611,622,611

611 CONTINUE

612 WRITE TAPE NTAPE, (NB1(I2),I2=1,NW)
 IF (SENSE LIGHT 2) 617, 623

617 IF (MTAPE) 618,620,618

618 WRITE OUTPUT TAPE LTAPE,619, NTAPE,MTAPE

619 FORMAT (1H130H2

1SS/37H

NTAPE = 0

GO TO 623

DATA TAPEI3,18H FAILED TO PROCE
 COMPILATION OF TAPEI3,14H WILL CONTINUE)

C
 C
 C

BOTH TAPES HAVE FAILED

620 WRITE OUTPUT TAPE LTAPE, 621, MTAPE,NTAPE

621 FORMAT (1H128H2

1COMPILED)

NEITHER TAPEI3,3H ORI3,18H COULD BE

622 CALL EROR (11)

623 RETURN

END (0,0,0)

SUBROUTINE KTAPRC (NW)

C
C WRITE RECORD ON INTERMEDIATE TAPE
C

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN

C
EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

C
EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

C
DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

C
630 CALL TAPECK (NB2,NW,ITAPE)

631 WRITE TAPE KTAPE, (NB2(I2),I2=1,NW)
IF (SENSE LIGHT 2) 636, 638

636 CALL ERROR (12)

638 RETURN

END (0,0,0)

SUBROUTINE DIMEN (LOC)

C

COMPUTE DIMENSIONS

C

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
 1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
 2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
 3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
 4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

C

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
 1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
 2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(1
 31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
 4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
 5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
 6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
 7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
 8),B),(NB1(1650),PNU),(NB1(1695),ETA)

C

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
 100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(1
 21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
 3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
 42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
 5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

C

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
 1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
 2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
 30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
 4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
 5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
 600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
 700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
 800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

C

DIMENSION LOC(1)

C

THIS ROUTINE CALCULATES THE NUMBER OF WORDS IN THE
 1SIGS0, SIGS1, RESONANCE, AND SIGNG RECORDS AND STORES THIS
 2INFO IN N1, N2, N3, N4 RESPECTIVELY. IT ALSO STORES THE
 3MOMIN,MOMAX,--,MPRIMEGAMMAMAX NUMBERS INTO REGION MATDIM
 4TO BE USED IN THE WRREC SERIES ROUTINES.

640 IF (LOC(NWDBR1 10)) 642,641,642

641 N1 = 0

GO TO 643

642 N1 = (LOC(NWDBR1-9)-LOC(NWDBR1-10) 1)*(LOC(NWDBR1-8)-LOC(NWDBR1-10
 1)+1) 1

643 IF (LOC(NWDBR1 7)) 645,644,645

644 N2 = 0

GO TO 646

645 N2 = (LOC(NWDBR1-6)-LOC(NWDBR1-7)+1)*(LOC(NWDBR1-5)-LOC(NWDBR1-7)+
 1)+1

646 IF (LOC(NWDBR1 4)) 648,647,648

```
647 N3 = 0
    GO TO 649
648 N3 = 5*LOC(NWDBR1-4)+1
649 IF (LOC(NWDBR1 3)) 651,650,651
650 N4 = 0
    GO TO 652
651 N4 = (LOC(NWDBR1-2)-LOC(NWDBR1-3)+1)*(LOC(NWDBR1-1)-LOC(NWDBR1-3)+
11)+1
652 M2 = NWDBR1-11
    DO 653 M1 = 1,10
        NA = M1 + M2
653 MATDIM(M1) = LOC(NA)
    NRES = MATDIM(7)
    RETURN
    END (0,0,0)
```

SUBROUTINE TRNSDB (ITAPI)

TRANSFER DATA BLOCK FROM INPUT OR INTERMEDIATE TAPE TO DATA TAPES

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(1
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(1
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

SET UP RECORD NUMBER

NB1(1) = NB6(4*I+4)

TEST FOR SPECTRAL DATA

660 IF (FB6(4*I+3) 500.0) 664,661,661

SPECTRAL - WRITE M,N TAPES, PRINT IF DESIRED

661 CALL NMTPRC (NSPECT)

662 CALL WRSPDB (0)

663 GO TO 679

CROSS-SECTION WRITE M,N TAPES, PRINT IF DESIRED

664 CALL NMTPRC (NWDBR1)

665 CALL DIMEN (NB1)

666 CALL WRREC1 (0,PTCODE,PNCODE)

DO SAME FOR REMAINING RECORDS OF DATA BLOCK AFTER READING THESE IN

667 J2 = 0

IF (N1) 668,670,668

668 J2 = J2+1

CALL TAPECK (NB1,N1,ITAPI)

NB1(1) = NB6(4*I+4) + J2


```
CALL NMTPRC (N1)
669 CALL WRREC2 (PTCODE,PNCODE)
670 IF (N2) 671,673,671
671 J2 = J2+1
    CALL TAPECK (NB1,N2,ITAPI)
    NB1(1) = NB6(4*I+4) + J2
    CALL NMTPRC (N2)
672 CALL WRREC3 (PTCODE,PNCODE)
673 IF (N3) 674,676,674
674 J2 = J2+1
    CALL TAPECK (NB1,N3,ITAPI)
    NB1(1) = NB6(4*I+4) + J2
    CALL NMTPRC (N3)
675 CALL WRREC4 (PTCODE,PNCODE)
676 IF (N4) 677,679,677
677 J2 = J2+1
    CALL TAPECK (NB1,N4,ITAPI)
    NB1(1) = NB6(4*I+4) + J2
    CALL NMTPRC (N4)
678 CALL WRREC5 (PTCODE,PNCODE)
679 RETURN
    END (0,0,0)
```

SUBROUTINE WRINDX

WRITE INDEX RECORD ON OUTPUT TAPE

```

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

```

```

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

```

```

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

```

```

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),S1
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

```

```

700 WRITE OUTPUT TAPE LTAPE, 701, (NAMTAP(I),I=2,3),NLEV

```

```

701 FORMAT (1H157X,5HDATE 2A6///30X,12HINDEX RECORD///I33,7H LEVELS/10
1X,4HDATA/63H          BLOCK NO.      CODE NO.      DESIGNATION      R
2ECOND NO.//)

```

```

DO 705 I = 1,MAXDB1

```

```

WRITE OUTPUT TAPE LTAPE, 702, I,NB1(4*I+3),NB1(4*I+1),NB1(4*I+2),
1NB1(4*I+4)

```

```

702 FORMAT (I14,F18.4,4X,2A6,I12)

```

```

IF (I-40*(I/40)) 705,703,705

```

```

703 WRITE OUTPUT TAPE LTAPE, 704, NLEV

```

```

704 FORMAT (1H1///30X,12HINDEX RECORD///I33,7H LEVELS/10X,4HDATA/63H
1          BLOCK NO.      CODE NO.      DESIGNATION      RECORD NO.//)

```

```

705 CONTINUE

```

PUNCH INDEX RECORD

```

CALL BRAND(NAMTAP(2),2)
CALL PUNACB(NB1,NWINDX,0)

```

```
      CALL PUNACB(0,0,0)
      DO 707 I = 1,NWINDX
707  NB6(I) =NB1(I)
      RETURN
      END (0,0,0)
```

SUBROUTINE WRSECR

WRITE RECORD 2 ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
 1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
 2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
 3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
 4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
 1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
 2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
 31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
 4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
 5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
 6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
 7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
 8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
 100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
 21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
 3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
 42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
 5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
 1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
 2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
 30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
 4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
 5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
 600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
 700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
 800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

CHECK FOR PRINTING SECOND RECORD

710 DO 711 I1=1,NOPRNT
 IF (PCODE(I1)-.000002) 711,712,711

711 CONTINUE

GO TO 730

PRINT

712 WRITE OUTPUT TAPE LTAPE, 713

713 FORMAT (52H1, LEVEL ENERGY (EV) LETHARGY)

I2 = NTLEV+1

DO 718 I1=1,NLEV

NA = I1 + I2

IF ((I1-1)-5*((I1-1)/5)) 714,716,714

714 WRITE OUTPUT TAPE LTAPE, 715, I1,NB1(I1+1),NB1(NA)

715 FORMAT (I19,1PE19.7,E17.7)

GO TO 718

716 WRITE OUTPUT TAPE LTAPE, 717, I1,NB1(I1+1),NB1(NA)

717 FORMAT (1H0I18,1PE19.7,E17.7)

718 CONTINUE

```

      I2 = NLEV1+NTLEV
      DO 723 I1=1,NTHGRP
      NA = NLEV1 + I1
      NB = I1 + I2
      NC = THERM(I1)
      IF ((I1-1)-5*((I1-1)/5)) 719,721,719
719  WRITE OUTPUT TAPE LTAPE, 720, NC,NB1(NA),NB1(NB)
720  FORMAT (I20,1PE18.7,E17.7)
      GO TO 723
721  WRITE OUTPUT TAPE LTAPE, 722, NC,NB1(NA),NB1(NB)
722  FORMAT (1H0I19,1PE18.7,E17.7)
723  CONTINUE
      I2 = 2*NTLEV + 2
      I3 = I2 + NLEV1
      I4 = I3 + NLEV
      WRITE OUTPUT TAPE LTAPE, 724, NB1(I2),NB1(I3)
724  FORMAT (62H1                LOWER                UPPER                1/V
1 FACTOR/63H                GROUP      ENERGY (EV)      LETHARGY      (220
20 M/SEC)//11H                0,1PE19.7,E17.7)
      DO 729 I1 = 1,NLEV
      NA = I1 + I2
      NB = I1 + I3
      NC = I1 + I4
      IF (I1-5*(I1/5)) 725,727,725
725  WRITE OUTPUT TAPE LTAPE, 726, I1,NB1(NA),NB1(NB),NB1(NC)
726  FORMAT (I11,1PE19.7,1PE17.7,1PE17.7)
      GO TO 729
727  WRITE OUTPUT TAPE LTAPE, 728, I1,NB1(NA),NB1(NB),NB1(NC)
728  FORMAT (1H0I10,1PE19.7,1PE17.7,1PE17.7)
729  CONTINUE
C
C   PUNCH RECORD 2
C
C   CHECK FOR PUNCHING
730  DO 731 I1=1,NOPUN
      IF (PUNCOD(I1) .000002) 731,732,731
731  CONTINUE
      GO TO 734
C   PUNCH
732  CONTINUE
      CALL BRAND(6HREC 2 ,1)
      CALL PUNACB(NB1,NWRC2,0)
      CALL PUNACB(0,0,0)
734  RETURN
      END (0,0,0)

```

SUBROUTINE WRSPDB (NG)

WRITE SPECTRAL DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

IF NG = 1, THEN THIS IS AN ADDED DATA BLOCK AND IS TO BE

1PRINTED AUTOMATICALLY, IF NG = 0, THEN THIS BLOCK IS FROM EITHER
2ITAPE OR KTAPE AND A CHECK IS MADE FOR PRINTING.

739 IF (NG) 742,740,742

740 DO 741 I1=1,NOPRNT

IF (PCODE(I1)-FB6(4*I+3)) 741,742,741

741 CONTINUE

GO TO 754

PRINT

742 WRITE OUTPUT TAPE LTAPE, 743, (NB1(I1), I1=2,3),NB6(4*I+1),
1NB6(4*I+2),NB1(NTLEV+5),NB1(NTLEV+6)

743 FORMAT(1H156X,5HDATE 2A6///35X,25HDELAY PRECURSOR/60H
1 DESIGNATION FRACTION MEAN LIFE//13X,2A6
2,1P2E18.4///17X,34HLEVEL ENERGY SPECTRUM)

DO 748 I1=1,NLEV

IF ((I1-1)-5*((I1-1)/5)) 744,746,744

744 WRITE OUTPUT TAPE LTAPE, 745, I1,ENERGY(I1),NB1(I1+4)

745 FORMAT (I20,1PE16.3,E18.7)

```

      GO TO 748
746 WRITE OUTPUT TAPE LTAPE, 747, I1,ENERGY(I1),NB1(I1+4)
747 FORMAT (1H0119,1PE16.3,E18.7)
748 CONTINUE
      I2 = NLEV+4
      DO 753 I1=1,NTHGRP
      NA = I1 + NLEV
      NB = I1 + I2
      NC = THERM(I1)
      IF ((I1-1)-5*((I1-1)/5)) 749,751,749
749 WRITE OUTPUT TAPE LTAPE, 750, NC,ENERGY(NA),NB1(NB)
750 FORMAT (I21,1PE15.3,E18.7)
      GO TO 753
751 WRITE OUTPUT TAPE LTAPE, 752, NC,ENERGY(NA),NB1(NB)
752 FORMAT(1H0120,1PE15.3,E18.7)
753 CONTINUE
C
C   PUNCH SPECTRAL DATA BLOCK
C
C   CHECK FOR PUNCHING
754 DO 755 I1 = 1,NOPUN
      IF (PUNCOD(I1) FB6(4*I+3)) 755,756,755
755 CONTINUE
      GO TO 758
C   PUNCH
756 CONTINUE
      CALL BRAND(NB6(4*I+1),2)
      CALL PUNACB(NB1,NSPECT,0)
758 RETURN
      END (0,0,0)
      SUBROUTINE WRREC1 (NG,PTCODE,PNCODE)
C
C   WRITE RECORD 1 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE
C
      COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFBR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN
C
      EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)
C
      EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)

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5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGSO(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

C

C IF NG = 1, PRINTING IS AUTOMATIC, IF NG = 0, PRINT IF REQUESTED.

759 IF (NG) 762,760,762

760 DO 761 I1=1,NOPRNT

IF (PCODE(I1)-FB6(4*I+3)) 761,762,761

761 CONTINUE

GO TO 808

C

PRINT

762 WRITE OUTPUT TAPE LTape, 764, NB1(2),NB1(3),NB6(4*I+1),

1NB6(4*I+2),NB6(4*I+3),NB1(6*NTLEV+5)

764 FORMAT (1H157X,5HDATE 2A6/// 9X,53HDESIGNATION CODE NO.

1 DENSITY FACTOR//9X,2A6,F17.4,1PE22.5///70H

2 SIGMA XI SIGMA SIGMA SIGMA XI1 SIGMA/70H LEVEL

3 ENERGY SCATTER SCATTER TRANSPORT ABSORPTION SCATTER 1)

I3 = NTLEV+4

I4 = I3+NTLEV

I5 = I4+NTLEV

I6 = I5+NTLEV

I7 = I6+NTLEV

DO 769 I1=1,NLEV

NA = I1 + I3

NB = I1 + I4

NC = I1 + I5

ND = I1 + I6

IF ((I1-1)-5*((I1-1)/5)) 765,767,765

765 WRITE OUTPUT TAPE LTape, 766, I1,ENERGY(I1),NB1(I1+4),NB1(NA),NB1(
1NB),NB1(NC),NB1(ND)

766 FORMAT (I4,1PE11.3,4E11.4,E12.4)

GO TO 769

767 WRITE OUTPUT TAPE LTape, 768, I1,ENERGY(I1),NB1(I1+4),NB1(NA),NB1(
1NB),NB1(NC),NB1(ND)

768 FORMAT (1H0I3,1PE11.3,4E11.4,E12.4)

769 CONTINUE

I2 = NLEV + 4

I3 = I3+NLEV

I4 = I4+NLEV

I5 = I5+NLEV

I6 = I6+NLEV

I7 = I7+NLEV

DO 774 I1=1,NTHGRP

J1 = THERM(I1)

NA = I1 + I2

NB = I1 + I3

NC = I1 + I4


```

ND = I1 + I5
NE = I1 + I6
NF = I1+NLEV
IF ((I1-1)-5*((I1-1)/5)) 770,772,770
770 WRITE OUTPUT TAPE LTAPE, 771, J1,ENERGY(NF),NB1(NA),NB1(NB),NB1(NC
1),NB1(ND),NB1(NE)
771 FORMAT (I5,1PE10.3,4E11.4,E12.4)
GO TO 774
772 WRITE OUTPUT TAPE LTAPE, 773, J1,ENERGY(NF),NB1(NA),NB1(NB),NB1(NC
1),NB1(ND),NB1(NE)
773 FORMAT (1H0I4,1PE10.3,4E11.4,E12.4)
774 CONTINUE

```

C
C (PAGE 2)
C

```

775 WRITE OUTPUT TAPE LTAPE, 776, NB6(4*I+1),NB6(4*I+2),NB6(4*I+3),
1NB1(6*NTLEV+5)
776 FORMAT (63H1 DESIGNATION CODE NO. DENSIT
1Y FACTOR//10X,2A6,F17.4,1PE22.5///43X,8HNU SIGMA/21X,30HLEVEL
2ENERGY FISSION)
I3 = I6 + NTHGRP
DO 781 I1=1,NLEV
NA = I1 + I3
IF ((I1-1)-5*((I1-1)/5)) 777,779,777
777 WRITE OUTPUT TAPE LTAPE, 778, I1,ENERGY(I1),NB1(NA)
778 FORMAT (I24,1PE14.3,E14.4)
GO TO 781
779 WRITE OUTPUT TAPE LTAPE, 780, I1,ENERGY(I1),NB1(NA)
780 FORMAT (1H0I23,1PE14.3,E14.4)
781 CONTINUE
I3 = I3 + NLEV
DO 786 I1=1,NTHGRP
NA = I1 + NLEV
NB = I1 + I3
NC = THERM(I1)
IF ((I1-1)-5*((I1-1)/5)) 782,784,782
782 WRITE OUTPUT TAPE LTAPE, 783, NC,ENERGY(NA),NB1(NB)
783 FORMAT (I25,1PE13.3,E14.4)
GO TO 786
784 WRITE OUTPUT TAPE LTAPE, 785, NC,ENERGY(NA),NB1(NB)
785 FORMAT (1H0I24,1PE13.3,E14.4)
786 CONTINUE

```

C
C (PAGES 4-8)
C

```

788 I2 = 6*NTLEV + 6
DO 793 J = 1,NTHGRP
IF ((J-1)-2*((J-1)/2)) 791,789,791
789 WRITE OUTPUT TAPE LTAPE, 790, NB6(4*I+1),NB6(4*I+2)
790 FORMAT (1H129X,2A6///23X,25HTHERMAL TRANSFER MATRICES)
791 I3 = J + NLEV
WRITE OUTPUT TAPE LTAPE, 792, NB1(I2),NB1(I2 1),NB1(I2 2),NB1(I2 3
1),NB1(I2+4),I3,NB1(I2+5),NB1(I2+6),NB1(I2+7),NB1(I2+8),NB1(I2+9),
2I3,NB1(I2+10),NB1(I2+11),NB1(I2+12),NB1(I2+13),NB1(I2+14),I3,
3NB1(I2+15),NB1(I2+16),NB1(I2+17),NB1(I2+18),NB1(I2+19),I3,

```

4NB1(I2+20),NB1(I2+21),NB1(I2+22),NB1(I2+23),NB1(I2+24),
 5I3,I3,I3,I3,I3,I3,NB1(I2+25),NB1(I2+26),NB1(I2+27),NB1(I2+28),
 6NB1(I2+29)

792 FORMAT (//////68H TEMPERATURE SIGMA SIGMA SI
 1GMA NU SIGMA/67H DEG. F. SCATTER TRANSPORT
 2 ABSORPTION FISSION//1PE13.4,4E14.4//31X,9HN1 N2/28X,15H
 3SIGMA S (N1/N2)//63H 21 21 21 22 21 23
 4 21 24 21I4/1E13.4,4E14.4/63H 22 21 22 22
 5 22 23 22 24 22I4/1E13.4,4E14.4/63H 23 21
 6 23 22 23 23 23 24 23I4/1E13.4,4E14.4
 74/63H 24 21 24 22 24 23 24 24
 824I4/1E13.4,4E14.4/I7,4H 21I10,4H 22I10,4H 23I10,4H 24I10,4H
 9E13.4,4E14.4)

793 I2 = I2+30

GO TO 794

C
C
C

(PAGE 9)

794 WRITE OUTPUT TAPE LTAPE, 795, NB6(4*I+1),NB6(4*I+2)

795 FORMAT (1H130X,2A6//////////)

IF (N1) 796,798,796

796 WRITE OUTPUT TAPE LTAPE, 797, MATDIM(1),MATDIM(2),MATDIM(1),MATDIM
 1(3)

797 FORMAT (32X,8HSIGMA S0//27H TRANSFERS FROM GROUPSI3,8H THROUG
 1HI3,10H TO GROUPSI3,8H THROUGH13////)

798 IF (N2) 799,801,799

799 WRITE OUTPUT TAPE LTAPE, 800, MATDIM(4),MATDIM(5),MATDIM(4),MATDIM
 1(6)

800 FORMAT (32X,8HSIGMA S1//27H TRANSFERS FROM GROUPSI3,8H THROUG
 1HI3,10H TO GROUPSI3,8H THROUGH13////)

801 IF (N3) 802,804,802

802 WRITE OUTPUT TAPE LTAPE, 803, MATDIM(7)

803 FORMAT (29X,14HNO. RESONANCES//137////)

804 IF (N4) 805,807,805

805 WRITE OUTPUT TAPE LTAPE, 806, MATDIM(8),MATDIM(9),MATDIM(8),MATDIM
 1(10)

806 FORMAT (28X,15HSIGMA (N,GAMMA)//27H TRANSFERS FROM GROUPSI3,8
 1H THROUGH13,10H TO GROUPSI3,8H THROUGH13)

C SET PTCODE = 1.0 ACCORDINGLY AS THIS RECORD IS OR IS NOT

C 1PRINTED THUS AVOIDING A CHECK OF THE PCODE BLOCK IN

C 2SUBSEQUENT RECORDS OF THIS DATA BLOCK

807 PTCODE = 1.0

GO TO 809

808 PTCODE = 0.0

C
C PUNCH RECORD 1 OF CROSS SECTION DATA BLOCK

C
C CHECK FOR PUNCHING

809 DO 810 I1 = 1,NOPUN

IF (PUNCOD(I1) FB6(4*I+3)) 810,811,810

810 CONTINUE

GO TO 813

PUNCH

811 CONTINUE

```
CALL BRAND(NB6(4*I+1),2)  
CALL PUNACB(NB1,NWDBR1,0)
```

```
C   SET PNCODE = 1,0 ACCORDINGLY AS THIS RECORD IS OR IS NOT  
C 1PUNCHED THUS AVOIDING A CHECK OF THE PUNCOD BLOCK IN  
C 2SUBSEQUENT RECORDS OF THIS DATA BLOCK.
```

```
    PNCODE = 1.0
```

```
    GO TO 814
```

```
813 PNCODE = 0.0
```

```
814 RETURN
```

```
    END (0,0,0)
```

SUBROUTINE WRREC2 (II3,II4)

WRITE RECORD 2 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(1
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(1
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

SUBROUTINES WRREC2,WRREC3,WRREC5 EACH USE ROUTINE RC235

1 TO SET UP THE PRINT FORMAT. AS ALL RECORDS OF A DATA BLOCK

2 WILL BE PRINTED IF THE FIRST IS, THE CODE WORDS I33,I44 WERE

3 SET TO 1,0 IN WRREC1 ACCORDINGLY AS THIS

4 BLOCK IS OR IS NOT TO BE PRINTED, PUNCHED. THE VALUES OF

5 MATDIM(J) ARE MOMIN,MOMAX,... NG IS

6 A CODE WORD INDICATING THE PAGE HEADING TO BE PRINTED.

816 IF (II3) 817,822,817

817 M1 = MATDIM(1)

M2 = MATDIM(2)

820 CALL RC235 (M1,M2,N1,0)

PUNCH RECORD 2 OF CROSS SECTION DATA BLOCK

822 IF (II4) 823,824,823

823 N = NWDBR1

CALL PUNACB (NB1,N1,N)

824 RETURN
END (0,0,0)

SUBROUTINE WRREC3 (II3,II4)

WRITE RECORD 3 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWER,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,
5NWSGS0,NWSGS1,NWRES

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DFN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(1
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(1
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

SEE COMMENTS IN WRREC2

825 IF (II3) 826,831,826

826 M1 = MATDIM(4)

M2 = MATDIM(5)

829 CALL RC235 (M1,M2,N2,1)

PUNCH RECORD 3 OF CROSS SECTION DATA BLOCK

831 IF (II4) 832,833,832

832 N = NWDBR1 - NWSGS0

CALL PUNACB (NB1,N2,N)

833 RETURN

END (0,0,0)

SUBROUTINE WRREC4 (II3,II4)

WRITE RECORD 4 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,
5NWSGS0,NWSGS1,NWRES

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(1
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(1
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

SEE COMMENTS IN WRREC2

834 IF (II3) 835,845,835

835 WRITE OUTPUT TAPE LTAPE, 836, (NB6(4*I+1),NB6(4*I+2))

836 FORMAT (1H130X,2A6///38H RESONANCE RESONANCE PEAK/65H
1 ENERGY INTEGRAL CROSS SECTION R ETA/

2/)

I2 = NRES+1

I3 = NRES+I2

I4 = NRES+I3

I5 = NRES+I4

DO 844 I1 = 1,NRES

NA = I1 + I2

NB = I1 + I3

NC = I1 + I4

ND = I1 + I5

IF (I1-1) 840,840,837

```

837 IF ((I1-1)-40*((I1-1)/40)) 839,838,839
838 WRITE OUTPUT TAPE LTAPE, 836, (NB6(4*I+1),NB6(4*I+2))
839 IF ((I1-1)-5*((I1-1)/5)) 840,842,840
840 WRITE OUTPUT TAPE LTAPE,841, NB1(I1+1),NB1(NA),NB1(NB),NB1(NC),NB1
1(ND)
841 FORMAT (1PE13.4,4E14.4)
GO TO 844
842 WRITE OUTPUT TAPE LTAPE,843, NB1(I1+1),NB1(NA),NB1(NB),NB1(NC),NB1
1(ND)
843 FORMAT (1H01PE12.4,4E14.4)
844 CONTINUE

```

C

C

C

PUNCH RECORD 4 OF CROSS SECTION DATA BLOCK

```

845 IF (II4) 846,847,846
846 N = NWDBR1 - NWSGS0 - NWSGS1
CALL PUNACB (NB1,N3,N)
847 RETURN
END (0,0,0)

```


SUBROUTINE WRREC5 (II3,II4)

WRITE RECORD 5 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWRFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,
5NWSGS0,NWSGS1,NWRES

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

SEE COMMENTS IN WRREC2

848 IF (II3) 849,854,849

849 M1 = MATDIM(8)

M2 = MATDIM(9)

852 CALL RC235 (M1,M2,N4,2)

PUNCH RECORD 5 OF CROSS SECTION DATA BLOCK

854 IF (II4) 855,8551,855

855 N = NWDBR1 - NWSGS0 - NWSGS1 - NWRES

CALL PUNACB (NB1,N4,N)

8551 RETURN

END (0,0,0)

SUBROUTINE RC235 (M1,M2,NW,NG)

SET UP PRINT OUT FOR RECORDS 2, 3, AND 5 OF CROSS SECTION DATA BLO

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)

THIS ROUTINE IS USED BY WRREC2,WRREC3,WRREC5 TO SET UP PAGE
1 HEADINGS

856 J5 = M1
M3 = (NW-1)/(M2-M1+1)
I2 = (NW-1)/5
I3 = (NW-1) - 5*I2
K5 = M1-1
I1 = 1
8561 IF (K5-M3) 858,857,858
857 J1 = J5+1
K1 = M1
GO TO 859
858 J1 = J5
K1 = K5+1
859 IF (K1-M3) 861,860,861
860 J2 = J1+1
K2 = M1

```

      GO TO 862
861 J2 = J1
      K2 = K1+1
862 IF (K2-M3) 864,863,864
863 J3 = J2+1
      K3 = M1
      GO TO 865
864 J3 = J2
      K3 = K2+1
865 IF (K3-M3) 867,866,867
866 J4 = J3+1
      K4 = M1
      GO TO 868
867 J4 = J3
      K4 = K3+1
868 IF (K4-M3) 870,869,870
869 J5 = J4+1
      K5 = M1
      GO TO 871
870 J5 = J4
      K5 = K4+1
      IF (I2-I1-2) 873,873,871
871 IF ((I1-1) - 20*((I1-1)/20)) 873,872,873
872 IF (NG-1) 820,829,852
873 IF (I1-I2) 874,874,876
874 WRITE OUTPUT TAPE LTAPE, 875, J1,K1,J2,K2,J3,K3,J4,K4,J5,K5,
      1NB1(5*I1-3),NB1(5*I1-2),NB1(5*I1-1),NB1(5*I1),NB1(5*I1 1)
875 FORMAT (I7,I4,4(I10,I4)/1PE13.4,4E14.4)
      I1 = I1+1
      GO TO 8561
876 IF (I3-1) 887,879,877
877 IF (I3-3) 881,883,885
879 WRITE OUTPUT TAPE LTAPE, 880, J1,K1,NB1(5*I1 3)
880 FORMAT (I7,I4/1PE13.4)
      GO TO 887
881 WRITE OUTPUT TAPE LTAPE,882, J1,K1,J2,K2,NB1(5*I1-3),NB1(5*I1-2)
882 FORMAT (I7,I4,I10,I4/1PE13.4,E14.4)
      GO TO 887
883 WRITE OUTPUT TAPE LTAPE,884, J1,K1,J2,K2,J3,K3,NB1(5*I1-3),
      1NB1(5*I1-2),NB1(5*I1-1)
884 FORMAT (I7,I4,2(I10,I4)/1PE13.4,2E14.4)
      GO TO 887
885 WRITE OUTPUT TAPE LTAPE,886, J1,K1,J2,K2,J3,K3,J4,K4,NB1(5*I1-3),
      1NB1(5*I1-2),NB1(5*I1-1),NB1(5*I1)
886 FORMAT (I7,I4,3(I10,I4)/1PE13.4,3E14.4)
887 RETURN
820 WRITE OUTPUT TAPE LTAPE, 821, NB6(4*I+1),NB6(4*I+2)
821 FORMAT (1H129X,2A6///32X,8HN1 N2/28X,17HSIGMA S0 (N1/N2) //)
      GO TO 873
829 WRITE OUTPUT TAPE LTAPE, 830, NB6(4*I+1),NB6(4*I+2)
830 FORMAT (1H129X,2A6///32X,8HN1 N2/28X,17HSIGMA S1 (N1/N2) //)
      GO TO 873
852 WRITE OUTPUT TAPE LTAPE, 853, NB6(4*I+1),NB6(4*I+2)
853 FORMAT (1H129X,2A6///32X,8HN1 N2/28X,17HSIGMA N,G (N1/N2) //)
      GO TO 873

```

END (0,0,0)

SUBROUTINE FINREC

```

C
C  WRITE FINAL RECORD ON OUTPUT TAPE
C
COMMON  NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN
C
EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)
C
EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)
C
DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)
C
C  CALCULATE RECORD NUMBER
N = NB1(1) + 1
C  IF THIS IS A NEW TAPE, THERE ARE NO MACROSCOPIC DATA BLOCKS
IF(NEWTAP) 898,900,898
898 DO 899 J = 2,NWFR
899 NB1(J) = 0
GO TO 915
C  READ TO EOF AND BACKSPACE FOR FINAL RECORD
900 CALL FSFBI (ITAPE,1)
BACKSPACE ITAPE
BACKSPACE ITAPE
C  IF DELETIONS OR RELOCATIONS HAVE OCCURRED, READ MACROSCOPIC
C  RECORD INTO NB2 REGION TO MAKE ADJUSTMENTS OTHERWISE
C  READ DIRECTLY INTO NB1
901 IF (NBD) 903,902,903
902 IF (NPSN) 903,913,903
903 CALL TAPECK (NB2,NWFR,ITAPE)
C  UPDATE RECORD SEARCH FOR PRESENCE IN THE FINAL RECORD OF EACH

```

```

C      1CODE NUMBER OF INDEX RECORD
      NE = 1
      NB2(NWFR+1) = 0
      DO 910 I = 1,MAXDB
      IF (NB6(4*I+3)) 904,911,904
904 NF = 2
905 IF (NB2(NF)) 906,910,906
906 IF (NB2(NF) - NB6(4*I+3)) 907,908,907
907 NF = NF + 2*(NB2(NF+1)+1)
      GO TO 905
C      CODE NUMBER HAS BEEN LOCATED - COPY INFO TO NB1 REGION
908 NG = (NB2(NF+1)+1)*2
      DO 909 J = 1,NG
      NE = NE+1
      NA = NF+J-1
909 NB1(NE) = NB2(NA)
910 CONTINUE
C      STORE ZEROS IN REMAINDER OF TABLE (INCLUDING NWFR+1)
911 DO 912 K = NE,NWFR
912 NB1(K+1) = 0
      GO TO 914
C
C      COPY DIRECTLY INTO NB1 REGION
C
913 CALL TAPECK (NB1,NWFR,ITAPE)
      NB1(NWFR+1) = 0
C
C      PRINT FINAL RECORD
C
914 IF (NB1(2)) 917,915,917
915 WRITE OUTPUT TAPE LTAPE, 916
916 FORMAT (28H1 NO MACROSCOPIC DATA BLOCKS)
      GO TO 933
917 NF = 2
      NE = 0
      WRITE OUTPUT TAPE LTAPE, 918
918 FORMAT (49H1 MACROSCOPIC CROSS SECTIONS//27X,
118HCONSTITUENT TABLES///)
919 IF (NB1(NF)) 920,933,920
920 NG = NB1(NF+1)
      IF (NE) 921,922,921
921 CALL RESTO
922 DO 923 I = 1,MAXDB
      IF (NB1(NF) - NB6(4*I+3)) 923,924,923
923 CONTINUE
924 WRITE OUTPUT TAPE LTAPE, 925, NB1(NF),NB6(4*I+1),NB1(4*I+2)
925 FORMAT (13X,20HMACROSCOPIC CODE NO.15X,11HDESIGNATION/F28.4,20X,2A
16//58H CONSTITUENT DESIGNATION WEIGHT/5
29H CODE NO. FRACTION/)
926 DO 932 J = 1,NG
      NA = NF+1+2*J
      NB = NA-1
      DO 928 I = 1,MAXDB
      IF (NB6(4*I+3)) 927,9281,927
927 IF (NB6(4*I+3) NB1(NB)) 928,930,928

```

```

928 CONTINUE
9281 WRITE OUTPUT TAPE LTAPE, 929, NB1(NB),NB1(NA)
929 FORMAT (F21.4,1PE39.4)
GO TO 932
930 WRITE OUTPUT TAPE LTAPE, 931, NB1(NB),NB6(4*I+1),NB6(4*I+2),NB1(N
1A)
931 FORMAT (F21.4,9X,2A6,1PE18.4)
932 CONTINUE
NE = 1
NF = NF + 2*(NB1(NF+1)+1)
GO TO 919
C
C SEARCH FOR DELETED CONSTITUENTS
C
933 IF (NBD) 934,942,934
934 CALL RESTO
NF = 2
935 IF (NB1(NF)) 936,942,936
936 NA = NB1(NF+1)
DO 940 J = 1,NA
NB = NF + 2*J
DO 939 K = 1,NBD
IF (NB1(NB)-NBDEL(K)) 939,937,939
937 WRITE OUTPUT TAPE LTAPE, 938, NBDEL(K),NB1(NF)
938 FORMAT (10H4 MATERIALF12.4,35H WHICH IS A CONSTITUENT OF MATERIALE
112.4/21X,29HHAS BEEN MODIFIED OR DELETED.)
GO TO 940
939 CONTINUE
940 CONTINUE
941 NF = NF + 2*(NB1(NF+1)+1)
GO TO 935
C SET UP RECORD NUMBER
942 NB1(1) = N
C WRITE N,M TAPES
CALL NMTPRC (NWFR)
C
C PUNCH FINAL RECORD
C
C CHECK FOR PUNCHING
943 IF (NOPUN) 944,948,944
944 DO 945 J = 1,NOPUN
IF (PUNCOD(J)) 945,946,945
945 CONTINUE
GO TO 948
946 CONTINUE
CALL BRAND(6HFINAL ,1)
CALL PUNACB(NB1,NWFR,0)
CALL PUNACB(0,0,0)
948 CONTINUE
C END FILES
950 END FILE MTAPE
END FILE NTAPE
C REWIND TAPES
REWIND MTAPE
REWIND NTAPE

```

```
      IF (NEWTAP) 954,951,954  
951 REWIND ITAPE  
952 IF (NPSN) 953,954,953  
953 REWIND KTAPE  
954 RETURN  
      END (0,0,0)
```


SUBROUTINE DIPERR (N)

C

```

COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,NCODOT,
5FB3,NB4

```

C

```

EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)

```

C

```

EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RIO),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),PO),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)

```

C

