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30-75
LA-5933-MS

Informal Report

Av 1355
UC-32 and UC-79

Reporting Date: March 1975

Issued: April 1975

**FTRCØL: A Computer Code to
Group Collapse FTR Files and
Output Standard CCCC Interface Files**

by

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MASTER

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Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22151
Price: Printed Copy \$5.45 Microfiche \$2.25

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FTRCØL: A COMPUTER CODE TO GROUP COLLAPSE FTR FILES
AND OUTPUT STANDARD CCCC INTERFACE FILES

by

Patrick D. Soran

ABSTRACT

1. Program Identification: FTRCØL.
2. Computer for which Program is Designed: CDC-7600, CDC-6600.
3. Description of Function: FTRCØL takes multigroups cross sections and resonance self-shielding factors structured in an FTR format and collapses to fewer groups.
4. Method of Solution: Cross-section information is collapsed by a $1/E$, $1/E + \text{fission}$, or an input weighting function.
5. Restrictions: Program is presently limited to 100 fine/broad groups, 3 temperatures, and 8 σ values. With minor modification these restrictions can be removed.
6. Running Time: Group collapsing from 30 groups to 5 groups of 15 isotopes using a $1/E + \text{fission}$ spectrum and producing ISØTXS and BRKØXS interface files requires 15 seconds of CDC-7600 time.
7. Unusual Features of the Program: FTRCØL produces version III standard ISØTXS and BRKØXS interface files. The $1/E + \text{fission}$ spectrum has optional energy cut points and theta values and uses an adaptive integration technique to produce the fine group fluxes.
8. Machine Requirements: Two system input/output units and six input/output units are required. All calculations are performed and stored in small core.
9. Related Programs: FTRCØL can be used with the BINX and LINX for additional processing flexibility. Also the ISØTXS and BRKØXS files can be converted back to FTR files by use of the FCFTR code.
10. Material Available: Source deck, test problems, and this report will be available from the Argonne Code Center.

I. INTRODUCTION

FTRCOL is a computer code for group collapsing multigroup cross sections and resonance self-shielding factors (f-factors). The collapsed cross-section information is then given as ISOTXS¹ and BRKOXS² standard interface files. Input libraries must be structured in the BCD FTR³ library format. FTR libraries are generally produced using the ETOX⁴ code and ENDF/B data, or one can produce ISOTXS and BRKOXS files by use of the FCFTR⁵ code. The need for a code such as FTRCOL arises from the requirement to perform two-dimensional, Sn transport calculations using TWOTRAN-II⁶ (steady-state) or TWOTIME⁷ (time-dependent) in a finite amount of time, thus a need for few group libraries (in ISOTXS format). Additionally one may wish to consider resonance self-shielding and temperature effects in transport calculations directly, especially in safety codes where there is material motion and temperature gradients, thus a need for few group f-factor libraries (in BRKOXS format).

II. SOLUTION ALGORITHM AND VERIFICATION

A. Solution Method and Equations

The FTRCOL code operates from a master library which exists in FTR format. Since the FTR format contains both information regarding multigroup neutron cross sections and resonance self-shielding factors only minimum additional information is required to produce ISOTXS and BRKOXS standard interface files. Given the master library and additional information/isotope to be processed (see Sec. III.B.) the data on the master tape can be collapsed to a fewer number of multigroups using a number of flux weighting schemes. The flux (both the fine and broad groups) terms are calculated or read in as prescribed by the user.

Equations which are employed in the collapsing procedure are specified in Table I. Using a fine group weighting spectrum ϕ_j , the ϕ_j terms are collapsed to broad group weighting spectrum, ϕ_J . Lower case subscripts i and j indicate fine groups and upper case subscripts I and J represent collapsed cross sections and f-factors. The application of the equations given in Table I is straightforward; however, a few words regarding the downscatter from group J to J+1 might be appropriate. If one uses the group average flux to collapse the elastic

TABLE I
EQUATIONS EMPLOYED IN GROUP COLLAPSING

1. Capture, fission, inelastic, elastic, and total cross section

$$\sigma_J = \sum_{j \in J} \sigma_j^k \phi_j / \phi_J$$

$$\phi_J = \sum_{j \in J} \phi_j$$

σ_j^k = the k-th type cross section for the j-th fine group

ϕ_j = the j-th group fine flux.

2. Total neutron yield/fission (ν)

$$\nu_J = \sum_{j \in J} \nu_j \sigma_j^f \phi_j / \sum_{j \in J} \sigma_j^f \phi_j$$

3. Average cosine of elastic scattering angle (μ)

$$\mu_J = \sum_{j \in J} \mu_j \sigma_j^s \phi_j / \sum_{j \in J} \sigma_j^s \phi_j$$

σ_j^s = the elastic scattering cross section for the j-th fine group.

4. Downscattering

$$\sigma_{I \rightarrow J} = \sum_{i \in I} \sum_{j \in J} \sigma_{i \rightarrow j}^{\text{in}} \phi_i / \sum_{i \in J} \phi_i$$

however,

$$\sigma_{I-1 \rightarrow I} = \sigma_{I-1}^d + \sigma_{I-1 \rightarrow I}^{\text{in}}$$

d = elastic downscatter (see discussion in text)

in = inelastic.

5. In-Group Scattering

$$\sigma_{I \rightarrow I} = \sigma_I^{\text{tr}} - \sigma_I^a - \sum_{J=I+1} \sigma_{I \rightarrow J}$$

where

$$\sigma_I^{\text{tr}} = \left(\sigma_I^t - (\sigma_I^f + \sigma_I^c + \sigma_I^{\text{in}}) \right) (1 - \mu_I) + \sigma_I^f + \sigma_I^c + \sigma_I^{\text{in}}$$

$$\sigma_I^a = \sigma_I^f + \sigma_I^c - \left[\sum_{J=I+1} \sigma_{I \rightarrow J}^{\text{in}} - \sigma_I^{\text{in}} \right]^*$$

tr = transport

t = total

f = fission

c = capture

* The (n,2n) cross section is multiplied by 2 and added to the inelastic scattering matrix; furthermore, the (n,2n) cross section is subtracted from the capture (c) cross section.

TABLE I (cont)

6. f-factor (capture, fission, elastic)

$$f_I = \frac{\sigma_I(T, \sigma_0)}{\sigma_I(T_{ref}, \infty)},$$

where

$$\sigma_I(T, \sigma_0) = \sum_{i \in I} \sigma_i f_i \phi_i / \sum_{i \in I} f_i \phi_i$$

$$\sigma_I(T_{ref}, \infty) = \sigma_I$$

T = temperature (K)

σ_0 = discrete background cross sections.

scattering to the adjacent group appreciable errors can occur.^{8,9} To circumvent this problem the lower boundary flux is used. Since elastic group transfer occurs near the lower group boundary the choice of the lower boundary for collapsing the elastic transfer is more logical than the group averaged flux. The method used to calculate elastic transfer is that of LD⁸ and is repeated in this report for convenience. For group J, the elastic transfer rate for each isotope is calculated using the flux at lethargy U_J^l such that

$$U_J^l = U_J - 0.66 \xi_J,$$

where:

U_J is the lethargy at lower group boundary J, and ξ_J is the average lethargy change by elastic scattering for group J.

Employing linear interpolation on the term $\xi \sigma^e \phi(u)$ the downscattering is calculated as

$$\sigma_{J+J+1} = \frac{1}{\Delta U_J} \left[(\xi \sigma^e)_J + \frac{U_J^l - U_J}{U_{J+1} - U_J} \left[\frac{\phi(U_{J+1})}{\phi(U_J)} (\xi \sigma^e)_{J+1} - (\xi \sigma^e)_J \right] \right] \quad (1)$$

Equation (1) can be applied for every group J except for J = 1.