```

DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RIO(200),GN(200),GG(200),GF(2
800),G(200),PO(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)
DIMENSION FB3(500),NB4(500)

```

C

```

400 WRITE OUTPUT TAPE LTAPE, 401, (NB6(4*I+1),NB6(4*I+2),NB6(4*I+3),
1MTAPE,NTAPE,ITAPE,KTAPE)
401 FORMAT (41H1A DIP ERROR HAS BEEN ENCOUNTERED IN DATA/7H BLOCK 2A6,
111H (CODE NO.F12.4,3H )///10H TO RERUN,7750H 1. REMOVE ALL
2DATA PRECEDING THIS DATA BLOCK/47H 2. INSERT PUNCHED CARD DAT
3A LABELED RERUN/30H 3. REMOUNT LOGICAL TAPES/12H A.I
44,4H ANDI4/12H B.I4,21H IF REVISING OLD TAPE/12H
5 C.I4,14H IF RELOCATING)

```

C

PUNCH OUT NECESSARY DATA FOR RERUNNING THIS CASE USING THE

C

1PARTIALLY COMPILED TAPES

PUNCH 404, BDATE(1),BDATE(2)

404 FORMAT(9H5BDATE,2,2A6/9H=RERUN,1,)

CALL BRAND(6HRERUN,1)

RERUN = 1.0

NC = NWINDX/4

CALL PUNACB(FB3,NC,0)

CALL PUNACB(NB4,NC,0)

CALL PUNACB (EL,NTLEV,0)

```

CALL PUNACB (FV,NTLEV,0)
NA = 4*(NBA+NPSN)
CALL PUNACB (NBPSN,NA,0)
CALL PUNACB (NB6,NWINDX,0)
NB = 10*NBA
CALL PUNACB (MOMIN,NB,0)
IF (NOPRNT) 4041,4042,4041
4041 CALL PUNACB (PCODE,NOPRNT,0)
4042 IF (NOPUN) 4043,4044,4043
4043 CALL PUNACB (PUNCOD,NOPUN,0)
4044 IF (NBD) 4045,4046,4045
4045 CALL PUNACB (NBDEL,NBD,0)
4046 IF (NPSN) 4047,4048,4047
4047 CALL PUNACB (NRRDB,NPSN,0)
CALL PUNACB (RLOCRC,NPSN,0)
4048 CALL PUNACB (THERM,68,0)
CALL PUNACB(0,0,0)
C PRINT ON-LINE COMMENT
PRINT 406, MTAPE,NTAPE
406 FORMAT (1H168H2A DIP ERROR HAS BEEN ENCOUNTERED WITH RND TAPES PAR
INITIALLY COMPILED.//35H PLEASE SAVE TAPES ON LOGICAL UNITS//I20/I20)
IF (NEWTAP) 412,407,412
407 PRINT 408,ITAPE
408 FORMAT (I20)
409 IF (NPSN) 410,412,410
410 PRINT 411, KTAPE
411 FORMAT (I20)
412 PRINT 413
413 FORMAT (1H1)
C EXIT TO STOP
414 CALL EROR (N)
RETURN
END (0,0,0)

```

SUBROUTINE TRYOVR

```

C
C RERUN A CASE IN WHICH A DIP DATA ERROR WAS ENCOUNTERED
C
COMMON NB1,NB2,NB6,NBPSN,MOMIN,PCODE,PUNCOD,NBDEL,NRRDB,RLOCRC,
1THERM,MATDIM,NAMTAP,NLEV,NEWTAP,NBA,NBD,NPSN,NOPRNT,NOPUN,NRES,
2NTHGRP,NLEV1,NTLEV,NWR,NWINDX,NWRC2,NWDBR1,N1,N2,N3,N4,NSPECT,
3NWFR,ITAPE,KTAPE,LTAPE,MTAPE,NTAPE,I,MAXDB2,
4MAXDB1,MAXDB,MAXDBM,IDMB11,IDMB12,IDMB21,IDMB22,AN,RERUN,NCODOT,
5FB3,NB4
C
EQUIVALENCE (NB1,FB1),(NB1(1006),EL,ENERGY),(NB1(1051),FV),(NB1(1
1096),UL,BDATE),(NB1(1141),EG),(NB1(1186),UG),(NB1(1098),AW),(NB1(1
2099),DEN),(NB1(1100),A2200),(NB1(1101),NDATA),(NB1(1102),A1),(NB1(
31103),B1),(NB1(1104),C1),(NB1(1105),D1),(NB1(1106),A2),(NB1(1107),
4B2),(NB1(1108),C2),(NB1(1109),D2),(NB1(1110),S,SIGS0,SIGS1,E0,SIGN
5G,BETA),(NB1(1111),TM),(NB1(1112),SOR),(NB1(1155),XIS),(NB1(1200),
6TR),(NB1(1245),A),(NB1(1290),XIS1),(NB1(1335),FNU),(NB1(1380),F),(
7NB1(1425),S1),(NB1(1470),T),(NB1(1515),X),(NB1(1560),X1),(NB1(1605
8),B),(NB1(1650),PNU),(NB1(1695),ETA)
C
EQUIVALENCE (NB1(1740),TS4500),(NB1(1770),TS4000),(NB1(1800),TS35
100),(NB1(1830),TS3000),(NB1(1860),TS2500),(NB1(1890),TS2000),(NB1(
21920),TS1500),(NB1(1950),TS1000),(NB1(1980),TS500),(NB1(2010),TS68
3),(NB1(1310),RI0),(NB1(1510),GN),(NB1(1710),GG),(NB2(1006),GF),(NB
42(1206),G),(NB2(1406),P0),(NB2(1606),R),(NB2(1806),ETAR),(NB2,FB2)
5,(NBPSN(2),BCODE),(NBPSN(3),BNAM),(NB6,FB6)
C
DIMENSION NB1(2100),FB1(2100),NB2(2050),FB2(2050),NB6(2010),
1FB6(2010),NBPSN(1992),BCODE(1991),BNAM(1990),MOMIN(4980),PCODE(500
2),PUNCOD(500),NBDEL(499),NRRDB(499),RLOCRC(499),THERM(15),MATDIM(1
30),EL(45),FV(45),UL(45),EG(45),UG(45),BDATE(2),S(45),SIGS0(925),SI
4GS1(925),E0(200),SIGNG(925),SOR(45),XIS(45),TR(45),A(45),XIS1(45),
5FNU(45),F(45),S1(45),T(45),X(45),X1(45),B(45),PNU(45),ETA(45),TS45
600(30),TS4000(30),TS3500(30),TS3000(30),TS2500(30),TS2000(30),TS15
700(30),TS1000(30),TS500(30),TS68(30),RI0(200),GN(200),GG(200),GF(2
800),G(200),P0(200),R(200),ETAR(200),ENERGY(45),NAMTAP(3)
DIMENSION FB3(500),NB4(500)
C
C READ IN DATA THAT WAS SAVED FROM THE FIRST ATTEMPT
CALL ACBIP
C POSITION MTAPE,NTAPE
I = I
NA = NB6(4*I+4) - 1
DO 400 J = 1,NA
READ TAPE MTAPE
400 READ TAPE NTAPE
IF (NEWTAP) 405,401,405
C POSITION ITAPE
401 N = NB4(NCODOT,1)
DO 4011 J = 2,N
4011 READ TAPE ITAPE
C POSITION KTAPE
IF (NPSN) 402,405,402
402 REWIND KTAPE

```

```
      IF (NWR) 403,405,403  
403 DO 404 J = 1,NWR  
404 READ TAPE KTAPE  
405 RETURN  
      END (0,0,0)
```

2.9 Program Mnemonic Glossary

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
A _i	σ_{ai} or Σ_{ai}	Absorption cross section
AN	m_n	Mass of neutron in atomic mass units (1.008986 A.M.U.)
AW	A	Atomic weight
A1	A ₁	Constant for calculation of ν (see Eq. 2.19)
A2	A ₂	Constant for calculation of η (see Eq. 2.14)
A2200	$\sigma_a(2200 \text{ m/sec})$	Absorption cross section at 2200 m/sec
B _i	$(1 - \bar{\mu}_0)_i$	$\bar{\mu}_0$ is the average scattering cosine in the laboratory system for isotropic scattering in the center-of-mass system
BCØDE _j		Data-block code number
BDATE _j		Date of data-block addition to tape
BETA	β	Spectral delay fraction
BNAM _j		12-letter BCI data-block identification
B1	B ₁	Constant for calculation of ν (see Eq. 2.19)
B2	B ₂	Constant for calculation of η (see Eq. 2.14)
C1	C ₁	Constant for calculation of ν (see Eq. 2.19)
C2	C ₂	Constant for calculation of η (see Eq. 2.14)
DEN	ρ	Density (gm/cm ³)
DF	A/N_0 or ρ	Density factor
EG _m		Group boundary energies (ev)
EL _i		Level energies (ev)
END		Dummy location for end of record card

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
ENERGY _i		Same as EL _i
ETA _i	η_i	$v\sigma_f/\sigma_a$
ETAR	η_l	$v\Gamma_f/(\Gamma_\gamma + \Gamma_f)$
EO	E_{ol}	Resonance energies (ev)
F _i	σ_{fi} or Σ_{fi}	Fission cross section
FB1		Temporary storage array (same as NB1)
FB2		Temporary storage array (same as NB2)
FB6		Temporary storage array (same as NB6)
FNU _i	$(v\sigma_f)_i$ or $(v\Sigma_f)_i$	Fission product cross section
FV _m		Group 1/v factors (value in a 1/v cross section in group m with a value of 1.0 at a neutron velocity, v, of 2200 m/sec)
G	g	Statistical weighting factor
GF	Γ_f	Resonance parameter (ev)
GG	Γ_γ	Resonance parameter (ev)
GN	Γ_n	Resonance parameter (ev)
IDMB11 IDMB12 IDMB21 IDMB22	} } } }	{ Limits of DØ loops used for clearing regions of memory
ITAPE		Old data tape being revised
KTAPE		Intermediate tape used for storage of data blocks being relocated
LTAPE		Output tape
MATDIM _n	(n = 1,2,...,10)	Temporary storage location for MO _{MIN} , MO _{MAX} , M' _O _{MAX} , M _L _{MIN} , M _L _{MAX} , M' _L _{MAX} , NRES, M _I _{MIN} , M _I _{MAX} , M' _I _{MAX} in that order for the material data block being considered
MAXDB		Maximum tolerable number of data blocks

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
MAXDBM		MAXDB - 1
MAXDB1		MAXDB + 1
MAXDB2		MAXDB + 2
MAXLEV		Maximum permissible number of energy levels
MTAPE		One of the new data tapes
	$M\Gamma_{MAX}$	Last group from which $\sigma_{n,\gamma}(m/m')$ transfers occur (see MOMIN, MATDIM)
	$M\Gamma_{MIN}$	First group from which and into which $\sigma_{n,\gamma}(m/m')$ transfers occur (see MOMIN, MATDIM)
	$M'\Gamma_{MAX}$	Last group into which $\sigma_{n,\gamma}(m/m')$ transfers occur (see MOMIN, MATDIM)
	MO_{MAX}	Last group from which $\sigma_{SO}(m/m')$ transfers occur (see MOMIN, MATDIM)
	MO_{MIN}	First group from which and into which $\sigma_{SO}(m/m')$ transfers occur (see MOMIN, MATDIM)
	$M'O_{MAX}$	Last group into which $\sigma_{SO}(m/m')$ transfers occur (see MOMIN, MATDIM)
	ML_{MAX}	Last group from which $\sigma_{S1}(m/m')$ transfers occur (see MOMIN, MATDIM)
	ML_{MIN}	First group from which and into which $\sigma_{S1}(m/m')$ transfers occur (see MOMIN, MATDIM)
	$M'l_{MAX}$	Last group into which $\sigma_{S1}(m/m')$ transfers occur (see MOMIN, MATDIM)
MOMIN		Block for storing the 10 pieces of index data MOMIN,...,M'\Gamma_{MAX} for data blocks added and relocated. The order is the same as in MATDIM, each data block occupying 10 consecutive locations
NAMTAP		12-letter BCI for tape name and date
NBA		Number of data blocks to be added to tape

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
NBD		Number of data blocks to be deleted from tape
NBDEL _j		Code numbers of blocks to be deleted
NBPSN _j		Data block position for blocks to be added and relocated
NB1		Temporary storage array (same as FB1)
NB2		Temporary storage array (same as FB2)
NB6		Temporary storage array (same as FB6)
NDATA		Data code (= 0 to perform calculations to complete data, = 1 to use data as entered only)
NEWTAP		Code for tape manufacture (= 0 to revise old tape, = 1 to make data tape solely from card data)
NLEV		Number of levels
NLEVL		NLEV + 1
NØPRNT		Number of blocks to be printed
NØPUN		Number of blocks to be punched
NPSN		Number of blocks to be relocated
NRES		Number of resonances for particular block under consideration
NRRDB _j		An array containing the physical record number of the first record of each data block on the intermediate tape (see RIØCRC)
NSPECT		Number of words on a spectral data block (= NTLEV + 6)
NTAPE		One of the new data tapes
NTHGRP		Number of thermal groups
NTLEV		Total number of levels (= NLEV + NTHGRP)
NW _j		Number of words in data block following the first record

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
NWDBR1		Number of words in first record of a material data block ($= 6 \times \text{NTLEV} + 30 \times \text{NTHGRP} + 16$)
NWFR		Number of words in final record
NWINDX		Number of words in index record
NWR		Current KTAPE position--used in subroutine DATACT
NWRC2		Number of words in the second record ($= 2 \times \text{NTLEV} + 3 \times \text{NLEV} + 3$)
NWSGSO		Amount by which $\sigma_{S1}(\text{ML}_{\text{MIN}}/\text{M}'\text{l}_{\text{MIN}})$ is to be relocated downward from $\sigma_{S0}(\text{MOMIN}/\text{M}'\text{OMIN})$ when punching the SIGS1 record of a material data block--depends on program RNDC requirements. It is independent of whether or not a SIGSO record exists
NWSGS1		Relates the location of the initial word of a resonance record to the initial word of the SIGS1 record as NWSGSO relates the initial word of the SIGS1 record to the initial word of a SIGSO record--independent of whether or not SIGS1 block exists
NWRES		Relates the location of the initial word of a SIGNG record to the initial word of a resonance record as NWSGS1 relates the initial word of the resonance record to the initial word of the SIGS1 record--independent of whether or not a resonance block exists
NWSGNG		Number of words reserved for SIGNG record to meet program RNDC requirements
N1		Number of words in SIGSO record--calculated by subroutine DIMEN
N2		Number of words in SIGS1 record--calculated by subroutine DIMEN
N3		Number of words in resonance record--calculated by subroutine DIMEN

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
N4		Number of words in SIGNG record--calculated by subroutine DIMEN
PC Ø DE _j		Code numbers of blocks to be printed
PNU _i	ν_i	Number of neutrons emitted per fission
PUNC Ø D		Code numbers of blocks to be punched
PO _l	σ_{ol}	Peak cross section (barns)
R _l	R _l	Doppler temperature coefficient ($^{\circ}\text{K}^{-1}$)
RERUN		Code word--not ordinarily at user's option--to signify a rerun case. It is normally set to 0. In case of a DIP error when reading data blocks from cards, it is punched together with other data by subroutine DIPERR.
RI _{ol}	I _{ol}	Resonance integral (barns)
RI Ø CRC _j		Code numbers of data blocks on intermediate tape (see NRRDB)
S _i	σ_{si} or Σ_{si}	Scattering cross section (barns or cm^{-1})
SIGNG	$\sigma_{n,\gamma}(m/m')$ or $\Sigma_{n,\gamma}(m/m')$	n, γ transfer matrix
SIGSO		Scattering transfer matrix
SIGSL		First-order scattering transfer matrix
SOR _i		Spectral level values
SL _i	σ_{sl_i} or Σ_{sl_i}	First-moment scattering cross section
T _i	σ_{ti} or Σ_{ti}	Total cross section
THERM _n	(n = 1,2,..., NTHGRP)	Thermal levels--fixed in subroutine INIT
TM		Mean life of neutron group precursor
TR _i	σ_{tri} or Σ_{tri}	Transport cross section

<u>Program Mnemonic</u>	<u>Math Symbol</u>	<u>Description</u>
TS...	$\sigma_s(k/k')$ or $\Sigma_s(k/k')$	Thermal scattering transfer matrix for ...OF
UG _m		Group boundary lethargies
UL ₁		Level lethargies
X ₁	ξ_1	Average logarithmic energy decrement
XIS ₁	$\xi\sigma_{s1}$ or $\xi\Sigma_{s1}$	Slowing-down cross section
XISL ₁	$(\xi_1\sigma_{s1})_1$ or $(\xi_1\Sigma_{s1})_1$	First-moment slowing-down cross section
XL ₁	ξ_{11}	First-moment average logarithmic energy decrement

3.0 REACTOR NUCLEAR DATA MACROSCOPIC PROGRAM

3.1 General Information

The Reactor Nuclear Data Macroscopic Program (RNDM) prepares macroscopic material cross-section data from microscopic cross section data present on the Reactor Nuclear Data Tape. Two new RND tapes, including these calculated macroscopic data blocks, are written and the index and final records updated. If requested, the program will print out and punch on binary cards the new macroscopic blocks as well as any other data blocks appearing on the tape. All program output, whether writing the new binary tapes, printing binary-coded decimal output, or punching binary cards, is performed in accordance with the same specifications and formats as described in section 2.0, for program RNDP.

3.2 Equations and Data Requirements

The macroscopic cross sections are calculated from the microscopic cross sections with the following equation:

$$\Sigma = \rho \sum_{i=1}^N \left[W_i \frac{N_O}{A_i} \sigma_i \right]$$

where

- ρ = material density in gm per cc,
- W_i = weight fraction of the i th constituent,
- N_O/A_i = density factor of the i th constituent,
- σ_i = microscopic cross section of the i th constituent,
- N = total number of constituents.

Several words in the data block are not calculated in the manner described above. The methods for treating these words are described below.

- DEN - material density, supplied as input
- MOMIN - minimum MO_{MIN} of the microscopic constituents, calculated
- MOMAX - maximum MO_{MAX} of the microscopic constituents, calculated
- MOPMAX - maximum $M'O_{MAX}$ of the microscopic constituents, calculated
- MLMIN - minimum ML_{MIN} of the microscopic constituents, calculated
- MLMAX - maximum ML_{MAX} of the microscopic constituents, calculated
- MLPMAX - maximum $M'l_{MAX}$ of the microscopic constituents, calculated
- NRES - $\sum_{i=1}^N (NRES)_i$ where N is the total number of constituents, calculated
- MGMIN - minimum MT_{MIN} of the microscopic constituents, calculated

- MGMAX - maximum M_{MAX} of the microscopic constituents, calculated
- MGPMAX - maximum M'_{MAX} of the microscopic constituents, calculated
- EO - contains all the resonance energies for each of the microscopic constituents, calculated
- RIO - calculated as $\rho W_1 N_0 / A_1 [I_0(l)]_1$ at each resonance energy level l , for each of the i constituents
- PO - calculated as $\rho W_1 N_0 / A_1 [\sigma_0(l)]_1$ at each resonance energy level l , for each of the i constituents
- R - calculated as $R(l)_1$ at each resonance energy level l , for each of the i constituents
- ETAR - calculated as $\eta(l)_1$ at each resonance energy level l , for each of the i constituents
- DATE - supplied as input
- BDATE - supplied as input

3.3 Description of Subroutines Unique to this Program

3.3.1 Subroutine MAC1

This subroutine sets tape assignments and program constants, the temperature levels of the thermal groups, and the maximum possible number of data blocks. The first record of card input data and the index record from the master data tape are read in and stored in NB6. The tape indices that depend on the number of energy levels are calculated, and the second record on the master tape is brought into core memory.

3.3.2 Subroutine MAC2

This subroutine collects the record location information from the master tape, identifies the next macroscopic data block to be processed, and calls subroutine MAC3 to calculate the macroscopic cross sections. The completed macroscopic data block is then written on an intermediate tape, KTAPE, and the index record is revised to reflect the addition of this data block. When all of the input-specified number of macroscopic data blocks have thus been calculated, control is returned to the main program.

3.3.3 Subroutine MAC3

Thus subroutine brings into memory the necessary input data for the next macroscopic data block to be processed. The microscopic constituents are ordered as they appear on the master tape, and subroutine MAC4 is called to process in turn each constituent, computing the macroscopic cross section data. When all the constituents have been combined, the final record is up-dated to include this macroscopic data block and control is returned to MAC2.

3.3.4 Subroutine MAC4

This subroutine reads into memory each of the records within the microscopic constituent data block. Each piece of data is multiplied by

the calculated weighting factor and added into the macroscopic cross section block. The matrix indices and number of resonances for the macroscopic data block are computed and stored in the appropriate locations. Control is then returned to subroutine MAC3.

3.3.5 Subroutine MAC5

This subroutine computes from information contained in record 1, the number of words in records 2, 3, 4, and 5 of the microscopic constituent data block.

3.3.6 Subroutine MAC6

This subroutine is used to position the master tape and read in the final record. The information for the new macroscopic data blocks is added, and the new revised final record is stored in core memory.

3.3.7 Subroutine MAC7

This subroutine is used to initiate the transfer of the revised index and final records, the second record, and all data blocks to the two new data tapes. As each data block is written on the new binary tapes, the program will check for possible printout of the data block. Only those data blocks, requested in the input, will be written on the output tape. The only exceptions are the index and final records which are automatically printed. The program will always punch on binary cards the index and final records, and all calculated macroscopic cross section data blocks. When all output operations have been completed, control is returned to the main program.

3.3.8 Subroutine MAC8

The purpose of this subroutine is to test for failures in reading or writing binary tapes. If tape failure does occur, sense light 2 is turned on, and the program will stop. If the subroutine finds the sense light off, control is returned to the calling subroutine.

3.3.9 Subroutine MAC9

The purpose of this subroutine is two-fold. First it serves to transfer a completed macroscopic data record from one portion of core storage to another, prior to writing this record on the intermediate tape KTAPE. Secondly, it computes the macroscopic cross sections from the microscopic constituent data for the fifth record in the macroscopic data block.

3.3.10 Subroutine MAC10

This is an auxiliary subroutine used to transfer a particular set of data from one portion of core storage to another.

3.4 Program Gross Flow Chart

The program gross flow chart is shown in Figure 3.1.

Fig. 3.1 Program Gross Flow Chart

3.5 Program Diagnostics

<u>External Formula Number</u>	<u>Error</u>
<u>Subroutine MAC1</u>	
900,902	Fifth consecutive failure in attempting to read the master tape
901	Sense light 1 after reading first DIP input data
<u>Subroutine MAC2</u>	
914	Negative value of N1
915	Negative value of N2
916	Negative value of N3
917	Negative value of N4
<u>Subroutine MAC3</u>	
921	Sense light 1 after reading DIP input data
<u>Subroutine MAC4</u>	
930	Negative value of N1
931	Negative value of N2
932	Negative value of N3
933	Negative value of N4
934	Number of resonances equals or exceeds NRMAX originally set as 200
935	Negative value of MOMIN in FB1
9351	Negative value of MOMIN in FB2
936	Negative value of MLMIN in FB1
9361	Negative value of MLMIN in FB2
937	Negative value of MGIN in FB1
9371	Negative value of MGIN in FB2
<u>Subroutine MAC5</u>	
940	Negative value of MOMIN in FB1
941	Negative value of MLMIN in FB1
942	Negative value of NRES in FB1
943	Negative value of MGIN in FB1
<u>Subroutine MAC8</u>	
980	Five consecutive failures in trying to read or write a tape record and check its accuracy against a second reading or writing

External Formula
Number

Error

Subroutine NMTPRC

624

Both data tapes have failed to check against a
written record five consecutive times

3.6 Program Input Forms

RNDM

PROGRAM RNDM

INDEX DATA

5DATE,2,	/ /		
	MONTH	DAY	YEAR
	(2 Characters)	(2 Characters)	(2 Characters)

4NØMAC,		, NØPRNT,	
	Number of macroscopic cross section blocks to be calculated.		Number of blocks to be printed out.*

*The Index and Final records are always printed out.

Code Numbers of Blocks To Be Printed

(2 × 10⁻⁶ = Record 2)

3PCØDE	,		,		,		,		,
①	,		,		,		,		,
①	,		,		,		,		,
①	,		,		,		,		,

NOTE: The Index Record, all calculated macroscopic cross section blocks, and the final record are always punched out in binary.

MACROSCOPIC CROSS SECTION BLOCKS

Index Data

	Data-Block Designation (12 Characters)
5BNAM, 2,	
N ₁ [*]	
E17510, 2,	
N ₂ [*]	
E17508, 2,	
N ₃	
E17506, 2,	
N ₄	
E17504, 2,	
N ₅	
E17502, 2,	
N ₆	
E17500, 2,	

	Data-Block Code No.
3BCØDE,	
3BCØDE, =,	
3BCØDE, 2=,	
3BCØDE, 3=,	
3BCØDE, 4=,	
3BCØDE, 5=,	
3BCØDE, 6=,	

	Data-Block Position
4NBPSN,	
4NBPSN, =,	
4NBPSN, 2=,	
4NBPSN, 3=,	
4NBPSN, 4=,	
4NBPSN, 5=,	
4NBPSN, 6=,	

* N_j = (Location of BNAM) - 2j

= END,	0	,
--------	---	---

RNDM

MACROSCOPIC CROSS SECTIONS

Constituent Data

5BDATE,2,	/	/
Month (2 char.)	Day (2 char.)	Year (2 char.)

3DEN,	,
Density	

4NCØN,	,
Number of Macroscopic Constituents	

Microscopic Constituent Code Numbers		Microscopic Constituent Weight Fractions	
3CØNNØ,	,	WGT,	,
3CØNNØ, =,	,	WGT, =,	,
3CØNNØ, 2=,	,	WGT, 2=,	,
3CØNNØ, 3=,	,	WGT, 3=,	,
3CØNNØ, 4=,	,	WGT, 4=,	,
3CØNNØ, 5=,	,	WGT, 5=,	,
3CØNNØ, 6=,	,	WGT, 6=,	,
3CØNNØ, 7=,	,	WGT, 7=,	,

= END,	0	,
--------	---	---

3.7 Program Source Deck Listing

```

C      PROGRAM RNDM
C
      COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
      1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
      2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
      3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
      4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
      5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
      EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
      DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
      DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
      1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
      2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
C
C      SET INDICES
C
      1 CALL MAC1
C
C      COMPILE MACROSCOPIC DATA BLOCKS AND PLACE ON INTERMEDIATE TAPE,
C      REVISE INDEX RECORD, TABULATE FOR FINAL RECORD
C
      2 CALL MAC2
C
C      COMPILE FINAL RECORD
C
      3 CALL MAC6
C
C      OUTPUT
      4 CALL MAC7
      CALL EXIT
      END

```

C SUBROUTINE TO SET RNDM INDICES
 SUBROUTINE MAC1

C
 COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
 1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
 2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
 3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
 4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
 5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
 EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
 DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
 DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
 1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
 2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
 100 NTHGRP=10
 NWSGS0=626
 NWSGS1=626
 NRMAX=200
 NWRES=1001
 NWINDX=2000
 NWFINR=1000
 NTR=20
 THERM(1)=4500.
 THERM(2)=4000.
 THERM(3)=3500.
 THERM(4)=3000.
 THERM(5)=2500.
 THERM(6)=2000.
 THERM(7)=1500.
 THERM(8)=1000.
 THERM(9)=500.
 THERM(10)=68.
 MAXDB1=NWINDX/4-1
 MAXDB=MAXDB1-1
 ITAPE=8
 KTAPE=9
 LTAPE=3
 MTAPE=7
 NTAPE=6
 REWIND ITAPE
 REWIND KTAPE
 REWIND MTAPE
 REWIND NTAPE
 CALL NOPAGE
 C READ IN FIRST INPUT DATA RECORD
 101 READ DIP DATE,NOMAC,NOPRNT,PCODE,BNAM,BCODE,
 1NBPSN,END
 IF(SENSE LIGHT1)901,102
 C
 C READ INDEX RECORD
 C
 102 READ TAPE ITAPE,(FB6(I1),I1=1,NWINDX)
 IF(SENSE LIGHT 2) 900,1021
 C SET INDICES THAT DEPEND ON NLEV
 1021 NLEV=NB6(4)

```
NTLEV=NLEV+NTHGRP
NWDBR1=6*NTLEV 30*NTHGRP 16
NWRC2=2*NTLEV+3*NLEV+3
NSPECT=NTLEV+6
MAXWD2=(NLEV+1)**2+1
NTWDS=2*MAXWD2 NWDBR1+5*NRMAX+20*NTLEV + 3
103 READ TAPE ITAPE,(FB1(I1),I1=1,NWRC2)
IF(SENSE LIGHT 2) 902,1031
1031 M4=NLEV+1
DO 1032 J1=1,M4
J2=2*NTLEV+1+J1
1032 ENERGY(J1)=FB1(J2)
NG=2*MAXWD2+2*NLEV
DO 1033 J1=1,NLEV
J2=NG+J1
ERA=ENERGY(J1)/ENERGY(J1 1)
1033 FLOC(J2)=LOGF(ERA)
104 RETURN
900 CALL ERRORA
STOP
901 CALL ERRORA
STOP
902 CALL ERRORA
STOP
END
```

SUBROUTINE MAC1

SUBROUTINE TO SET RNDM INDICES

```

C
C
COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
100 NTHGRP=10
NWSGS0=626
NWSGS1=626
NRMAX=200
NWRES=1001
NWINDX=2000
NWFINR=1000
NTR=20
THERM(1)=4500.
THERM(2)=4000.
THERM(3)=3500.
THERM(4)=3000.
THERM(5)=2500.
THERM(6)=2000.
THERM(7)=1500.
THERM(8)=1000.
THERM(9)=500.
THERM(10)=68.
MAXDB1=NWINDX/4-1
MAXDB=MAXDB1-1
ITAPE=8
KTAPE=9
LTAPE=3
MTAPE=7
NTAPE=6
REWIND ITAPE
REWIND KTAPE
REWIND MTAPE
REWIND NTAPE
CALL NOPAGE
C READ IN FIRST INPUT DATA RECORD
101 READ DIP DATE,NOMAC,NOPRNT,PCODE,BNAM,BCODE,
1NBPSN,END
IF(SENSE LIGHT1)901,102
C
C READ INDEX RECORD
C
102 READ TAPE ITAPE,(FB6(I1),I1=1,NWINDX)
IF(SENSE LIGHT 2) 900,1021
C SET INDICES THAT DEPEND ON NLEV
1021 NLEV=NB6(4)

```



```
NTLEV=NLEV+NTHGRP
NWDBR1=6*NTLEV 30*NTHGRP 16
NWRC2=2*NTLEV+3*NLEV+3
NSPECT=NTLEV+6
MAXWD2=(NLEV+1)**2+1
NTWDS=2*MAXWD2 NWDBR1+5*NRMAX+20*NTLEV + 3
103 READ TAPE ITAPE,(FB1(I1),I1=1,NWRC2)
IF(SENSE LIGHT 2) 902,1031
1031 M4=NLEV+1
DO 1032 J1=1,M4
J2=2*NTLEV+1+J1
1032 ENERGY(J1)=FB1(J2)
NG=2*MAXWD2+2*NLEV
DO 1033 J1=1,NLEV
J2=NG+J1
ERA=ENERGY(J1)/ENERGY(J1 1)
1033 FLOC(J2)=LOGF(ERA)
104 RETURN
900 CALL ERRORA
STOP
901 CALL ERRORA
STOP
902 CALL ERRORA
STOP
END
```

SUBROUTINE MAC2

```

C
C SUBROUTINE TO ADD MACROSCOPIC DATA BLOCKS TO
C INTERMEDIATE TAPE
C
COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
C COLLECT RECORD LOCATING INFORMATION
103 DO 104 I1=1,MAXDB
IF(NB6(4*I1 + 8) - NB6(4*I1 + 4))1035,1035,104
1035 II3 = I1
GO TO 1041
104 CONTINUE
II3 = MAXDB
1041 DO 1045 J1=1,II3
FINR(2*J1 - 1) = FB6(4*J1 + 3)
NFINR(2*J1) = NB6(4*J1 + 4)
1045 CONTINUE
NA=1
NR=0
105 DO 1150 I=1,MAXDB
1055 DO 106 J1=1,NOMAC
NF=J1
IF(I NBPSN(J1))106,112,106
106 CONTINUE
111 GO TO 1150
112 DO 1125 I1=1,NTWDS
1125 NB2(I1)=0
CALL MAC3
DO 1126 I1=1,NWDBR1
1126 FB1(I1)=FB2(I1)
ND=6*NTLEV+6
DO 1127 J=1,NTHGRP
FB1(ND)=THERM(J)
ND=ND+30
1127 CONTINUE
C
C WHEN CALLING MAC8(NT,NW,ITAPI) SET NT=1 FOR WRITING TAPE ITAPI
C
NW=NWDBR1
ITAPI=KTAPE
WRITE TAPE ITAPI,(NB1(I1),I1=1,NW)
CALL MAC8(1,NW,ITAPI)
CALL MAC5
M=1
ND=NWDBR1

```

```

      IF(N1)914,1132,113
113  M4=NLEV+1
      CALL MAC9(MA2,MB2,MC2,M4,0.0)
      M=M+1
      WRITE TAPE ITAPI,(NB1(I1),I1=1,N1)
      CALL MAC8(1,N1,ITAPI)
1132 ND=ND+MAXWD2
      IF(N2)915,1135,1133
1133 M=M+1
      M4=NLEV+1
      CALL MAC9(MA3,MB3,MC3,M4,0.0)
      WRITE TAPE ITAPI,(NB1(I1),I1=1,N2)
      CALL MAC8(1,N2,ITAPI)
1135 ND=ND+MAXWD2
      IF(N3)916,1142,1136
1136 M=M+1
      NW = NRES + 1
      DO 1137 J1= 1,NW
        J2 = ND + J1
1137 FB1(J1) = FB2(J2)
        ND = ND + NRMAX + 1
        DO 1138 J1 =1,NRES
          J2 = ND + J1
          J3 = J1 + NW
1138 FB1(J3) = FB2(J2)
          ND = ND + NRMAX
          NW = NW + NRES
          DO 1139 J1 = 1,NRES
            J2 = ND + J1
            J3 = NW + J1
1139 FB1(J3) = FB2(J2)
            ND = ND + NRMAX
            NW = NW + NRES
            DO 1140 J1 = 1,NRES
              J2 = ND + J1
              J3 = NW + J1
1140 FB1(J3) = FB2(J2)
              ND = ND + NRMAX
              NW = NW + NRES
              DO 1141 J1=1,NRES
                J2 = ND + J1
                J3 = NW + J1
1141 FB1(J3) = FB2(J2)
              WRITE TAPE ITAPI,(NB1(I1),I1=1,N3)
              CALL MAC8(1,N3,ITAPI)
1142 ND = NWDBR1 + 2*MAXWD2 + 5*NRMAX + 1
              IF(N4)917,1145,1143
1143 CALL MAC9(MA5,MB5,MC5,NTR,0.0)
              M=M+1
              WRITE TAPE ITAPI,(NB1(I1),I1=1,N4)
              CALL MAC8(1,N4,ITAPI)
C      CORRECT INDEX RECORD
1145 DO 1146 J1=1,NWINDX
1146 FB1(J1)=FB6(J1)
      FB6(4*I+1)=BNAM(2*NF-1)

```

```
FB6(4*I+2)=BNAM(2*NF)
FB6(4*I+3)=BCODE(NF)
NB6(4*I+8)=NB6(4*I+4)+M
NB=I 1
DO 1149 I1=NB,MAXDB
FB6(4*I1+1)=FB1(4*I1-3)
FB6(4*I1+2)=FB1(4*I1-2)
FB6(4*I1+3)=FB1(4*I1-1)
IF(NB1(4*I1+4) NB1(4*I1))1147,1147,1148
1147 NB6(4*I1+8)=0
NB6(NWINDX+1)=NB6(4*I1+4)
GO TO 1150
1148 NB6(4*I1+8)=NB6(4*I1+4)+NB1(4*I1+4)-NB1(4*I1)
1149 CONTINUE
1150 CONTINUE
1153 RETURN
914 CALL ERRORA
STOP
915 CALL ERRORA
STOP
916 CALL ERRORA
STOP
917 CALL ERRORA
STOP
END
```

SUBROUTINE MAC3