Note that the collapse of the f-factors is performed by calculating a fine group shielded cross section at some temperature (T) and background cross section (σ_0) collapsing this shielded cross section and dividing by the previously collapsed infinite dilution cross section. In FTRCOL, no special consideration is given to the collapse of the total and transport f-factor.

B. Verification of FTRCOL

Two objectives were sought in verifying the few group cross-sections information calculated by FTRCOL:

- One which could check the ISOTXS file and
- One which could check the ISOTXS and BRKXOS file.

Both files should be verified on a realistic description of a nuclear reactor. At this time only the ISOTXS file has been verified on a reactor model with the BRKXOS file verified by analytic models.

1. ISOTXS Verification

Figure 1 represents an FTR calculational model (referred to as the detail model) and is discussed in Ref. 10. To reduce computational costs, the FTR model used in the present cross-section validation was that of Fig. 1 modified by using symmetry about the midplane and eliminating the upper core structure (referred to as the modified model). This modification reduces computation time by a factor of eight for a 10-energy group, two-dimensional transport calculation, yet is sufficiently accurate as is discussed below.

The cross-section set employed in the analysis described in Ref. 10 was a 10-group set (referred to as the reference set)¹¹ obtained by using flux volumes from a 30-group MC²-generated set.¹² (MC² problems were run with 30-energy group independent isotope data sets for the inner core, outer core, and axial reflector, and the flux volumes were calculated using the MC²-generated data on the detail model.) The reference library has temperature, energy, and spatial effects incorporated within its

generation and represents a reasonable data set with which to compare other cross-section sets.

Using the FTRCOL code, two 10-energy group, one 7-energy group, and one 5-energy group libraries were generated using a 1/E plus a fission spectrum (an energy cutoff of 821 keV and a theta of 1.4 MeV). The first library (102F0) was calculated by collapsing the 30-energy group FTR-300³ library, while the second (102E3), third (072E3), and fourth (052E3) libraries were obtained by

Fig. 1. FTR calculational model.

collapsing a 29-group library.¹³ (See Table II for more information on all of the libraries used in this study.)

Having the necessary ISOTXS libraries and calculational models, validation consisted of three steps: 1) detail model and the reference cross-section set, 2) modified model and the reference cross-section set, and 3) modified model and libraries 102F0, 102E3, 072E3, and 052E3. For each stage a k_{eff} calculation was performed using TWOTRAN-II code with r-z geometry and S_4 quadrature. The results of this study are illustrated in Table III. It appears that the FTRCOL algorithm is sufficient for generation if ISOTXS information.

2. BRKOXS Verification

To date, there are no transport codes which use f-factors (BRKOXS files) directly in their calculation. Although TWOTRAN-II and TWOTIME are being modified to do the f-factor calculation as an integral part of the code, modification is not complete. Consequently, only analytic models could be analyzed. To this end f-factors which were: a) constant, b) linear, and c) quadratic as a function of energy were collapsed by FTRCOL and compared to hand calculations. The agreement was excellent. When the modifications are complete to TWOTRAN-II, the BRKOXS file will be verified using the FTR calculational model discussed earlier.

III. GUIDE TO USER'S APPLICATION

A. Overall Program Flow

A schematic flow chart for FTRCOL is given in Fig. 2. A more detailed flow chart is provided in Sec. IV.A.2.

TABLE II
LIBRARY DESCRIPTION

Library Name	Point-Wise Data Source	No. of Isotopes	Chi Value Source	No. of Temp	No. of σ_0 Values	F-Factors
Reference ^a	ENDF/B-I	36	ENDF/B-I	1	NA	No
102F0	ENDF/B-II ^b	29	Reference	3	6	Yes
102E3	ENDF/B-III	15	Reference	3	6	Yes
072E3	ENDF/B-III	15	ENDF/B-IV	3	6	Yes
052E3	ENDF/B-III	15	ENDF/B-IV	3	6	Yes

^aSee Ref. 5 for details.

^bModified to give agreement with various critical experiments.

TABLE III
REACTOR k_{eff} VALUES AS A FUNCTION OF REACTOR MODEL AND CROSS-SECTION LIBRARY

Library Name	FTR Model	No. of Energy Groups	k_{eff} Value	Percent Dev. from Reference ¹	CDC-7600 Time (min.)
Reference ^a	Detail ^a	10	1.056		62
Reference	Modified ^b	10	1.047	0.85	8.2
102F0	Modified	10	1.009	4.45	8.2
102E3	Modified	10	1.020	3.41	8.2
072E3	Modified	7	1.030	2.46	5.4
052E3	Modified	5	1.058	-0.19	3.9

^a See Ref. 5 for details.

^b Same model as described in Ref. 5, but modified by using symmetry about core midplane.

B. Description of Input Data

In the following pages the input data for FTRCOL are listed in exactly the order in which they are entered in the code. The data are divided into two categories: 1) data required to perform the group collapse, e.g., number of subgroups, isotopes to manipulate, and 2) data required to write the ISOTXS and BRKOXS files. The two categories are explicitly discussed below.

1. Group Collapse Data

The user enters the data as noted below:

Fig. 2. Simplified logical flow diagram for FTRCOL.

Number of Word on Card	Name of Variable	Comments	
Integers	(I5 format)		-----Card 1
1	NGPS	Number of energy groups on the input PTR structured library.	
2	NXDN	Maximum number of downscatter groups permitted on the input PTR structured library.	
2	IWGT	Group collapsing flux spectrum: 1/2/3 - 1/E everywhere/1/E + fission spectrum (additional input required)/input of the fine group fluxes - NGPS entries.	
4	NCR	Number of broad groups.	
5	NISO	Number of isotopes to group collapse from the input PTR structured library.	
6	IC	Output option: 0/1 - do not write an output tape/do write an output tape (ISOTXS and BRKOXS files) - also see Sec. IV.B.	
7	IE	Edit of output tape: 0/1 - do not edit the output tape/do edit the output tape.	
8	IB	Type of output tape: 0/1 - not a new output tape so add data to the end of a master tape which has ISOTXS/BRKOXS information on it/output a new master tape so write file identification, file control, and file data information for the ISOTXS and BRKOXS files.	

If IWGT is 2			
	Floating point (2E10 format)		-----Card 2
1	ECUT	The energy cutoff point for the 1/E in units of eV.	
2	ETEMP	Neutron temperature used in the fission spectrum in units of eV.	

If IWGT is 3			
	Floating point (7E10 format)		-----Card 2
1		The fine group fluxes which will be used in groups collapsing.	
.			
.			
.			
NGPS			

If IWGT is 1 or 2			
	Floating point (7E10 format)		-----Card 2/3
1		The actual energy (eV) cut points of the input PTR structured library.	
.		Need to calculate the broad group fluxes.	
.			
.			
NGPS+1			

Integers	(I4I5 format)		-----Card 2/3/4
1		Each NFIB (J) entry contains the number which is a subset of the fine group structure. The entry then gives the cutoff of i-th fine group which will occur in the j-th broad group, e.g., NFIB(1)=7, this says that groups 1 to 7 of the fine group library will appear in group 1 of the broad group collapse.	
.			
.	NFIB(J)		
.			
NCR			

Number of Word on Card	Name of Variable	Comments
Alpha	(12A6 format)	-----Card 3/4/5
1		Name of the k-th isotope on the input FTR structured library.
.		
.	XISO (K)	
.		
NISO		

2. Output File Data

The user enters the following if the IC term of Card 1 is greater than zero and is entered as noted below:

Number of Word on Card	Name of Variable	Comments
Mixed	(15,3A6,2E12.5)	-----Card 1
1	KBR	
2	HISØNM	
3	HIDENr	See Ref. 2 for a complete description of these parameters - listed
4	HMAT	under the ISOTXS file.
5	EFISS	
6	ECAPT	

If EFISS > 0

Floating point (6E12.5)-----Card 2

1		
.		
.	CHISØ (J)	The isotope chi values for this isotope.
.		
NCR		

If IB is 1 only

alpha (12A6)-----Card 3

1		
.		
.	A(I)	Title to go on the ISOTXS/BRKOXS file.
.		
12		

Cards 1 and 2 are repeated for NISO cases; note that Card 3 is only read in once if IB is 1.