```

C
C SUBROUTINE TO LOCATE CONSTITUENT DATA BLOCKS
C
COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
C
C READ CONSTITUENT DATA
NE=0
120 READ DIP BDATE,DEN,NCON,CONNO,WGT,END
IF(SENSE LIGHT 1)921,1205
1205 ND=5 6*NTLEV
FB2(ND)=DEN
NB2(1)=NB6(4*1 4)
FB2(2)=BDATE(1)
FB2(3)=BDATE(2)
FB2(4)=BCODE(NF)
C LOCATE CONSTITUENT DATA BLOCKS
121 DO 128 J=1,MAXDB
DO 1215 J1=1,NCON
NB=J1
IF(FINR(2*J-1) CONNO(J1))1215,122,1215
1215 CONTINUE
GO TO 128
122 IF(NA= J)125,127,123
123 NC = NFINR(2*NA) - NFINR(2*J)
NA=J
DO 124 J1=1,NC
124 BACKSPACE ITAPE
GO TO 127
125 NC=NFINR(2*J)-NFINR(2*NA)
NA=J
DO 126 J1=1,NC
126 READ TAPE ITAPE
127 CALL MAC4
NA =NA+1
128 CONTINUE
1281 ND=NWINDX+2+NR
FB6(ND)=BCODE(NF)
ND=ND+1
NB6(ND)=NCON
DO 1286 J1=1,NCON
J2=ND+2*J1-1
J3=ND+2*J1
6 FB6(J2)=CONNO(J1)
5 1286 FB6(J3)=WGT(J1)

```

NR=NR+2*NCON+2

129 RETURN

921 CALL ERRORA

STOP

END

SUBROUTINE MAC4

SUBROUTINE TO COMPILE MACROSCOPIC DATA BLOCKS

```

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

```

```

WHEN CALLING MAC8(NT,NW,ITAPI), SET NT=0 FOR READING NW WORDS
FROM ITAPI INTO FB1

```

```

130 READ TAPE ITAPE,(NB1(J1),J1=1,NWDBR1)

```

```

CALL MAC8(0,NWDBR1,ITAPE)

```

```

COMPUTE WEIGHTING FACTOR

```

```

ND=5 6*NTLEV

```

```

WGHTFR=DEN*WGT(NB)/FB1(ND)

```

```

CALCULATE AND STORE MACROSCOPIC CONSTITUENTS

```

```

ND=ND-1

```

```

DO 131 J1=5,ND

```

```

131 FB2(J1)=WGHTFR*FB1(J1)+FB2(J1)

```

```

ND=ND+2

```

```

DO 132 I2=1,NTHGRP

```

```

DO 1316 J1=1,29

```

```

J2=ND+J1

```

```

1316 FB2(J2)=WGHTFR*FB1(J2)+FB2(J2)

```

```

ND=ND+30

```

```

132 CONTINUE

```

```

LOCATE AND STORE MINIMUM MOMIN, MAX MOIMAX, MAX MOOMAX

```

```

IF(NB1(NWDBR1-10))935,135,1321

```

```

1321 IF(NB2(NWDBR1-10))9351,133,134

```

```

133 NB2(NWDBR1-10)=NB1(NWDBR1-10)

```

```

NB2(NWDBR1-9)=NB1(NWDBR1 9)

```

```

NB2(NWDBR1-8)=NB1(NWDBR1 8)

```

```

GO TO 135

```

```

134 NB2(NWDBR1-10)=XMINOF(NB2(NWDBR1-10),NB1(NWDBR1-10))

```

```

NB2(NWDBR1-9)= XMAXOF(NB2(NWDBR1-9),NB1(NWDBR1-9))

```

```

NB2(NWDBR1-8)= XMAXOF(NB2(NWDBR1-8),NB1(NWDBR1-8))

```

```

LOCATE AND STORE MINIMUM M1MIN, MAXIMUM M1IMAX, MAXIMUM M1OMAX

```

```

135 IF(NB1(NWDBR1-7))936,138,1355

```

```

1355 IF(NB2(NWDBR1-7))9361,136,137

```

```

136 NB2(NWDBR1-7)=NB1(NWDBR1 7)

```

```

NB2(NWDBR1-6)=NB1(NWDBR1 6)

```

```

NB2(NWDBR1-5)=NB1(NWDBR1 5)

```

```

GO TO 138

```

```

137 NB2(NWDBR1-7)= XMINOF(NB2(NWDBR1-7),NB1(NWDBR1-7))

```

```

NB2(NWDBR1-6)= XMAXOF(NB2(NWDBR1-6),NB1(NWDBR1-6))

```

```

      NB2(NWDBR1-5)=XMAXOF(NB2(NWDBR1-5),NB1(NWDBR1-5))
C      ADD SUMS OF NRES TERMS
138  NB2(NWDBR1-4)=NB2(NWDBR1 4)+NB1(NWDBR1-4)
      IF(NB2(NWDBR1-4)-NRMAX)1381,934,934
C      LOCATE AND STORE MINIMUM MGMIN, MAXIMUM MG1MAX, MAXIMUM MGOMAX
1381 IF(NB1(NWDBR1-3))937,1406,139
139  IF(NB2(NWDBR1-3))9371,140,1405
140  NB2(NWDBR1-3)=NB1(NWDBR1 3)
      NB2(NWDBR1-2)=NB1(NWDBR1 2)
      NB2(NWDBR1-1)=NB1(NWDBR1 1)
      GO TO 1406
1405 NB2(NWDBR1-3)=XMINOF(NB2(NWDBR1-3),NB1(NWDBR1-3))
      NB2(NWDBR1-2)=XMAXOF(NB2(NWDBR1-2),NB1(NWDBR1-2))
      NB2(NWDBR1-1)=XMAXOF(NB2(NWDBR1-1),NB1(NWDBR1-1))
C      STORE SCATTERING CROSS-SECTIONS IN RECORD 2,3 MATRICES
1406 NG=2*MAXWD2
      DO 700 J1=1,NG
700  FLOC(J1)=0.0
      NG=2*MAXWD2+2*NLEV
      M4=NLEV+1
      NH=1
      NJ=NTLEV+4
      DO 1407 J1=1,NLEV
1407 J2=NH+J1
      J3=NG+J1
      J4=NJ+J1
      FLOC(J2+1)=FB1(J4)/FLOC(J3)
      FLOC(J2)=FB1(J1+4)-FLOC(J2+1)
      NH=NH+M4
1407 CONTINUE
      NH=MAXWD2
      NJ=4*NTLEV+4
      DO 1408 J1=1,NLEV
1408 J2=NH+J1
      J3=NG+J1
      J4=NJ+J1
      J5=2*NTLEV+4+J1
      FLOC(J2+1)=FB1(J4)/FLOC(J3)
      FLOC(J2)=FB1(J1+4)-FB1(J5)-FLOC(J2 1)
      NH=NH+M4
1408 CONTINUE
C      COPY RECORDS 2,3,4,5
141  CALL MAC5
      ND=NWDBR1
      IF(N1)930,1425,1415
1415 READ TAPE ITAPE,(FB1(J1),J1=1,N1)
      CALL MAC8(0,N1,ITAPE)
      CALL MAC10(MA2,MB2,MC2,M4,0)
      DO 1416 J1=1,MAXWD2
1416 J2=ND+J1
      FB2(J2)=WGHTFR*FLOC(J1)+FB2(J2)
1425 ND=ND+MAXWD2
      IF(N2)931,145,143
143  READ TAPE ITAPE,(FB1(J1),J1=1,N2)
      CALL MAC8(0,N2,ITAPE)

```



```

CALL MAC10(MA3,MB3,MC3,M4,1)
DO 144 J1=1,MAXWD2
  J2=ND+J1
  J3=MAXWD2+J1
144 FB2(J2)=WGHTFR*FLOC(J3)+FB2(J2)
145 ND=ND+MAXWD2
  IF(N3)932,1485,1455
1455 READ TAPE ITAPE,(FB1(J1),J1=1,N3)
  CALL MAC8(0,N3,ITAPE)
  NRES1=NRES+1
  DO 146 J1=2,NRES1
    J2=ND+NE+J1
146 FB2(J2)=FB1(J1)
    ND = ND + NRMAX + 1
    DO 1465 J1=1,NRES
      J2=NRES1+J1
      J3=ND+NE+J1
1465 FB2(J3)=WGHTFR*FB1(J2)
      ND=ND+NRMAX
      DO 147 J1=1,NRES
        J2=2*NRES+1+J1
        J3=ND+NE+J1
147 FB2(J3)=WGHTFR*FB1(J2)
        ND=ND+NRMAX
        DO 1475 J1=1,NRES
          J2=3*NRES+1 + J1
          J3=ND+NE+J1
1475 FB2(J3)=FB1(J2)
          ND=ND+NRMAX
          DO 148 J1=1,NRES
            J2=4*NRES+1+J1
            J3=ND+NE+J1
148 FB2(J3)=FB1(J2)
          NE=NE+NRES
1485 ND = NWDBR1 + 2*MAXWD2 + 5*NRMAX + 1
          IF(N4)933,149,1486
1486 READ TAPE ITAPE,(FB1(J1),J1=1,N4)
          CALL MAC8(0,N4,ITAPE)
          CALL MAC9(MA5,MB5,MC5,NTR,WGHTFR)
149 RETURN
930 CALL ERRORA
  STOP
931 CALL ERRORA
  STOP
932 CALL ERRORA
  STOP
933 CALL ERRORA
  STOP
934 CALL ERRORA
  STOP
935 CALL ERRORA
  STOP
9351 CALL ERRORA
  STOP
936 CALL ERRORA

```

	STOP
9361	CALL ERRORA
	STOP
937	CALL ERRORA
	STOP
9371	CALL ERRORA
	STOP
	END

SUBROUTINE MAC5

SUBROUTINE TO DETERMINE RECORD 2,3,4,5 INDICES

```

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

```

```

150 N1=0
    N2=0
    N3=0
    N4=0

```

```

1505 IF(NB1(NWDBR1-10))940,152,151

```

```

151 MA2=NB1(NWDBR1 10)
    MB2=NB1(NWDBR1 9)
    MC2=NB1(NWDBR1 8)
    N1=(MB2-MA2+1)*(MC2-MA2+1)+1

```

```

152 IF(NB1(NWDBR1-7))941,154,153

```

```

153 MA3=NB1(NWDBR1 7)
    MB3=NB1(NWDBR1 6)
    MC3=NB1(NWDBR1 5)
    N2=(MB3-MA3+1)*(MC3-MA3+1)+1

```

```

154 IF(NB1(NWDBR1-4))942,156,155

```

```

155 NRES=NB1(NWDBR1-4)
    N3=5*NRES+1

```

```

156 IF(NB1(NWDBR1-3))943,158,157

```

```

157 MA5=NB1(NWDBR1 3)
    MB5=NB1(NWDBR1 2)
    MC5=NB1(NWDBR1 1)
    N4=(MB5-MA5+1)*(MC5-MA5+1)+1

```

```

158 RETURN

```

```

940 CALL ERRORA
    STOP

```

```

941 CALL ERRORA
    STOP

```

```

942 CALL ERRORA
    STOP

```

```

943 CALL ERRORA
    STOP
    END

```

SUBROUTINE MAC6

SUBROUTINE TO WRITE FINAL RECORD

```

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

```

```

160 CALL FSFBT(ITAPE,1)
BACKSPACE ITAPE
BACKSPACE ITAPE

```

```

WHEN CALLING MAC8(NT,NW,ITAPI), SET NT=0 FOR READING NW WORDS
FROM ITAPI INTO FB1

```

```

READ TAPE ITAPE,(FB1(J1),J1=1,NWFINR)
CALL MAC8(0,NWFINR,ITAPE)
DO 170 J1=1,NWFINR
170 FINR(J1)=FB1(J1)
NFINR(1)=NB6(NWINDX+1)
NTR=NB6(NWINDX 1)
DO 172 J1=1,NWFINR
NC=J1
IF(FB1(J1))172,175,172
172 CONTINUE

```

```

TRANSFER ADDITIONS TO FINAL RECORD

```

```

175 DO 177 J1=1,NR
J2=NWINDX+J1+1
J3=NC+J1-1
177 FINR(J3)=FB6(J2)
RETURN
END

```

SUBROUTINE MAC7

C
C
C
OUTPUT SUBROUTINE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
 1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
 2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
 3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
 4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
 5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
 EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
 DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
 DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
 1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
 2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

C
C
C
OUTPUT INDEX RECORD

180 DO 181 J1=1,NWINDX
 181 FB1(J1)=FB6(J1)
 NW=NWINDX
 CALL NMTPRC(NWINDX)
 CALL WRINDX

C
C
C
OUTPUT RECORD 2

182 REWIND ITAPE
 REWIND KTAPE
 READ TAPE ITAPE

C
C
C
C
WHEN CALLING MAC8(NT,NW,ITAPI), SET NT=0 FOR READING NW WORDS
 FROM ITAPI INTO FB1

183 READ TAPE ITAPE,(FB1(J1),J1=1,NWRC2)
 CALL MAC8(0,NWRC2,ITAPE)
 1831 DO 1832 J1=1,NTLEV
 J2=1 J1
 1832 ENERGY(J1)=FB1(J2)
 NW=NWRC2
 CALL NMTPRC(NWRC2)
 1836 CALL WRSECR

C
184 DO 1852 I=1,MAXDB
 NX=4*I+3
 IF(NB6(NX+1)-NTR)1841,186,1841
 1841 DO 185 J1=1,NOMAC
 IF(FB6(NX)-BCODE(J1))185,1851,185
 185 CONTINUE
 CALL TRNSDB(ITAPE,0.0)
 GO TO 1852
 1851 CALL TRNSDB(KTAPE,1.0)
 1852 CONTINUE
 186 CALL FINREC
 RETURN
 END

SUBROUTINE MAC8(NT,NW,ITAPI)

C

TAPE CHECKING SUBROUTINE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
 1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
 2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
 3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
 4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
 5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
 EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
 DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
 DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
 1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
 2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

C

NT=NT

NW=NW

ITAPI=ITAPI

IF(SENSE LIGHT 2) 980, 198

198 RETURN

980 CALL ERRORA
 STOP

END

SUBROUTINE MAC9(M1,M2,M3,M4,WFR)

SUBROUTINE TO TRANSFER RECORD2,3,5 MATRIX DATA

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

M1 = LOCATION OF FIRST FB1 MATRIX MAIN DIAGONAL ELEMENT

M2 = LOCATION OF LAST FB1 MATRIX COLUMN

M3 = LOCATION OF LAST FB1 MATRIX ROW

L1 = NUMBER OF FB1 MATRIX COLUMNS

L2 = NUMBER OF FB1 MATRIX ROWS

L3 = LOCATION OF FIRST FB1 MATRIX WORD

M4 = MAXIMUM FB2 MATRIX ROWS

ALL FB1 LOCATIONS WITH RESPECT TO THE FB2 MAXIMUM SIZE MATRIX

L1=M2-M1+1

L2=M3-M1+1

L3=(M1-1)(M4+1)+1

NNH=1

IF(WFR)200,204,200

200 DO 202 J1=1,L1

DO 201 J2=1,L2

J3=NNH+J2

J4=ND+L3+J2

201 FB2(J4)=WFR*FB1(J3)+FB2(J4)

NNH=NNH+L2

L3=L3+M4

202 CONTINUE

GO TO 207

204 DO 206 J1=1,L1

DO 205 J2=1,L2

J3=NNH+J2

J4=ND+L3+J2

205 FB1(J3)=FB2(J4)

NNH=NNH+L2

L3=L3+M4

206 CONTINUE

207 RETURN

END

SUBROUTINE MAC10(M1,M2,M3,M4,NT)

C

SUBROUTINE TO TRANSFER RECORDS 2 AND 3 MATRIX DATA

C

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

C

L1=M2-M1+1
L2=M3-M1+1
L3=(M1-1)(M4+1)+1+NT*MAXWD2
NNH=1
DO 212 J1=1,L1
DO 211 J2=1,L2
J3=NNH+J2
J4=L3+J2
211 FLOC(J4)=FB1(J3)
NNH=NNH+L2
L3=L3+M4
212 CONTINUE
RETURN

END

SUBROUTINE NMTPRC (NW)

WRITE RECORD ON DATA TAPES

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

MTAPE

600 IF (MTAPE) 601,610,601
601 CONTINUE
602 WRITE TAPE MTAPE, (NB1(I2),I2=1,NW)
IF(SENSE LIGHT 2) 607, 610
607 IF (NTAPE) 608,620,608
608 WRITE OUTPUT TAPE LTAPE, 609, MTAPE,NTAPE
609 FORMAT (1H130H2 DATA TAPEI3,18H FAILED TO PROCE
1SS/37H COMPILATION OF TAPEI3,14H WILL CONTINUE)
MTAPE = 0

NTAPE

610 IF (NTAPE) 611,622,611
611 CONTINUE
612 WRITE TAPE NTAPE, (NB1(I2),I2=1,NW)
IF(SENSE LIGHT 2) 617, 623
617 IF (MTAPE) 618,620,618
618 WRITE OUTPUT TAPE LTAPE,619, NTAPE,MTAPE
619 FORMAT (1H130H2 DATA TAPEI3,18H FAILED TO PROCE
1SS/37H COMPILATION OF TAPEI3,14H WILL CONTINUE)
NTAPE = 0
GO TO 623

BOTH TAPES HAVE FAILED

620 WRITE OUTPUT TAPE LTAPE, 621, MTAPE,NTAPE
621 FORMAT (1H128H2 NEITHER TAPEI3,3H OR I3,18H COULD BE
1COMPILED)
622 GO TO 624
623 RETURN
624 CALL ERRORA
STOP
END

SUBROUTINE TRNSDB(ITAPI,PNCODE)

TRANSFER DATA BLOCK FROM INPUT OR INTERMEDIATE TAPE TO DATA TAPES

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

TEST FOR SPECTRAL DATA

SET UP RECORD NUMBER

WHEN CALLING MAC8(NT,NW,ITAPI) SET NT=0 FOR READING TAPE ITAPI

660 IF (FB6(4*I+3) 500.0) 664,661,661
SPECTRAL - WRITE M,N TAPES, PRINT IF DESIRED

661 READ TAPE ITAPI,(NB1(J1),J1=1,NSPECT)
CALL MAC8(0,NSPECT,ITAPI)
NB1(1)=NB6(4*I 4)
CALL NMTPRC(NSPECT)

662 CALL WRSPDB (0)

663 GO TO 679

664 READ TAPE ITAPI,(NB1(J1),J1=1,NWDBR1)
CALL MAC8(0,NWDBR1,ITAPI)
NB1(1)=NB6(4*I 4)

CROSS-SECTION WRITE M,N TAPES, PRINT IF DESIRED

CALL NMTPRC(NWDBR1)

665 CALL MAC5

666 CALL WRREC1 (0,PTCODE,PNCODE)

DO SAME FOR REMAINING RECORDS OF DATA BLOCK AFTER READING THESE IN

667 J2 = 0
IF (N1) 668,670,668

668 J2 = J2+1
READ TAPE ITAPI,(NB1(J1),J1=1,N1)
CALL MAC8(0,N1,ITAPI)
NB1(1) = NB6(4*I+4) + J2
CALL NMTPRC (N1)

669 CALL WRREC2 (PTCODE,PNCODE)

670 IF (N2) 671,673,671

671 J2 = J2+1
READ TAPE ITAPI,(NB1(J1),J1=1,N2)
CALL MAC8(0,N2,ITAPI)
NB1(1) = NB6(4*I+4) + J2
CALL NMTPRC (N2)

672 CALL WRREC3 (PTCODE,PNCODE)

673 IF (N3) 674,676,674

674 J2 = J2+1

```
READ TAPE ITAPI,(NB1(J1),J1=1,N3)
CALL MAC8(0,N3,ITAPI)
NB1(1) = NB6(4*I+4) + J2
CALL NMTPRC (N3)
675 CALL WRREC4 (PTCODE,PNCODE)
676 IF (N4) 677,679,677
677 J2 = J2+1
READ TAPE ITAPI,(NB1(J1),J1=1,N4)
CALL MAC8(0,N4,ITAPI)
NB1(1) = NB6(4*I+4) + J2
CALL NMTPRC (N4)
678 CALL WRREC5 (PTCODE,PNCODE)
679 IF(PNCODE)680,681,680
680 CALL PUNACB(0,0,0)
681 RETURN
END
```

SUBROUTINE WRINDX

C
C

WRITE INDEX RECORD ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

C

700 WRITE OUTPUT TAPE LTAPE, 701, (DATE(I1),I1 = 1,2),NLEV
701 FORMAT (1H157X,5HDATE 2A6///30X,12HINDEX RECORD///I33,7H LEVELS/10
1X,4HDATA/63H BLOCK NO. CODE NO. DESIGNATION R
2ECOND NO.//)
DO 705 I = 1,MAXDB1
WRITE OUTPUT TAPE LTAPE, 702, I,NB1(4*I+3),NBI(4*I+1),NB1(4*I+2),
1NB1(4*I+4)
702 FORMAT (I14,F18.4,4X,2A6,I12)
IF (I-40*(I/40)) 705,703,705
703 WRITE OUTPUT TAPE LTAPE, 704, NLEV
704 FORMAT (1H1///30X,12HINDEX RECORD///I33,7H LEVELS/10X,4HDATA/63H
1 BLOCK NO. CODE NO. DESIGNATION RECORD NO.//)
705 CONTINUE

C
C
C

PUNCH INDEX RECORD

CALL BRAND(DATE,2)
CALL PUNACB (NB1,NWINDX,0)
CALL PUNACB(0,0,0)
RETURN
END

SUBROUTINE WRSECR

WRITE RECORD 2 ON OUTPUT TAPE

```

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,MOPUN,I13,J,M,N,NWSGS0,NWSGSI,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

```

CHECK FOR PRINTING SECOND RECORD

NLEV1 = NLEV + 1

710 DO 711 I1=1,NOPRNT

IF (PCODE(I1)-.000002) 711,712,711

711 CONTINUE

GO TO 730

PRINT

712 WRITE OUTPUT TAPE LTAPE, 713

713 FORMAT (52H1 LEVEL ENERGY (EV) LETHARGY)

I2 = NTLEV+1

DO 718 I1=1,NLEV

NA = I1 + I2

IF ((I1-1)-5*((I1-1)/5)) 714,716,714

714 WRITE OUTPUT TAPE LTAPE, 715, I1,NB1(I1+1),NB1(NA)

715 FORMAT (I19,1PE19.7,E17.7)

GO TO 718

716 WRITE OUTPUT TAPE LTAPE, 717, I1,NB1(I1+1),NB1(NA)

717 FORMAT (1H0I18,1PE19.7,E17.7)

718 CONTINUE

I2 = NLEV1+NTLEV

DO 723 I1=1,NTHGRP

NA = NLEV1 + I1

NB = I1 + I2

NC = THERM(I1)

IF ((I1-1)-5*((I1-1)/5)) 719,721,719

719 WRITE OUTPUT TAPE LTAPE, 720, NC,NB1(NA),NB1(NB)

720 FORMAT (I20,1PE18.7,E17.7)

GO TO 723

721 WRITE OUTPUT TAPE LTAPE, 722, NC,NB1(NA),NB1(NB)

722 FORMAT (1H0I19,1PE18.7,E17.7)

723 CONTINUE

I2 = 2*NTLEV + 2

I3 = I2 + NLEV1

I4 = I3 + NLEV

WRITE OUTPUT TAPE LTAPE, 724, NB1(I2),NB1(I3)

724 FORMAT (62H1 LOWER UPPER 1/V

1 FACTOR/63H GROUP ENERGY (EV) LETHARGY (220

20 M/SEC)//11H 0,1PE19.7,E17.7)

DO 729 I1 = 1,NLEV

```
NA = I1 + I2
NB = I1 + I3
NC = I1 + I4
IF (I1-5*(I1/5)) 725,727,725
725 WRITE OUTPUT TAPE LTape, 726, I1,NB1(NA),NB1(NB),NB1(NC)
726 FORMAT (I11,1PE19.7,1PE17.7,1PE17.7)
GO TO 729
727 WRITE OUTPUT TAPE LTape, 728, I1,NB1(NA),NB1(NB),NB1(NC)
728 FORMAT (1H0I10,1PE19.7,1PE17.7,1PE17.7)
729 CONTINUE
C
C PUNCH RECORD 2
C
C CHECK FOR PUNCHING
730 DO 731 I1=1,NOPUN
IF (PUNCOD(I1) .000002) 731,732,731
731 CONTINUE
GO TO 734
C PUNCH
732 CALL BRAND(6HREC 2 ,1)
CALL PUNACB (NB1,NWRC2,0)
CALL PUNACB(0,0,0)
734 RETURN
END
```

SUBROUTINE WRSPDB (NG)

WRITE SPECTRAL DATA BLOCK ON OUTPUT TAPE

```
COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGS0,NWSGSI,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
```

IF NG = 1, THEN THIS IS AN ADDED DATA BLOCK AND IS TO BE
1PRINTED AUTOMATICALLY, IF NG = 0, THEN THIS BLOCK IS FROM EITHER
2ITAPE OR KTAPE AND A CHECK IS MADE FOR PRINTING.

739 IF (NG) 742,740,742

740 DO 741 I1=1,NOPRNT

IF (PCODE(I1)-FB6(4*I+3)) 741,742,741

741 CONTINUE

GO TO 754

PRINT

742 WRITE OUTPUT TAPE LTAPE, 743, (NB1(I1), I1=2,3),NB6(4*I+1),

1NB6(4*I+2),NB1(NTLEV+5),NB1(NTLEV+6)

743 FORMAT(1H156X,5HDATE 2A6///35X,25HDELAY PRECURSOR/60H

1	DESIGNATION	FRACTION	MEAN LIFE//13X,2A6
2,1P2E18.4///17X,34HLEVEL	ENERGY	SPECTRUM)	

DO 748 I1=1,NLEV

IF ((I1-1)-5*((I1-1)/5)) 744,746,744

744 WRITE OUTPUT TAPE LTAPE, 745, I1,ENERGY(I1),NB1(I1+4)

745 FORMAT (I20,1PE16.3,E18.7)

GO TO 748

746 WRITE OUTPUT TAPE LTAPE, 747, I1,ENERGY(I1),NB1(I1+4)

747 FORMAT (1H0I19,1PE16.3,E18.7)

748 CONTINUE

I2 = NLEV+4

DO 753 I1=1,NTHGRP

NA = I1 + NLEV

NB = I1 + I2

NC = THERM(I1)

IF ((I1-1)-5*((I1-1)/5)) 749,751,749

749 WRITE OUTPUT TAPE LTAPE, 750, NC,ENERGY(NA),NB1(NB)

750 FORMAT (I21,1PE15.3,E18.7)

GO TO 753

751 WRITE OUTPUT TAPE LTAPE, 752, NC,ENERGY(NA),NB1(NB)

752 FORMAT(1H0I20,1PE15.3,E18.7)

753 CONTINUE

PUNCH SPECTRAL DATA BLOCK

CHECK FOR PUNCHING

754 DO 755 I1 = 1,NOPUN

```
IF (PUNCOD(I1) FB6(4*I+3)) 755,756,755
755 CONTINUE
GO TO 758
C PUNCH
756 M=4*I+1
CALL BRAND(FB6(M),2)
CALL PUNACB (NB1,NSPECT,0)
758 RETURN
END
```


SUBROUTINE WRREC1 (NG,PTCODE,PNCODE)

WRITE RECORD 1 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

IF NG = 1, PRINTING IS AUTOMATIC, IF NG = 0, PRINT IF REQUESTED.

759 IF (NG) 762,760,762

760 DO 761 I1=1,NOPRNT

IF (PCODE(I1)-FB6(4*I+3)) 761,762,761

761 CONTINUE

GO TO 808

PRINT

762 WRITE OUTPUT TAPE LTAPE, 764, NB1(2),NB1(3),NB6(4*I+1),

1NB6(4*I+2),NB6(4*I+3),NB1(6*NTLEV+5)

764 FORMAT (1H157X,5HDATE 2A6/// 9X,53HDESIGNATION CODE NO.

1 DENSITY FACTOR//9X,2A6,F17.4,1PE22.5///70H

2 SIGMA XI SIGMA SIGMA SIGMA XII SIGMA/70H LEVEL

3 ENERGY SCATTER SCATTER TRANSPORT ABSORPTION SCATTER 1)

I3 = NTLEV+4

I4 = I3+NTLEV

I5 = I4+NTLEV

I6 = I5+NTLEV

I7 = I6+NTLEV

DO 769 I1=1,NLEV

NA = I1 + I3

NB = I1 + I4

NC = I1 + I5

ND = I1 + I6

IF ((I1-1)-5*((I1-1)/5)) 765,767,765

765 WRITE OUTPUT TAPE LTAPE, 766, I1,ENERGY(I1),NB1(I1+4),NB1(NA),NB1(1NB),NB1(NC),NB1(ND)

766 FORMAT (I4,1PE11.3,4E11.4,E12.4)

GO TO 769

767 WRITE OUTPUT TAPE LTAPE, 768, I1,ENERGY(I1),NB1(I1+4),NB1(NA),NB1(1NB),NB1(NC),NB1(ND)

768 FORMAT (1H0I3,1PE11.3,4E11.4,E12.4)

769 CONTINUE

I2 = NLEV + 4

I3 = I3+NLEV

I4 = I4+NLEV

I5 = I5+NLEV

I6 = I6+NLEV

I7 = I7+NLEV

DO 774 I1=1,NTHGRP

```

J1 = THERM(I1)
NA = I1 + I2
NB = I1 + I3
NC = I1 + I4
ND = I1 + I5
NE = I1 + I6
NF = I1+NLEV
IF ((I1-1)-5*((I1-1)/5)) 770,772,770
770 WRITE OUTPUT TAPE LTAPE, 771, J1,ENERGY(NF),NB1(NA),NB1(NB),NB1(NC
1),NB1(ND),NB1(NE)
771 FORMAT (I5,1PE10.3,4E11.4,E12.4)
GO TO 774
772 WRITE OUTPUT TAPE LTAPE, 773, J1,ENERGY(NF),NB1(NA),NB1(NB),NB1(NC
1),NB1(ND),NB1(NE)
773 FORMAT (1H0I4,1PE10.3,4E11.4,E12.4)
774 CONTINUE

```

C
C
C

```

(PAGE 2)
775 WRITE OUTPUT TAPE LTAPE, 776, NB6(4*I+1),NB6(4*I+2),NB6(4*I+3),
1NB1(6*NTLEV+5)
776 FORMAT (63H1 DESIGNATION CODE NO. DENSIT
1Y FACTOR//10X,2A6,F17.4,1PE22.5///43X,8HNU SIGMA/21X,30HLEVEL
2ENERGY FISSION)
I3 = I6 + NTHGRP
DO 781 I1=1,NLEV
NA = I1 + I3
IF ((I1-1)-5*((I1-1)/5)) 777,779,777
777 WRITE OUTPUT TAPE LTAPE, 778, I1,ENERGY(I1),NB1(NA)
778 FORMAT (I24,1PE14.3,E14.4)
GO TO 781
779 WRITE OUTPUT TAPE LTAPE, 780, I1,ENERGY(I1),NB1(NA)
780 FORMAT (1H0I23,1PE14.3,E14.4)
781 CONTINUE
I3 = I3 + NLEV
DO 786 I1=1,NTHGRP
NA = I1 + NLEV
NB = I1 + I3
NC = THERM(I1)
IF ((I1-1)-5*((I1-1)/5)) 782,784,782
782 WRITE OUTPUT TAPE LTAPE, 783, NC,ENERGY(NA),NB1(NB)
783 FORMAT (I25,1PE13.3,E14.4)
GO TO 786
784 WRITE OUTPUT TAPE LTAPE, 785, NC,ENERGY(NA),NB1(NB)
785 FORMAT (1H0I24,1PE13.3,E14.4)
786 CONTINUE

```

C
C
C

```

(PAGES 4-8)
788 I2 = 6*NTLEV + 6
DO 793 J = 1,NTHGRP
IF ((J-1)-2*((J-1)/2)) 791,789,791
789 WRITE OUTPUT TAPE LTAPE, 790, NB6(4*I+1),NB6(4*I+2)
790 FORMAT (1H129X,2A6///23X,25HTHERMAL TRANSFER MATRICES)
791 I3 = J + NLEV

```

```

WRITE OUTPUT TAPE LTape, 792, NB1(I2),NB1(I2 1),NB1(I2 2),NB1(I2 3
1),NB1(I2+4),I3,NB1(I2+5),NB1(I2+6),NB1(I2+7),NB1(I2+8),NB1(I2+9),
2I3,NB1(I2+10),NB1(I2+11),NB1(I2+12),NB1(I2+13),NB1(I2+14),I3,
3NB1(I2+15),NB1(I2+16),NB1(I2+17),NB1(I2+18),NB1(I2+19),I3,
4NB1(I2+20),NB1(I2+21),NB1(I2+22),NB1(I2+23),NB1(I2+24),
5I3,I3,I3,I3,I3,I3,NB1(I2 25),NB1(I2+26),NB1(I2+27),NB1(I2+28),
6NB1(I2+29)

```

```

792 FORMAT (////68H TEMPERATURE SIGMA SIGMA SI
1GMA NU SIGMA/67H DEG. F. SCATTER TRANSPORT
2 ABSORPTION FISSION//1PE13.4,4E14.4//3IX,9HN1 NZ728X,I5H
3SIGMA S (N1/N2)//63H 21 21 21 22 21 23
4 21 24 21I4/1E13.4,4E14.4/63H 22 21 22 22
5 22 23 22 24 22I4/1E13.4,4E14.4/63H 23 21
6 23 22 23 23 23 24 23I4/1E13.4,4E14.
74/63H 24 21 24 22 24 23 24 24
824I4/1E13.4,4E14.4/I7,4H 21I10,4H 22I10,4H 23I10,4H 24I10,I4/I
9E13.4,4E14.4)
793 I2 = I2+30
GO TO 794

```

C
C (PAGE 9)
C

```

794 WRITE OUTPUT TAPE LTape, 795, NB6(4*I+1),NB6(4*I+2)
795 FORMAT (1H130X,2A6/////////)
IF (N1) 796,798,796
796 WRITE OUTPUT TAPE LTape,797,MA2,MB2,MA2,MC2
797 FORMAT (32X,8HSIGMA S0//27H TRANSFERS FROM GROUPSI3,8H THROUG
1HI3,10H TO GROUPSI3,8H THROUGH I3////)
798 IF (N2) 799,801,799
799 WRITE OUTPUT TAPE LTape, 800, MA3,MB3,MA3,MC3,
800 FORMAT (32X,8HSIGMA S1//27H TRANSFERS FROM GROUPSI3,8H THROUG
1HI3,10H TO GROUPSI3,8H THROUGH I3////)
801 IF (N3) 802,804,802
802 WRITE OUTPUT TAPE LTape,803,NRES
803 FORMAT (29X,14HNO. RESONANCES//I37////)
804 IF (N4) 805,807,805
805 WRITE OUTPUT TAPE LTape, 806, MA5,MB5,MA5,MC5
806 FORMAT (28X,15HSIGMA (N,GAMMA)//27H TRANSFERS FROM GROUPSI3,8
1H THROUGH I3,10H TO GROUPSI3,8H THROUGH I3)

```

C
C SET PTCODE=1.0 AS THIS RECORD IS OR IS NOT PRINTED FOR REFERENCE
C IN OTHER RECORDS OF THIS DATA BLOCK
C

```

807 PTCODE = 1.0
GO TO 8085
808 PTCODE = 0.0

```

C
C PUNCH RECORD 1 OF CROSS SECTION DATA BLOCK
C
C CHECK FOR PUNCHING
C

```

8085 IF(PNCODE)811,809,811
809 DO 810 I1 = 1,NOPUN
IF (PUNCOD(I1) FB6(4*I+3)) 810,811,810
810 CONTINUE

```

```
----- GO TO 813
C      PUNCH
----- 811 M=4*I+1
      CALL BRAND(FB6(M),2)
      CALL PUNACB (NB1,NWDBR1,0)
C
C      SET PNCODE=1,0 AS THIS RECORD IS OR IS NOT PUNCHED FOR REFERENCE
C      IN OTHER RECORDS OF THIS DATA BLOCK
C
----- PNCODE = 1.0
      GO TO 814
----- 813 PNCODE = 0.0
----- 814 RETURN
      END
```

SUBROUTINE WRREC2 (II3,II4)

WRITE RECORD 2 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

SUBROUTINES WRREC2,WRREC3,WRREC5 EACH USE ROUTINE RC235
1TO SET UP THE PRINT FORMAT. AS ALL RECORDS OF A DATA BLOCK
2WILL BE PRINTED IF THE FIRST IS, THE CODE WORDS I33,I44 WERE
3SET TO 1,0 IN WRREC1 ACCORDINGLY AS THIS
4BLOCK IS OR IS NOT TO BE PRINTED,PUNCHED. THE VALUES OF
5MATDIM(J) ARE MOMIN,MOMAX,... NG IS
6A CODE WORD INDICATING THE PAGE HEADING TO BE PRINTED.

816 IF (II3) 817,822,817
817 CALL RC235 (MA2,MB2,N1,0)

PUNCH RECORD 2 OF CROSS SECTION DATA BLOCK

822 IF (II4) 823,824,823
823 N = NWDBR1
CALL BRAND(FB6(M),2)
CALL PUNACB (NB1,N1,N)
824 RETURN
END

SUBROUTINE WRREC3 (II3,II4)

C

C

WRITE RECORD 3 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