C. Output Description for a Test Problem

The test problem presented in this report is given in Appendix A. The problem illustrated is that of generating library 052E3 as discussed in

Sec. II.B.1. The information given in Appendix A illustrates the input data for all isotopes and only gives the ISOTXS and BRKOXS information for one isotope although 15 isotopes were used in the original calculation.

IV. PROGRAM INFORMATION

In this section we give some of the details of the FTRCOL program. The material contained in this section is designed to help in future local modification of the program. Additional information is provided by the program comment cards.

A. Program Structure

1. Role and Function of Subprograms

We describe in Table IV the function of all the subprograms in FTRCOL. In Table IV, the place from which each subprogram is called is also discussed.

2. Program Flow

In Fig. 3 we show an amplified version of Fig. 2, depicting the overall flow of the FTRCOL program and showing subroutine names.

B. External and Internal Data Files

All files used for input, output, and scratch are referred to by symbolic names throughout the code. The user may easily change the physical unit assigned a file by modification of the unit name in subroutine UNITS. Also important to note, that for the present version of FTRCOL, if one wishes to generate output tapes, then the ISOTXS/BRKXXS files will appear on units 8/10 if the NISO value is even. If NISO is odd, then the ISOTXS/BRKXXS files will appear on units 9/11. Table V indicates the files required by FTRCOL.

TABLE IV
FUNCTION OF SUBPROGRAMS

<u>Subroutine</u>	<u>Function</u>
FTRCOL	Main driver of program. Calls UNITS, INPUT, FLUX, SERCH, COLAP, RITPUN, and CHKDUN.
INPUT	Reads in required data for a problem. Calls WOT and WOTI.
FLUX	Calculates broad and fine group fluxes used during collapse. Calls WOT and QNC7.
CDEF	External function used to calculate $1/E + fission$ spectrum information.
QNC7	Adaptive integration routine.
SERCH	Searches FTR tape for isotope of interest and processes.
COLAP	Collapses cross section and f-factors.
INITC	Initializes arrays.
RITPUN	Writes standard CCCC files -- if desired, calls RITNW, RITISØ, and RITBRK. Additional information is also read.
RITISØ	Reads and arranges data for ISØTXS-III file. Calls REED, RITE, and STØW.
RITBRK	Reads and arranges data for BRKØXS-III file. Calls REED, RITE, STØW, CØPYF, BF, and XS.
BF	Stores f-factors in correct location for use in RITBRK.
XS	Stores cross section in correct location for use in RITBRK.
CHKDUN	Checks to see if all nuclides have been processed. Calls EDIT.
EDIT	Will edit information if so desired. Calls BISØTX and BBRKX.
BISØTX	Reads and edits the ISØTXS-III file. Calls REED and WOT.
BBRKX	Reads and edits the BRKØXS-III file. Calls REED, STØW, WØT8, and WØT.
RITNW	Produces the file identification, file control, and file data information for ISØTXS and BRKØXS. Calls FILD, ISFC, ISFD, BRFC, and BRFD.
FILD	Produces file identification for BRKØXS and ISØTXS.
ISFC	Produces file control for ISØTXS.
ISFD	Produces file data for ISØTXS. Calls RITE.
BRFC	Produces file control for BRKØXS.
BRFD	Produces file data for BRKØXS. Calls RITE.
WØT	Prints a 1-, 2-, or 3-dimensional array.
WØT8	Prints up to 8 one-dimensional arrays.

TABLE IV (cont)

Subroutine	Function
WDTI	Prints a 1-, 2-, or 3-dimensional integer array.
RITE	Write binary file.
REED	Reads binary file.
STOW	Stores a vector.

TABLE V
INPUT/OUTPUT UNITS

Name	Logical Unit	Remarks
IU3	3	Scratch unit
IU4	4	Scratch unit
IU5	5	Problem code-dependent decimal input
IU6	6	Problem decimal output
IU7	7	Punch card
IU8	8	Storage of ISOTXS-III file, if desired. Final output will be on this unit if there are an <u>even</u> number of nuclides collapsed.
IU9	9	Same as IU8, except output will be on this file if there are an <u>odd</u> number of nuclides collapsed.
IU10	10	Storage of BRKOXS-III file, if desired. Final output will be on this unit if there are an even number of nuclides collapsed.
IU11	11	Same as IU10, except output will be on this file if there are an <u>odd</u> number of nuclides collapsed.

Fig. 3. Amplified logical flow chart for FTRC0L.

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APPENDIX A

CODE LISTING: SAMPLE INPUT AND OUTPUT

LASL Identification
Number: LP-0518

```
*****
INDEX COMPILED ON 06/11/74
INDEX START TIME IS 14.943 SECONDS
*****
```

VARIABLES ARE DESCRIBED BY TYPE
FOR ARRAYS TYPE IS PRECEDED BY ()

CODE	MEANING OF CODE ASSOCIATED WITH LINE REFERENCES	LA	LINE#
*	STATEMENT NUMBER DEFINED	LC	VARIABLE IN LCM
=	VARIABLE APPEARS ON LEFT OF = SIGN	LG	LOGICAL
AG	ARGUMENT IN SUBROUTINE, FUNCTION OR CALL	LX	LEFT ROUTINE
AS	ASSIGN STATEMENT	RM	REALIST
BI	BUFFER IN	RA	PARAMETER
BO	BUFFER OUT	PS	POINT
CA	NAME OF LABELLED COMMON	PH	PURCH
CO	VARIABLE IN COMMON	PC	PLAN
CA	COMPLEX	PL	PLAN
DA	DATA STATEMENT	SI	SMALL IN
DI	DOUBLE PRECISION	SM	SMALL
DO	DO LOOP	SO	SMALL OUT
DI	DIMENSION	SI	SUBROUTINE
DO	DO LOOP	TI	TIME IN
FC	ENDCODE	TO	TIME OUT
FN	ENTRY POINT	WR	WRITE
EQ	EQUIVALENCE		
F	FUNCTION		
IN	INTEGER		

INDEX 02/1A/75 PROGRAM FTFCOL (INP,OUT,PUN,FSET3,FSET4,FSET5=INP,FSET6=OUT,FSET7=

1	PROGRAM FTFCOL (INP,OUT,PUN,FSET3,FSET4,FSET5=INP,FSET6=OUT,FSET7=	FTFCOL	2
	1PUN,FSET8=FSET9,FSET10,FSET11)	FTFCOL	3
		FTFCOL	4
	COLLAPSE DATA WHICH IS IN AN FTR TYPE FORMAT TO FEWER GROUPS	FTFCOL	5
		FTFCOL	6
2	COMMON /ALL/ I03,I04,I05,I06,I07,I08,I09,NGPS,NXDN,IWGT,NCR,NISO,I	FTFCOL	7
3	IC,IF,FG(100),NFIR(100),XISO(100),FGPHT(100),CGPHT(100)	FTFCOL	8
	COMMON /FTR/ HOLN(1),ATW(1),NT(1),NGR(1),NGE(1),NPF(4,1),TEM(3,1)	FTFCOL	9
4	1,SE(4,1),FF(4,300),SR(9,100),SM(1,40),F40(1),TGM,NXCMR	FTFCOL	10
5	COMMON /FTR/ NGHC(1),NGEC(1),FF(4,300),SR(9,100),SM(100,40)	FTFCOL	11
6	COMMON /FTR/ I010,I011,KBR,MISONM,HIFENT,HMAT,EFISS,ECAPT	FTFCOL	12
7	CALL UNITS	FTFCOL	13
8	CALL RTRN	FTFCOL	14
9	CALL FLUX	FTFCOL	15
10	NFINO=	FTFCOL	16
11	10 CALL SFRM (NFINO)	FTFCOL	17
12	CALL COLAP	FTFCOL	18
13	CALL RTOUN	FTFCOL	19
14	CALL CHKUN (NFINO)	FTFCOL	20
15	GO TO 10	FTFCOL	21
16	END	FTFCOL	22
		FTFCOL	23