```

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

```

C

C

SEE COMMENTS IN WRREC2

C

```

825 IF (II3) 826,831,826
826 CALL RC235 (MA3,MB3,N2,1)

```

C

C

PUNCH RECORD 3 OF CROSS SECTION DATA BLOCK

C

```

831 IF (II4) 832,833,832
832 N = NWDBR1 - NWSGS0
CALL BRAND(FB6(M),2)
CALL PUNACB (NB1,N2,N)

```

```

833 RETURN
END

```

SUBROUTINE WRREC4 (II3,II4)

WRITE RECORD 4 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

SEE COMMENTS IN WRREC2

834 IF (II3) 835,845,835

835 WRITE OUTPUT TAPE LTAPE, 836, (NB6(4*I+1),NB6(4*I+2))

836	FORMAT (1H130X,2A6///38H	RESONANCE	RESONANCE	PEAK/65H
1	ENERGY	INTEGRAL	CROSS SECTION	R
2/)				ETA/

12 = NRES+1

13 = NRES+I2

14 = NRES+I3

15 = NRES+I4

DO 844 I1 = 1,NRES

NA = I1 + I2

NB = I1 + I3

NC = I1 + I4

ND = I1 + I5

IF (I1-1) 840,840,837

837 IF ((I1-1)-40*((I1-1)/40)) 839,838,839

838 WRITE OUTPUT TAPE LTAPE, 836, (NB6(4*I+1),NB6(4*I+2))

839 IF ((I1-1)-5*((I1-1)/5)) 840,842,840

840 WRITE OUTPUT TAPE LTAPE,841, NB1(I1+1),NB1(NA),NB1(NB),NB1(NC),NB1
1(ND)

841 FORMAT (1PE13.4,4E14.4)

GO TO 844

842 WRITE OUTPUT TAPE LTAPE,843, NB1(I1+1),NB1(NA),NB1(NB),NB1(NC),NB1
1(ND)

843 FORMAT (1H01PE12.4,4E14.4)

844 CONTINUE

PUNCH RECORD 4 OF CROSS SECTION DATA BLOCK

845 IF (II4) 846,847,846

846 N = NWDBR1 - NWSGS0 - NWSGS1

CALL BRAND(FB6(M),2)

CALL PUNACB (NB1,N3,N)

847 RETURN

END

SUBROUTINE WRREC5 (II3,II4)

WRITE RECORD 5 OF CROSS SECTION DATA BLOCK ON OUTPUT TAPE

COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)

SEE COMMENTS IN WRREC2

848 IF (II3) 849,854,849
849 CALL RC235 (MA5,MB5,N4,2)

PUNCH RECORD 5 OF CROSS SECTION DATA BLOCK

854 IF (II4) 855,8552,855
855 N = NWDBR1 - NWSGS0 - NWSGS1 - NWRES
CALL BRAND(FB6(M),2)
CALL PUNACB (NB1,N4,N)

8552 RETURN
END

SUBROUTINE FINREC

WRITE FINAL RECORD ON OUTPUT TAPE

```
COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,I13,J,M,N,NWSGSO,NWSGST,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
```

```
DO 900 I1=1,NWFINR
900 NB1(I1)=NFINR(I1)
CALL NMTPRC(NWFINR)
WRITE OUTPUT TAPE LTAPE,901
901 FORMAT(1H1/23X,26HMACROSCOPIC CROSS SECTIONS//27X,18HCONSTITUENT T
1ABLES////)
NE=2
NC=0
902 IF(NB1(NE))903,916,903
903 NA=NB1(NE+1)
IF(40-NC)904,904,906
904 WRITE OUTPUT TAPE LTAPE,905,NB1(NE)
905 FORMAT(1H1///26X,20HMACROSCOPIC CODE NO./F40.4//)
NC=0
GO TO 908
906 WRITE OUTPUT TAPE LTAPE,907,NB1(NE)
907 FORMAT(1H0/26X,20HMACROSCOPIC CODE NO./F40.4//)
908 NC=NC+8
WRITE OUTPUT TAPE LTAPE,909
909 FORMAT(7X,11HCONSTITUENT,6X,6HWEIGHT,10X,11HCONSTITUENT,6X,6HWEIGH
1T,/8X,9HCODE NO.,6X,8HFRACTION,10X,9HCODE NO.,6X,8HFRACTION//)
ND=(NA+1)/2
DO 915 I1=1,ND
J1=NE+4*I1-2
NC=NC+1
IF(48-NC)9091,9096,9096
9091 WRITE OUTPUT TAPE LTAPE,9092
9092 FORMAT(1H1/////7X,11HCONSTITUENT,6X,6HWEIGHT,10X,11HCONSTITUENT,6X
1,6HWEIGHT/8X,9HCODE NO.,6X,8HFRACTION,10X,9HCODE NO.,6X,8HFRACTI
2ON//)
NC=3
9096 IF(NA-2*(NA/2))910,913,910
910 IF(NA-2*I1)911,911,913
911 WRITE OUTPUT TAPE LTAPE,912,NB1(J1),NB1(J1+1)
912 FORMAT(F18.4,1PE14.4)
GO TO 915
913 WRITE OUTPUT TAPE LTAPE,914,NB1(J1),NB1(J1+1),NB1(J1+2),NB1(J1+3)
914 FORMAT(F18.4,1PE14.4,0PF19.4,1PE14.4)
915 CONTINUE
```

```
NE=NE+2*NA+2
GO TO 902
C PUNCH FINAL RECORD
916 CONTINUE
CALL BRAND(6HFINAL ,1)
CALL PUNACB(NB1,NWFINR,0)
CALL PUNACB(0,0,0)
END FILE MTAPE
END FILE NTAPE
REWIND ITAPE
REWIND KTAPE
REWIND MTAPE
REWIND NTAPE
RETURN
END
```

SUBROUTINE RC235 (M1,M2,NW,NG)

SET UP PRINT OUT FOR RECORDS 2, 3, AND 5 OF CROSS SECTION DATA BLO

```
COMMON NB1,NB2,NB6,NLOC,NFINR,WGT,CONNO,BNAM,PCODE,BCODE,NCONN,
1NBPSN,PUNCOD,ENERGY,THERM,DATE,BDATE,NTHGRP,NWINDX,ITAPE,KTAPE,
2LTAPE,MTAPE,NTAPE,MAXDB2,MAXDB1,MAXDB,I,NA,NB,NC,ND,NE,NF,NR,NX,
3MA2,MA3,MA5,MB2,MB3,MB5,MC2,MC3,MC5,N1,N2,N3,N4,NRES,NTR,MCON,
4NCON,NOMAC,NOPRNT,NTLEV,NLEV,NWDBR1,NWRC2,NSPECT,NRMAX,MAXWD2,
5NTWDS,DEN,NWFINR,NOPUN,II3,J,M,N,NWSGS0,NWSGS1,NWRES
EQUIVALENCE(NB1,FB1),(NB2,FB2),(NB6,FB6),(NFINR,FINR),(NLOC,FLOC)
DIMENSION FB1(2010),FB2(5010),FB6(3010),NFINR(1010),FINR(1010)
DIMENSION NB1(2010),NB2(5010),NB6(3010),THERM(10),NLOC(2010),
1ENERGY(45),PCODE(124),BNAM(248),BCODE(124),NCONN(124),FLOC(2010),
2NBPSN(124),DATE(2),WGT(1000),CONNO(1000),PUNCOD(124),BDATE(2)
```

THIS ROUTINE IS USED BY WRREC2,WRREC3,WRREC5 TO SET UP PAGE
1 HEADINGS

```
856 J5 = M1
      M3 = (NW-1)/(M2-M1+1)
      I2 = (NW-1)/5
      I3 = (NW-1) - 5*I2
      K5 = M1-1
      I1 = 1
8561 IF (K5-M3) 858,857,858
857 J1 = J5+1
      K1 = M1
      GO TO 859
858 J1 = J5
      K1 = K5+1
859 IF (K1-M3) 861,860,861
860 J2 = J1+1
      K2 = M1
      GO TO 862
861 J2 = J1
      K2 = K1+1
862 IF (K2-M3) 864,863,864
863 J3 = J2+1
      K3 = M1
      GO TO 865
864 J3 = J2
      K3 = K2+1
865 IF (K3-M3) 867,866,867
866 J4 = J3+1
      K4 = M1
      GO TO 868
867 J4 = J3
      K4 = K3+1
868 IF (K4-M3) 870,869,870
869 J5 = J4+1
      K5 = M1
      GO TO 871
870 J5 = J4
      K5 = K4+1
```

```

      IF (I2-I1-2) 873,873,871
871 IF ((I1-1) - 20*((I1-1)/20)) 873,872,873
872 IF (NG-1) 820,829,852
873 IF (I1-I2) 874,874,876
874 WRITE OUTPUT TAPE LTAPE, 875, J1,K1,J2,K2,J3,K3,J4,K4,J5,K5,
      1NB1(5*I1-3),NB1(5*I1-2),NB1(5*I1-1),NB1(5*I1),NB1(5*I1 1)
875 FORMAT (I7,I4,4(I10,I4)/1PE13.4,4E14.4)
      I1 = I1+1
      GO TO 8561
876 IF (I3-1) 887,879,877
877 IF (I3-3) 881,883,885
879 WRITE OUTPUT TAPE LTAPE, 880, J1,K1,NB1(5*I1 3)
880 FORMAT (I7,I4/1PE13.4)
      GO TO 887
881 WRITE OUTPUT TAPE LTAPE,882, J1,K1,J2,K2,NB1(5*I1-3),NB1(5*I1-2)
882 FORMAT (I7,I4,I10,I4/1PE13.4,E14.4)
      GO TO 887
883 WRITE OUTPUT TAPE LTAPE,884, J1,K1,J2,K2,J3,K3,NB1(5*I1-3),
      1NB1(5*I1-2),NB1(5*I1-1)
884 FORMAT (I7,I4,2(I10,I4)/1PE13.4,2E14.4)
      GO TO 887
885 WRITE OUTPUT TAPE LTAPE,886, J1,K1,J2,K2,J3,K3,J4,K4,NB1(5*I1-3),
      1NB1(5*I1-2),NB1(5*I1-1),NB1(5*I1)
886 FORMAT (I7,I4,3(I10,I4)/1PE13.4,3E14.4)
887 RETURN
820 WRITE OUTPUT TAPE LTAPE, 821, NB6(4*I+1),NB6(4*I+2)
821 FORMAT (1H129X,2A6////32X,8HN1      N2/28X,17HSIGMA SO (N1/N2) //)
      GO TO 873
829 WRITE OUTPUT TAPE LTAPE, 830, NB6(4*I+1),NB6(4*I+2)
830 FORMAT (1H129X,2A6////32X,8HN1      N2/28X,17HSIGMA S1 (N1/N2) //)
      GO TO 873
852 WRITE OUTPUT TAPE LTAPE, 853, NB6(4*I+1),NB6(4*I+2)
853 FORMAT (1H129X,2A6////32X,8HN1      N2/28X,17HSIGMA N,G (N1/N2) //)
      GO TO 873
END

```

3.8 Program Mnemonic Glossary

<u>Program Mnemonic</u>	<u>Description</u>
BCØDE	Code number for a data block either microscopic or macroscopic
BDATE	Date data block was added to Nuclear Data Tape, read in as card input in MAC3
BNAM	2-word name of data block, read in as card input in MAC1
CØNNØ	Code numbers (BCØDE) of microscopic constituents of a given macroscopic nuclear data block, read in as card input in MAC3
DATE	The date of a Nuclear Data Tape was compiled, read in as card input in MAC1
DEN	Density factor of any data block, defined as (mass density)/(Avogadro's number)(10^{24}), read in as card input in MAC3
ENERGY	Energy of each of the energy levels expressed in ev, read from master tape record 2 in MAC7
FBI	Eq. NB1--core storage location of 2010 words used to store information read from and into tapes
FB2	Eq. NB2--core storage location of 5010 words used principally to store macroscopic data blocks while they are being calculated
FB6	Eq. NB6--core storage location of 3010 words used principally to store the index record and additions to the final record
FINR	Eq. NFINR--core storage location of 1010 words used to store old master tape indexing information while calculating macroscopic blocks and for storing corrected final record after all block calculations
FLØC	Eq. NLØC--core storage location of 2010 words used in MAC1 to store logarithmic decrements, and in MAC4 to store records 2 and 3
I	Index in common used principally for locating index record information
II3	Maximum number of data blocks on original tapes
ITAPE	Original master Nuclear Data Tape number, set in MAC1
ITAPI	Tape number from which information is being read or into which information is being written
J	Index in common
KTAPE	Intermediate tape number, set in MAC1
LTAPE	Output tape number, set in MAC1

<u>Program Mnemonic</u>	<u>Description</u>
M	The number of records in a given macroscopic data block used for correcting the index records
MA2	First group from which and into which $\sigma_{SO}(m m')$ transfers occur--MOMIN
MB2	Last group from which $\sigma_{SO}(m m')$ transfers occur--MOMAX
MC2	Last group into which $\sigma_{SO}(m m')$ transfers occur--MOPMAX
MA3	First group from which and into which $\sigma_{S1}(m m')$ transfers occur--MLMIN
MB3	Last group from which $\sigma_{S1}(m m')$ transfers occur--MLMAX
MC3	Last group into which $\sigma_{S1}(m m')$ transfers occur--MLPMAX
MA5	First group from which and into which $\sigma_{n,g}(m m')$ transfers occur--MGMIN
MB5	Last group from which $\sigma_{n,g}(m m')$ transfers occur--MGMAX
MC5	Last group into which $\sigma_{n,g}(m m')$ transfers occur--MGFMAX
MAXDB	Maximum number of data blocks, $(NWINDX/4) - 2$, set in MAC1
MAXDB1	$(NWINDX/4) - 1$, set in MAC1
MAXWD2	Maximum number of words in data-block records 2 and 3, calculated in MAC1
MTAPE	New data tape number assigned in MAC1
NTAPE	New data tape number assigned in MAC1
N1	Number of words in data-block record 2, set by MAC5 operating on data-block record 1 stored in FBI
N2	Number of words in data-block record 3, set by MAC5
N3	Number of words in data-block record 4, set by MAC5
N4	Number of words in data-block record 5, set by MAC5
N	Amount of relocation of records 2, 3, 4, and 5 by PUNACB subroutine
NA	Index record of data block on master tape in position to be read, also used in several writing subroutines
NB	Used while calculating a macroscopic data block to indicate relative location of constituent data blocks on master tape, also used in several writing subroutines

<u>Program Mnemonic</u>	<u>Description</u>
NC	Number of records skipped in positioning tape in MAC3, number of lines in output printout in FINREC, also used in several writing subroutines
ND	Used extensively to indicate information storage, locations generally defined immediately before use
NE	Used in MAC4 to indicate number of words currently stored in the macroscopic data block record 4 being calculated, also used in several writing subroutines
NF	Used while calculating macroscopic data blocks to determine relative location of macroscopic block data in case input
NR	Number of words to be added to final record to describe calculated macroscopic data blocks
NX	Dummy index used in MAC7
NB1	2010-word core storage location, equivalent to FB1
NB2	5010-word core storage location, equivalent to FB2
NB6	3010-word core storage location, equivalent to FB6
NBPSN	Index-record position number of macroscopic data blocks being added to tape, read in as card input data in MAC1
NCØN	Number of constituent data blocks in a macroscopic data block, read in as card input for each macroscopic data block in MAC3
NFINR	1010-word core storage area used to store ITAPE indexing information and later on to store the revised final record, equivalent to FINR
NLEV	Number of epithermal energy levels present read in MAC1 from original tape index record
NØMAC	Number of macroscopic blocks added to tape, read in as card input in MAC1
NØPRNT	Number of data blocks to be printed, read in as card input in MAC1
NØPUN	Number of data blocks to be punched by this program in addition to those calculated by this program not now used, could be added in MAC1
NRES	Number of resonance energy levels which exist in a given data block, set by MAC5 operating on data-block record 1 stored in NB1
NRMAX	Maximum number of resonance energy levels allowable in a macroscopic data block, set in MAC1
NSPECT	Number of words in spectral data blocks computed in MAC1 using NLEV

<u>Program Mnemonic</u>	<u>Description</u>
NTHGRP	Number of thermal energy levels, set in MAC1
NTLEV	Total number of energy levels, computed in MAC1 as NLEV + NTLEV
NTR	Maximum number of rows in record-5 matrix set in MAC1, final record number set in MAC6, used in MAC7
NTWDS	Maximum total number of words possible in a macro- scopic data block including all 5 records, computed in MAC1
NWDBR1	Number of words in data-block record 1, computed in MAC1
NWFINR	Number of words in final record, set in MAC1
NWINDX	Number of words in index record, set in MAC1
NWRC2	Number of words in second record, computed in MAC2
NWRES	Maximum number of words possible in data-block record 4, set in MAC1
NWSGS1	Maximum number of words possible in data-block record 3, set in MAC1
NWSGSO	Maximum number of words possible in data-block record 2, set in MAC1
PCØDE	Code numbers in data blocks to be printed, read in as card input in MAC1
PNCØDE	Control word for punching a given data block on binary cards
PTCØDE	Control word for writing a given data block on the output tape
PUNCØD	Code numbers of data blocks to be punched, in addition to those automatically punched, not now used, could be added as card input to MAC1
THERM	The temperature corresponding to each of the thermal energy levels, set in MAC1
WFR	Weighting factor for compiling the macroscopic-cross- section matrices
WGHTFR	Weighting factor for converting microscopic data to macroscopic data
WGT	The weight fraction of a constituent in a macroscopic data block, read-in as card input in MAC3

4.0 REACTOR NUCLEAR DATA COPY AND CORRECT PROGRAM

4.1 General Information

The Reactor Nuclear Data Copy and Correct Program (RNDC) performs the following functions. First the program has the capability of correcting and/or copying a Reactor Nuclear Data Tape with a minimum of input information. Corrections may be made in any record or data block on the tape. Two copies of the corrected tape may be requested. Second, the provision is made to manufacture a Reactor Nuclear Data Tape directly from binary cards punched out by program RNDP. Third, the program will print out any record or data block on a Reactor Nuclear Data Tape, as the tape is copied, as the tape is made from binary cards, or as a separate function.

4.2 Description of Subroutines Unique to this Program

4.2.1 Control Routine

Four main functions are assigned to the control routine during an execution of program RNDC. The first is the initializing of various subroutines and the preassigning of values to certain variables. The next function is the clearing of the input data storage and the reading of the general input data which also include any values for the program-preassigned variables that the user may wish to change. The third function the control routine performs is to make a logical consistency check on the general input data, and, if an inconsistency is discovered, to halt the program. The last function is to direct the flow of the program by initializing and selecting the three first-order subroutines in the program, namely, the INDEX subroutine, ELLV subroutine, and the RAPRL subroutine; and, if the program has executed properly, denote the final stop.

4.2.2 Subroutine INDEX

The INDEX subroutine, as its name implies, processes all the information pertaining to the index record on the data tape. It is a first-order subroutine in the sense that it is entered from the control routine and its normal exit is to the control routine. This subroutine examines all the options connected with the control words NCDEL, NCOR, and NTAPE and performs the necessary operations. The control word NPRINT is not examined because the index record is always printed out whenever the program is used. In addition the INDEX subroutine performs one other major function and that is to determine the record number of the microscopic constituents record, the final record, as it was on the old data tape and as it should be on the new data tape. This is a safeguard designed in the program to make certain that the user has properly corrected the record numbers on the index record in the event of records being added to material data blocks through correction cards. It should be noted that error diagnostics have been programmed into the INDEX subroutine so that only the normal return is to the control routine.

4.2.3 Subroutine ELLV

The ELLV subroutine is another first-order subroutine which processes all the information pertaining to the energy-lethargy-1/v factor record on the data tape. It is also entered from the control routine, and its normal exit is to that same routine. This subroutine examines all the options connected with the control words NCØDEL, NØCØR, and NØTAPE and performs the necessary operations. The control word NØPRNT is not examined because the energy-lethargy-1/v factor record is always printed out whenever the program is used. There are no special functions performed by this subroutine. There are error diagnostics in the ELLV subroutine.

4.2.4 Subroutine RAPRL

The RAPRL subroutine is the first-order subroutine which acts as a control routine for the second-order subroutines DBLKR, SPECT, and MICRØ. The RAPRL subroutine establishes a reading and processing loop in which a record is read from the old binary data tape, the code number tested, and depending upon the value of the code number, control is transferred to one of the above-mentioned secondary subroutines. When control is transferred back to RAPRL from one of the secondary subroutines, the data tape will be in position for RAPRL to read the first record on the next data block. In the case in which the data block is on binary cards instead of tape, RAPRL performs in the same manner except for reading the cards rather than the tape. After the last record on tape has been processed, that is, the microscopic constituents record, and control has been transferred back to RAPRL from MICRØ, RAPRL then transfers control to the program control routine. In the RAPRL subroutine there are no correction cards read, no binary tapes are written, no printout written, and only one record of a data block is read. There are error diagnostics in this subroutine, and only the normal return is to the control routine.

4.2.5 Subroutine DBLKR

If the code number examined by subroutine RAPRL is less than 500.0 in value, then RAPRL transfers control to the secondary subroutine DBLKR or the material-data-block subroutine. This subroutine is the largest and most complicated in the program due to the other options available within a material data block besides the normal NCØDEL, NØCØR, NØPRNT, and NØTAPE options. Since a material data block may have from one to five records on tape and since subroutine RAPRL only reads in the first record, subroutine DBLKR immediately must determine if any other records are in the data block, determine the type and length, and read them into their proper storage locations from the old data tape. It should be noted at this point that, if binary cards are being read rather than tape, subroutine RAPRL reads the complete set of cards representing the material data block, and hence no binary cards are read in DBLKR. The subroutine next determines if corrections are to be made to the data block, and, if so, the correction cards are read into their proper locations. Included in this reading of correction cards is, of course, the option of adding from one to four records to the material data block. Hence, the subroutine must recalculate the length of the records,

determine the type of record, and calculate the proper record number of each of the records before the new tapes can be written. The last function performed by DBLKR is to determine if the material data block is to be printed out and, if it is, to do so. Control is then returned to subroutine RAPRL for the processing of the next record. There are error diagnostics in DBLKR, and only the normal return is to RAPRL.

4.2.6 Subroutine SPECT

If the code number examined by subroutine RAPRL is equal to or greater than 500.0, then RAPRL transfers control to the secondary subroutine SPECT or the spectral record subroutine. The purpose of this subroutine is to process each spectral record on the data tape. All the options connected with the control words NCDEL, NCOR, NTAPE, and NPRINT are examined and the required operations performed. After the SPECT subroutine is completed, control is transferred to the RAPRL subroutine for the processing of the next record from the data tape. There are error diagnostics in SPECT, and only the normal return is to RAPRL.

4.2.7 Subroutine MICRØ

If the code number examined by subroutine RAPRL is equal to zero, then RAPRL transfers control to the secondary subroutine MICRØ or the microscopic constituents record subroutine. This subroutine processes the last record of the data tape and, hence, is the last subroutine to be executed in the program. All the options connected with the control words NCDEL, NCOR, and NTAPE are examined and the required operations performed. The control word NPRINT is not examined because the microscopic constituents record is always printed out. If there are no macroscopic material data blocks on the tape and hence no microscopic constituents, a comment to this effect is printed out. Also if any of the microscopic constituents of a macroscopic material have been changed through correction cards, these changes are noted in the printout. The one special function the MICRØ subroutine performs is to check the logical record number of the microscopic constituents record, to determine if the actual number of records present on the tape is identical to the record number of this last record. There are error diagnostics in MICRØ, and only the normal return is to RAPRL.

4.2.8 Subroutine CALDIM

The CALDIM subroutine is a third-order subroutine which is used solely in conjunction with the DBLKR subroutine. It is entered from the DBLKR subroutine, and its only exit is to that same subroutine. The only function CALDIM performs is to calculate the dimensions or length of the second, third, fourth, and fifth records of a material data block. The subroutine is entered twice, the first time being before the old data tape is read and the second time, after the corrections are read into the data block storage and before the new data tapes are written. There are no error diagnostics in CALDIM.

4.2.9 Subroutine CLEAR

The CLEAR subroutine is a third-order subroutine used in conjunction with the control routine and the RAPRL subroutine. Its function is

to set the two temporary data storage arrays to zero. There are no error diagnostics in CLEAR.

4.2.10 Subroutine PSOLNG

The PSOLNG subroutine is a third-order subroutine which is used solely in conjunction with the DBLKR subroutine. It is entered from the DBLKR subroutine, and its only exit is to that same subroutine. The only function PSOLNG performs is to print out the isotropic scattering, first moment scattering, and $n-\gamma$ transfer matrices or records two, three, and five of a material data block. Hence, this subroutine can be entered a maximum of three times for each material data block. There are no error diagnostics in PSOLNG.

4.2.11 Subroutine RBTIJK

The RBTIJK subroutine is a third-order subroutine used in conjunction with the ELLV, RAPRL, and DBLKR subroutines. Its purpose is to read a binary record from the old data tape of variable length and test for a tape check. An attempt will be made to read the tape a total of ten times. There are no error diagnostics in the subroutine. However, sense light one is turned on if the tape cannot be read properly by the tenth attempt and subroutines ELLV, RAPRL, and DBLKR have provision for monitoring sense light one.

4.2.12 Subroutine RIJKT

The RIJKT subroutine is a third-order subroutine used in conjunction with the INDEX, ELLV, RAPRL, DBLKR, SPECT, and MICRØ subroutines. This subroutine simply rewinds ITAPE, JTAPE, and KTAPE. There are no error diagnostics in RIJKT.

4.2.13 Subroutine SWTCH

The SWTCH subroutine is a third-order subroutine which is used solely in conjunction with the DBLKR subroutine. It is entered from the DBLKR subroutine, and its only exit is to that subroutine. The only function SWTCH performs is to "expand" the fourth record of the material data block, or resonance data array so that the corrections can be read in properly. On the binary data tape the resonance record is not written to its possible maximum length but only to the actual number of resonances given. However, when correcting the resonance array in storage, the maximum length must be allowed. The same logic holds for the binary card reading as for the binary tape reading. There are no error diagnostics in SWTCH.

4.2.14 Subroutine WBTIJ

The WBTIJ subroutine is a third-order subroutine used in conjunction with the ELLV, DBLKR, SPECT, and MICRØ subroutines. Its purpose is to write a binary record on a new data tape of variable length. The subroutine will permit a maximum of five attempts at writing the new tape. There are no error diagnostics in the subroutine. However, sense light one is turned on if failure occurs five times and subroutines ELLV, DBLKR, SPECT, and MICRØ have provisions for monitoring sense light one.

4.3 Program Flow Chart

Fig. 4.1 Flow Chart of Control Routine

4.4 Program Diagnostics

External Formula
Number

Error

Control Routine

190	General input data error
191	NØTAPE control word has minus or zero value
192	Inconsistency between NØCØR control word and CCØDE table
193	Inconsistency between NØPRNT control word and PCØDE table
194	Tape number ITAPE has negative value
195	Tape number JTAPE has negative value

INDEX Subroutine

2905	Tape number KTAPE cannot be read properly
2906	Input data error in INDEX correction cards
2907	Tape number ITAPE cannot be written properly
2908	Neither tape number ITAPE nor tape number JTAPE could be written properly
2909	NØTAPE control word has negative value
2911	More than 499 data blocks in index record of data tape
2913	More than 499 data blocks in index record in core storage

ELLV Subroutine

3907	Tape number KTAPE cannot be read properly
3908	Input data error in ELLV correction cards
3909	Tape number ITAPE cannot be written properly
3910	Tape number ITAPE could not be written properly; tape number JTAPE had failed previously
3911	Tape number JTAPE could not be written properly; tape number ITAPE had failed previously
3912	Tape number ITAPE has negative value
3913	Tape number JTAPE has negative or zero value

RAPRL Subroutine

8903	Less than three records on the data tape. There must be present on the data tape at least the index, the energy-lethargy-1/v factor, and the microscopic constituents records.
------	--

External Formula
Number

Error

8904	Tape number KTAPE cannot be read properly
8905	Calculated physical record number of microscopic constituents record does not agree with input final record number on the index record. This occurs when adding records to a material data block through correction cards.

DBLKR Subroutine

9938	MOMIN has negative value when read from KTAPE
9939	Record 2, scattering transfer matrix, cannot be read properly from KTAPE
9940	MLMIN has negative value when read from KTAPE
9941	Record 3, first moment scattering transfer matrix, cannot be read properly from KTAPE
9942	NRES has negative value when read from KTAPE
9943	Record 4, resonance data, cannot be read properly from KTAPE
9944	MGMIN has a negative value when read from KTAPE
9945	Record 5, n- γ transfer matrix, cannot be read properly from KTAPE
9946	NCDEL control word has negative value
9947	Input data error in DBLKR correction cards
9980	MOMIN has negative value after corrections read into storage
9981	MLMIN has negative value after corrections read into storage
9982	NRES has negative value after corrections read into storage
9983	MGMIN has negative value after corrections read into storage
9948	NOTAPE control word has zero value
9949	A record of the material data block could not be written properly on tape number ITAPE
9950	A record of the material data block could not be written properly on tape number ITAPE after tape number JTAPE had failed previously
9951	MOMIN has negative value prior to writing tape ITAPE
9952	MLMIN has negative value prior to writing tape ITAPE

<u>External Formula Number</u>	<u>Error</u>
9953	NRES has negative value prior to writing tape ITAPE
9954	MGMIN has negative value prior to writing tape ITAPE
9955	Tape number JTAPE has negative value
9956	A record of the material data block could not be written properly on tape number JTAPE after tape number ITAPE had failed previously
9957	MOMIN has negative value prior to writing tape JTAPE
9958	MLMIN has negative value prior to writing tape JTAPE
9959	NRES has negative value prior to writing tape JTAPE
9960	MGMIN has negative value prior to writing tape JTAPE
9961	Tape number ITAPE has negative value
9962	Code number of material data block not present in index record.
9964	MOMIN has negative value prior to printout of scattering transfer matrix
9965	MLMIN has negative value prior to printout of first moment scattering transfer matrix
9966	NRES has negative value prior to printout of resonance data
9967	MGMIN has negative value prior to printout of n- γ transfer matrix
9968	Record number of second record, scattering transfer matrix, has negative value
9969	Record number of third record, first moment transfer matrix, has negative value
9970	Record number of fourth record, resonance data, has negative value
9971	Record number of fifth record, n- γ transfer matrix, has negative value
<u>SPECT Subroutine</u>	
9197	Input data error in SPECT correction cards
9198	Tape number ITAPE cannot be written properly
9199	Tape number ITAPE could not be written properly; tape number JTAPE had failed previously

<u>External Formula Number</u>	<u>Error</u>
9131	Tape number JTAPE could not be written properly; tape number ITAPE had failed previously
9132	Code number of spectrum not present in index record
9133	Tape number ITAPE has negative value
9134	Tape number JTAPE has negative value

MICRØ Subroutine

9062	NØCØR control has negative value
9063	Input data error in MICRØ correction cards
9064	Calculated physical record number of micro- scopic constituents record is less than final record number on the index record. This occurs when adding records to a material data block through correction cards.
9065	Calculated physical record number of micro- scopic constituents record is greater than final record number on the index record
9066	NØTAPE control has zero value
9067	Tape number ITAPE cannot be written properly
9068	Tape number ITAPE has negative value
9069	Tape number ITAPE could not be written properly; tape number JTAPE had failed previously
9070	Tape number JTAPE has negative value
9071	Tape number JTAPE could not be written properly; tape number ITAPE had failed previously
9072	Macroscopic-material data-block code number cannot be found on index record
9073	Microscopic-constituent material-data-block code number cannot be found on index record

4.5 Program Input Forms

All input data in Program RNDC are loaded by the DIP subroutine through READ DIP source statements followed by a list of variables representing those quantities to be loaded. All conventions, standards, and options noted in the DIP subroutine description are recognized by the program. Although end-of-record conditions are needed in the decimal-input-deck make-up, there is no end-of-file condition necessary since the logic of the program determines when it has exhausted its supply of input data. This, of course, imposes upon the user the necessity of assembling the decimal input deck correctly. As an added safeguard, the variables contained in the DIP lists of the various subroutines for the most part are unique among themselves and hence the

possibility of incorrect decimal-input-deck assembly going undetected through a program execution is further reduced. The necessity for designing these safeguards into the program was occasioned by the fact that the identifying code number of a particular data block does not have to be given with the set of correction data for that data block, hence no cross-checking of code numbers could be effected.

4.5.1 General Input Data Sheets

The general input data needed by Program RNDC consist of four control option words and two arrays of identifying data-block code numbers with an end-of-record card being the final card of the record.

The four control words, `NODEL`, `NOPRNT`, `NOCOR`, `NOTAPE`, actually determine the type of program operation to perform and, except for one point, are explained fully on the data sheets. Under the `NODEL` control word, if option minus one (-1) is used, there must be a decimal identification card preceeding each group of binary cards representing each of the various data blocks to be written on the tape. This decimal identification card has only the first column read by the program and places the contents of the first column in a waste location. Hence any type of Hollerith information can be punched in the first column as well as the rest of the card.

The second general-input data sheet contains the two arrays of identifying data-block code numbers. The first array contains the code numbers of the data blocks to be printed, and the second the code numbers of the data blocks to be corrected. Again these arrays are fully explained on the data sheet. The code numbers can be given in any order in the print-code array, and, except when the final record is to be corrected, the same is true of the correction-code array. If the final record (microscopic constituents record) is to be corrected, then its code (0) must be given as the last entry in the array.

4.5.2 Correction Input Data Sheet

In general the correction input data sheets are divided into five categories; index-record corrections, energy-lethargy record corrections, material-data-block corrections, spectral-record corrections, and microscopic-constituents-record corrections. For the most part the various data sheets are self-explanatory when used in conjunction with the input glossary. One point to be noted is that when correcting a value in an array, the equal sign (=) convention in DIP to bypass storage locations is very helpful and eliminates the necessity of knowing or calculating the absolute memory location of a particular value. By preceeding the equal sign with an integer, *n*, the storage location of the variable is decreased by *n*.

With regard to index-record corrections, the two-word BCD identification of the first material or spectrum is assigned the mnemonic `BIDENT`. This card which has a loading address of $(28100)_{10}$ contains both words of the identification of the first material or spectrum. To arrive at the loading address of the second material or spectrum, simply subtract two from $(28100)_{10}$ or $(28098)_{10}$. This pattern

continues for each succeeding identification until the last material or spectrum identification loads at address $(27104)_{10}$.

The remaining corrections on the index record should be self-explanatory, as should be the case with the energy-lethargy record corrections.

A material data block on the Reactor Nuclear Data Tape is composed of a minimum of one and a maximum of five separate binary records. However, when using Program RNDC to effect corrections to a material data block, all the corrections to all the binary records of a block are read in with one record of decimal input data. Thus, although the material data block correction sheets are divided into five parts each corresponding to its counterpart on the data tape, there is only one end-of-record card indicated and necessary for the whole material data block.

The material-data-block corrections themselves should be self-explanatory as should be the spectral-record corrections.

The fifth and last category of corrections to the data tape pertains to the microscopic-constituents record or last record of the tape. Since there is no set pattern to the contents of this record, the whole data array of 1000 words had to be indicated by one variable. This variable, NMICRØ, is actually the physical record number of the microscopic-constituents record, a diagram of which appears in Figure 4.2.

As is indicated on the diagram, there are only five "assigned" storage locations in the NMICRØ data array, and these are the first five locations. The remainder of the array is variable in content. In addition the array contains both fixed-point and floating-point variables. The fixed-point variables are the record number and the number of microscopic constituents, while the floating-point variables are the various code numbers and the weight fractions. Thus the user, when correcting the microscopic-constituents record, must be careful not only to insert the corrections in the proper locations but also to have the proper control punch in column one of the correction card.

4.5.3 Addition of Records to a Material Data Block Through Correction Cards

It is possible, with Program RNDC, to add from one to four records to a material data block by reading the contents of the record or records into the proper locations through input-data correction cards. This can only be done, however, with the last four records of the material data block, namely, the isotropic scattering transfer matrix, first moment scattering transfer matrix, resonance data, and the n - γ transfer matrix. Additionally, the first record of the material data block containing the ordinary cross section data must already be present on the tape or on binary data cards for this option to work correctly. It should be noted that there is a considerable amount of work entailed in using this feature of the program. The logic of the program necessitates correcting, by decimal input, all of

Record Number	
Constituent Table for Macroscopic Block 1	Code Number of Macroscopic Block 1
	Number of Microscopic Constituents
	Constituent 1 Code Number
	Weight Fraction of Constituent 1
	Constituent 2 Code Number
	⋮
	Constituent N Code Number
	Weight Fraction of Constituent N
⋮	
Constituent Table for Macroscopic Block L	Code Number of Macroscopic Block L
	Number of Microscopic Constituents
	Constituent 1 Code Number
	Weight Fraction of Constituent 1
	⋮
	Weight Fraction of Constituent N

Fig. 4.2 - Macroscopic-Constituent Index (Final Record)

the record numbers on the index record of those material data blocks and spectral records following that material data block which had a record or records added, in order to reflect the proper physical-position change on the data tape. Obviously, the record number of the microscopic-constituents record also must be corrected. Thus, if a material data block which is physically positioned near the beginning of the tape is to have records added to it, several-score index-record quantities might have to be corrected to effect this change. There is, however, no limit to the number of material data blocks that may have records added to them through correction cards, nor does this option in any way detract from the other options in the program.

4.5.4 Glossary for Input Sheets

A	An array containing absorption cross sections for a given material, cross sections are given in order from high to low energy, maximum of 34, floating-point variables.
BC $\emptyset$ DE	An array containing code numbers identifying the data blocks present on the tape, maximum of 499, floating-point variables.
BETA	A location containing the value of the spectral delay fraction of a given spectrum, floating-point variable.
CC $\emptyset$ DE	An array containing the code numbers of data blocks on tape to be corrected, maximum of 499, floating-point variables.
C $\emptyset$ DE	A location containing the code number of a given data block on tape, floating-point variable.
DATE	Two locations containing 12 characters of BCD information indicating the date of manufacture of the tape or the date of a data block.
DF	A location containing the density factor of a given material, floating-point variable.
EG	An array containing the group boundary energies of the data tape, energies are given from high to low, maximum of 25 words, floating-point variables.
EL	An array containing the level energies of the data tape, energies are given from high to low, maximum of 34, floating-point variables.
END	A location containing the value of the "end-of-record" card.
EO	An array containing the resonance energies of a given material, maximum of 200, floating-point variables.
ETAR	An array containing the number of fission neutron produced per absorption for a material given in the order of resonance energies, maximum of 200, floating-point variables.
FNU	An array containing fission production cross sections for a given material, cross sections are given in order from high to low energy, maximum of 34, floating-point variables.

FV	An array containing the group l/v factors of the data tape, the l/v factors are given in order from high to low energy, maximum of 24, floating-point variables.
MGLMAX	A location containing the last group from which n- γ transfers occur, fixed-point variable.
MGMIN	A location containing the first group from which and first group into which n- γ transfers occur, fixed-point variable.
MGØMAX	A location containing the last group into which n- γ transfers occur, fixed-point variable.
MOIMAX	A location containing the last group from which scattering transfers occur, fixed-point variable.
MOMIN	A location containing the first group from which and first group into which scattering transfers occur, fixed-point variable.
MOØMAX	A location containing the last group into which scattering transfers occur, fixed-point variable.
MLIMAX	A location containing the last group from which first moment scattering transfers occur, fixed-point variable.
MLMIN	A location containing the first group from which and first group into which first moment scattering transfers occur, fixed-point variable.
MLØMAX	A location containing the last group into which first moment scattering transfers occur, fixed-point variable.
NAME	A location containing six characters of BCD information identifying the tape by name.
NCØDEL	A location containing a control word having three options pertaining to the basic operation of Program RNDC, fixed-point variable.
NMICRØ	An array containing the contents of the microscopic-constituents record or last record on tape, maximum of 1000, the array contains both floating-point and positive fixed-point variables.
NLEV	A location containing the number of energy levels of the data tape, positive fixed-point variable.
NØCØR	A location containing a control word indicating the number of data blocks that are to be corrected, positive fixed-point variable.
NØPRINT	A location containing a control word having three options pertaining to the BCD output listing, fixed-point variable.
NØTAPE	A location containing a control word having two options pertaining to the number of new binary tapes that are to be written, positive fixed-point variable.
NRES	A location containing the number of resonances of a given material, positive fixed-point variable.

NW	A location containing a value indicating the total number of binary words contained in a material data block after the first record, positive fixed-point variable.
N1R	A location containing the physical record number of the first record of a given data block, also pertains to the record number of the index record, second record, and final record, positive fixed-point variable. When N1R is subscripted, it refers to an array containing the record numbers of the initial records of each data block, maximum of 499, positive fixed-point variable.
N2R	A location containing the physical record number of the second record of a given data block, positive fixed-point variable.
N3R	A location containing the physical record number of the third record of a given data block, positive fixed-point variable.
N4R	A location containing the physical record number of the fourth record of a given data block, positive fixed-point variable.
N5R	A location containing the physical record number of the fifth record of a given data block, positive fixed-point variable.
PC Ø DE	An array containing the code numbers of data blocks on tape to be printed, maximum of 499, floating-point variables.
PO	An array containing the peak cross sections of a given material given in the order of the resonance energies, maximum of 200, floating-point variables.
R	An array containing the Doppler temperature coefficients of a given material given in the order of the resonance energies, maximum of 200, floating-point variables.
RIO	An array containing the resonance integrals of a given material given in the order of the resonance energies, maximum of 200, floating-point variables.
S	An array containing scattering cross sections for a given material, the cross sections are given in order from high to low energy, maximum of 34, floating-point variables.
SIGNG	An array containing the n-γ transfer matrix of a material in which the elements are given by varying the column subscript (exit group) to its maximum for each row subscript (incident group) variation, also given in high to low energy, maximum of 680, floating-point variables.
SIGSO	An array containing the scattering transfer matrix of a material given in the order as described for the n-γ transfer matrix, maximum of 625, floating-point variables.
SIGS1	An array containing the first moment scattering transfer matrix for a material given in the order as described for the n-γ transfer matrix, maximum of 625, floating-point variables.

SØR	An array containing the level spectral values of a spectrum given in order from high to low energy, maximum of 34, floating-point variables.
TM	A location containing the mean life of the delayed neutron group precursor, floating-point variable.
TR	An array containing transport cross sections for a given material, the cross sections are given in order from high to low energy, maximum of 34, floating-point variables.
TS4500	An array containing the thermal scattering matrix for 4500 degrees F. for a given material, the values in the matrix are given by varying the column subscript (exit group) to its maximum for each row subscript (incident group) variation, also given in high to low energy, maximum of 30, floating-point variables.
TS4000	An array containing the thermal scattering matrix for 4000 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS3500	An array containing the thermal scattering matrix for 3500 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS3000	An array containing the thermal scattering matrix for 3000 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS2500	An array containing the thermal scattering matrix for 2500 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS2000	An array containing the thermal scattering matrix for 2000 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS1500	An array containing the thermal scattering matrix for 1500 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS1000	An array containing the thermal scattering matrix for 1000 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS500	An array containing the thermal scattering matrix for 500 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
TS68	An array containing the thermal scattering matrix for 68 degrees F. for a given material as described for the 4500-degree matrix, maximum of 30, floating-point variables.
UG	An array containing the group boundary lethargies of the data tape, lethargies are given from low to high, maximum of 25, floating-point variables.
UL	An array containing the level lethargies of the data tape, lethargies are given from low to high, maximum of 34, floating-point variables.

- XIS An array containing slowing-down cross sections for a given material, cross sections are given in order from high to low energy, maximum of 34, floating-point variables.
- XIS1 An array containing first-moment slowing-down cross sections for a given material, cross sections are given in order from high to low energy, maximum of 34, floating-point variables.

PROGRAM RND C

GENERAL INPUT DATA

4NCØDEL,		, NØPRNT,		, NØCØR,		,
= -1 → Write tape from binary cards. = 0 → Write tape from binary tape. = 1 → Print-out tape only.		= -1 → Print-out complete tape. = 0 → Print-out index, second, and final records only. = N → Print-out N specified data blocks (PCØDE).		= N → Correct N specified data block (CCØDE). NOTE: Enter only if NCØDEL is -1 or 0.		

NOTE: Under the NØPRNT control, if N is specified, the index, second, and final records are not to be totaled in N as they are always printed out.

Under the NØCØR control, if the index, second, and/or final records are to be corrected, they must be totaled in N.

4NØTAPE,		,
= 1 → Write 1 binary tape. = 2 → Write 2 binary tapes. NOTE: Enter only if NCØDEL is -1 or 0.		

GENERAL INPUT DATA

PCODE - Code Numbers of Blocks to be Printed
499 Code Numbers Maximum

3PCODE,		,		,		,	
---------	--	---	--	---	--	---	--

①		,		,		,	
---	--	---	--	---	--	---	--

①		,		,		,	
---	--	---	--	---	--	---	--

①		,		,		,	
---	--	---	--	---	--	---	--

CCODE - Code Numbers of Blocks to be Corrected
499 Code Numbers Maximum

1×10^{-6} = Code Index Record 2×10^{-6} = Code Record 2 0 = Code Final Record

3CCODE,		,		,		,	
---------	--	---	--	---	--	---	--

①		,		,		,	
---	--	---	--	---	--	---	--

①		,		,		,	
---	--	---	--	---	--	---	--

①		,		,		,	
---	--	---	--	---	--	---	--

NOTE: If final record is to be corrected code number 0 must be given last.

=END,	0,
-------	----

CORRECTIONS FOR INDEX RECORD 7090 VERSION

220

Tape Name

5NAME,1,

Date of Manufacture

5DATE,2, / /

* ** ***

*
Month
(2 char.)

**
Day
(2 char.)

Year
(2 char.)

Number of Levels

4NLEV,

Identification of First Material

5BIDENT,2,

E28100,2,

Code Numbers of Materials

3BCØDE,

Record Numbers of First Record of Each Material

4NIR,

End of Record

=END,

0,

RNDG

CORRECTIONS FOR ENERGY-LETHARGY RECORD

Record Number

4NIR,		,
-------	--	---

Level Energies

3EL,		,		,		,		,
------	--	---	--	---	--	---	--	---

Level Lethargies

3UL,		,		,		,		,
------	--	---	--	---	--	---	--	---

Group Energies

3EG,		,		,		,		,
------	--	---	--	---	--	---	--	---

Group Lethargies

3UG,		,		,		,		,
------	--	---	--	---	--	---	--	---

Group 1/v Factors

3FV,		,		,		,		,
------	--	---	--	---	--	---	--	---

End of Record

=END,	0,
-------	----

CORRECTIONS FOR MATERIAL-DATA-BLOCK RECORD ONE

222

Record Number

4NIR,		,
-------	--	---

Date

5DATE,2,	/	/	
	*	**	***

*
Month
(2 char.)

**
Day
(2 char.)

Year
(2 char.)

Code Number

3CØDE,		,
--------	--	---

Scattering Cross Section

3S,		,		,		,		,
-----	--	---	--	---	--	---	--	---

Slowing-Down Cross Section

3XIS,		,		,		,		,
-------	--	---	--	---	--	---	--	---

Transport Cross Section

3TR,		,		,		,		,
------	--	---	--	---	--	---	--	---

Absorption Cross Section

3A,		,		,		,		,
-----	--	---	--	---	--	---	--	---

First-Moment Slowing-Down Cross Section

3XIS1,		,		,		,		,
--------	--	---	--	---	--	---	--	---

Fission Production Cross Section

3FNU,		,		,		,		,
-------	--	---	--	---	--	---	--	---

ENDC

CORRECTIONS FOR MATERIAL DATA BLOCK RECORD ONE (continued)

Density Factor

3DF,		,
------	--	---

Thermal Scattering Transfer Matrix - 4500°F

3TS4500,		,		,		,		,
----------	--	---	--	---	--	---	--	---

4000°F

3TS4000,		,		,		,		,
----------	--	---	--	---	--	---	--	---

3500°F

3TS3500,		,		,		,		,
----------	--	---	--	---	--	---	--	---

3000°F

3TS3000,		,		,		,		,
----------	--	---	--	---	--	---	--	---

2500°F

3TS2500,		,		,		,		,
----------	--	---	--	---	--	---	--	---

2000°F

3TS2000,		,		,		,		,
----------	--	---	--	---	--	---	--	---

1500°F

3TS1500,		,		,		,		,
----------	--	---	--	---	--	---	--	---

1000°F

3TS1000,		,		,		,		,
----------	--	---	--	---	--	---	--	---

500°F

3TS500,		,		,		,		,
---------	--	---	--	---	--	---	--	---

CORRECTIONS FOR MATERIAL DATA BLOCK RECORD ONE (continued)

Thermal Scattering Transfer Matrix - 68°F

3TS68,	,	,	,	,	,	,
--------	---	---	---	---	---	---

First-Group Scatter Transfers

4MOMIN,	,
---------	---

First-Group N-Gamma Transfers

4MGMIN,	,
---------	---

Last-Group Scatter From

4MOIMAX,	,
----------	---

Last-Group N-Gamma From

4MGIMAX,	,
----------	---

Last-Group Scatter Into

4MOØMAX,	,
----------	---

Last-Group N-Gamma Into

4MGØMAX,	,
----------	---

First-Group Scatter One Transfers

4MLMIN,	,
---------	---

Number of Words in Rest of Data Block

4NW,	,
------	---

Last-Group Scatter One From

4MLIMAX,	,
----------	---

Last-Group Scatter One Into

4MLØMAX,	,
----------	---

Number of Resonances

4NRES,	,
--------	---

CCORRECTIONS FOR MATERIAL-DATA-BLOCK RECORD TWO

Record Number

4N2R,	,
-------	---

Scattering Transfer Matrix

3SIGS0,	,	,	,	,	,	,
---------	---	---	---	---	---	---

COFRECTIONS FOR MATERIAL-DATA-BLOCK RECORD THREE

Record Number

4N3R,	,
-------	---

First-Moment Scattering Transfer Matrix

3SIGS1,	,	,	,	,	,	,
---------	---	---	---	---	---	---

CORRECTIONS FOR MATERIAL-DATA-BLOCK RECORD FOUR

Record Number

4N4R,		,
-------	--	---

Resonance Energies

3EO,		,		,		,		,
------	--	---	--	---	--	---	--	---

Resonance Integrals

3RIO,		,		,		,		,
-------	--	---	--	---	--	---	--	---

Peak Cross Sections

3PO,		,		,		,		,
------	--	---	--	---	--	---	--	---

Doppler Temperature Coefficients

3R,		,		,		,		,
-----	--	---	--	---	--	---	--	---

Eta Ratios

3ETAR,		,		,		,		,
--------	--	---	--	---	--	---	--	---

CORRECTIONS FOR MATERIAL-DATA-BLOCK RECORD FIVE

Record Number

4N5R,		,
-------	--	---

N-Gamma Transfer Matrix

3SIGNG,		,		,		,		,
---------	--	---	--	---	--	---	--	---

End of Record

= END,	0	,
--------	---	---

CORRECTIONS FOR SPECTRAL-DATA RECORD

Record Number

4NLR,		,
-------	--	---

Date

5DATE,2,	/	/	
----------	---	---	--

*

**

*

 Month
(2 char.)

**

 Day
(2 char.)

 Year
(2 char.)

Code Number

3CODE,		,
--------	--	---

Level Spectral Values

3SOR,		,		,		,		,		,
-------	--	---	--	---	--	---	--	---	--	---

Spectral Delay Fraction

3BETA,		,
--------	--	---

Mean Life

3TM,		,
------	--	---

End of Record

= END,	0	,
--------	---	---

CORRECTIONS FOR MICROSCOPIC-CONSTITUENTS RECORD

First Word - Record Number

4NMICRØ,		,
----------	--	---

End of Record

= END,	0	,
--------	---	---

4.6 Program Source Deck Listing

```

C      THOMAS A HOFFMAN PROGRAM RNDC      ANP NUMBER 599
C
C      THIS IS THE RNDC CONTROL ROUTINE
C      THE CONTROL ROUTINES PREASSIGNS VALUES TO VARIOUS
C      VARIABLES , SETS THE TEMPORARY DATA ARRAYS TO ZERO ,
C      CLEARS THE INPUT DATA , READS THE GENERAL INPUT
C      PLUS ANY PREASSIGNED VARIABLES THE USER IS DESIROUS
C      OF CHANGING , MAKES AN INPUT CONSISTENCY CHECK ON
C      THE INPUT DATA , TRANSFERS CONTROL IN ORDER TO
C      SUBROUTINES INDEX,ELIV,RAPRL, AND HAS THE FINAL STOP.
C
C      COMMON FOR CONTROL BLOCK
C      COMMON DATA,PCODE,CCODE,NCODE1,NOPRNT,NOCOR,NOTAPE,ITAPE,
1JTAPE,KTAPE,NWOT,NOBLKS,NOTWDS,TEMP,THERM,NOTHGP,NLLEVS,EL,
2NRNMCR,BNAM1,BNAM2,BCODE,NROMCR,NRSAVE
C
C      DIMENSION FOR CONTROL BLOCK
C      DIMENSION DATA(3454),PCODE(499),CCODE(499),TEMP(2000),THERM(
115),EL(34),BNAM1(499),BNAM2(499),BCODE(499),NDATA(3454)
C
C      EQUIVALENCE FOR CONTROL BLOCK
C      EQUIVALENCE (DATA,NDATA)
C
C      CONTROL INITIALIZATION AND CONSISTENCY ROUTINE
C
C      BEGIN EXECUTABLE PART OF ROUTINE
C
100  NWOT=2
      CALL WOT (NWOT)
      ITAPE=5
      REWIND ITAPE
      JTAPE=6
      REWIND JTAPE
      KTAPE=7
      REWIND KTAPE
      CALL NOPAGE
C      CLEAR STORAGE
      CALL CLEAR (DATA,TEMP)
C      INITIALIZE QUASI INPUT
      NOBLKS=499
      NOTHGP=10
      THERM(1)=4500.0
      THERM(2)=4000.0
      THERM(3)=3500.0
      THERM(4)=3000.0
      THERM(5)=2500.0
      THERM(6)=2000.0
      THERM(7)=1500.0
      THERM(8)=1000.0
      THERM(9)=500.0
      THERM(10)=68.0

```

```

C   CLEAR DATA INPUT
      NCODE1=0
      NOCOR=0
      NOTAPE=0
      NOPRNT=0
      DO 101 I=1,NOBLKS
      CCODE(I)=0.0
      PCODE(I)=0.0
101  CONTINUE
      SENSE LIGHT 0
C   READ GENERAL INPUT
      READ DIP PCODE,CCODE,NCODE1,NOCOR,NOTAPE,NOPRNT,ITAPE,JTAPE,
1KTAPE,NWOT,NOBLKS,NOTHGP,THERM,END
      IF (SENSE LIGHT 1) 190,102
C   MAKE CONSISTENCY CHECK
102  IF (NCODE1) 103,103,104
103  IF (NOTAPE) 191,191,105
105  J=0
      DO 106 I=1,NOBLKS
      IF (CCODE(I)) 107,108,107
107  J=J+1
106  CONTINUE
108  IF (NOCOR-J) 192,109,110
110  J=J+1
      IF (NOCOR-J) 192,109,192
104  NOCOR=0
      NOTAPE=0
C   TEST NOPRNT
109  IF (NOPRNT) 111,111,112
112  J=0
      DO 113 I=1,NOBLKS
      IF (PCODE(I)) 114,115,114
114  J=J+1
113  CONTINUE
115  IF (NOPRNT-J) 193,111,193
C   PROCESS INDEX RECORD
111  NOTWDS=NOBLKS*4+4
      CALL INDEX (NCODE1,ITAPE,JTAPE,KTAPE,NOCOR,NOTAPE,NOBLKS,
1NOTWDS,CCODE,TEMP,NRNMCR,NROMCR,DATA)
C   DETERMINE NUMBER OF LEVELS
      NLLEVS=NDATA(4)
C   TRANSFER DESIGNATIONS AND CODE NUMBER
      DO 118 I=1,NOBLKS
      BNAM1(I)=DATA(I+4)
      BNAM2(I)=DATA(I+503)
      BCODE(I)=DATA(I+1002)
118  CONTINUE
C   PROCESS EL1/V RECORD
      NOTWDS=5*NLLEVS+2*NOTHGP 3
C   CLEAR STORAGE
      CALL CLEAR (DATA,TEMP)
      SENSE LIGHT 0
      CALL EL1V (NCODE1,ITAPE,JTAPE,KTAPE,NOCOR,NOTAPE,NOTWDS,
1CCODE,TEMP,DATA,NLLEVS,NOTHGP,THERM)
C   TRANSFER LEVEL ENERGIES

```

```

      J=NLLEVS+NOTHGP
      DO 119 I=1,J
      EL(I)=DATA(I+1)
-----
119 CONTINUE
C   SET UP LOOP TO READ AND PROCESS THE REMAINING RECORDS
C   OF BINARY DATA AND CORRECTIONS IF ANY
      SENSE LIGHT 0
      CALL RAPRL
      REWIND KTAPE
-----
      IF (NOTAPE-1) 120,120,121
121 IF (ITAPE) 194,122,123
122 ITAPE=5
      PRINT 124, ITAPE
124 FORMAT (1H119X,5HTAPE 11,23H COULD NOT BE PROCESSED)
      GO TO 120
-----
123 IF (JTAPE) 195,125,120
125 JTAPE=6
      PRINT 126, JTAPE
126 FORMAT (1H119X,5HTAPE 11,23H COULD NOT BE PROCESSED)
C   FINAL STOP
120 CALL EXIT
-----
C   ERROR STOPS
C   DIP GENERAL INPUT ERROR
190 CALL ERRORA
      GO TO 120
-----
C   CONTROL NOTAPE IS INCORRECT
191 CALL ERRORA
      GO TO 120
-----
C   NUMBER OF CORRECTIONS INCORRECT
192 CALL ERRORA
      GO TO 120
-----
C   NUMBER OF BLOCKS PRINTED INCORRECT
193 CALL ERRORA
      GO TO 120
-----
C   MACHINE ERROR TAPE NUMBER ITAPE IS NEGATIVE
194 CALL ERRORA
      GO TO 120
-----
C   MACHINE ERROR TAPE NUMBER JTAPE IS NEGATIVE
195 CALL ERRORA
      GO TO 120
-----
      END

```

```

C   SUBROUTINE INDEX
C
C   THE INDEX SUBROUTINE IS A FIRST ORDER SUBROUTINE
C   UNDER THE CONTROL OF THE CONTROL ROUTINE . THE INDEX
C   SUBROUTINE READS THE INDEX RECORD FROM TAPE ,CORRECTS
C   THE INDEX RECORD IF NECESSARY , WRITES THE NEW
C   INDEX RECORD ON THE NEW TAPES , AND PRINTS OUT
C   THE INDEX RECORD . IF THE INDEX RECORD IS ON
C   BINARY CARDS THESE ALSO ARE READ IN THIS ROUTINE.
C   CONTROL IS TRANSFERRED BACK TO THE CONTROL ROUTINE.
C
C   SUBROUTINE INDEX (NCODE1,ITAPE,JTAPE,KTAPE,NOCOR,NOTAPE,NOBLKS,
C   1NOTWDS,CCODE,BIDENT,NRNMCR,NROMCR,DATA)
C
C   COMMON FOR INDEX SUBROUTINE
C   COMMON NAME,DATE,NLEV,BNAM1,BNAM2,BCODE,N1R
C
C   DIMENSION FOR INDEX SUBROUTINE
C   DIMENSION CCODE(499),BIDENT(2000),DATE(2),BNAM1(499),
C   1BNAM2(499),BCODE(499),N1R(499),DATA(3454)
C
C   EQUIVALENCE FOR INDEX SUBROUTINE
C   EQUIVALENCE (NAME,TNAME)
C
C   BEGIN EXECUTABLE PART OF SUBROUTINE INDEX
C
2000 IF (NCODE1) 2100,2001,2001
C   READ BINARY TAPE
2001 READ TAPE KTAPE, NAME,DATE(1),DATE(2),NLEV,(BNAM1(I),BNAM2(I),
1BCODE(I),N1R(I),I=1,NOBLKS)
IF (SENSE LIGHT 2) 2900,2002
C   FIND OLD RECORD NUMBER OF MICROSCOPIC CONSTITUENT RECORD
2002 DO 2050 I=1,NOBLKS
IF (BCODE(I)) 2050,2051,2050
2050 CONTINUE
GO TO 2910
2051 NROMCR=N1R(I)
C   DETERMINE IF CORRECTIONS
DO 2006 I=1,NOCOR
IF (CCODE(I)-1.0E-6) 2006,2008,2006
2006 CONTINUE
NRNMCR=NROMCR
GO TO 2007
C   READ CORRECTIONS
2008 J=1
DO 2003 I=1,NOBLKS
BIDENT(J)=BNAM1(I)
BIDENT(J+1)=BNAM2(I)
J=J+2
2003 CONTINUE
2004 READ DIP NAME,DATE,NLEV,BIDENT,BCODE,N1R,END
IF (SENSE LIGHT 1) 2901,2052
C   FIND NEW RECORD NUMBER OF MICROSCOPIC CONSTITUENT RECORD
2052 DO 2053 I=1,NOBLKS
IF (BCODE(I)) 2053,2054,2053

```

```

2053 CONTINUE
GO TO 2912
2054 NRNMCR=N1R(I)
DETERMINE IF BINARY TAPES ARE TO BE WRITTEN
J=1
DO 2005 I=1,NOBLKS
BNAM1(I)=BIDENT(J)
BNAM2(I)=BIDENT(J+1)
J=J+2
2005 CONTINUE
2007 IF (NOTAPE) 2904,2010,2009
C WRITE ITAPE AND CHECK
2009 WRITE TAPE ITAPE, NAME,DATE(1),DATE(2),NLEV,(BNAM1(I),BNAM2(I),
1BCODE(I),N1R(I),I=1,NOBLKS)
IF (SENSE LIGHT 2) 2014,2020
C ITAPE CANNOT BE WRITTEN PROPERLY
2014 IF (NOTAPE-1) 2902,2902,2019
2019 REWIND ITAPE
ITAPE=0
C DETERMINE IF JTAPE IS TO BE WRITTEN
2020 IF (NOTAPE-1) 2010,2010,2022
C WRITE JTAPE AND CHECK
2022 WRITE TAPE JTAPE,NAME,DATE(1),DATE(2),NLEV,(BNAM1(I),BNAM2(I),
1BCODE(I),N1R(I),I=1,NOBLKS)
IF (SENSE LIGHT 2) 2026,2010
C PRINT OUT INDEX RECORD
2010 PRINT 2041,DATE(1),DATE(2),NLEV
2041 FORMAT (1H156X,5HDATE 2A6//7730X,12HINDEX RECORD//77133,7H LEVELS/10
1X,4HDATA/8X,9HBLOCK NO.5X,8HCODE NO.6X,11HDESIGNATION6X,10HRECORD
2NO.//)
DO 2032 I=1,NOBLKS
PRINT 2033,I,BCODE(I),BNAM1(I),BNAM2(I),N1R(I)
2033 FORMAT (I14,F18.4,4X,2A6,I12)
IF (I-40*(I/40)) 2032,2035,2032
2035 PRINT 2036,NLEV
2036 FORMAT (1H1///30X,12HINDEX RECORD///133,7H LEVELS/10X,4HDATA/8X,9
1HBLOCK NO.5X,8HCODE NO.6X,11HDESIGNATION6X,10HRECORD NO.//)
2032 CONTINUE
GO TO 2034
C JTAPE CANNOT BE WRITTEN PROPERLY
2026 REWIND JTAPE
JTAPE=0
C DETERMINE IF ITAPE HAS BEEN WRITTEN PROPERLY
IF (ITAPE) 2903,2903,2010
C READ BINARY CARDS
C READ HOLLERITH IDENTIFICATION CARD
2100 READ INPUT TAPE 2,2101
2101 FORMAT (1H )
CALL ACBIP
C STORE INDEX DATA PROPERLY
DO 2055 I=1,NOBLKS
BIDENT(I+4)=DATA(4*I+1)
BIDENT(I+503)=DATA(4*I+2)
BIDENT(I+1002)=DATA(4*I+3)
BIDENT(I+1501)=DATA(4*I+4)

```



```
2055 CONTINUE
      J=4*NOBLKS
      DO 2056 I=1,J
      DATA(I+4)=BIDENT(I+4)
2056 CONTINUE
      GO TO 2002
C      ERROR STOPS
C      KTAPE CANNOT BE READ PROPERLY
2900 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2905 CALL ERRORA
      GO TO 2914
C      DIP ERROR IN CORRECTIONS
2901 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2906 CALL ERRORA
      GO TO 2914
C      ITAPE CANNOT BE WRITTEN PROPERLY
2902 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2907 CALL ERRORA
      GO TO 2914
C      NEITHER ITAPE NOR JTAPE CAN BE WRITTEN PROPERLY
2903 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2908 CALL ERRORA
      GO TO 2914
C      MACHINE ERROR CONTROL NOTAPE IS NEGATIVE
2904 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2909 CALL ERRORA
      GO TO 2914
C      MORE THAN 499 BLOCKS ON INDEX RECORD
2910 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2911 CALL ERRORA
      GO TO 2914
C      MORE THAN 499 BLOCKS ON INDEX RECORD
2912 CALL RIJKT (ITAPE,JTAPE,KTAPE)
2913 CALL ERRORA
      GO TO 2914
2914 CALL EXIT
2034 RETURN
      END
```

```

C   SUBROUTINE EL1V
C
C   THE EL1V SUBROUTINE IS A FIRST ORDER SUBROUTINE UNDER
C   THE CONTROL OF THE CONTROL ROUTINE. THE EL1V SUBROUTINE
C   READS THE ENERGY-LETHARGY-1/V FACTOR RECORD FROM TAPE,
C   CORRECTS THE RECORD IF NECESSARY ,WRITES THE NEW RECORD
C   ON THE NEW TAPES ,AND PRINTS OUT THE RECORD. IF THE
C   ENERGY-LETHARGY 1/V FACTOR RECORD IS ON BINARY CARDS
C   THESE ALSO ARE READ IN THIS ROUTINE. CONTROL IS
C   TRANSFERRED BACK TO THE CONTROL ROUTINE.
C
C   SUBROUTINE EL1V (NCODE1,ITAPE,JTAPE,KTAPE,NOCOR,NOTAPE,NOTWDS,
C   1CCODE,TEMP,DATA,NLLEVS,NOTHGP,THERM)
C
C   COMMON FOR EL1V SUBROUTINE
C   COMMON N1R,EL,UL,EG,UG,FV
C
C   DIMENSION FOR EL1V SUBROUTINE
C   DIMENSION CCODE(499),EL(34),UL(34),EG(25),UG(25),
C   1FV(24),TEMP(2000),DATA(3454),THERM(15)
C
C   BEGIN EXECUTABLE PART OF SUBROUTINE EL1V
C
C   DETERMINE IF BINARY TAPE OR CARDS
C   3000 IF (NCODE1) 3100,3001,3001
C   READ BINARY TAPE
C   3001 CALL RBT1JK (KTAPE,DATA,NOTWDS)
C   IF (SENSE LIGHT 1) 3900,3002
C   DETERMINE IF CORRECTIONS
C   3002 DO 3003 I=1,NOCOR
C   IF (CCODE(I)-2.0E-6) 3003,3004,3003
C   3003 CONTINUE
C   GO TO 3005
C   READ CORRECTIONS
C   3004 READ DIP N1R,EL,UL,EG,UG,FV,END
C   IF (SENSE LIGHT 1) 3901,3005
C   DETERMINE IF BINARY TAPES ARE TO BE WRITTEN
C   3005 IF (NOTAPE-1) 3006,3007,3008
C   WRITE ITAPE AND CHECK
C   3007 CALL WBT1J (DATA,TEMP,ITAPE,NOTWDS)
C   IF (SENSE LIGHT 1) 3902,3006
C   BOTH TAPES TO BE WRITTEN
C   3008 IF (ITAPE) 3905,3013,3010
C   3010 CALL WBT1J (DATA,TEMP,ITAPE,NOTWDS)
C   IF (SENSE LIGHT 1) 3011,3012
C   3011 REWIND ITAPE
C   ITAPE=0
C   IF (JTAPE) 3903,3903,3013
C   3012 IF (JTAPE) 3906,3006,3013
C   WRITE JTAPE AND CHECK
C   3013 CALL WBT1J (DATA,TEMP,JTAPE,NOTWDS)
C   IF (SENSE LIGHT 1) 3014,3006
C   3014 IF (ITAPE) 3904,3904,3015
C   3015 REWIND JTAPE
C   JTAPE=0

```

C PRINT OUT EL1V RECORD

3006 PRINT 3020
 3020 FORMAT (1H115X,5HLEVEL5X,11HENERGY (EV)7X,8HLETHARGY//)

DO 3025 I=1,NLLEVS
 IF ((I-1)-5*((I-1)/5)) 3022,3023,3022

3022 PRINT 3024, I,EL(I),UL(I)
 3024 FORMAT (I19,1PE19.7,E17.7)

GO TO 3025

3023 PRINT 3026, I,EL(I),UL(I)
 3026 FORMAT (1H0118,1PE19.7,E17.7)
 3025 CONTINUE

J=NLLEVS+1
 DO 3027 I=1,NOTHGP
 K=THERM(I)
 IF ((I-1)-5*((I-1)/5)) 3028,3029,3028

3028 PRINT 3030, K,EL(J),UL(J)
 3030 FORMAT (I20,1PE18.7,E17.7)

J=J+1
 GO TO 3027

3029 PRINT 3031, K,EL(J),UL(J)
 3031 FORMAT (1H0119,1PE18.7,E17.7)

J=J+1

3027 CONTINUE

C PRINT SECOND PAGE EL1V RECORD

PRINT 3032, EG(1),UG(1)

3032 FORMAT (1H120X,5HLOWER12X,5HUPPER9X,10H1/V FACTOR/8X,5HGROUP5X,11H
 1ENERGY (EV)7X,8HLETHARGY7X,12H(2200 M/SEC)//10X,1H0,1PE19.7,E17.7)

DO 3033 I=1,NLLEVS
 IF (I-5*(I/5)) 3034,3035,3034

3034 PRINT 3036, I,EG(I+1),UG(I+1),FV(I)
 3036 FORMAT (I11,1PE19.7,1PE17.7,1PE17.7)

GO TO 3033

3035 PRINT 3038, I,EG(I+1),UG(I+1),FV(I)
 3038 FORMAT (1H0110,1PE19.7,1PE17.7,1PE17.7)

3033 CONTINUE

GO TO 3037

C READ BINARY CARDS

C READ HOLLERITH IDENTIFICATION CARD

3100 READ INPUT TAPE 2,3101

3101 FORMAT (1H)
 CALL ACBIP

GO TO 3002

C ERROR STOPS

C KTAPE CANNOT BE READ PROPERLY
 3900 CALL RIJKT (ITAPE,JTAPE,KTAPE)

3907 CALL ERRORA
 GO TO 3914

C DIP ERROR IN CORRECTIONS

3901 CALL RIJKT (ITAPE,JTAPE,KTAPE)
 3908 CALL ERRORA

GO TO 3914

C ITAPE CANNOT BE WRITTEN PROPERLY

3902 CALL RIJKT (ITAPE,JTAPE,KTAPE)

3909 CALL ERRORA
 GO TO 3914

```
C      ITAPE CANNOT BE WRITTEN PROPERLY JTAPE ALREADY FAILED
3903 CALL RIJKT (ITAPE,JTAPE,KTAPE)
3910 CALL ERRORA
      GO TO 3914
C      JTAPE CANNOT BE WRITTEN PROPERLY ITAPE ALREADY FAILED
3904 CALL RIJKT (ITAPE,JTAPE,KTAPE)
3911 CALL ERRORA
      GO TO 3914
C      MACHINE ERROR TAPE NUMBER ITAPE IS NEGATIVE
3905 CALL RIJKT (ITAPE,JTAPE,KTAPE)
3912 CALL ERRORA
      GO TO 3914
C      MACHINE ERROR TAPE NUMBER JTAPE IS NEGATIVE
3906 CALL RIJKT (ITAPE,JTAPE,KTAPE)
3913 CALL ERRORA
      GO TO 3914
3914 CALL EXIT
3037 RETURN
      END
```

SUBROUTINE RAPRL