INDEX 02/1P/75 PROGRAM FTFCOL (INP,OUT,PUN,FSET3,FSET4,FSET5=INP,FSET6=OUT,FSET7=

SINGLY REFERENCED VARIABLES

A	(1R	2CO	FF	(1R	4CO	FSET7	=R	1AG	IC	=I	3CO	I07	=I	3CO	NGEC	(11	5CO	SM	(1R	4CO
ALL	=	3CO	FFC	(1R	4CO	FSET8	=R	1AG	IF	=I	3CO	I08	=I	3CO	NGPS	=I	3CO	SHC	(1R	5CO
ATW	(1R	4CO	FGPHT	(1R	3CO	FSET9	=R	1AG	TGM	=I	4CO	I09	=I	3CO	NISO	=I	3CO	SR	(1R	4CO
CCCC	=	4CO	FLUX	=	7SU	FTR	=	4CO	HIFENT	=	8SU	I06T	=I	3CO	NPF	(11	4CO	SRC	(1R	5CO
CGPHT	(1R	3CO	FSET10	=R	1AG	FTRC	=	5CO	I01A	=I	6CO	KBR	=I	4CO	NT	(11	4CO	TEM	(1R	4CO
CHKUN	=	14SU	FSET11	=R	1AG	FTFCOL	=	15U	I011	=I	6CO	NCR	=I	3CO	NXCMR	=I	4CO	UNITS	=	7SU
COLAP	=	12SU	FSET12	=R	1AG	HIFENT	=R	6CO	I03	=I	3CO	NF19	(11	3CO	NXDN	=I	3CO	XISO	(1R	3CO
ECAPT	=R	4CO	FSET14	=R	1AG	MISONM	=R	6CO	I04	=I	3CO	NGR	(11	4CO	RTRN	=	13SU			
EFISS	=R	4CO	FSET5	=R	1AG	HMAT	=R	6CO	I05	=I	3CO	NGRC	(11	5CO	SEARCH	=	11SU			
ER	(1R	3CO	FSET16	=R	1AG	HOLN	(1R	4CO	I06	=I	3CO	NGF	(11	4CO	SF	(1R	4CO			

MULTIPLY-REFERENCED VARIABLES

IC	=	1R	15
COMMON	=	7F	3F
INP	=I	1AG	1AG
NFINO	=I	10*	11AG
OUT	=R	1AG	1AG
PUN	=R	1AG	1AG

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SUBROUTINE UNITS

1	SUBROUTINE UNITS	FTFCOL	24
	DEFINE AND REFINO UNITS	FTFCOL	25
2	COMMON /ALL/ I03,I04,I05,I06,I07,I08,I09,NGPS,NXDN,IWGT,NCR,NISO,I	FTFCOL	26
	IC,IF,FG(100),NFIR(100),XISO(100),FGPHT(100),CGPHT(100)	FTFCOL	27
3	COMMON /FTR/ HOLN(1),ATW(1),NT(1),NGR(1),NGE(1),NPF(4,1),TEM(3,1)	FTFCOL	28
4	I03=3	FTFCOL	29
5	I04=4	FTFCOL	30
6	I05=5	FTFCOL	31
7	I06=6	FTFCOL	32
8	I07=7	FTFCOL	33
9	I08=8	FTFCOL	34
10	I09=9	FTFCOL	35
11	I010=10	FTFCOL	36
12	I011=11	FTFCOL	37
13	REFINO I03	FTFCOL	38
14	REFINO I04	FTFCOL	39
15	REFINO I05	FTFCOL	40
16	REFINO I06	FTFCOL	41
17	REFINO I07	FTFCOL	42
18	END	FTFCOL	43

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SUBROUTINE UNITS

SINGLY REFERENCED VARIABLES

ALL	-	2CN	FFISS	-R	300	HISDNH	-R	300	IWGT	-I	200	NGPS	-I	200	UNITS	-	15U
CCCC	-	2CN	EG	(IR	200	HMAT	-R	300	KRR	-I	300	NISN	-I	200	XISN	(IR	200
CGPHI	(IR	200	FGPHI	(IR	200	IC	-I	200	NCR	-I	200	NXDN	-I	200			
ECUT	-R	200	HICENT	-R	200	IF	-I	200	WFIR	(II	200	RETURN	-	17F			

MULTIPLY-REFERENCED VARIABLES

COMMON	-	2F	3F														
I(1)	-I	300	11	=													
I(1)	-I	300	12	=													
I(3)	-I	200	4	=	13												
I(4)	-I	200	5	=	14												
I(5)	-I	200	6	=													
I(6)	-I	200	7	=													
I(7)	-I	200	8	=													
I(8)	-I	200	9	=	15												
I(9)	-I	200	10	=	16												
END	-	13F	14F	15F	16F												

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SUBROUTINE INPUT

PAGE 5

1	SUBROUTINE INPUT		
2	HEAD REQUIRED DATA	FTRCOL	44
3	COMMON /ALL/ IU3,IU4,IU5,IU6,IU7,IU8,IU9,NGPS,NXDN,IWGT,NCR,NISO,I	FTRCOL	45
4	IC,IE,EG(100),NFIB(100),XISO(100),FGPHI(100),CGPHI(100)	FTRCOL	46
5	COMMON /ISLAP/ IB	FTRCOL	47
6	COMMON /EPFIS/ ECUT,ETEMP,ANDRM	FTRCOL	48
7	READ (IU5,20)NGPS,NXDN,IWGT,NCR,NISO,IC,IE,IR	FTRCOL	49
8	IF (IWGT.EQ.2) READ (IU5,10)ECUT,ETEMP	FTRCOL	50
9	ANDRM=EXP(-ECUT/ETEMP)*ECUT*.15	FTRCOL	51
10	IF (IWGT.EQ.3) READ (IU5,30) (FGPHI(I),I=1,NGPS)	FTRCOL	52
11	NENP=NGPS*1	FTRCOL	53
12	IF (IWGT.LE.2) READ (IU5,30) (EG(J),J=1,NENP)	FTRCOL	54
13	READ (IU5,20) (NFIB(J),J=1,NCR)	MAH21	1
14	READ (IU5,40) (XISO(J),J=1,NISO)	FTRCOL	55
15	WRITE (IU6,50)NGPS,NXDN,IWGT,NCR,NISO,IC,IE	FTRCOL	56
16	IF (IWGT.EQ.2) WRITE (IU6,10)ECUT,ETEMP,ANDRM	FTRCOL	57
17	WRITE (IU6,70) IB	FTRCOL	59
18	CALL WOT (EG(1),NENP,1,1,6H GROUP,6HBOUND,1,IU6)	FTRCOL	60
19	CALL WOTI (NFIB,NCR,1,1,6HBD,GRP,6HNUMBR,1,IU6)	FTRCOL	61
20	WRITE (IU6,60) (XISO(J),J=1,NISO)	FTRCOL	62
21	RETURN	FTRCOL	63
22		FTRCOL	64
23		FTRCOL	65
24		FTRCOL	66
25	10 FORMAT (* FOR 1/E FISSION SPECTRUM/* ENERGY CUT (EV)*.1PE12,5/	FTRCOL	67
26	1* TEMPERATURE (EV)*.1PE12,5/* NORMALIZATION*.1PE12,5)	FTRCOL	68
27	20 FORMAT (14I5)	FTRCOL	69
28	30 FORMAT (7E10,3)	FTRCOL	70
29	40 FORMAT (12A6)	FTRCOL	71
30	50 FORMAT (*NO. OF GROUPS ON MASTER TAPE*.15/* DOWNSCATTER TERMS	FTRCOL	72
31	1 * .15/* WGT. FCN. OPTION * .15/* 1 1/E WEIGHT FU	FTRCOL	73
32	2 FUNCTION/* 2 1/E * FISSION WEIGHT FUNCTION/* 3 INPUT WEI	FTRCOL	74
33	3IGHTING FUNCTION/* NO. OF COLLAPSED GROUPS * .15/* NO. OF ISOTOP	FTRCOL	75
34	4ES FROM MASTER*.15/* OUTPUT CARD/TAPE,6/1 * .15/* EDIT COLLAP	FTRCOL	76
35	5SE 1-YES/1-NO * .15)	FTRCOL	77
36	60 FORMAT (*OLIST OF ISOTOPES FROM TAPE*.12X,*ISOTOPE NAME*/(16X,A6/	FTRCOL	78
37	1)	FTRCOL	79
38	70 FORMAT (* NEW TAPE (ISOTXS/BRKXS)*.1 I/O (YES/NO)	FTRCOL	80
39	1*.15)	FTRCOL	81
40	END	FTRCOL	82