```

C
C THE RAPRL SUBROUTINE IS A FIRST ORDER SUBROUTINE UNDER
C THE CONTROL OF THE CONTROL ROUTINE. THE RAPRL
C SUBROUTINE DOES NOT PROCESS ANY RECORDS BUT ACTS AS A
C SECONDARY CONTROL ROUTINE FOR SUBROUTINES DBLKR,
C SPECT AND MICRO. RAPRL WILL READ ONE BINARY
C RECORD FROM TAPE OR ONE BLOCK OF BINARY CARDS,
C TEST THE CODE NUMBER OF THE RECORD OR BLOCK
C AND TRANSFER CONTROL TO THE PROPER SUBROUTINE. THIS
C SUBROUTINE TRANSFERS CONTROL BACK TO RAPRL WHICH THEN
C PROCESSES THE NEXT CODE NUMBER. THIS PROCESS CONTINUES
C UNTIL THE MICROSCOPIC CONSTITUENTS RECORD IS PROCESSED,
C AT WHICH TIME RAPRL TRANSFERS CONTROL TO THE
C CONTROL ROUTINE
C
C COMMON FOR SUBROUTINE RAPRL
C COMMON DATA,PCODE,CCODE,NCODE1,NOPRNT,NOCOR,NOTAPE,ITAPE,
C 1JTAPE,KTAPE,NWOT,NOBLKS,NOTWDS,TEMP,THERM,NOTHGP,NLLEVS,EL,
C 2NRNMCR,BNAM1,BNAM2,BCODE,NROMCR,NRSAVE
C
C DIMENSION FOR SUBROUTINE RAPRL
C DIMENSION DATA(3454),PCODE(499),CCODE(499),TEMP(2000),THERM(15),
C 1EL(34),BNAM1(499),BNAM2(499),BCODE(499),NDATA(3454)
C
C EQUIVALENCE FOR SUBROUTINE RAPRL
C EQUIVALENCE (DATA,NDATA)
C
C BEGIN EXECUTABLE PART OF SUBROUTINE RAPRL
C
C 8000 NRSAVE=3
C TEST IF LESS THAN THREE RECORDS
C IF (NROMCR-3) 8900,8001,8001
C 8001 DO 8011 N=1,NOBLKS
C CALL CLEAR (DATA,TEMP)
C IF (NCODE1) 8002,8003,8003
C READ BINARY CARDS
C READ HOLLERITH IDENTIFICATION CARD
C 8002 READ INPUT TAPE 2,8004
C 8004 FORMAT (1H )
C CALL ACBIP
C GO TO 8005
C READ BINARY TAPE KTAPE
C 8003 SENSE LIGHT 0
C IF (BCODE(N)) 8016,8013,8016
C 8016 IF (BCODE(N)-500.0) 8012,8014,8014
C 8012 NOTWDS=6*(NLLEVS+NOTHGP) (30*NOTHGP)+16
C GO TO 8015
C 8013 NOTWDS=1000
C GO TO 8015
C 8014 NOTWDS=NLLEVS+NOTHGP+6
C 8015 CALL RBTJK (KTAPE,DATA,NOTWDS)
C IF (SENSE LIGHT 1) 8901,8005
C DETERMINE WHAT RECORD
C 8005 IF (NROMCR-NDATA) 8902,8006,8007

```

```

C      MICROSCOPIC CONSTITUENT RECORD
8006  SENSE LIGHT 0
      NOTWDS=1000
      CALL MICRO (NCODE1,NOCOR,NOTAPE,ITAPE,JTAPE,KTAPE,NOTWDS,
1TEMP,DATA,CCODE,NRNMCR,NRSAVE,NROMCR,BCODE,BNAM1,BNAM2,NOBLKS)
      GO TO 8008
C      DETERMINE IF SPECTRAL OR DATA BLOCK
8007  IF (DATA(4)-500.0) 8009,8010,8010
C      SPECTRAL
8010  SENSE LIGHT 0
      NOTWDS=NLLEVS+NOTHGP+6
      CALL SPECT (DATA,PCODE,CCODE,NCODE1,NOPRNT,NOCOR,NOTAPE,ITAPE,
1JTAPE,KTAPE,NOTWDS,TEMP,THERM,NOTHGP,NLLEVS,EL,BNAM1,BNAM2,
2BCODE,NOBLKS,NRSAVE)
      GO TO 8011
C      DATA BLOCK
8009  SENSE LIGHT 0
      SENSE LIGHT 0
      NOTWDS=6*(NLLEVS+NOTHGP) (30*NOTHGP)+16
      CALL DBLKR (DATA,PCODE,CCODE,NCODE1,NOPRNT,NOCOR,NOTAPE,
1ITAPE,JTAPE,KTAPE,NOTWDS,TEMP,THERM,NOTHGP,NLLEVS,EL,BNAM1,
2BNAM2,BCODE,NOBLKS,NRSAVE)
8011  CONTINUE
      GO TO 8902
C      ERROR STOPS
C      LESS THAN THREE RECORDS ON KTAPE
8900  CALL RIJKT (ITAPE,JTAPE,KTAPE)
8903  CALL ERRORA
      GO TO 8906
C      KTAPE CANNOT BE PROCESSED CORRECTLY
8901  CALL RIJKT (ITAPE,JTAPE,KTAPE)
8904  CALL ERRORA
      GO TO 8906
C      RECORD NUMBER OF MICROSCOPIC CONSTITUENT RECORD DOES NOT
C      AGREE WITH FINAL RECORD NUMBER ON INDEX RECORD
8902  CALL RIJKT (ITAPE,JTAPE,KTAPE)
8905  CALL ERRORA
      GO TO 8906
8906  CALL EXIT
8008  RETURN
      END

```

SUBROUTINE DBLKR

THE DBLKR SUBROUTINE IS A SECOND ORDER SUBROUTINE UNDER
 THE CONTROL OF SUBROUTINE RAPRL. THE DBLKR SUBROUTINE
 READS THE REMAINING RECORDS OF A MATERIAL DATA BLOCK
 FROM TAPE IF ANY, READS IN THE CORRECTIONS, ADDS RECORDS
 TO A MATERIAL DATA BLOCK IF NECESSARY, WRITES THE NEW
 DATA TAPES, AND WRITES THE BCD OUTPUT. CONTROL IS
 TRANSFERRED BACK TO SUBROUTINE RAPRL.

SUBROUTINE DBLKR (DATA, PCODE, CCODE, NCODE1, NOPRNT, NOCOR, NOTAPE,
 1ITAPE, JTAPE, KTAPE, NOTWDS, TEMP, THERM, NOTHGP, NLLEVS, EL, BNAM1, BNAM2,
 2BCODE, NOBLKS, NRSAVE)

COMMON FOR SUBROUTINE DBLKR

COMMON N1R, DATE, CODE, S, XIS, TR, A, XIS1, FNU, DF, TS4500, TS4000,
 1TS3500, TS3000, TS2500, TS2000, TS1500, TS1000, TS500, TS68, MOMIN,
 2MOIMAX, MOOMAX, M1MIN, M1IMAX, M1OMAX, NRES, MGMIN, MGIMAX, MGOMAX,
 3NW, N2R, SIGS0, N3R, SIGS1, N4R, E0, R10, P0, R, ETAR, N5R, SIGNG

DIMENSION FOR SUBROUTINE DBLKR

DIMENSION DATA(3454), PCODE(499), CCODE(499), TEMP(2000), THERM(15),
 1EL(34), BNAM1(499), BNAM2(499), BCODE(499), DATE(2), S(34), XIS(34),
 2TR(34), A(34), XIS1(34), FNU(34), TS4500(30), TS4000(30), TS3500(30),
 3TS3000(30), TS2500(30), TS2000(30), TS1500(30), TS1000(30), TS500(30),
 4TS68(30), SIGS0(625), SIGS1(625), E0(200), R10(200), P0(200), R(200),
 5ETAR(200), SIGNG(680)

BEGIN EXECUTABLE PART OF SUBROUTINE DBLKR

9200 CALL CALDIM (MOMIN, MOIMAX, MOOMAX, M1MIN, M1IMAX, M1OMAX,
 1NRES, MGMIN, MGIMAX, MGOMAX, N2SAVE, N3SAVE, N4SAVE, N5SAVE)

IF (NCODE1) 9367, 9201, 9201

9367 CALL SWCH (NRES, E0, R10, P0, R, ETAR, TEMP)

GO TO 9210

9201 IF (MOMIN) 9900, 9202, 9203

READ SECOND RECORD

9203 CALL RBTIJK (KTAPE, N2R, N2SAVE)

IF (SENSE LIGHT 1) 9901, 9202

9202 IF (M1MIN) 9902, 9204, 9205

READ THIRD RECORD

9205 CALL RBTIJK (KTAPE, N3R, N3SAVE)

IF (SENSE LIGHT 1) 9903, 9204

9204 IF (NRES) 9904, 9206, 9207

READ FOURTH RECORD

9207 CALL RBTIJK (KTAPE, N4R, N4SAVE)

IF (SENSE LIGHT 1) 9905, 9365

9365 CALL SWCH (NRES, E0, R10, P0, R, ETAR, TEMP)

9206 IF (MGMIN) 9906, 9208, 9209

READ FIFTH RECORD

9209 CALL RBTIJK (KTAPE, N5R, N5SAVE)

IF (SENSE LIGHT 1) 9907, 9208

TEST IF PRINT OUT ONLY

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9208 IF (NCODE1) 9908,9210,9211
C   TEST IF CORRECTIONS
9210 DO 9212 I=1,NOCOR
      IF (CCODE(I)-CODE) 9212,9213,9212
9212 CONTINUE
      GO TO 9214
C   READ CORRECTIONS
9213 READ DIP N1R,DATE,CODE,S,XIS,TR,A,XIS1,FNU,DF,TS4500,TS4000,
      1TS3500,TS3000,TS2500,TS2000,TS1500,TS1000,TS500,TS68,MOMIN,MOIMAX,
      2MOOMAX,M1MIN,M1IMAX,M1OMAX,NRES,MGMIN,MGIMAX,MGOMAX,
      3NW,N2R,SIGS0,N3R,SIGS1,N4R,E0,RIO,P0,R,ETAR,N5R,SIGNG,END
      IF (SENSE LIGHT 1) 9909,9214
9214 CALL CALDIM (MOMIN,MOIMAX,MOOMAX,M1MIN,M1IMAX,M1OMAX,NRES,
      1MGMIN,MGIMAX,MGOMAX,N2SAVE,N3SAVE,N4SAVE,N5SAVE)
      DO 9368 I=1,NRES
        J=I+NRES
        E0(J)=RIO(I)
9368 CONTINUE
        DO 9369 I=1,NRES
          J=I+2*NRES
          E0(J)=P0(I)
9369 CONTINUE
          DO 9370 I=1,NRES
            J=I+3*NRES
            E0(J)=R(I)
9370 CONTINUE
            DO 9371 I=1,NRES
              J=I+4*NRES
              E0(J)=ETAR(I)
9371 CONTINUE
C   SET UP PROPER RECORD NUMBERS
      N1R=NRSAVE
      NRSAVE=NRSAVE+1
      IF (MOMIN) 9976,9330,9331
9331 N2R=NRSAVE
      NRSAVE=NRSAVE+1
9330 IF (M1MIN) 9977,9332,9333
9333 N3R=NRSAVE
      NRSAVE=NRSAVE+1
9332 IF (NRES) 9978,9334,9335
9335 N4R=NRSAVE
      NRSAVE=NRSAVE+1
9334 IF (MGMIN) 9979,9336,9337
9337 N5R=NRSAVE
      NRSAVE=NRSAVE+1
C   WRITE HOW MANY BINARY TAPES
9336 IF (NOTAPE-1) 9910,9215,9216
C   ITAPE ONLY
9215 CALL WBTIJ (N1R,TEMP,ITAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9217,9218
C   CHECK ERROR
9217 REWIND ITAPE
      ITAPE=0
      IF (NOTAPE-1) 9911,9911,9219
9219 IF (JTAPE) 9912,9912,9372

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9218 IF (MOMIN) 9913,9220,9221
C WRITE SECOND RECORD
9221 CALL WBTIJ (N2R,TEMP,ITAPE,N2SAVE)
IF (SENSE LIGHT 1) 9217,9220
9220 IF (MIMIN) 9914,9222,9223
C WRITE THIRD RECORD
9223 CALL WBTIJ (N3R,TEMP,ITAPE,N3SAVE)
IF (SENSE LIGHT 1) 9217,9222
9222 IF (NRES) 9915,9224,9225
C WRITE FOURTH RECORD
9225 CALL WBTIJ (N4R,TEMP,ITAPE,N4SAVE)
IF (SENSE LIGHT 1) 9217,9224
9224 IF (MGMIN) 9916,9372,9226
C WRITE FIFTH RECORD
9226 CALL WBTIJ (N5R,TEMP,ITAPE,N5SAVE)
IF (SENSE LIGHT 1) 9217,9372
C WRITE BOTH TAPES JTAPE FIRST
9216 IF (JTAPE) 9917,9215,9227
C WRITE FIRST RECORD
9227 CALL WBTIJ (N1R,TEMP,JTAPE,NOTWDS)
IF (SENSE LIGHT 1) 9228,9229
9228 REWIND JTAPE
JTAPE=0
IF (ITAPE) 9918,9918,9215
9229 IF (MOMIN) 9919,9230,9360
C WRITE SECOND RECORD
9360 CALL WBTIJ (N2R,TEMP,JTAPE,N2SAVE)
IF (SENSE LIGHT 1) 9228,9230
9230 IF (MIMIN) 9920,9231,9361
C WRITE THIRD RECORD
9361 CALL WBTIJ (N3R,TEMP,JTAPE,N3SAVE)
IF (SENSE LIGHT 1) 9228,9231
9231 IF (NRES) 9921,9232,9362
C WRITE FOURTH RECORD
9362 CALL WBTIJ (N4R,TEMP,JTAPE,N4SAVE)
IF (SENSE LIGHT 1) 9228,9232
9232 IF (MGMIN) 9922,9233,9234
C WRITE FIFTH RECORD
9234 CALL WBTIJ (N5R,TEMP,JTAPE,N5SAVE)
IF (SENSE LIGHT 1) 9228,9233
9233 IF (ITAPE) 9932,9372,9215
9372 CALL SWCH (NRES,E0,R10,P0,R,ETAR,TEMP)
C DETERMINE IF PRINT OUT
9211 IF (NOPRNT) 9235,9236,9237
C DETERMINE IF CODE NUMBER FOR PRINT
9237 DO 9238 I=1,NOPRNT
IF (PCODE(I)-CODE) 9238,9235,9238
9238 CONTINUE
GO TO 9236
C PRINT OUT DATA BLOCK
C PRINT FIRST RECORD
C FIND CODE AND DESIGNATION
9235 DO 9239 N=1,NOBLKS
IF (BCODE(N)-CODE) 9239,9240,9239
9239 CONTINUE

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GO TO 9923
9240 PRINT 9241, DATE(1),DATE(2),BNAM1(N),BNAM2(N),BCODE(N),DF
9241 FORMAT (1H157X,5HDATE 2A6///9X,11HDESIGNATION10X,8HCODE NO.10X,14H
1DENSITY FACTOR//9X,2A6,F17.4,1PE22.5,///18X,5HSIGMA5X,8HXI SIGMA4X
2,5HSIGMA6X,5HSIGMA5X,9HXI1 SIGMA/70H LEVEL ENERGY SCATTER SC
3ATTER TRANSPORT ABSORPTION SCATTER 1)
DO 9242 I=1,NLLEVS
IF ((I-1)-5*((I-1)/5)) 9243,9244,9243
9243 PRINT 9245, I,EL(I),S(I),XIS(I),TR(I),A(I),XIS1(I)
9245 FORMAT (I4,1PE11.3,4E11.4,E12.4)
GO TO 9242
9244 PRINT 9246, I,EL(I),S(I),XIS(I),TR(I),A(I),XIS1(I)
9246 FORMAT (1H0I3,1PE11.3,4E11.4,E12.4)
9242 CONTINUE
J=NLLEVS+1
DO 9247 I=1,NOTHGP
K=THERM(I)
IF ((I-1)-5*((I-1)/5)) 9248,9249,9248
9248 PRINT 9250, K,EL(J),S(J),XIS(J),TR(J),A(J),XIS1(J)
9250 FORMAT (I5,1PE10.3,4E11.4,E12.4)
J=J+1
GO TO 9247
9249 PRINT 9251, K,EL(J),S(J),XIS(J),TR(J),A(J),XIS1(J)
9251 FORMAT (1H0I4,1PE10.3,4E11.4,E12.4)
J=J+1
9247 CONTINUE
C
C PAGE 2 RECORD 1 DATA BLOCK PRINT OUT
C
PRINT 9252, BNAM1(N),BNAM2(N),BCODE(N),DF
9252 FORMAT (1H18X,11HDESIGNATION10X,8HCODE NO.10X,14HDENSITY FACTOR//9
1X,2A6,F17.4,1PE22.5,///43X,8HNU SIGMA/21X,5HLEVEL5X,6HENERGY7X,7HF
2ISSION)
DO 9253 I=1,NLLEVS
IF ((I-1)-5*((I-1)/5)) 9254,9255,9254
9254 PRINT 9256, I,EL(I),FNU(I)
9256 FORMAT (I24,1PE14.3,E14.4)
GO TO 9253
9255 PRINT 9257, I,EL(I),FNU(I)
9257 FORMAT (1H0I23,1PE14.3,E14.4)
9253 CONTINUE
J=NLLEVS+1
DO 9258 I=1,NOTHGP
K=THERM(I)
IF ((I-1)-5*((I-1)/5)) 9259,9260,9259
9259 PRINT 9261, K,EL(J),FNU(J)
9261 FORMAT (I25,1PE13.3,E14.4)
J=J+1
GO TO 9258
9260 PRINT 9262, K,EL(J),FNU(J)
9262 FORMAT (1H0I24,1PE13.3,E14.4)
J=J+1
9258 CONTINUE
C
C PAGES 3 THROUGH 7 RECORD 1 DATA BLOCK PRINT OUT

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9264 K=1
DO 9275 I=1,NOTHGP
  IF ((I-1)-2*((I-1)/2)) 9276,9277,9276
9277 PRINT 9278, BNAME1(N),BNAME2(N)
9278 FORMAT (1H129X,2A6///23X,25HTHERMAL TRANSFER MATRICES)
9276 J=I+NLLEVS
  PRINT 9279, TS4500(K),TS4500(K+1),TS4500(K+2),TS4500(K+3),TS4500
  1(K+4),J,TS4500(K+5),TS4500(K+6),TS4500(K+7),TS4500(K+8),TS4500(K
  2+9),J,TS4500(K+10),TS4500(K+11),TS4500(K+12),TS4500(K+13),TS4500
  3(K+14),J,TS4500(K+15),TS4500(K+16),TS4500(K+17),TS4500(K+18),
  4TS4500(K+19),J,TS4500(K+20),TS4500(K+21),TS4500(K+22),TS4500(K+
  523),TS4500(K+24),J,J,J,J,J,J,TS4500(K+25),TS4500(K+26),TS4500
  6(K+27),TS4500(K+28),TS4500(K+29)
9279 FORMAT (///3X,1HTEMPERATURE5X,5HSIGMA9X,5HSIGMA9X,5HSIGMA8X,8HN
  1U SIGMA/4X,8HDEG. F.6X,7HSCATTER6X,9HTRANSPORT5X,10HABSORPTION5X,
  27HFISSION//1PE13.4,4E14.4///31X,2HN15X,2HN2/28X,15HSIGMA S (N1/N2)
  3//5X,6H21 218X,6H21 228X,6H21 238X,6H21 248X,2H212X,I2/1E13.4,
  44E14.4/5X,6H22 218X,6H22 228X,6H22 238X,6H22 248X,2H222X,I2/1E
  513.4,4E14.4/5X,6H23 218X,6H23 228X,6H23 238X,6H23 248X,2H232X,
  6I2/1E13.4,4E14.4/5X,6H24 218X,6H24 228X,6H24 238X,6H24 248X,2H
  7242X,I2/1E13.4,4E14.4/I7,4H 21I10,4H 22I10,4H 23I10,4H 24I10,I
  84/1E13.4,4E14.4)
  K=K+30
9275 CONTINUE
C
C PAGE 8 RECORD 1 DATA BLOCK PRINT OUT
C
  PRINT 9280, BNAME1(N),BNAME2(N)
9280 FORMAT (1H130X,2A6/////////)
  IF (MOMIN) 9925,9281,9282
9282 PRINT 9283, MOMIN,MOIMAX,MOMIN,MOOMAX
9283 FORMAT (32X,8HSIGMA S0//6X,21HTRANSFERS FROM GROUPSI3,8H THROUGH I3
  1,10H TO GROUPSI3,8H THROUGH I3////)
9281 IF (M1MIN) 9926,9284,9285
9285 PRINT 9286, M1MIN,M1IMAX,M1MIN,M1OMAX
9286 FORMAT (32X,8HSIGMA S1//6X,21HTRANSFERS FROM GROUPSI3,8H THROUGH I3
  1,10H TO GROUPSI3,8H THROUGH I3////)
9284 IF (NRES) 9927,9287,9288
9288 PRINT 9289, NRES
9289 FORMAT (29X,14HNO. RESONANCES//I37////)
9287 IF (MGMIN) 9928,9290,9291
9291 PRINT 9292, MGMIN,MGIMAX,MGMIN,MGOMAX
9292 FORMAT (28X,15HSIGMA (N,GAMMA)//6X,21HTRANSFERS FROM GROUPSI3,8H T
  1HROUGH I3,10H TO GROUPSI3,8H THROUGH I3////)
C
9290 BNAMEX1=BNAME1(N)
  BNAMEX2=BNAME2(N)
C
C DETERMINE IF SECOND RECORD IS PRESENT
  IF (N2R) 9933,9293,9294
C PRINT SECOND RECORD OF DATA BLOCK
9294 NFORK=0
  CALL PSOING (MOMIN,MOIMAX,N2SAVE,BNAMEX1,BNAMEX2,NFORK,SIGS0)
C DETERMINE IF THIRD RECORD IS PRESENT

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C
9293 IF (N3R) 9929,9296,9297
PRINT THIRD RECORD DATA BLOCK
9297 NFORK=1
CALL PS0ING (M1MIN,M1IMAX,N3SAVE,BNAMX1,BNAMX2,NFORK,SIGS1)
C
C DETERMINE IF FOURTH RECORD IS PRESENT
C
9296 IF (N4R) 9930,9299,9300
C PRINT FOURTH RECORD
9300 PRINT 9301,BNAM1(N),BNAM2(N)
9301 FORMAT (1H130X,2A6///3X,9HRESONANCE5X,9HRESONANCE8X,4HPEAK/5X,6HEN
1ERGY7X,8HINTEGRAL4X,13HCROSS SECTION6X,1HR12X,3HETA//)
DO 9302 I=1,NRES
IF (I-1) 9303,9303,9304
9304 IF ((I-1)-40*((I-1)/40)) 9305,9306,9305
9306 PRINT 9307,BNAM1(N),BNAM2(N)
9307 FORMAT (1H130X,2A6///3X,9HRESONANCE5X,9HRESONANCE8X,4HPEAK/5X,6HEN
1ERGY7X,8HINTEGRAL4X,13HCROSS SECTION6X,1HR12X,3HETA//)
9305 IF ((I-1)-5*((I-1)/5)) 9303,9308,9303
9303 PRINT 9309, E0(I),R10(I),P0(I),R(I),ETAR(I)
9309 FORMAT (1PE13.4,4E14.4)
GO TO 9302
9308 PRINT 9310, E0(I),R10(I),P0(I),R(I),ETAR(I)
9310 FORMAT (1H01PE12.4,4E14.4)
9302 CONTINUE
C
C DETERMINE IF FIFTH RECORD IS PRESENT
C
9299 IF (N5R) 9931,9236,9311
C PRINT FIFTH RECORD
9311 NFORK=2
CALL PS0ING (MGMIN,MGIMAX,N5SAVE,BNAMX1,BNAMX2,NFORK,SINGG)
GO TO 9236
C ERROR STOPS
C MACHINE ERROR M0MIN IS NEGATIVE
9900 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9938 CALL ERRORA
GO TO 9984
C RECORD 2 DATA BLOCK KTAPE COULD NOT BE READ PROPERLY
9901 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9939 CALL ERRORA
GO TO 9984
C MACHINE ERROR M1MIN IS NEGATIVE
9902 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9940 CALL ERRORA
GO TO 9984
C RECORD 3 DATA BLOCK KTAPE COULD NOT BE READ PROPERLY
9903 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9941 CALL ERRORA
GO TO 9984
C MACHINE ERROR NRES IS NEGATIVE
9904 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9942 CALL ERRORA
GO TO 9984

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C	RECORD 4 DATA BLOCK KTAPE COULD NOT BE READ PROPERLY
9905	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9943	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MGIN IS NEGATIVE
9906	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9944	CALL ERRORA
	GO TO 9984
C	RECORD 5 DATA BLOCK KTAPE COULD NOT BE READ PROPERLY
9907	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9945	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR NCODE1 MINUS AT ILLOGICAL POINT
9908	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9946	CALL ERRORA
	GO TO 9984
C	ERROR IN READING DIP CORRECTIONS
9909	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9947	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MOMIN IS NEGATIVE
9976	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9980	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MIMIN IS NEGATIVE
9977	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9981	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR NRES IS NEGATIVE
9978	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9982	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MGIN IS NEGATIVE
9979	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9983	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR NOTAPE ZERO AT ILLOGICAL POINT
9910	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9948	CALL ERRORA
	GO TO 9984
C	A RECORD OF DATA BLOCK ITAPE COULD NOT BE WRITTEN PROPERLY
9911	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9949	CALL ERRORA
	GO TO 9984
C	A RECORD OF DATA BLOCK ITAPE COULD NOT BE WRITTEN
C	PROPERLY JTAPE ALREADY FAILED
9912	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9950	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MOMIN IS NEGATIVE
9913	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9951	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MIMIN IS NEGATIVE
9914	CALL RIJKT (ITAPE,JTAPE,KTAPE)

9952	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR NRES IS NEGATIVE
9915	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9953	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MGIN IS NEGATIVE
9916	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9954	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR TAPE NUMBER JTAPE IS NEGATIVE
9917	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9955	CALL ERRORA
	GO TO 9984
C	A RECORD OF DATA BLOCK JTAPE COULD NOT BE WRITTEN PROPERLY
C	ITAPE ALREADY FAILED
9918	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9956	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MMIN IS NEGATIVE
9919	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9957	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR M1MIN IS NEGATIVE
9920	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9958	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR NRES IS NEGATIVE
9921	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9959	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MGIN IS NEGATIVE
9922	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9960	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR TAPE NUMBER ITAPE IS NEGATIVE
9932	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9961	CALL ERRORA
	GO TO 9984
C	CODE NUMBER OF DATA BLOCK NOT PRESENT IN INDEX RECORD
9923	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9962	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR MMIN IS NEGATIVE
9925	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9964	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR M1MIN IS NEGATIVE
9926	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9965	CALL ERRORA
	GO TO 9984
C	MACHINE ERROR NRES IS NEGATIVE
9927	CALL RIJKT (ITAPE,JTAPE,KTAPE)
9966	CALL ERRORA
	GO TO 9984

C MACHINE ERROR MGIN IS NEGATIVE
9928 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9967 CALL ERRORA
GO TO 9984

C MACHINE ERROR N2R IS NEGATIVE
9933 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9968 CALL ERRORA
GO TO 9984

C MACHINE ERROR N3R IS NEGATIVE
9929 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9969 CALL ERRORA
GO TO 9984

C MACHINE ERROR N4R IS NEGATIVE
9930 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9970 CALL ERRORA
GO TO 9984

C MACHINE ERROR N5R IS NEGATIVE
9931 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9971 CALL ERRORA
GO TO 9984
9984 CALL EXIT

C
9236 RETURN
END

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C      SUBROUTINE SPECT
C
C      THE SPECT SUBROUTINE IS A SECOND ORDER SUBROUTINE UNDER
C      THE CONTROL OF SUBROUTINE RAPRL. THE SPECT SUBROUTINE
C      READS IN THE CORRECTIONS, WRITES THE NEW DATA TAPES, AND
C      WRITES THE BCD OUTPUT FOR A SPECTRAL RECORD. CONTROL
C      IS TRANSFERRED BACK TO SUBROUTINE RAPRL.
C
C      SUBROUTINE SPECT (DATA,PCODE,CCODE,NCODE1,NOPRNT,NOCOR,NOTAPE,
1ITAPE,JTAPE,KTAPE,NOTWDS,TEMP,THERM,NOTHGP,NLLEVS,EL,BNAM1,
2BNAM2,BCODE,NOBLKS,NRSAVE)
C
C      COMMON FOR SUBROUTINE SPECT
C      COMMON N1R,DATE,CODE,SOR,BETA,TM
C
C      DIMENSION FOR SUBROUTINE SPECT
C      DIMENSION DATA(3454),PCODE(499),CCODE(499),TEMP(2000),THERM(
115),EL(34),DATE(2),SOR(34),BNAM1(499),BNAM2(499),BCODE(499)
C
C      BEGIN EXECUTABLE PART OF SUBROUTINE SPECT
C
9100 DO 9101 I=1,NOCOR
      IF (CCODE(I)-CODE) 9101,9102,9101
9101 CONTINUE
      GO TO 9103
C      READ DIP CORRECTIONS
9102 READ DIP N1R,DATE,CODE,SOR,BETA,TM,END
      IF (SENSE LIGHT 1) 9190,9103
9103 N1R=NRSAVE
      NRSAVE=NRSAVE+1
C      TEST NCODE1
      IF (NCODE1) 9104,9104,9105
9104 IF (NOTAPE-1) 9105,9106,9107
C      WRITE ITAPE AND CHECK
9106 CALL WBTIJ (DATA,TEMP,ITAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9191,9105
C      WRITE AND CHECK BOTH TAPES
9107 IF (ITAPE) 9195,9108,9109
9109 CALL WBTIJ (DATA,TEMP,ITAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9110,9111
9110 REWIND ITAPE
      ITAPE =0
      IF (JTAPE) 9192,9192,9108
9111 IF (JTAPE) 9196,9105,9108
9108 CALL WBTIJ (DATA,TEMP,JTAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9112,9105
9112 IF (ITAPE) 9193,9193,9113
9113 REWIND JTAPE
      JTAPE=0
C      TEST FOR PRINT OUT
9105 IF (NOPRNT) 9114,9115,9116
C      DETERMINE IF THIS RECORD IS TO BE PRINTED
9116 DO 9117 I=1,NOPRNT
      IF (PCODE(I)-CODE) 9117,9114,9117
9117 CONTINUE

```



```

      GO TO 9115
C      LOCATE DESIGNATION
9114 DO 9118 J=1,NOBLKS
      IF (BCODE(J)-CODE) 9118,9119,9118
9118 CONTINUE
      GO TO 9194
C      PRINT THIS RECORD OUT
9119 PRINT 9120, DATE(1),DATE(2),BNAM1(J),BNAM2(J),BETA,TM
9120 FORMAT (1H156X,5HDATE 2A6///34X,5HDELAY11X,9HPRECURSOR/12X,11HDESI
      GNATION10X,8HFRACTION9X,9HMEAN LIFE//12X,1A6,1A6,1PE18.4,1PE18.4//
      2/17X,5HLEVEL6X,6HENERGY9X,8HSPECTRUM)
      DO 9121 I=1,NLLEVS
      IF ((I-1)-5*((I-1)/5)) 9122,9123,9122
9122 PRINT 9124, I,EL(I),SOR(I)
9124 FORMAT (I21,1PE15.3,E18.7)
      GO TO 9121
9123 PRINT 9125, I,EL(I),SOR(I)
9125 FORMAT (1H0I20,1PE15.3,E18.7)
9121 CONTINUE
      J=NLLEVS+1
      DO 9126 I=1,NOTHGP
      K=THERM(I)
      IF ((I-1)-5*((I-1)/5)) 9127,9128,9127
9127 PRINT 9129, K,EL(J),SOR(J)
9129 FORMAT (I22,1PE14.3,E18.7)
      J=J+1
      GO TO 9126
9128 PRINT 9130, K,EL(J),SOR(J)
9130 FORMAT (1H0I21,1PE14.3,E18.7)
      J=J+1
9126 CONTINUE
      GO TO 9115
C      ERROR STOPS
C      ERROR IN READING DIP CORRECTIONS
9190 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9197 CALL ERRORA
      GO TO 9135
C      ERROR IN WRITING ITAPE
9191 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9198 CALL ERRORA
      GO TO 9135
C      ERROR IN WRITING ITAPE JTAPE ALREADY FAILED
9192 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9199 CALL ERRORA
      GO TO 9135
C      ERROR IN WRITING JTAPE ITAPE ALREADY FAILED
9193 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9131 CALL ERRORA
      GO TO 9135
C      SPECTRAL CODE NUMBER NOT PRESENT IN INDEX RECORD
9194 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9132 CALL ERRORA
      GO TO 9135
C      MACHINE ERROR TAPE NUMBER ITAPE IS NEGATIVE
9195 CALL RIJKT (ITAPE,JTAPE,KTAPE)

```

```
9133 CALL ERRORA
      GO TO 9135
C     MACHINE ERROR TAPE NUMBER JTAPE IS NEGATIVE
9196 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9134 CALL ERRORA
      GO TO 9135
9135 CALL EXIT
9115 RETURN
      END
```

```

C      SUBROUTINE MICRO
C
C      SUBROUTINE MICRO IS A SECOND ORDER SUBROUTINE UNDER
C      THE CONTROL OF SUBROUTINE RAPRL. THE MICRO SUBROUTINE
C      READS THE CORRECTIONS, WRITES THE NEW DATA TAPES, AND
C      WRITES THE BCD OUTPUT FOR THE MICROSCOPIC CONSTITUENTS
C      RECORD. CONTROL IS TRANSFERRED BACK TO THE RAPRL
C      SUBROUTINE. MICRO IS THE LAST SUBROUTINE TO BE
C      EXECUTED IN THE PROGRAM.
C
C      SUBROUTINE MICRO (NCODE1,NOCOR,NOTAPE,ITAPE,JTAPE,KTAPE,NOTWDS,
1TEMP,DATA,CCODE,NRNMCR,NRSAVE,NROMCR,BCODE,BNAM1,BNAM2,NOBLKS)
C
C      COMMON FOR SUBROUTINE MICRO.
COMMON NMICRO
C
C      DIMENSION FOR SUBROUTINE MICRO
C      DIMENSION NMICRO(1000),TEMP(2000),DATA(3454),CCODE(499),BCODE
1(499),BNAM1(499),BNAM2(499),AMICRO(1000)
C
C      EQUIVALENCE FOR SUBROUTINE MICRO
EQUIVALENCE (NMICRO,AMICRO)
C
C      BEGIN EXECUTABLE PART OF SUBROUTINE
C
9000 IF (NCODE1) 9001,9001,9002
9001 IF (NOCOR) 9050,9003,9004
C      DETERMINE IF CORRECTIONS
9004 DO 9005 I=1,NOCOR
      IF (CCODE(I)) 9005,9006,9005
9005 CONTINUE
      GO TO 9003
C      READ CORRECTIONS
9006 READ DIP NMICRO,END
      IF (SENSE LIGHT 1) 9051,9003
C      DETERMINE IF RECORD NUMBERS ARE CONSISTENT
9003 IF (NRSAVE-NRNMCR) 9052,9007,9053
9007 NMICRO=NRSAVE
      IF (NOTAPE=1) 9054,9008,9009
C      WRITE ITAPE AND CHECK
9008 CALL WBTIJ (NMICRO,TEMP,ITAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9055,9010
9010 END FILE ITAPE
      REWIND ITAPE
      GO TO 9002
C      BOTH TAPES ARE TO BE WRITTEN
9009 IF (ITAPE) 9056,9011,9012
9012 CALL WBTIJ (NMICRO,TEMP,ITAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9013,9014
9013 REWIND ITAPE
      ITAPE=0
      IF (JTAPE) 9057,9057,9011
9014 END FILE ITAPE
      REWIND ITAPE
      IF (JTAPE) 9058,9002,9011

```

```

9011 CALL WBTIJ (NMICRO,TEMP,JTAPE,NOTWDS)
      IF (SENSE LIGHT 1) 9015,9016
9016 END FILE JTAPE
      REWIND JTAPE
      GO TO 9002
9015 IF (JTAPE) 9059,9059,9017
9017 REWIND JTAPE
      JTAPE=0
C
C      PRINT OUT MICROSCOPIC CONSTITUENT RECORD
9002 N=2
9029 IF (NMICRO(N)) 9020,9021,9020
9020 DO 9022 I=1,NOBLKS
      IF (AMICRO(N)-BCODE(I)) 9022,9023,9022
9022 CONTINUE
      GO TO 9060
C      PRINT HEADING
9023 PRINT 9024, NMICRO(N),BNAM1(I),BNAM2(I)
9024 FORMAT (1H122X,26HMACROSCOPIC CROSS SECTIONS//27X,18HCONSTITUENT T
1ABLES///13X,20HMACROSCOPIC CODE NO.15X,11HDESIGNATION/F28.4,20X,2A
26//10X,11HCONSTITUENT9X,11HDESIGNATION11X,6HWEIGHT/11X,9HCODE NO.
331X,8HFRACTION//)
C      SET UP PRINT LOOP
      I=NMICRO(N+1)
      DO 9025 J=1,I
      DO 9026 K=1,NOBLKS
      IF (BCODE(K)-AMICRO(N+2)) 9026,9027,9026
9026 CONTINUE
      GO TO 9061
9027 PRINT 9028, NMICRO(N+2),BNAM1(K),BNAM2(K),NMICRO(N+3)
9028 FORMAT (F21.4,9X,2A6,1PE18.4)
      N=N+2
9025 CONTINUE
      N=N+2
      GO TO 9029
9021 IF (NMICRO(2)) 9030,9031,9030
9031 PRINT 9032
9032 FORMAT (43H1NO MACROSCOPIC DATA BLOCKS PRESENT ON TAPE)
      GO TO 9033
C      DETERMINE IF MICROSCOPICS HAVE BEEN CORRECTED
9030 PRINT 9034
9034 FORMAT (1H1)
      N=2
9041 IF (NMICRO(N)) 9035,9033,9035
9035 M=N
      I=NMICRO(N+1)
      DO 9036 J=1,NOCOR
      N=M
      DO 9037 K=1,I
      IF (CCODE(J)-AMICRO(N+2)) 9038,9039,9038
9039 PRINT 9040, CCODE(J),NMICRO(M)
9040 FORMAT (10H MATERIAL1X,F11.4,35H WHICH IS A CONSTITUENT OF MATERI
1AL1X,F11.4/30X,18HHAS BEEN MODIFIED.)
      GO TO 9036
9038 N=N+2

```

```

9037 CONTINUE
9036 CONTINUE
      N=N+2
      GO TO 9041
C      ERROR STOPS
C      CONTROL NOCOR IS NEGATIVE
9050 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9062 CALL ERRORA
      GO TO 9074
C      DIP CORRECTION ERROR
9051 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9063 CALL ERRORA
      GO TO 9074
C      FINAL RECORD NUMBER OF LAST RECORD ON INDEX IS GREATER
C      THAN ACTUAL FINAL RECORD NUMBER
9052 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9064 CALL ERRORA
      GO TO 9074
C      FINAL RECORD NUMBER OF LAST RECORD ON INDEX IS LESS
C      THAN ACTUAL FINAL RECORD NUMBER
9053 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9065 CALL ERRORA
      GO TO 9074
C      CONTROL NOTAPE IS ZERO
9054 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9066 CALL ERRORA
      GO TO 9074
C      ITAPE COULD NOT BE PROCESSED PROPERLY
9055 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9067 CALL ERRORA
      GO TO 9074
C      TAPE NUMBER ITAPE IS NEGATIVE
9056 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9068 CALL ERRORA
      GO TO 9074
C      ITAPE COULD NOT BE PROCESSED PROPERLY JTAPE ALREADY FAILED
9057 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9069 CALL ERRORA
      GO TO 9074
C      TAPE NUMBER JTAPE IS NEGATIVE
9058 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9070 CALL ERRORA
      GO TO 9074
C      JTAPE COULD NOT BE PROCESSED PROPERLY ITAPE ALREADY FAILED
9059 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9071 CALL ERRORA
      GO TO 9074
C      MACROSCOPIC CODE NUMBER CANNOT BE FOUND ON INDEX RECORD
9060 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9072 CALL ERRORA
      GO TO 9074
C      MICROSCOPIC CONSTITUENT CODE NUMBER CANNOT BE FOUND ON
C      INDEX RECORD
9061 CALL RIJKT (ITAPE,JTAPE,KTAPE)
9073 CALL ERRORA

```

```
      GO TO 9074  
9074 CALL EXIT  
-----  
C    EXIT TO CONTROL BLOCK  
9033 RETURN  
-----  
      END
```

```

C      SUBROUTINE CALDIM
C
C      SUBROUTINE CALDIM IS A THIRD ORDER SUBROUTINE USED TO
C      CALCULATE THE NUMBER OF WORDS IN THE SCATTERING,
C      FIRST MOMENT SCATTERING, AND N-GAMMA TRANSFER MATRICES
C      AND THE RESONANCE DATA ARRAY OF A MATERIAL DATA BLOCK.
C      SUBROUTINE CALDIM IS USED ONLY IN CONJUNCTION WITH
C      SUBROUTINE DBLKR.
C
C      SUBROUTINE CALDIM(MOMIN,MOIMAX,MOOMAX,MIMIN,MIIMAX,MIOMAX,
C      1NRES,MGMIN,MGIMAX,MGOMAX,N2SAVE,N3SAVE,N4SAVE,N5SAVE)
C
C      BEGIN EXECUTABLE PART OF SUBROUTINE CALDIM
C
C      9800 N2SAVE=(MOIMAX MOMIN+1)*(MOOMAX-MOMIN+1)+1
C      N3SAVE=(MIIMAX MIMIN+1)*(MIOMAX-MIMIN+1)+1
C      N4SAVE=5*NRES+1
C      N5SAVE=(MGIMAX MGMIN+1)*(MGOMAX-MGMIN+1)+1
C      RETURN

```

```
C SUBROUTINE CLEAR
C
C SUBROUTINE CLEAR IS A THIRD ORDER SUBROUTINE USED TO
C SET THE TWO TEMPORARY STORAGE ARRAYS TO ZERO.
C SUBROUTINE CLEAR IS USED IN CONJUNCTION WITH THE
C CONTROL ROUTINE AND SUBROUTINE RAPRL.
C
C SUBROUTINE CLEAR (DATA,TEMP)
C DIMENSION FOR CLEAR SUBROUTINE
C DIMENSION DATA(3454),TEMP(2000)
C BEGIN EXECUTABLE PART OF SUBROUTINE CLEAR
1000 DO 1001 I=1,3454
      DATA(I)=0.0
1001 CONTINUE
      DO 1002 I=1,2000
      TEMP(I)=0.0
1002 CONTINUE
      RETURN
      END
```



```

C SUBROUTINE PS01NG
C
C THE PS01NG SUBROUTINE IS A THIRD ORDER SUBROUTINE UNDER
C THE CONTROL OF SUBROUTINE DBLKR. THE PS01NG SUBROUTINE
C PRINTS OUT THE SCATTERING, FIRST MOMENT SCATTERING, AND
C N-GAMMA TRANSFER MATRICES. CONTROL IS TRANSFERRED BACK
C TO SUBROUTINE DBLKR.
C
C SUBROUTINE PS01NG (N1,N2,NWDS,BNAMX1,BNAMX2,NFORK,ARRAY)
C
C DIMENSION FOR SUBROUTINE PS01NG
C DIMENSION ARRAY(681)
C
C BEGIN EXECUTABLE PART OF SUBROUTINE PS01NG
C
9700 I1=1
      I2=(NWDS-1)/5
      I3=NWDS-5*I2-1
      N3=(NWDS-1)/(N2-N1+1)
      J5=N1
      K5=N1-1
9724 IF (K5-N3) 9701,9702,9701
9702 J1=J5+1
      K1=N1
      GO TO 9703
9701 J1=J5
      K1=K5+1
9703 IF (K1-N3) 9704,9705,9704
9705 J2=J1+1
      K2=N1
      GO TO 9706
9704 J2=J1
      K2=K1+1
9706 IF (K2-N3) 9707,9708,9707
9708 J3=J2+1
      K3=N1
      GO TO 9709
9707 J3=J2
      K3=K2+1
9709 IF (K3-N3) 9710,9711,9710
9711 J4=J3+1
      K4=N1
      GO TO 9712
9710 J4=J3
      K4=K3+1
9712 IF (K4-N3) 9713,9714,9713
9714 J5=J4+1
      K5=N1
      GO TO 9715
9713 J5=J4
      K5=K4+1
9715 IF (I1-I2) 9716,9717,9718
9716 IF ((I1-1)-20*((I1-1)/20)) 9717,9719,9717
9719 IF (NFORK-1) 9720,9721,9722
9717 PRINT 9723, J1,K1,J2,K2,J3,K3,J4,K4,J5,K5,ARRAY(5*I1-4),

```

```

1ARRAY(5*I1-3),ARRAY(5*I1 2),ARRAY(5*I1-1),ARRAY(5*I1)
9723 FORMAT (I7,I4,4(I10,I4)/1PE13.4,4E14.4)
      I1=I1+1
      GO TO 9724
9718 IF (I3-1) 9732,9726,9727
9727 IF (I3-3) 9728,9729,9730
9726 PRINT 9731, J1,K1,ARRAY(5*I1-4)
9731 FORMAT (I7,I4/1PE13.4)
      GO TO 9732
9728 PRINT 9733, J1,K1,J2,K2,ARRAY(5*I1 4),ARRAY(5*I1-3)
9733 FORMAT (I7,I4,I10,I4/1PE13.4,E14.4)
      GO TO 9732
9729 PRINT 9734, J1,K1,J2,K2,J3,K3,ARRAY(5*I1-4),ARRAY(5*I1 3),ARRAY
1(5*I1-2)
9734 FORMAT (I7,I4,2(I10,I4)/1PE13.4,2E14.4)
      GO TO 9732
9730 PRINT 9735, J1,K1,J2,K2,J3,K3,J4,K4,ARRAY(5*I1-4),ARRAY(5*I1
1-3),ARRAY(5*I1 2),ARRAY(5*I1-1)
9735 FORMAT (I7,I4,3(I10,I4)/1PE13.4,3E14.4)
      GO TO 9732
9720 PRINT 9736, BNAMX1,BNAMX2
9736 FORMAT (1H129X,2A6////32X,2HN14X,2HN2/28X,16HSIGMA S0 (N1/N2)///)
      GO TO 9717
9721 PRINT 9737, BNAMX1,BNAMX2
9737 FORMAT (1H129X,2A6////32X,2HN14X,2HN2/28X,16HSIGMA S1 (N1/N2)///)
      GO TO 9717
9722 PRINT 9738, BNAMX1,BNAMX2
9738 FORMAT (1H129X,2A6////32X,2HN14X,2HN2/28X,17HSIGMA N,G (N1/N2)///)
      GO TO 9717
9732 RETURN
      END

```

```
C   SUBROUTINE RBTIJK .....
C
C   SUBROUTINE RBTIJK IS A THIRD ORDER SUBROUTINE USED TO
C   READ THE OLD BINARY DATA TAPE AND TEST FOR TAPE CHECKS.
C   IF A TAPE CHECK IS INDICATED BY THE IBM SUBROUTINE
C   RER AFTER NINE ATTEMPTS AT READING, SENSE LIGHT 2
C   IS TURNED ON. IBM SUBROUTINE RER HAS BEEN MODIFIED
C   TO DO THIS. SUBROUTINE RBTIJK IS USED IN CONJUNCTION
C   WITH SUBROUTINES EL1V,RAPRL,DBLKR.
C
C   SUBROUTINE RBTIJK(NTAPE,ARRAY,NWDS)
C   DIMENSION FOR SUBROUTINE RBTIJK
C   DIMENSION ARRAY(2000)
C   BEGIN EXECUTABLE PART OF SUBROUTINE RBTIJK
4000 READ TAPE NTAPE,(ARRAY(I),I=1,NWDS)
    IF (SENSE LIGHT 2) 4001,4002
4001 SENSE LIGHT 1
4002 RETURN
    END
```

```
C      SUBROUTINE RIJKT
C
C      SUBROUTINE RIJKT IS A THIRD ORDER SUBROUTINE USED TO
C      REWIND THE THREE DATA TAPES ITAPE,JTAPE, AND KTAPE.
C      SUBROUTINE RIJKT IS USED IN CONJUNCTION WITH THE
C      CONTROL ROUTINE AND SUBROUTINES INDEX,EL1V,RAPRL,
C      DBLKR,SPECT, AND MICRO.
C
C      SUBROUTINE RIJKT (ITAPE,JTAPE,KTAPE)
C      BEGIN EXECUTABLE PART OF SUBROUTINE RIJKT
6000 ITAPE=5
      JTAPE=6
      KTAPE=7
      REWIND ITAPE
      REWIND JTAPE
      REWIND KTAPE
      RETURN
      END
```

C SUBROUTINE SWITCH

C
C SUBROUTINE SWITCH IS A THIRD ORDER SUBROUTINE USED TO
C EXPAND THE RESONANCE DATA ARRAY TO ITS MAXIMUM ALLOWABLE
C LENGTH IN STORAGE. ON BINARY TAPE ONLY THE ACTUAL
C NUMBER OF RESONANCES GIVEN ARE WRITTEN. HOWEVER IN
C STORAGE FOR CORRECTION PURPOSES THE TAPE RECORD MUST
C BE EXPANDED. SUBROUTINE SWITCH IS USED ONLY IN CONJUNCTION
C WITH SUBROUTINE DBLKR.

C
C SUBROUTINE SWITCH (NRES,E0,R10,P0,R,ETAR,TEMP)

C
C DIMENSION FOR SUBROUTINE SWITCH
C DIMENSION E0(200),R10(200),P0(200),R(200),ETAR(200),TEMP(2000)

C
C BEGIN EXECUTABLE PART OF SUBROUTINE SWITCH

C
9505 DO 9504 I=1,2000
TEMP(I)=0.0

9504 CONTINUE

9500 DO 9501 I=1,NRES
J=I+NRES
TEMP(I)=E0(J)
K=I+2*NRES
TEMP(I+200)=E0(K)
L=I+3*NRES
TEMP(I+400)=E0(L)
M=I+4*NRES
TEMP(I+600)=E0(M)

9501 CONTINUE
DO 9502 I=1,NRES
R10(I)=TEMP(I)
P0(I)=TEMP(I+200)
R(I)=TEMP(I+400)
ETAR(I)=TEMP(I 600)

9502 CONTINUE
DO 9503 I=1,2000
TEMP(I)=0.0

9503 CONTINUE
RETURN
END

```
C      SUBROUTINE WBTIJ
C
C      SUBROUTINE WBTIJ IS A THIRD ORDER SUBROUTINE USED
C      TO WRITE AND TEST FOR TAPE CHECK THE NEWLY WRITTEN
C      BINARY DATA TAPE. IF A TAPE CHECK IS INDICATED BY
C      THE IBM SUBROUTINE WER AFTER TWO ATTEMPTS AT
C      WRITING, SENSE LIGHT 2 IS TURNED ON. IBM SUBROUTINE
C      WER HAS BEEN MODIFIED TO DO THIS. SUBROUTINE WBTIJ
C      IS USED IN CONJUNCTION WITH SUBROUTINES EL1V,DBLKR,
C      SPECT,MICRO.
C
C      SUBROUTINE WBTIJ (ARRAY,HOLD,NTAPE,NWDS)
C      DIMENSION FOR SUBROUTINE WBTIJ
C      DIMENSION ARRAY(3454),HOLD(2000)
C      BEGIN EXECUTABLE PART OF SUBROUTINE WBTIJ
5000 WRITE TAPE NTAPE, (ARRAY(I),I=1,NWDS)
      IF (SENSE LIGHT 2) 5001,5002
5001 SENSE LIGHT 1
5002 HOLD(1)=0.0
      RETURN
      END
```

4.7 Program Mnemonic Glossary

This glossary contains all the variables used in Program RNDC which are not described in the input glossary with the exception of those fixed-point variables used simply as upper limits of DØ loops.

<u>Program Mnemonic</u>	<u>Description</u>
AMICRØ	Refer to NMICRØ in the input glossary
ARRAY	A temporary array identical to DATA below, used in binary data tape reading and writing subroutines.
BNAM1	For the 7090 version refer to BIDENT in the input glossary
BNAM2	For the 7090 version refer to BIDENT in the input glossary
BNAMXI	A location containing the first word of the two-word material-data-block identification or spectral-record identification
BNAMX2	A location containing the second word of the two-word material-data-block identification or spectral-record identification
DATA	The main temporary storage array of the program into which the contents of the original data tape records and decimal correction cards are read, and from which the new data tapes and BCD output are written
EL	A permanent storage array containing the level energies of the data tape
HØLD	A temporary storage array used in checking the contents of a record written on the new binary data tape for accuracy. This feature is not used in the 7090 version.
ITAPE	A location containing the logical tape unit number of the primary new data tape to be written, preassigned to 5
JTAPE	A location containing the logical tape unit number of the secondary new data tape to be written, preassigned to 6
KTAPE	A location containing the logical tape unit number of the original data tape to be read, preassigned to 7
NDAATA	Refer to DATA in this glossary
NFØRK	A location containing various values used in determining which of the three transfer matrices are being used
NLLEVS	Refer to NLEV in the input glossary
NØBLKS	A location containing the number of material data blocks and spectral records present on the data tape, preassigned to 499

<u>Program Mnemonic</u>	<u>Description</u>
NØTHGP	A location containing the number of thermal groups on the data tape, preassigned to 10
NØTWDS	A location containing the number of words contained in various data arrays
NRNMCR	A location containing the new physical record number of the microscopic-constituents record; this will be different from the old record number only when records are added to material data blocks
NRØMCR	A location containing the old physical record number of the microscopic-constituents record
NRSAVE	A location containing the physical record number of the <u>record</u> being written on the new binary data tapes
NTAPE	Refer to ITAPE, JTAPE, and KTAPE in this glossary
NWDS	Refer to NØTWDS in this glossary
N1	A location equivalent to MOMIN, MIMIN, or MGIN, refer to these in the input glossary
N2	A location equivalent to MOIMAX, MIMAX, or MGIMAX, refer to these in the input glossary
N2SAVE	A location containing the number of words in the second record of a material data block
N3SAVE	A location containing the number of words in the third record of a material data block
N4SAVE	A location containing the number of words in the fourth record of a material data block
N5SAVE	A location containing the number of words in the fifth record of a material data block
TEMP	A temporary storage array used in realigning the resonance data read from the old data tape for the purpose of corrections and print-out
THERM	A permanent storage array containing the Fahrenheit temperatures of the thermal transfer matrices
TNAME	Refer to NAME in the input glossary

APPENDIX A - Sample Problem

A1 - Sample Problem Input

5NAMTAP,3,RNDT2505/15/61

4NLEV,24,

4NEWTAP,1,NBA,2,NBD,0,

4NPSN,0,

5BNAM,2,URANIUM 235

3BCODE,92.235,

4NBPSN,1,

4MOMIN,1,10,16,0,0,0,45,1,34,11,

E28406,2,35 SPECTRUM

3BCODE,4=,500.0,

4NBPSN,4=,2,

4MOMIN,10=,0,0,0,0,0,0,0,0,0,0,0,0,

4NOPRNT,3,NOPUN,0,

3PCODE,2.0 6,92.235,500.0,

=END,0,

3EL,1.0+7,6.065307+6,3.6787944 6,2.2313016+6,1.3533528+6,

8.2084998 5,4.9787068+5,3.0197384+5,1.8315639+5,6.737947+4,

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4.0946+00	7.6538+00	8.9217+00	6.7988-02	
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5.4046+00	1.0103+01	1.1776+01	8.9741-02	
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4.6870-02	1.1561-01	4.7495-01	1.4655+00	3.4840+00
7.5273+00	1.4070+01	1.6401+01	1.2499-01	
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6.7991-02	1.6771-01	6.8898-01	2.1259+00	5.0540+00
1.0919+01	2.0411+01	2.3792+01	1.8131-01	
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1.4990+01	2.8020+01	3.2662+01	2.4890-01	
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2.2202+01	4.1502+01	4.8377+01	3.6866-01	
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2.8010-01	6.9092-01	2.8384+00	8.7579+00	2.0821+01
4.4985+01	8.4087+01	9.8018+01	7.4694-01	

0 0

4.4698-01	1.1026+00	4.5294+00	1.3976+01	3.3226+01
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7.1786+01	1.3418+02	1.5641+02	1.1920+00	
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0 0

8.8428-01	2.1812+00	8.9607+00	2.7648+01	6.5731+01
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1.4201+02	2.6546+02	3.0944+02	2.3581+00	
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0 0

1.3090+00	3.2288+00	1.3264+01	4.0927+01	9.7300+01
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2.1022+02	3.9295+02	4.5805+02	3.4906+00	
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0 0

4.8909-01	1.2064+00	4.9561+00	1.5292+01	3.6356+01
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7.8548+01	1.4682+02	1.7115+02	1.3042+00	
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0 0

5.7386-01	1.4155+00	5.8151+00	1.7943+01	4.2657+01
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9.2162+01	1.7227+02	2.0081+02	1.5303+00	
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0 0

1.1411+00	2.8148+00	1.1563+01	3.5679+01	8.4823+01
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1.8326+02	3.4256+02	3.9931+02	3.0430+00	
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0 0

3.0167+00	7.4411+00	3.0569+01	9.4321+01	2.2424+02
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4.8448+02	9.0560+02	1.0556+03	8.0444+00	
-----------	-----------	-----------	-----------	--

0 0

4.7394+00	1.1690+01	4.8026+01	1.4818+02	3.5229+02
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7.6114+02	1.4228+03	1.6585+03	1.2638+01	
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0 0

7.7934+00	1.9224+01	7.8973+01	2.4367+02	5.7931+02
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1.2516+03	2.3396+03	2.7272+03	2.0782+01	
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0 0

1.2917+01	3.1861+01	1.3089+02	4.0386+02	9.6014+02
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2.0744+03	3.8776+03	4.5200+03	3.4445+01	
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0 0				
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1.2926+01	3.1885+01	1.3099+02	4.0416+02	9.6086+02
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2.0760+03	3.8805+03	4.5234+03	3.4470+01	
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0 0				
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1.2941+01	3.1922+01	1.3114+02	4.0463+02	9.6197+02
-----------	-----------	-----------	-----------	-----------

2.0784+03	3.8850+03	4.5286+03	3.4510+01	
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0 0				
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1.2959+01	3.1966+01	1.3132+02	4.0519+02	9.6330+02
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2.0812+03	3.8903+03	4.5348+03	3.4558+01	
-----------	-----------	-----------	-----------	--

0 0				
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1.2984+01	3.2026+01	1.3157+02	4.0596+02	9.6512+02
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2.0852+03	3.8977+03	4.5434+03	3.4623+01	
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0 0				
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1.3020+01	3.2116+01	1.3194+02	4.0710+02	9.6783+02
-----------	-----------	-----------	-----------	-----------

2.0910+03	3.9086+03	4.5562+03	3.4720+01	
-----------	-----------	-----------	-----------	--

0 0				
-----	--	--	--	--

1.3074+01	3.2249+01	1.3248+02	4.0877+02	9.7182+02
-----------	-----------	-----------	-----------	-----------

2.0996+03	3.9247+03	4.5749+03	3.4863+01	
-----------	-----------	-----------	-----------	--

0 0				
-----	--	--	--	--

1.3166+01	3.2476+01	1.3342+02	4.1166+02	9.7868+02
-----------	-----------	-----------	-----------	-----------

2.1145+03	3.9524+03	4.6072+03	3.5109+01	
-----------	-----------	-----------	-----------	--

0 0				
-----	--	--	--	--

1.3359+01	3.2952+01	1.3537+02	4.1769+02	9.9301+02
-----------	-----------	-----------	-----------	-----------

2.1454+03	4.0103+03	4.6747+03	3.5624+01	
-----------	-----------	-----------	-----------	--

0 0				
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1.3858+01	3.4184+01	1.4043+02	4.3330+02	1.0301+03
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2.2257+03 4.1603+03 4.8495+03 3.6956+01

=END,0,

5BDATE,2,12/07/60

3BETA,1.0,TM,0.0,

3SOR 0.0120488 0.1122472 0.3278114 0.4631222 0.4218180

0.2953138 0.1762738 0.0955957 0.0421600 0.0125488

0.0028805 0.0006485 0.0001451 0.0000324 0.0000060

0.0000008 0.0000001 0.0000000 0. 0.

0. 0. 0. 0. 0.

0. 0. 0. 0. 0.

0. 0. 0. 0.

=END,0,

A2 - Sample Problem Output

4-814

RGHERRMANN

RNDP

CHARGE 54323, SEQUENCE 4-814, CHANNELS , TAPES , MODE 1, UNIT 4317

DATE 05/15/61, PROG. NO. 598, BG. 3809, START 15.29 STOP

START TIME AFTER INSTRUCTIONS ON 1 STOP COMMENT CARD FOLLOWED 15.300

S XEQ

\$ DATA

EXECUTION

EXIT	27640	(TES)	27636	EXP(3	27436	LOG	27464
EXP	27552	BSF	27310	FSFBT	27312	FSFDT	27312
(EFT)	27300	(WER)	27225	(WTC)	27257	(RER)	27162
(RDC)	27205	(RWT)	27147	(BST)	27120	(STB)	27035
(WLR)	27057	(TSB)	26772	(RLR)	27013	(IOB)	26302
(EXB)	26354	(SCH)	26221	(SPH)	25725	NOPAGE	25363
ANPIPM	25417	(STH)	25634	(STHM)	25637	RESTO	25322
LINES	25332	PAGES	25324	NEWSET	25337	HDING	25346
NOHEAD	25365	COLUMN	25355	BOTTOM	25372	(IOH)	22673
(FIL)	24303	(RTN)	24314	PUNACB	22437	SCAR	22551
C79	22575	RBH	22610	BRAND	22636	ACBIP	22127
ERROR	21700	ERRORA	21677	(DIP)	20461	(IOU)	20437
(TRC)	20376	(IOS)	20310	(RDS)	20365	(WRS)	20366
(BSR)	20367	(WEF)	20370	(REW)	20371	(ETT)	20372
(RCH)	20373	(TEF)	20374	(TCO)	20375	(FPT)	20264
TRYOVR	20123	DIPERR	17417	FINREC	16222	RC235	15256
WRREC5	15172	WRREC4	14611	WRREC3	14526	WRREC2	14445
WRREC1	12403	WRSPDB	11736	WRSECR	11107	WRINDX	10655
TRNSDB	10353	DIMEN	10101	KTAPRC	10026	NMTPRC	07605
INPTDB	04476	DATACT	04044	REC2	03604	INDXRV	01612
INDXNT	01404	INIT	00657	TAPECK	00566	EROR	00255
000000	00157						

DATE 05/15/61

INDEX RECORD *

24 LEVELS

DATA BLOCK NO.	CODE NO.	DESIGNATION	RECORD NO.
1	92.2350	URANIUM 235	3
2	500.0000	35 SPECTRUM	7
3	0.	000000000000	8
4	0.	000000000000	0
5	0.	000000000000	0
6	0.	000000000000	0
7	0.	000000000000	0
8	0.	000000000000	0
9	0.	000000000000	0
10	0.	000000000000	0
11	0.	000000000000	0
12	0.	000000000000	0
13	0.	000000000000	0
14	0.	000000000000	0
15	0.	000000000000	0
16	0.	000000000000	0
17	0.	000000000000	0
18	0.	000000000000	0
19	0.	000000000000	0
20	0.	000000000000	0
21	0.	000000000000	0
22	0.	000000000000	0
23	0.	000000000000	0
24	0.	000000000000	0
25	0.	000000000000	0
26	0.	000000000000	0
27	0.	000000000000	0
28	0.	000000000000	0
29	0.	000000000000	0
30	0.	000000000000	0
31	0.	000000000000	0
32	0.	000000000000	0
33	0.	000000000000	0
34	0.	000000000000	0
35	0.	000000000000	0
36	0.	000000000000	0
37	0.	000000000000	0
38	0.	000000000000	0
39	0.	000000000000	0
40	0.	000000000000	0

* The index record on the tape will always be a fixed length, containing 2000 words of index information for the tape heading and 499 data blocks.

LEVEL	ENERGY (EV)	LETHARGY
1	1.0000000E 07	0.
2	6.0653070E 06	5.0000000E-01
3	3.6787944E 06	1.0000000E 00
4	2.2313016E 06	1.5000000E 00
5	1.3533528E 06	2.0000000E 00
6	8.2084997E 05	2.5000000E 00
7	4.9787068E 05	3.0000000E 00
8	3.0197384E 05	3.5000000E 00
9	1.8315639E 05	4.0000000E 00
10	6.7379469E 04	5.0000000E 00
11	2.4787522E 04	6.0000000E 00
12	9.1188195E 03	7.0000000E 00
13	3.3546263E 03	8.0000000E 00
14	1.2340980E 03	9.0000000E 00
15	4.5399929E 02	1.0000000E 01
16	8.7190523E 01	1.1650000E 01
17	3.5449023E 01	1.2550000E 01
18	1.3040967E 01	1.3550000E 01
19	5.0434766E 00	1.4500000E 01
20	1.4449802E 00	1.5750000E 01
21	6.8256034E-01	1.6500000E 01
22	2.5109992E-01	1.7500000E 01
23	9.2374499E-02	1.8500000E 01
24	2.5301182E-02	1.9795000E 01
4500	3.0229500E-01	1.7314330E 01
4000	2.7182000E-01	1.7420610E 01
3500	2.4134500E-01	1.7539500E 01
3000	2.1087017E-01	1.7674512E 01
2500	1.8039517E-01	1.7830605E 01
2000	1.4992017E-01	1.8015652E 01
1500	1.1944517E-01	1.8242897E 01
1000	8.8970174E-02	1.8537454E 01
500	5.8495175E-02	1.8956811E 01
68	3.2164769E-02	1.9554883E 01

GROUP	LOWER ENERGY (EV)	UPPER LETHARGY	1/V FACTOR (2200 M/SEC)
0	1.2840254E 07	-2.5000000E-01	
1	7.7880077E 06	2.5000000E-01	5.0428001E-05
2	4.7236655E 06	7.5000000E-01	6.4750835E-05
3	2.8650479E 06	1.2500000E 00	8.3141723E-05
4	1.7377394E 06	1.7500000E 00	1.0675608E-04
5	1.0539922E 06	2.2500000E 00	1.3707754E-04
6	6.3927861E 05	2.7500000E 00	1.7601099E-04
7	3.8774208E 05	3.2500000E 00	2.2600263E-04
8	2.3517746E 05	3.7500000E 00	2.9019310E-04
9	1.1108997E 05	4.5000000E 00	3.9793803E-04
10	4.0867714E 04	5.5000000E 00	6.1914461E-04
11	1.5034392E 04	6.5000000E 00	1.0207969E-03
12	5.5308437E 03	7.5000000E 00	1.6830096E-03
13	2.0346837E 03	8.5000000E 00	2.7748135E-03
14	7.4851830E 02	9.5000000E 00	4.5748941E-03
15	1.9895839E 02	1.0825000E 01	8.2454356E-03
16	5.5595137E 01	1.2100000E 01	1.5773244E-02
17	2.1500919E 01	1.3050000E 01	2.7305059E-02
18	8.1099823E 00	1.4025000E 01	4.4204265E-02
19	2.6995785E 00	1.5125000E 01	7.4459925E-02
20	9.9311942E-01	1.6125000E 01	1.2559766E-01
21	4.1399378E-01	1.7000000E 01	2.0021685E-01
22	1.5229980E-01	1.8000000E 01	3.2072485E-01
23	4.8344435E-02	1.9147500E 01	5.5045328E-01
24	2.5301182E-02	1.9795000E 01	8.5441626E-01

DATE DEC 01 1960

DESIGNATION		CODE NO.		DENSITY FACTOR			
URANIUM 235		92.2350		3.90255E 02			
LEVEL	ENERGY	SIGMA SCATTER	XI SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	XII SIGMA SCATTER 1	
1	1.000E 07	4.2674E 00	3.5234E 00	1.8065E 00	1.8753E 00	-2.2758E 00	
2	6.065E 06	5.5836E 00	4.0356E 00	2.6955E 00	1.4500E 00	-2.6710E 00	
3	3.679E 06	6.5600E 00	3.6298E 00	3.4476E 00	1.3100E 00	-2.8783E 00	
4	2.231E 06	6.0060E 00	2.8205E 00	3.6298E 00	1.4100E 00	-2.1976E 00	
5	1.353E 06	5.2747E 00	2.0257E 00	3.5451E 00	1.4000E 00	-1.5996E 00	
6	8.208E 05	5.4181E 00	1.4641E 00	3.8018E 00	1.3378E 00	-1.4948E 00	
7	4.979E 05	6.2158E 00	1.2757E 00	4.5950E 00	1.4239E 00	-1.4989E 00	
8	3.020E 05	7.4775E 00	1.0831E 00	5.8924E 00	1.5699E 00	-1.4660E 00	
9	1.832E 05	9.0132E 00	7.9060E-01	7.7903E 00	1.8439E 00	-1.1310E 00	
10	6.738E 04	1.0327E 01	2.8458E-01	1.0025E 01	2.2750E 00	-2.7949E-01	
11	2.479E 04	1.0462E 01	8.9530E-02	1.0431E 01	3.6903E 00	-2.8104E-02	
12	9.119E 03	1.0044E 01	8.5960E-02	1.0016E 01	5.2241E 00	-2.6568E-02	
13	3.355E 03	1.0034E 01	8.5871E-02	1.0005E 01	7.3008E 00	-2.6540E-02	
14	1.234E 03	1.1925E 01	1.0206E-01	1.1891E 01	1.0816E 01	-3.1542E-02	
15	4.540E 02	1.3353E 01	1.1428E-01	1.3315E 01	2.3062E 01	-3.5318E-02	
16	8.719E 01	1.6138E 01	1.3811E-01	1.6092E 01	3.6485E 01	-4.2687E-02	
17	3.545E 01	2.5994E 01	2.2246E-01	2.5920E 01	7.2663E 01	-6.8754E-02	
18	1.304E 01	1.1277E 01	9.6508E-02	1.1245E 01	1.0987E 02	-2.9827E-02	
19	5.043E 00	1.0183E 01	8.6379E-02	1.0155E 01	4.0863E 01	-2.6705E-02	
20	1.445E 00	1.1605E 01	9.8435E-02	1.1572E 01	4.2582E 01	-3.0431E-02	
21	6.826E-01	1.2827E 01	1.0880E-01	1.2790E 01	7.9234E 01	-3.3636E-02	
22	2.511E-01	1.3767E 01	1.1678E-01	1.3728E 01	2.0812E 02	-3.6103E-02	
23	9.237E-02	1.4351E 01	1.2173E-01	1.4311E 01	3.3004E 02	-3.7633E-02	
24	2.530E-02	1.4600E 01	1.2385E-01	1.4559E 01	5.6816E 02	-3.8287E-02	
4500	3.023E-01	1.3336E 01	1.1312E-01	1.3299E 01	1.6357E 02	-3.4971E-02	
4000	2.718E-01	1.3435E 01	1.1396E-01	1.3397E 01	1.7565E 02	-3.5230E-02	
3500	2.413E-01	1.3540E 01	1.1485E-01	1.3501E 01	1.8992E 02	-3.5505E-02	
3000	2.109E-01	1.3651E 01	1.1579E-01	1.3612E 01	2.0703E 02	-3.5797E-02	
2500	1.804E-01	1.3769E 01	1.1679E-01	1.3730E 01	2.2790E 02	-3.6106E-02	
2000	1.499E-01	1.3895E 01	1.1786E-01	1.3855E 01	2.5393E 02	-3.6436E-02	
1500	1.194E-01	1.4030E 01	1.1901E-01	1.3990E 01	2.8778E 02	-3.6789E-02	
1000	8.897E-02	1.4180E 01	1.2028E-01	1.4139E 01	3.3612E 02	-3.7183E-02	
500	5.850E-02	1.4355E 01	1.2176E-01	1.4314E 01	4.2093E 02	-3.7642E-02	
68	3.216E-02	1.4531E 01	1.2326E-01	1.4490E 01	5.9117E 02	-3.8105E-02	