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SUBROUTINE FLUX

SINGLY REFERENCED VARIABLES																	
ALL	-	3CN	EPFIS	-	4CN	IC	-I	3CO	115	-I	3CO	KT	-I	27	RETURN	-	33F
ALOG	-	ASH	ETEMP	-R	4CO	IE	-I	3CO	117	-I	3CO	NISN	-I	3CO	XISO	(1R	3CO
ANDRM	-R	4CN	EXTERNA	-	2F	1U3	-I	3CO	118	-I	3CO	NXDN	-I	3CO			
ECUT	-R	4CO	FLUX	-	1SU	1U4	-I	3CO	119	-I	3CO	GNC7	-	27SU			

MULTIPLY-REFERENCED VARIABLES

1A	-	5	6*														
2A	-	7DO	9*														
3A	-	5	10*	20													
4A	-	17DO	19*														
5A	-	14DO	21*														
6A	-	5	23*														
7A	-	24DO	28*														
8A	-	22	30*														
9A	-	11WR	34*														
10A	-	31WR	35*														
CDEF	-	2SU	27														
COMMON	(1R	3CO	15=	18=	18	32AG											
COMMON	-	2F	4F														
EG	(1R	3CO	8	25	26												
ELIGH	-R	24=	27														
ELOW	-R	2A=	27														
EPFIS	(1R	3CO	A=	12AG	18	27=											
FORMAT	-	34F	25F														
I	-I	7DO	A	A	A	14DO	15	16	18	18	24DO	25	26	27			
IIA	-I	3CO	11WR	12AG	31WR	32AG											
ISGT	-I	3CO	5														
J	-I	17DO	18														
JO	-I	13=	17DO	2A=													
NCH	-I	3CO	14DO	12AG													
NISN	(1I	3CO	15														
NXDN	-I	3CO	7DO	12AG	24DO												
N	-I	15=	17DO	2A													
WAT	-	12SU	12SU														
WRITE	-	11F	31F														

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FUNCTION CDEF (EX)

1	FUNCTION CDEF (EX)																
2	COMMON /EPFIS/ ECUT,ETEMP,ANDRM																
3	IF (EX,GE,ECUT) GO TO 10																
4	CDEF=ANDRM/EX																
5	RETURN																
6	10 CDEF=SQRT(EX)*EXP(-EX/ETEMP)																
7	RETURN																
8	END																

FTACOL	125
FTACOL	126
FTACOL	127
FTACOL	128
FTACOL	129
FTACOL	130
FTACOL	131
FTACOL	132

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FUNCTION CDEF (EX)

SINGLY REFERENCED VARIABLES

COMMON	-	2F	EPFIS	-	2CN	EXP	-	6SU	SQRT	-	6SU
--------	---	----	-------	---	-----	-----	---	-----	------	---	-----

MULTIPLY-REFERENCED VARIABLES

1A	-	3	6*								
ANDRM	-R	2CO	4								
CDEF	-	1SU	4=	6=							
ECUT	-R	2CO	3								
ETEMP	-R	2CO	6								
EX	-R	1AG	3	4	6	6					
RETURN	-	5F	7F								

1	FUNCTION QNC7 (F0F,Y1,Y2,FERR,KOUNT)	FTRCOL	133
2	DT=FUSION F0T(20), F1T(20), F2T(20), F3T(20), F4T(20), F5T(20), F6	FTRCOL	134
	1T(20), F(13), W(4), LEG(20), DAT(20), XMT(20), ART(20), PST(20),	FTRCOL	135
	2ESTT(20), SUM1(20)	FTRCOL	136
3	W(1)=47./R40.	FTRCOL	137
4	W(2)=216./R40.	FTRCOL	138
5	W(3)=27./R40.	FTRCOL	139
6	W(4)=272./R40.	FTRCOL	140
7	A=Y1	FTRCOL	141
8	B=Y2	FTRCOL	142
9	EPS=FERR	FTRCOL	143
10	DA=B-A	FTRCOL	144
11	ADFA=1.	FTRCOL	145
12	EST=1.	FTRCOL	146
13	I=1	FTRCOL	147
14	DO 10 T=1,12	FTRCOL	148
15	10 F(I)=F0F(A+DA*(I-1)/12.)	FTRCOL	149
16	KOUNT=T	FTRCOL	150
17	20 HX=DA/6.	FTRCOL	151
18	XN=A+HX	FTRCOL	152
19	DO 30 T=2,12	FTRCOL	153
20	30 F(I)=F0F(A+DA*(I-1)/12.)	FTRCOL	154
21	KOUNT=KOUNT+6	FTRCOL	155
22	QNC7=.	FTRCOL	156
23	IF (KOUNT.GT.5000) RETURN	FTRCOL	157
24	ESTL=(W(1)*F(1)+W(2)*F(2)+W(3)*F(3)+W(4)*F(4)+W(5)*F(5)+W(6)*F(6)+	FTRCOL	158
	W(7)*F(7)+W(8)*F(8)+W(9)*F(9)+W(10)*F(10)+W(11)*F(11)+W(12)*F(12)+	FTRCOL	159
25	W(13)*F(13))*DA	FTRCOL	160
	12)+W(13)*F(13))*DA	FTRCOL	161
26	ADFA=AREA-A45(EST)+ABS(ESTL)+ABS(FSTR)	FTRCOL	162
27	SUM=FSTL+FSTR	FTRCOL	163
28	IF (ABS(FST-SUM)-EPS*AREA) 40,45,55	FTRCOL	164
29	40 IF (FST=1.) 70,50,70	FTRCOL	165
30	50 IF (L=20) 60,70,70	FTRCOL	166
31	60 L=L+1	FTRCOL	167
32	LEG(L)=2	FTRCOL	168
33	F0T(L)=F(7)	FTRCOL	169
34	F1T(L)=F(8)	FTRCOL	170
35	F2T(L)=F(9)	FTRCOL	171
36	F3T(L)=F(10)	FTRCOL	172
37	F4T(L)=F(11)	FTRCOL	173
38	F5T(L)=F(12)	FTRCOL	174
39	F6T(L)=F(13)	FTRCOL	175
40	DXT(L)=DX	FTRCOL	176
41	XMT(L)=XM	FTRCOL	177
42	ART(L)=ADFA	FTRCOL	178
43	PST(L)=EPS/1.4	FTRCOL	179
44	FST(L)=FSTR	FTRCOL	180
45	DA=DX	FTRCOL	181
46	F(13)=F(7)	FTRCOL	182
47	F(11)=F(4)	FTRCOL	183
48	F(9)=F(2)	FTRCOL	184
49	F(7)=F(4)	FTRCOL	185
50	F(5)=F(3)	FTRCOL	186
51	F(3)=F(2)	FTRCOL	187
52	EST=ESTL	FTRCOL	188
53	EPS=EPS+T(L)	FTRCOL	189
54	GO TO 70	FTRCOL	190
55	70 IF (L=1) 90,80,80	FTRCOL	191
56	80 SUM(L)=SUM	FTRCOL	192
57	LEG(L)=1	FTRCOL	193
58	A=XMT(L)	FTRCOL	194
59	DA=DXT(L)	FTRCOL	195
60	F(1)=F0T(L)	FTRCOL	196
61	F(2)=F1T(L)	FTRCOL	197
62	F(3)=F2T(L)	FTRCOL	198
63	F(4)=F3T(L)	FTRCOL	199
64	F(5)=F4T(L)	FTRCOL	200
	F(11)=F5T(L)	FTRCOL	201
	F(12)=F6T(L)	FTRCOL	202
	ART=ART(L)	FTRCOL	203
68	EST=EST(L)	FTRCOL	204
69	EPS=EPS+T(L)	FTRCOL	205
70	GO TO 70	FTRCOL	206
71	90 SUM=SUM1(L)+SUM	FTRCOL	207
72	L=L+1	FTRCOL	208
73	IF (L=7) 100,100,70	FTRCOL	209
74	100 QNC7=SUM	FTRCOL	210
75	RETURN	FTRCOL	211
76	END	FTRCOL	212

INDEX 02/18/75			FUNCTION QNCT (FNF,Y1,Y2,PFRR,KOUNT)																			
SINGLY REFERENCED VARIABLES																						
DIMFMSI = 2F																						
MULTIPLY-REFERENCED VARIABLES																						
1n	=	1400	15*																			
2n	=	17*	44	7n																		
3n	=	1900	28*																			
4n	=	78	28	29*																		
5n	=	28	29	7n*																		
6n	=	30	31*																			
7n	=	29	29	3n	30	55*	73															
8n	=	45	55	56*																		
9n	=	45	71*																			
10n	=	73	73	74*																		
A	=R	7=	15	15	18	20	58*															
ARS	=	265U	265U	265U	265U																	
AREA	=R	11*	26*	26	28	42	67*															
ART	(1)R	2P1	42*	67																		
R	=R	8*	1n																			
DA	=R	10*	15	17	20	45*	59*															
DX	=R	17*	18	24	25	40																
DXT	(1)R	2n1	4*	59																		
EPS	=R	9*	28	43	53*	69*																
EPST	(1)R	201	43*	53	69																	
EST	=R	12*	26	28	29	52*	68*															
F51L	=R	24*	26	27	42																	
F510	=R	25*	25	27	44																	
F51T	(1)R	201	44*	68																		
F	(1)R	201	15*	20*	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		23	24	25	26	27	28	29	30	30	44*	44*	44*	47*	47	48*	48	49*	49	50*	50	50
		51*	61	60*	61*	62*	63*	64*	64*	66*												
FERR	=R	1AG	9																			
FOF	=	1AG	145U	245U																		
FOT	(1)R	201	33*	60																		
F1T	(1)R	201	36*	51																		
F2T	(1)R	201	36*	60																		
F3T	(1)R	201	36*	60																		
F4T	(1)R	201	37*	44																		
F5T	(1)R	201	37*	65																		
F6T	(1)R	201	37*	66																		
I	=I	1400	15	15	1900	20	20															
KOUNT	=I	1AG	1A*	21*	21	23																
L	=I	11*	21	21*	21	23	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	47
		53	65	64	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	73
LEG	(1)I	201	20*	65	57*																	
QNCT	=	15U	22*	74*																		
RETURN	=	23F	76F																			
SUM	=R	27*	29	56	71*	71	74															
SUM1	(1)R	201	6A*	71																		
W	(1)R	201	3*	4*	5*	6*	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		25	26																			
XN	=R	1A*	41																			
XMT	(1)R	201	61*	58																		
Y1	=R	1AG	7																			
Y2	=R	1AG	8																			

INDEX 02/19/75		SUBROUTINE SEARCH(FIN)																			
1		SUBROUTINE SEARCH(FIN)																			
2		FIND LOG OF INTEREST AND PROCEED																			
3		COMMON /ALL/ IUS,IU4,IUS,IU6,IU7,IU9,IU9,NGPS,NXON,IWGT,NCR,NISO,I																			
4		1C1F F6(1A1) *F1B(100) *XISO(100) *F6P(1A1) *CAP(100)																			
5		COMMON /FTR/ WOLN(1) *ATW(1) *NT(1) *NGR(1) *NGE(1) *NPFF(4) *TEM(3)																			
6		1 *SF(4,1) *FF(4,30) *R1 *SR(9,100) *SW(1A1) *F40) *IGM *NXCMP																			
7		DISPLAY ON																			
8		NXCMP = XON																			
9		IGM = NGPS																			
10		IGM = 1																			
11		CONTINUE																			
12		READ (1U7,15) X																			
13		IF (F06(IU3) 30,20																			
14		CONTINUE																			
15		I=1																			
16		IF (X,F0,XISO(I)) GO TO 40																			
17		GO TO 10																			
18		CONTINUE																			
19		WRITE (1U4,160)																			
20		STOP																			
21		CONTINUE																			
22		NFCAD = FNDAT																			
23		BACKSPACE (U3																			
24		DO 55 I=1,4																			
25		DO 55 I=1,300																			
26		DO 55 I=1,8																			
27		50 FF(I,J,K)=1.0																			
28		WRITE (1U4,170) XISO(I)																			
29		READ (1U5,180) WOLN(1) *ATW(1) *NT(1) *NGR(1) *NGE(1) *NPFF(K,1) *K=1,4																			
30		1 *TEM(1) *K=1,3																			
31		IF (NT(1) 40,60,70																			
32		40 NCR=1																			
33		50 NCR=1																			
34		60 GO TO 20																			

```

30 70 K=7000000-2
31 IF=3000000000
32 80 DO 100 K=1,4
33 IF=NDFF(W)
34 IF (K=10000000000
35 90 READ (100,100) (SF(K+1,N),N=1,NF)
36 READ (100,100) ((FF(K,J,N),N=1,NF),J=ND,NF)
37 100 CONTINUE
38 DO 110 I=1,100
39 READ (100,200) L (SR(K,TIG),K=1,9)
40 110 CONTINUE
41 DO 120 I=1,100
42 IF (NXCM2-1) 120,120,130
43 120 READ (100,210) L (SM(IIG,K),K=1,NXCM2)
44 GO TO 140
45 130 READ (100,220) L (SM(IIG,K),K=1,NXCM2)
46 140 CONTINUE
47 150 FORMAT (A)
48 160 FORMAT (A,SEARCHED ENTIRE TAPE BUT COULD NOT FIND DATA-CHECK INPUT)
49 170 FORMAT (A,PROCESSING ISOTYPE NAME *.A)
50 180 FORMAT (A,FA,2,716,3E4.0)
51 190 FORMAT (12FA,3)
52 200 FORMAT (13F10.4,E9.4,F5.3,E10.4,F6.4,F9.4,E6.4,FA,4,EB,4)
53 210 FORMAT (13F7.4,10F6.4)
54 220 FORMAT (13F7.4,10F6.4/12E6.4)
55 END
56 C HCU FHS

```

FTRCOL 247
 FTRCOL 248
 FTRCOL 249
 FTRCOL 250
 FTRCOL 251
 FTRCOL 252
 FTRCOL 253
 FTRCOL 254
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 FTRCOL 271
 FTRCOL 272
 FTRCOL 273
 FTRCOL 274
 FTRCOL 275
 FTRCOL 276
 FTRCOL 277