DESIGNATION	CODE NO.	DENSITY FACTOR
URANIUM 235	92.2350	3.90255E 02
LEVEL	ENERGY	NU SIGMA FISSION
1	1.000E 07	6.9925E 00
2	6.065E 06	4.5404E 00
3	3.679E 06	3.6346E 00
4	2.231E 06	3.6462E 00
5	1.353E 06	3.4147E 00
6	8.208E 05	3.1485E 00
7	4.979E 05	3.1571E 00
8	3.020E 05	3.4727E 00
9	1.832E 05	4.0151E 00
10	6.738E 04	5.2672E 00
11	2.479E 04	7.1501E 00
12	9.119E 03	9.7837E 00
13	3.355E 03	1.3226E 01
14	1.234E 03	1.8956E 01
15	4.540E 02	3.8800E 01
16	8.719E 01	5.8755E 01
17	3.545E 01	1.1692E 02
18	1.304E 01	1.6817E 02
19	5.043E 00	4.1692E 01
20	1.445E 00	7.8811E 01
21	6.826E-01	1.6651E 02
22	2.511E-01	4.2217E 02
23	9.237E-02	6.9597E 02
24	2.530E-02	1.1813E 03
4500	3.023E-01	3.3586E 02
4000	2.718E-01	3.6092E 02
3500	2.413E-01	3.9049E 02
3000	2.109E-01	4.2597E 02
2500	1.804E-01	4.6930E 02
2000	1.499E-01	5.2361E 02
1500	1.194E-01	5.9471E 02
1000	8.897E-02	6.9680E 02
500	5.850E-02	8.7503E 02
68	3.216E-02	1.2278E 03

URANIUM 235

THERMAL TRANSFER MATRICES

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
4.5000E 03	1.5266E 01	1.5223E 01	9.4388E 02	1.9530E 03

N1 N2
SIGMA S (N1/N2)

21 21	21 22	21 23	21 24	21 25
1.2029E 01	7.9735E-01	0.	0.	0.
22 21	22 22	22 23	22 24	22 25
7.4379E-01	1.2511E 01	5.3921E-01	3.2044E-06	0.
23 21	23 22	23 23	23 24	23 25
0.	1.6640E 00	1.2287E 01	4.6070E-01	1.5072E-02
24 21	24 22	24 23	24 24	24 25
0.	5.8352E-05	4.0938E 00	9.0732E 00	1.6364E 00
25 21	25 22	25 23	25 24	25 25
0.	0.	3.1019E-01	4.0124E 00	1.0943E 01

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
4.0000E 03	1.5209E 01	1.5166E 01	9.4471E 02	1.9547E 03

N1 N2
SIGMA S (N1/N2)

21 21	21 22	21 23	21 24	21 26
1.1971E 01	8.5606E-01	0.	0.	0.
22 21	22 22	22 23	22 24	22 26
6.6455E-01	1.2577E 01	5.5054E-01	1.3563E-06	0.
23 21	23 22	23 23	23 24	23 26
0.	1.5468E 00	1.2406E 01	4.5436E-01	1.2336E-02
24 21	24 22	24 23	24 24	24 26
0.	2.0541E-05	3.8851E 00	9.3140E 00	1.5840E 00
26 21	26 22	26 23	26 24	26 26
0.	0.	2.3944E-01	3.8469E 00	1.1122E 01

 URANIUM 235

 THERMAL TRANSFER MATRICES

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
3.5000E 03	1.5152E 01	1.5109E 01	9.4575E 02	1.9569E 03

N1		N2		
SIGMA S (N1/N2)				
21 21	21 22	21 23	21 24	21 27
1.1892E 01	9.3479E-01	0.	0.	0.
22 21	22 22	22 23	22 24	22 27
5.8011E-01	1.2641E 01	5.6801E-01	4.7133E-07	0.
23 21	23 22	23 23	23 24	23 27
0.	1.4213E 00	1.2533E 01	4.4896E-01	9.7505E-03
24 21	24 22	24 23	24 24	24 27
0.	5.7018E-06	3.6589E 00	9.5787E 00	1.5252E 00
27 21	27 22	27 23	27 24	27 27
0.	0.	1.7582E-01	3.6597E 00	1.1316E 01

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
3.0000E 03	1.5094E 01	1.5051E 01	9.4710E 02	1.9596E 03

N1		N2		
SIGMA S (N1/N2)				
21 21	21 22	21 23	21 24	21 28
1.1783E 01	1.0435E 00	0.	0.	0.
22 21	22 22	22 23	22 24	22 28
4.8987E-01	1.2702E 01	5.9492E-01	1.2359E-07	0.
23 21	23 22	23 23	23 24	23 28
0.	1.2854E 00	1.2667E 01	4.4518E-01	7.3546E-03
24 21	24 22	24 23	24 24	24 28
0.	1.1314E-06	3.4117E 00	9.8720E 00	1.4588E 00
28 21	28 22	28 23	28 24	28 28
0.	0.	1.2065E-01	3.4465E 00	1.1527E 01

 URANIUM 235

 THERMAL TRANSFER MATRICES

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
2.5000E 03	1.5037E 01	1.4994E 01	9.4891E 02	1.9634E 03

N1		N2		SIGMA S (N1/N2)	
21	21	21	22	21	23
1.1628E 01		1.1991E 00		0.	
22	21	22	22	22	23
3.9342E-01		1.2754E 01		6.3722E-01	
23	21	23	22	23	23
0.		1.1365E 00		1.2812E 01	
24	21	24	22	24	23
0.		1.3640E-07		3.1384E 00	
29	21	29	22	29	23
0.		0.		7.5036E-02	
				21	24
				22	24
				23	24
				24	24
				29	24
				21	29
				22	29
				23	29
				24	29
				29	29
				0.	
				4.4432E-01	
				5.1984E-03	
				1.3838E 00	
				1.1760E 01	

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
2.0000E 03	1.4980E 01	1.4937E 01	9.5148E 02	1.9687E 03

N1		N2		SIGMA S (N1/N2)	
21	21	21	22	21	23
1.1405E 01		1.4216E 00		0.	
22	21	22	22	22	23
2.9111E-01		1.2784E 01		7.0658E-01	
23	21	23	22	23	23
0.		9.7085E-01		1.2967E 01	
24	21	24	22	24	23
0.		0.		2.8320E 00	
30	21	30	22	30	23
0.		0.		4.0195E-02	
				21	24
				22	24
				23	24
				24	24
				30	24
				21	30
				22	30
				23	30
				24	30
				30	30
				0.	
				4.4901E-01	
				3.3296E-03	
				1.2989E 00	
				1.2021E 01	

 URANIUM 235

 THERMAL TRANSFER MATRICES

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
1.5000E 03	1.4922E 01	1.4880E 01	9.5541E 02	1.9767E 03

		N1	N2		
SIGMA S (N1/N2)					
21 21	21 22	21 23	21 24	21 31	
1.1231E 01	1.5963E 00	0.	0.	0.	
22 21	22 22	22 23	22 24	22 31	
1.8563E-01	1.2765E 01	8.2879E-01	0.	0.	
23 21	23 22	23 23	23 24	23 31	
0.	7.8257E-01	1.3134E 01	4.6514E-01	1.8146E-03	
24 21	24 22	24 23	24 24	24 31	
0.	0.	2.4815E 00	1.0997E 01	1.2030E 00	
31 21	31 22	31 23	31 24	31 31	
0.	0.	1.6770E-02	2.5849E 00	1.2321E 01	

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
1.0000E 03	1.4865E 01	1.4823E 01	9.6215E 02	1.9906E 03

		N1	N2		
SIGMA S (N1/N2)					
21	21	21	22	21	23
1.1813E 01		1.0136E 00		0.	
22	21	22	22	22	23
8.6243E-02		1.2620E 01		1.0708E 00	
23	21	23	22	23	23
0.		5.6306E-01		1.3303E 01	
24	21	24	22	24	23
0.		0.		2.0681E 00	
32	21	32	22	32	23
0.		0.		4.3602E-03	
21	24	21	24	21	24
0.		0.		0.	
22	24	22	24	22	24
0.		0.		0.	
23	24	23	24	23	24
5.0881E-01					
24	24	24	24	24	24
1.1497E 01					
32	24	32	24	32	24
2.1840E 00					
21	32	21	32	21	32
0.		0.		1.2677E 01	

URANIUM 235

THERMAL TRANSFER MATRICES

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
5.0000E 02	1.4808E 01	1.4766E 01	9.7638E 02	2.0199E 03

N1 N2
SIGMA S (N1/N2)

21 21	21 22	21 23	21 24	21 33
1.2242E 01	5.8504E-01	0.	0.	0.
22 21	22 22	22 23	22 24	22 33
1.1342E-01	1.2114E 01	1.5469E 00	0.	0.
23 21	23 22	23 23	23 24	23 33
0.	3.0313E-01	1.3426E 01	6.3973E-01	1.3613E-04
24 21	24 22	24 23	24 24	24 33
0.	0.	1.5529E 00	1.2104E 01	9.8421E-01
33 21	33 22	33 23	33 24	33 33
0.	0.	3.6961E-04	1.6797E 00	1.3128E 01

TEMPERATURE DEG. F.	SIGMA SCATTER	SIGMA TRANSPORT	SIGMA ABSORPTION	NU SIGMA FISSION
6.8000E 01	1.4761E 01	1.4719E 01	1.0130E 03	2.0951E 03

N1 N2
SIGMA S (N1/N2)

21 21	21 22	21 23	21 24	21 34
1.2222E 01	6.0478E-01	0.	0.	0.
22 21	22 22	22 23	22 24	22 34
2.2358E-01	1.3094E 01	4.5215E-01	0.	0.
23 21	23 22	23 23	23 24	23 34
0.	7.0153E-02	1.3196E 01	1.0961E 00	3.3100E-06
24 21	24 22	24 23	24 24	24 34
0.	0.	9.4606E-01	1.2758E 01	9.1931E-01
34 21	34 22	34 23	34 24	34 34
0.	0.	2.0326E-06	1.0814E 00	1.3680E 01

URANIUM 235

SIGMA S0

TRANSFERS FROM GROUPS 1 THROUGH 10 TO GROUPS 1 THROUGH 16

NO. RESONANCES

45

SIGMA (N,GAMMA)

TRANSFERS FROM GROUPS 1 THROUGH 34 TO GROUPS 1 THROUGH 11

 URANIUM 235

 N1 N2
 SIGMA S0 (N1/N2)

1 1	1 2	1 3	1 4	1 5
2.6523E 00	5.6288E-02	1.2204E-01	3.2373E-01	4.1481E-01
1 6	1 7	1 8	1 9	1 10
3.3208E-01	1.9723E-01	9.7316E-02	5.3622E-02	1.5357E-02
1 11	1 12	1 13	1 14	1 15
2.2541E-03	3.1267E-04	4.3386E-05	5.7750E-06	8.5069E-07
1 16	2 1	2 2	2 3	2 4
6.5787E-08	0.	3.4958E 00	1.1877E-01	7.8291E-01
2 5	2 6	2 7	2 8	2 9
5.0790E-01	5.0491E-01	3.4359E-01	1.8443E-01	1.0762E-01
2 10	2 11	2 12	2 13	2 14
3.2121E-02	4.8168E-03	6.7356E-04	9.3737E-05	1.2491E-05
2 15	2 16	3 1	3 2	3 3
1.8408E-06	1.4238E-07	0.	0.	4.4606E 00
3 4	3 5	3 6	3 7	3 8
1.9993E-01	4.2854E-01	5.4878E-01	4.3871E-01	2.6039E-01
3 9	3 10	3 11	3 12	3 13
1.6276E-01	5.1049E-02	7.8551E-03	1.1091E-03	1.5490E-04
3 14	3 15	3 16	4 1	4 2
2.0670E-05	3.0476E-06	2.3576E-07	0.	0.
4 3	4 4	4 5	4 6	4 7
0.	4.1358E 00	3.1690E-01	4.7205E-01	4.6521E-01
4 8	4 9	4 10	4 11	4 12
3.1494E-01	2.1556E-01	7.2170E-02	1.1489E-02	1.6433E-03
4 13	4 14	4 15	4 16	5 1
2.3056E-04	3.0823E-05	4.5474E-06	3.5188E-07	0.
5 2	5 3	5 4	5 5	5 6
0.	0.	0.	3.7148E 00	4.2245E-01
5 7	5 8	5 9	5 10	5 11
4.2491E-01	3.3915E-01	2.6036E-01	9.4652E-02	1.5731E-02
5 12	5 13	5 14	5 15	5 16
2.2870E-03	3.2279E-04	4.3251E-05	6.3864E-06	4.9433E-07
6 1	6 2	6 3	6 4	6 5
0.	0.	0.	0.	0.
6 6	6 7	6 8	6 9	6 10
4.1891E 00	4.0365E-01	3.5454E-01	3.1634E-01	1.2807E-01
6 11	6 12	6 13	6 14	6 15
2.2518E-02	3.3447E-03	4.7579E-04	6.3947E-05	9.4526E-06
6 16	7 1	7 2	7 3	7 4
7.3197E-07	0.	0.	0.	0.

 URANIUM 235

 N1 N2
 SIGMA S0 (N1/N2)

7 5	7 6	7 7	7 8	7 9
0.	0.	5.0022E 00	5.0657E-01	4.5132E-01
7 10	7 11	7 12	7 13	7 14
2.0918E-01	3.9491E-02	6.0281E-03	8.6606E-04	1.1685E-04
7 15	7 16	8 1	8 2	8 3
1.7297E-05	1.3401E-06	0.	0.	0.
8 4	8 5	8 6	8 7	8 8
0.	0.	0.	0.	6.3931E 00
8 9	8 10	8 11	8 12	8 13
6.7463E-01	3.2932E-01	6.7969E-02	1.0739E-02	1.5624E-03
8 14	8 15	8 16	9 1	9 2
2.1185E-04	3.1414E-05	2.4355E-06	0.	0.
9 3	9 4	9 5	9 6	9 7
0.	0.	0.	0.	0.
9 8	9 9	9 10	9 11	9 12
0.	8.1023E 00	7.6682E-01	1.2043E-01	2.0190E-02
9 13	9 14	9 15	9 16	10 1
3.0024E-03	4.1060E-04	6.1074E-05	4.7406E-06	0.
10 2	10 3	10 4	10 5	10 6
0.	0.	0.	0.	0.
10 7	10 8	10 9	10 10	10 11
0.	0.	0.	9.8918E 00	4.1526E-01
10 12	10 13	10 14	10 15	10 16
1.6981E-02	2.6067E-03	3.6096E-04	5.3931E-05	4.1933E-06

URANIUM 235

RESONANCE ENERGY	RESONANCE INTEGRAL	PEAK CROSS SECTION	R	ETA
1.1270E 00	2.4131E 01	1.1541E 02	7.3754E-05	8.0000E-01
2.0400E 00	3.8782E 00	1.1445E 02	1.5513E-03	3.1818E-01
2.8200E 00	6.5325E-01	1.1727E 01	4.1529E-04	7.0000E-01
3.1400E 00	5.9296E 00	7.1825E 01	1.6980E-04	8.1818E-01
3.6100E 00	7.2130E 00	1.7259E 02	5.7634E-04	6.8750E-01
4.8400E 00	4.6433E 00	3.0407E 02	3.2196E-03	3.6170E-01
5.4500E 00	1.4585E 00	5.6215E 01	9.9046E-04	6.6667E-01
6.1200E 00	1.4980E 00	6.4828E 01	1.1121E-03	6.6667E-01
6.4000E 00	1.5206E 01	1.0626E 03	2.7728E-03	4.8276E-01
7.1000E 00	4.4609E 00	3.5936E 02	3.3214E-03	4.6429E-01
8.8200E 00	3.1124E 01	1.7271E 03	1.2686E-03	7.0000E-01
9.2700E 00	3.0647E 00	2.0067E 02	1.6807E-03	6.6667E-01
9.7400E 00	7.4604E-01	5.1380E 01	1.7696E-03	6.6667E-01
1.0150E 01	1.2110E 00	8.6885E 01	1.8430E-03	6.6667E-01
1.0640E 01	5.9402E-01	4.4691E 01	1.9332E-03	6.6667E-01
1.1110E 01	7.7930E-01	6.1211E 01	2.0179E-03	6.6667E-01
1.1660E 01	8.7303E 00	9.5892E 02	3.7600E-03	2.6866E-01
1.2400E 01	1.7602E 01	2.0040E 03	3.7985E-03	4.4118E-01
1.3400E 01	8.4022E-01	7.9576E 01	2.4324E-03	6.6667E-01
1.3800E 01	1.6066E 00	1.5657E 02	2.5009E-03	6.6667E-01
1.4110E 01	2.0578E 00	2.0493E 02	2.5542E-03	6.6667E-01
1.4600E 01	1.6236E 00	1.6737E 02	2.6447E-03	6.6667E-01
1.5500E 01	2.3250E 00	2.5414E 02	2.8013E-03	6.6667E-01
1.6100E 01	2.2278E 00	2.5292E 02	2.9091E-03	6.6667E-01
1.6800E 01	2.0899E 00	2.4756E 02	3.0352E-03	6.6667E-01
1.8100E 01	2.9309E 00	3.7330E 02	3.2570E-03	6.6667E-01
1.8700E 01	1.2721E 00	1.6787E 02	3.3838E-03	6.6667E-01
1.9300E 01	1.7294E 01	1.7247E 03	1.8725E-03	7.5000E-01
2.0600E 01	1.7576E 00	2.5508E 02	3.7155E-03	6.6667E-01
2.1100E 01	4.2128E 00	6.2241E 02	3.7593E-03	6.6667E-01
2.2100E 01	3.9661E-01	6.1935E 01	4.0099E-03	6.6667E-01
2.2900E 01	2.6153E 00	4.2051E 02	4.1024E-03	6.6667E-01
2.3500E 01	6.5675E 00	1.0704E 03	4.1074E-03	6.6667E-01
2.4400E 01	1.4986E 00	2.5740E 02	4.3939E-03	6.6667E-01
2.5300E 01	1.2265E 00	2.1857E 02	4.5612E-03	6.6667E-01
2.5800E 01	9.4108E-01	1.7117E 02	4.6594E-03	6.6667E-01
2.6500E 01	1.4584E 00	2.7186E 02	4.7652E-03	6.6667E-01
2.7300E 01	3.0326E-01	5.8491E 01	4.9516E-03	6.6667E-01
2.7900E 01	2.0809E 00	4.0709E 02	4.9847E-03	6.6667E-01
3.0700E 01	9.5320E-01	2.0599E 02	5.5280E-03	6.6667E-01

URANIUM 235

RESONANCE ENERGY	RESONANCE INTEGRAL	PEAK CROSS SECTION	R	ETA
3.1100E 01	3.6793E-01	8.0784E 01	5.6330E-03	6.6667E-01
3.2100E 01	2.2398E 00	5.0225E 02	5.6922E-03	6.6667E-01
3.3600E 01	3.9278E 00	9.1122E 02	5.8208E-03	6.6667E-01
3.4600E 01	7.7040E 00	1.7918E 03	5.6814E-03	6.6667E-01
3.5300E 01	1.1773E 01	2.7074E 03	5.4438E-03	6.6667E-01

URANIUM 235

N1		N2		SIGMA N,G (N1/N2)	
1	1	1	2	1	3
0.		0.		2.6856E-02	6.6246E-02
1	6	1	7	1	8
8.3971E-01		1.9963E 00		4.3131E 00	8.0623E 00
1	11	2	1	2	2
7.1617E-02		0.		0.	1.9943E-02
2	5	2	6	2	7
2.0209E-01		6.2354E-01		1.4824E 00	3.2028E 00
2	10	2	11	3	1
6.9786E 00		5.3181E-02		0.	0.
3	4	3	5	3	6
4.6375E-02		1.9051E-01		5.8783E-01	1.3975E 00
3	9	3	10	3	11
5.6439E 00		6.5790E 00		5.0135E-02	0.
4	3	4	4	4	5
1.9936E-02		4.9175E-02		2.0202E-01	6.2333E-01
4	8	4	9	4	10
3.2017E 00		5.9847E 00		6.9762E 00	5.3162E-02
5	2	5	3	5	4
0.		1.9638E-02		4.8441E-02	1.9900E-01
5	7	5	8	5	9
1.4598E 00		3.1539E 00		5.8954E 00	6.8721E 00
6	1	6	2	6	3
0.		0.		1.8955E-02	4.6755E-02
6	6	6	7	6	8
5.9265E-01		1.4090E 00		3.0441E 00	5.6902E 00
6	11	7	1	7	2
5.0546E-02		0.		0.	1.9790E-02
7	5	7	6	7	7
2.0054E-01		6.1878E-01		1.4711E 00	3.1783E 00
7	10	7	11	8	1
6.9253E 00		5.2774E-02		0.	0.
8	4	8	5	8	6
5.3491E-02		2.1975E-01		6.7803E-01	1.6120E 00
8	9	8	10	8	11
6.5100E 00		7.5885E 00		5.7828E-02	0.
9	3	9	4	9	5
2.5496E-02		6.2889E-02		2.5835E-01	7.9716E-01
9	8	9	9	9	10
4.0946E 00		7.6538E 00		8.9217E 00	6.7988E-02
					0.

 URANIUM 235

 N1 N2
 SIGMA N,G (N1/N2)

10 2	10 3	10 4	10 5	10 6
0.	3.3653E-02	8.3010E-02	3.4101E-01	1.0522E 00
10 7	10 8	10 9	10 10	10 11
2.5015E 00	5.4046E 00	1.0103E 01	1.1776E 01	8.9741E-02
11 1	11 2	11 3	11 4	11 5
0.	0.	4.6870E-02	1.1561E-01	4.7495E-01
11 6	11 7	11 8	11 9	11 10
1.4655E 00	3.4840E 00	7.5273E 00	1.4070E 01	1.6401E 01
11 11	12 1	12 2	12 3	12 4
1.2499E-01	0.	0.	6.7991E-02	1.6771E-01
12 5	12 6	12 7	12 8	12 9
6.8898E-01	2.1259E 00	5.0540E 00	1.0919E 01	2.0411E 01
12 10	12 11	13 1	13 2	13 3
2.3792E 01	1.8131E-01	0.	0.	9.3337E-02
13 4	13 5	13 6	13 7	13 8
2.3023E-01	9.4581E-01	2.9183E 00	6.9380E 00	1.4990E 01
13 9	13 10	13 11	14 1	14 2
2.8020E 01	3.2662E 01	2.4890E-01	0.	0.
14 3	14 4	14 5	14 6	14 7
1.3825E-01	3.4101E-01	1.4009E 00	4.3225E 00	1.0276E 01
14 8	14 9	14 10	14 11	15 1
2.2202E 01	4.1502E 01	4.8377E 01	3.6866E-01	0.
15 2	15 3	15 4	15 5	15 6
0.	2.8010E-01	6.9092E-01	2.8384E 00	8.7579E 00
15 7	15 8	15 9	15 10	15 11
2.0821E 01	4.4985E 01	8.4087E 01	9.8018E 01	7.4694E-01
16 1	16 2	16 3	16 4	16 5
0.	0.	4.4698E-01	1.1026E 00	4.5294E 00
16 6	16 7	16 8	16 9	16 10
1.3976E 01	3.3226E 01	7.1786E 01	1.3418E 02	1.5641E 02
16 11	17 1	17 2	17 3	17 4
1.1920E 00	0.	0.	8.8428E-01	2.1812E 00
17 5	17 6	17 7	17 8	17 9
8.9607E 00	2.7648E 01	6.5731E 01	1.4201E 02	2.6546E 02
17 10	17 11	18 1	18 2	18 3
3.0944E 02	2.3581E 00	0.	0.	1.3090E 00
18 4	18 5	18 6	18 7	18 8
3.2288E 00	1.3264E 01	4.0927E 01	9.7300E 01	2.1022E 02
18 9	18 10	18 11	19 1	19 2
3.9295E 02	4.5805E 02	3.4906E 00	0.	0.

 URANIUM 235

 N1 N2
 SIGMA N,G (N1/N2)

19 3	19 4	19 5	19 6	19 7
4.8909E-01	1.2064E 00	4.9561E 00	1.5292E 01	3.6356E 01
19 8	19 9	19 10	19 11	20 1
7.8548E 01	1.4682E 02	1.7115E 02	1.3042E 00	0.
20 2	20 3	20 4	20 5	20 6
0.	5.7386E-01	1.4155E 00	5.8151E 00	1.7943E 01
20 7	20 8	20 9	20 10	20 11
4.2657E 01	9.2162E 01	1.7227E 02	2.0081E 02	1.5303E 00
21 1	21 2	21 3	21 4	21 5
0.	0.	1.1411E 00	2.8148E 00	1.1563E 01
21 6	21 7	21 8	21 9	21 10
3.5679E 01	8.4823E 01	1.8326E 02	3.4256E 02	3.9931E 02
21 11	22 1	22 2	22 3	22 4
3.0430E 00	0.	0.	3.0167E 00	7.4411E 00
22 5	22 6	22 7	22 8	22 9
3.0569E 01	9.4321E 01	2.2424E 02	4.8448E 02	9.0560E 02
22 10	22 11	23 1	23 2	23 3
1.0556E 03	8.0444E 00	0.	0.	4.7394E 00
23 4	23 5	23 6	23 7	23 8
1.1690E 01	4.8026E 01	1.4818E 02	3.5229E 02	7.6114E 02
23 9	23 10	23 11	24 1	24 2
1.4228E 03	1.6585E 03	1.2638E 01	0.	0.
24 3	24 4	24 5	24 6	24 7
7.7934E 00	1.9224E 01	7.8973E 01	2.4367E 02	5.7931E 02
24 8	24 9	24 10	24 11	25 1
1.2516E 03	2.3396E 03	2.7272E 03	2.0782E 01	0.
25 2	25 3	25 4	25 5	25 6
0.	1.2917E 01	3.1861E 01	1.3089E 02	4.0386E 02
25 7	25 8	25 9	25 10	25 11
9.6014E 02	2.0744E 03	3.8776E 03	4.5200E 03	3.4445E 01
26 1	26 2	26 3	26 4	26 5
0.	0.	1.2926E 01	3.1885E 01	1.3099E 02
26 6	26 7	26 8	26 9	26 10
4.0416E 02	9.6086E 02	2.0760E 03	3.8805E 03	4.5234E 03
26 11	27 1	27 2	27 3	27 4
3.4470E 01	0.	0.	1.2941E 01	3.1922E 01
27 5	27 6	27 7	27 8	27 9
1.3114E 02	4.0463E 02	9.6197E 02	2.0784E 03	3.8850E 03
27 10	27 11	28 1	28 2	28 3
4.5286E 03	3.4510E 01	0.	0.	1.2959E 01

 URANIUM 235

 N1 N2
 SIGMA N,G (N1/N2)

28 4	28 5	28 6	28 7	28 8
3.1966E 01	1.3132E 02	4.0519E 02	9.6330E 02	2.0812E 03
28 9	28 10	28 11	29 1	29 2
3.8903E 03	4.5348E 03	3.4558E 01	0.	0.
29 3	29 4	29 5	29 6	29 7
1.2984E 01	3.2026E 01	1.3157E 02	4.0596E 02	9.6512E 02
29 8	29 9	29 10	29 11	30 1
2.0852E 03	3.8977E 03	4.5434E 03	3.4623E 01	0.
30 2	30 3	30 4	30 5	30 6
0.	1.3020E 01	3.2116E 01	1.3194E 02	4.0710E 02
30 7	30 8	30 9	30 10	30 11
9.6783E 02	2.0910E 03	3.9086E 03	4.5562E 03	3.4720E 01
31 1	31 2	31 3	31 4	31 5
0.	0.	1.3074E 01	3.2249E 01	1.3248E 02
31 6	31 7	31 8	31 9	31 10
4.0877E 02	9.7182E 02	2.0996E 03	3.9247E 03	4.5749E 03
31 11	32 1	32 2	32 3	32 4
3.4863E 01	0.	0.	1.3166E 01	3.2476E 01
32 5	32 6	32 7	32 8	32 9
1.3342E 02	4.1166E 02	9.7868E 02	2.1145E 03	3.9524E 03
32 10	32 11	33 1	33 2	33 3
4.6072E 03	3.5109E 01	0.	0.	1.3359E 01
33 4	33 5	33 6	33 7	33 8
3.2952E 01	1.3537E 02	4.1769E 02	9.9301E 02	2.1454E 03
33 9	33 10	33 11	34 1	34 2
4.0103E 03	4.6747E 03	3.5624E 01	0.	0.
34 3	34 4	34 5	34 6	34 7
1.3858E 01	3.4184E 01	1.4043E 02	4.3330E 02	1.0301E 03
34 8	34 9	34 10	34 11	
2.2257E 03	4.1603E 03	4.8495E 03	3.6956E 01	

DATE 12/07/60

DESIGNATION	DELAY FRACTION	PRECURSOR MEAN LIFE
35 SPECTRUM	1.0000E 00	0.

LEVEL	ENERGY	SPECTRUM
1	1.000E 07	1.2048800E-02
2	6.065E 06	1.1224720E-01
3	3.679E 06	3.2781140E-01
4	2.231E 06	4.6312220E-01
5	1.353E 06	4.2181799E-01
6	8.208E 05	2.9531380E-01
7	4.979E 05	1.7627380E-01
8	3.020E 05	9.5595700E-02
9	1.832E 05	4.2160000E-02
10	6.738E 04	1.2548800E-02
11	2.479E 04	2.8805000E-03
12	9.119E 03	6.4850000E-04
13	3.355E 03	1.4510000E-04
14	1.234E 03	3.2399999E-05
15	4.540E 02	5.9999999E-06
16	8.719E 01	7.9999999E-07
17	3.545E 01	9.9999999E-08
18	1.304E 01	0.
19	5.043E 00	0.
20	1.445E 00	0.
21	6.826E-01	0.
22	2.511E-01	0.
23	9.237E-02	0.
24	2.530E-02	0.
4500	3.023E-01	0.
4000	2.718E-01	0.
3500	2.413E-01	0.
3000	2.109E-01	0.
2500	1.804E-01	0.
2000	1.499E-01	0.
1500	1.194E-01	0.
1000	8.897E-02	0.
500	5.850E-02	0.
68	3.216E-02	0.

NO MACROSCOPIC DATA BLOCKS

+ THIS PROGRAM PROCESSED ALL AVAILABLE CARDS

STOP TIME BEFORE MACHINE RESTORED T STANDARD SET-UP 15.320

RESTORE MACHINE TO STANDARD SET UP - - - PUSH START.

STOP 15.32

SUBROUTINES

IDENTIFICATION:

Title: DIP - Decimal Input
 Source Language: FAP
 Application: 7090 FORTRAN
 Author: Dorothea S. Clarke
 Unit: CTD
 Installation: General Electric - Evendale
 Date: April 1960

GENERAL INFORMATION:

The DIP input program loads from the peripheral input tape, converts and stores integers, floating-point data, alphabetic data or octal instructions. Column 1 of every data card is reserved for control information, which indicates whether the data is to be converted to integers, floating-point, six-bit binary-coded decimal, or an octal instruction. Other controls used are end-of-record, absolute location, and end-of-file. The data cards may be set up for any number of fields, limited only by the 72 columns on the card.

USAGE:Data Card FormatColumn 1

Column 1 is reserved for control punches. Below is a list of the various control punches that are permitted by DIP and their meaning:

<u>Control</u>	<u>Symbol</u>	<u>Designation</u>
0 (Zero)	0	Octal Instruction
2	2	Data is Binary-Coded Decimal stored ascending order
3	3	Data is Floating-Point
4	4	Data is Fixed-Point
5	5	Data is Binary-Coded Decimal stored descending order
8	8	End-of-File when followed by 5 blanks
8-0	Y	Octal Instruction - End-of-Record
8-3	=	Data is Floating-Point - End-of-Record

DIP

<u>Control</u>	<u>Symbol</u>	<u>Designation</u>
8-4	-	Data is Fixed-Point - End-of-Record
9	9	This Card is to be ignored
12	+	Conversion mode is continued from previous card -- first number on card is absolute storage location
12-2	B	Data is Binary-Coded Decimal -- first number is an absolute storage location
12-3	C	Data is Floating-Point -- first number is an absolute storage location
12-4	D	Data is Fixed-Point -- first number is an absolute storage location
12-5	E	Data is Binary-Coded Decimal -- first number is an absolute storage location
12-8	H	Conversion mode is continued from the previous card -- first number is an absolute storage location -- end-of-record
12-8-2	None	Data is Binary-Coded Decimal -- first field is an absolute storage location -- end-of-record
12-8-3	.	Data is Floating-Point -- first field is an absolute storage location -- end-of-record
12-8-4	)	Data is Fixed-Point -- first field is an absolute storage location -- end-of-record
Blank		The conversion mode is continued from the previous card, with the exception of control 0 (Zero).

Absolute Locations

Whenever there is a 12 punch in column 1, the next number on the card must be an absolute location. DIP will then store all the data that follow in descending order with the first piece of data stored at this location.

Variable Storage Reference

Whenever a variable is found on the data card, DIP searches through the List of Variables and equates it to an absolute storage location. The variable may appear anywhere on the card with the

exception of column 1, and all data that follow are stored with reference to the absolute location.

Data

Floating Point: - A 3 punch in column 1 indicates that all the data on this card are to be converted to 704 floating-point notation. There are a variety of acceptable ways to punch floating-point data, e. g.:

8126
+ 8126.00
8.126/3
+ 8.126/+3
8.126 + 3
+ 812600/-2
812600-2

The plus sign on the data is optional. The exponent is separated from the mantissa by either a /, +, or - sign. A blank or a comma tells DIP that this is the end of the number.

Fixed Point: - A 4 punch in column 1 indicates that all data on this card are to be converted to a binary integer and stored in the decrement field of the current absolute storage location. The data on the card must be punched as an integer and may be preceded by a sign. The absolute value of the integer must not exceed 32767. The end of the integer is indicated by a blank or a comma.

Bypassing Storage Locations: - An equal sign immediately followed by a blank or a comma causes the storage location to be decreased by one. An integer (n) immediately preceding the equal sign causes the storage location to be decreased by n. This feature enables the loading of data into scattered locations without continually defining the storage location.

Octal-Instruction Cards: - If column 1 contains a zero punch, this indicates to DIP that this is an octal-instruction card. Each octal-instruction card must have a zero punch in column 1, an octal address in columns 7 - 11, a sign and 12 octal numbers of the instruction in columns 18 - 30.

DIP

Binary-Coded Decimal Data: - If column 1 contains a 2 or a 5 punch, the data on the card are stored in six-bit binary-coded decimal form. If there is also a 12 punch in column 1, then the first information must be the absolute storage location. If there is no 12 punch in column 1, the first character of the next field is examined to determine if it is numeric or alphabetic. If alphabetic, the field is interpreted to be the variable defining the storage location. Following the storage reference, and separated from it by either a blank or a comma, is the integer N where $N \times 6$ is the number of BCD characters to be stored. If the first character of the first field is numeric, the field is interpreted as N and the storage location is sequential from the previous card. The integer N is followed by a blank or comma and the next character will be the first BCD character to be stored. DIP will store BCD information in ascending locations if the column 1 control punch is a 2, or in descending order if the column 1 control punch is a 5. (When BCD information is being read for use as format by IOH, the control 5 must be used.)

When it is necessary to continue BCD information for more than one card, the following cards must have a blank or an 8 punch (EOR) in column 1 followed by the integer N, a blank or comma, and the BCD information. Note: N may not exceed the physical capacity of one card. Succeeding cards must each contain N.

End-of-File: - When either a physical or control punch end-of-file is encountered the standard QUIT sequence is executed without comment.

Error Codes: - When DIP encounters an error, it reads in, but does not convert the remaining cards until an end-of-record control punch occurs in column 1. While bypassing the data cards, DIP will continue to search for errors, printing out each as it is found. After bypassing the data cards, DIP exits to the ERROR subroutine. The standard error procedure print-out is produced on the peripheral output tape as:

AN ERROR HAS BEEN FOUND AT OR NEAR

EXTERNAL FORMULA NO. α , INTERNAL FORMULA NO. β , of
(DIP)

⋮

where α is the error code and β is $1000 \times \text{card count} + \text{column number}$ where the error occurred. The error codes are:

DIP

Code	1	Column 1 control not acceptable
	5	Error in data character
	7	Integer is too large
	8	Variable not given in list
	9	Tape failure

CODING INFORMATION:**Restrictions**

1. The control punch zero must be on every octal-instruction card. In the octal fields, blanks are equivalent to zero.
2. A data field is terminated by either a blank or a comma. Any number of blanks may separate the data fields.
3. Absolute storage locations, if specified, must be designated in the first field of the card.
4. An end-of-file error exit may be obtained by either an end-of-file control card or, if there is an attempt to read more data cards, when no more are available.
5. A control character including a BCD 5 control and an EOR control is an illegal character unacceptable to the peripheral card reader.

AIRCRAFT NUCLEAR PROPULSION DEPARTMENT

GENERAL ELECTRIC