INDEX #2/10/75										SUBROUTINE SEARCH(MPTN)									
SINGLY REFERENCED VARIABLES																			
ALL	2CM	EO	11R	2CO	FTR	-	3CM	104	-	2CO	108	-	2CO	NCR	-	2CO	SEARCH	-	18U
BACKPA	19F	EOF	-	9F	IC	-	2CO	114	-	2CO	116	-	2CO	NFIR	111	2CO			
CGPHI	11R	2CO	CGPHI	11R	2CO	IF	-	2CO	117	-	2CO	118	-	2CO	NISN	-	2CO		
MULTIPLY-REFERENCED VARIABLES																			
1*	7*	13																	
2*	9	14*																	
3*	9	14*																	
4*	12	17*																	
5*	2400	2100	2200	23*															
6*	26	26	27*																
7*	26	26	27*																
8*	29	29*																	
9*	34	35*																	
10*	3000	34	37*																
11*	3000	40*																	
12*	42	42	43*																
13*	42	45*																	
14*	4100	44	46*																
15*	800	44*																	
16*	1500	40*																	
17*	2400	40*																	
18*	2500	41*																	
19*	3500	4400	52*																
20*	3500	43*																	
21*	4100	44*																	
22*	4500	45*																	
ATM	11R	200	2000																
COMMON	2F	2F																	
FF	11R	200	200	3600															
FORMAT	40F	40F	40F	51F	52F	53F	54F	40F											
HOLM	11R	200	2500																
I	-1	6*	11	12	2000	23													
IGM	-1	200	5*	2000	4100														
IZ	-1	11*	2400																
110	-1	3000	3400	4100	4300	4500													
113	-1	200	400	9	19	2500	3400	3600	4000	4400	4500								
116	-1	200	1500	2400															
J	-1	2100	23	2400	2600														
K	-1	2000	23	2400	2500	2500	2500	3200	33	3400	3600	3900	3900	4300	4300	4500	4600		
L	-1	2000	4700	4500															
N	-1	2500	2400	2400	2400														
NH	-1	27*	30*	2400															
NE	-1	24*	11*	2400															
NF	-1	33*	24	2400	2500														
NFIND	-1	146	6	18*	18														
NH8	111	300	2400	27	20														
NH8	111	300	2400	28	21														
NHPS	-1	200	5																
NHFF	111	300	2400	32															
NT	111	300	2400	26															
NHCHR	-1	200	4*	42	4300	4500													
NHCH	-1	200	4																
OF6U	-	40	24F	34F	36F	30F	43F	45F											
RETURN	-	16F	47F																
SF	11R	300	3500																
SW	11R	200	4300	4500															
SR	11R	300	3000																
TEH	11R	300	2500																
WRITE	-	15F	24F																
X	-R	12																	
XISO	11R	200	12	2400															

1		SUBROUTINE COLAP	FTRCOL	278
2	C	COLLAPSE THE CROSS SECTION AND F-FACTOR INFORMATION	FTRCOL	279
3		COMMON A(100,100)	FTRCOL	280
4		COMMON VALL/ IU3,IU4,IU5,IU6,IU7,IU8,IU9,IU0,NGPS,NXON,INGT,NCR,NISO,I	FTRCOL	281
5		IC,IF,FA(100),NFIL(100),XISO(100),FGRPH(100),CGRPH(100)	FTRCOL	282
6		COMMON /PTR/ MOLA(1),ATW(1),NT(1),NGR(1),NGE(1),NPEF(4,1),TEM(3,1)	FTRCOL	283
7		1,SE(4,100),FF(4,300,8),SP(0,100),SW(1,1,340),IGM,NXCMR	FTRCOL	284
8		COMMON /PTR/ NGR(1),GFC(1),FFC(4,300,8),SPC(9,100),SMC(100,40)	FTRCOL	285
9		COMMON /PTRS/ STRC(150),SRCN2N(40)	FTRCOL	286
10	C	COLLAPSE THE PRINCIPAL CROSS SECTIONS	FTRCOL	287
11	C	DISPLAY OFF	FTRCOL	288
12		CALL INITC	FTRCOL	289
13		JC=1	FTRCOL	290
14		DO 20 N=1,NCR	FTRCOL	291
15		ST=0.	FTRCOL	292
16		SF=0.	FTRCOL	293
17		SC=0.	FTRCOL	294
18		SI=0.	FTRCOL	295
19		SE=0.	FTRCOL	296
20		SU=0.	FTRCOL	297
21		NX=NFIL(N)	FTRCOL	298
22		DO 10 I=1,NX	FTRCOL	299
23		ST=ST+SR(I,1)*FGRPH(I)	FTRCOL	300
24		SF=SF+SR(2,1)*FGRPH(I)	FTRCOL	301
25		SC=SC+SR(4,1)*FGRPH(I)	FTRCOL	302
26		SI=SI+SR(5,1)*FGRPH(I)	FTRCOL	303
27		SE=SE+SR(6,1)*FGRPH(I)	FTRCOL	304
28		SC=SC+SR(4,1)*FGRPH(I)	FTRCOL	305
29		CPH=1./FGRPH(N)	FTRCOL	306
30		SPC(1,1)=ST*CPH	FTRCOL	307
31		SPC(2,1)=SF*CPH	FTRCOL	308
32		SPC(4,1)=SC*CPH	FTRCOL	309
33		SPC(5,1)=SI*CPH	FTRCOL	310
34		SPC(6,1)=SE*CPH	FTRCOL	311
35		SPC(9,1)=SC*CPH	FTRCOL	312
36		JC=JC+1	FTRCOL	313
37	C	NOW COLLAPSE NU AND MU	FTRCOL	314
38		JC=1	FTRCOL	315
39		DO 40 N=1,NCR	FTRCOL	316
40		SH=0.	FTRCOL	317
41		SL=0.	FTRCOL	318
42		SX=0.	FTRCOL	319
43		CP=0.	FTRCOL	320
44		SP=0.	FTRCOL	321
45		NX=NFIL(N)	FTRCOL	322
46		DO 30 I=1,NX	FTRCOL	323
47		CPH=CPH+SR(2,1)*FGRPH(I)	FTRCOL	324
48		SP=SP+SR(4,1)*FGRPH(I)	FTRCOL	325
49		SH=SH+SR(2,1)*SR(3,1)*FGRPH(I)	FTRCOL	326
50		SL=SL+SR(4,1)*SR(7,1)*FGRPH(I)	FTRCOL	327
51		SX=SH+SR(6,1)*SR(8,1)*FGRPH(I)	FTRCOL	328
52		IF (CPH=0.,0.) GO TO 40	FTRCOL	329
53		SRC(3,1)=SH/CPH	FTRCOL	330
54		IF (SP=0.,0.) GO TO 50	FTRCOL	331
55		SRC(7,1)=SL/SPH	FTRCOL	332
56		SRC(8,1)=SX/SPH	FTRCOL	333
57		JC=JC+1	FTRCOL	334
58	C	NOW COLLAPSE DOWNSCATTER MATRIX	FTRCOL	335
59		NSFT=NGPS+NXCMR	FTRCOL	336
60		DO 60 I=1,NSFT	FTRCOL	337
61		DO 60 J=1,NSFT	FTRCOL	338
62		A(I,1)=0.	FTRCOL	339
63		DO 70 I=1,NGPS	FTRCOL	340
64		II=I	FTRCOL	341
65		JJ=1	FTRCOL	342
66		JK=1	FTRCOL	343
67		DO 70 I=1,NGPS	FTRCOL	344
68		A(I,JK)=SM(I,JJ)	FTRCOL	345
69		JJ=JJ+1	FTRCOL	346
70		JK=JK+1	FTRCOL	347
71		CONTINUE	FTRCOL	348
72		JC=1	FTRCOL	349
73		DO 100 J=1,NCR	FTRCOL	350
74		KL=J	FTRCOL	351
75		IF (KL=GT.NCMR) GO TO 130	FTRCOL	352
76		IX=NFIL(I)	FTRCOL	353
77		KSTF=0.	FTRCOL	354
78		DO 120 K=KL,NCR	FTRCOL	355
79		SUM=0.	FTRCOL	356
80		IF (K=0,1) GO TO 80	FTRCOL	357
81		KC=NFIL(K-1)+1	FTRCOL	358
82		GO TO 80	FTRCOL	359
83		KC=1	FTRCOL	360
84		KD=NFIL(K)	FTRCOL	361
85		DO 110 J=1,NX	FTRCOL	362
86		SUM=0.	FTRCOL	363
87		KE=KD	FTRCOL	364
88		IF (KE=GT.NXCMR) KE=JJ+NXCMR-1	FTRCOL	365
89		DO 100 K=KE,NCR	FTRCOL	366

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95 SUM=SUM+A(JJ+KK) FTACOL 367
96 100 CONTINUE FTACOL 368
97 SL=SUM1+SUM*FGPH(JJ) FTACOL 369
98 110 CONTINUE FTACOL 370
99 SMC(J,KSTFP)=SUM1/CGPH(JJ) FTACOL 371
100 KSTFP=KSTFP+1 FTACOL 372
101 JC=NX+1 FTACOL 373
102 C CALCULATE GROUP LETHARGY DIFFERENCE FTACOL 374
103 NCR=1 FTACOL 375
104 DO 145 I=1,NCR FTACOL 376
105 NY=NF(N(I)) FTACOL 377
106 A(I+1)=A(NG(EG(NX)/EG(NY))) FTACOL 378
107 NX=NY FTACOL 379
108 140 CONTINUE FTACOL 380
109 UG=0.0 FTACOL 381
110 NCP=NCP+1 FTACOL 382
111 DO 155 I=1,NCP FTACOL 383
112 U1=UG+A(I+1) FTACOL 384
113 U2=UG+A(I+1) FTACOL 385
114 U3=UG+A(I+1) FTACOL 386
115 UX=UG+A(I+1) FTACOL 387
116 TEMP1=CGPH(I+1)*A(I+1)/(CGPH(I)*A(I+1)) FTACOL 388
117 TEMP2=(UX-U1)/(U2-U1) FTACOL 389
118 TEMP3=SRC(I+1)*SMC(6,I) FTACOL 390
119 TEMP4=SRC(I+1)*SRC(6,I+1) FTACOL 391
120 SRC(I+1)=(TEMP3+TEMP2*(TEMP1*TEMP4-TEMP3))/A(I+1) FTACOL 392
121 150 CONTINUE FTACOL 393
122 NOW CALCULATE IN GROUP SCATTERING FTACOL 394
123 ISTOP=NCR FTACOL 395
124 IF (ISTOP.GT.NXCMR) ISTOP=NXCMR FTACOL 396
125 DO 175 J=1,NCR FTACOL 397
126 TEMP=0.0 FTACOL 398
127 DO 160 J=1,ISTOP FTACOL 399
128 TEMP=TEMP+SMC(I,J) FTACOL 400
129 SAH=SRC(I+1)*SRC(4,I)-(TEMP-SRC(I+1)) FTACOL 401
130 STC(I)=(SRC(I+1)-SAH-TEMP)*(1.0-SRC(7,I))+SAH+TEMP FTACOL 402
131 STC(I)=SRC(I+1)-SRC(6,I)*SRC(7,I) FTACOL 403
132 SMC(I+1)=STC(I)-SAH-TEMP+SMC(I+1)-SRC(9,I) FTACOL 404
133 SMC(I+1)=SMC(I+1)+SRC(9,I) FTACOL 405
134 SRCN2N(I)=TEMP+SMC(5,I) FTACOL 406
135 ISTOP=ISTOP+1 FTACOL 407
136 170 CONTINUE FTACOL 408
137 BALANCE THE CROSS SECTIONS FTACOL 409
138 ISTOP=0 FTACOL 410
139 IF (ISTOP.GT.NXCMR) ISTOP=NXCMR FTACOL 411
140 NCR=NCR FTACOL 412
141 DO 215 I=1,NCR FTACOL 413
142 TEMP=0.0 FTACOL 414
143 DO 180 J=1,ISTOP FTACOL 415
144 TEMP=TEMP+SMC(I,J) FTACOL 416
145 ISTOP=ISTOP+1 FTACOL 417
146 TEMP NOW HAS THE SCATTERING COMPONENT FTACOL 418
147 NOW GET ABSORPTION FTACOL 419
148 SAH=SRC(I+1)*SRC(4,I)-SRCN2N(I) FTACOL 420
149 NOT COMPUTE SCATTERING AND ABSORPTION TO TOTAL (TRANSPORT) FTACOL 421
150 DELTA=SRC(I+1)-(SAH+TEMP) FTACOL 422
151 IF (ABS(DELTA).GT.1.0E-06) GO TO 165 FTACOL 423
152 GO TO 195 FTACOL 424
153 190 CONTINUE FTACOL 425
154 CORRECT CROSS SECTION BY PUTTING IN THE BOTTOM COLLAPSED GROUP FTACOL 426
155 ASSUMING THAT DISCREPANCY IS DUE TO DOWN SCATTERING INTO THE FTACOL 427
156 DOWN (SMK) GROUP THAT IS GROUP NCR+1 FTACOL 428
157 SMC(I,NCR+1)=SMC(I,NCR)/DELTA FTACOL 429
158 NCR=NCR+1 FTACOL 430
159 200 CONTINUE FTACOL 431
160 NOW CALCULATE F-FACTORS FOR FISSION, CAPTURE AND ELASTIC FTACOL 432
161 NCR=NCR+1 FTACOL 433
162 NCR=NCR+1 FTACOL 434
163 DO 225 I=1,4 FTACOL 435
164 II=I FTACOL 436
165 GO TO (220+230+240+250)*II FTACOL 437
166 220 JJ=2 FTACOL 438
167 GO TO 265 FTACOL 439
168 230 JJ=4 FTACOL 440
169 GO TO 265 FTACOL 441
170 240 JJ=1 FTACOL 442
171 GO TO 265 FTACOL 443
172 250 JJ=6 FTACOL 444
173 NCR=NCR+1 FTACOL 445
174 IF (NCR.NE.1) GO TO 320 FTACOL 446
175 LOOP OVER SIGMA VALUES=FIRST SET PRODUCT OF F-FACTOR AND FINE X-SE FTACOL 447
176 SECTION FTACOL 448
177 DO 325 J=1,NCR FTACOL 449
178 JC=1 FTACOL 450
179 ISF=1 FTACOL 451
180 ICM=1 FTACOL 452
181 DO 315 LI=1,NCR FTACOL 453
182 LSAV=1 FTACOL 454
183 NX=NF(N(LI)) FTACOL 455

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159 IF (IX.LT.NX) GO TO 308
160 ISU=ISU+1
161 IF (ISU.EQ.1) NGRC(1)=LL
INITIALIZE THE NUMERATOR TERM FLUX*ROSS SECTION * F-FACTOR
162 SUM1=0.0
163 SUM2=0.0
164 SUM3=0.0
165 DO 280 KX=JC,NX
166 IF (NT(1,GT,0)) GO TO 278
167 SUM1=SUM1+FGPH(KK)*FF(1,IKK,J)*SR(JJ,KK)
168 GO TO 282
169 270 IT=3*KK-3
MAY HAVE TO PUT IN SPECIAL LOOP FOR TOTAL (IT=3)
170 SUM1=SUM1+FGPH(KK)*FF(1,IT*0,J)*SR(JJ,KK)
171 SUM2=SUM2+FGPH(KK)*FF(1,IT*1,J)*SR(JJ,KK)
172 SUM3=SUM3+FGPH(KK)*FF(1,IT*2,J)*SR(JJ,KK)
173 280 CONTINUE
174 IF (SR(1,1,LL).EQ.0.0) GO TO 300
175 IF (NT(1,GT,0)) GO TO 282
176 FFC(1,LL,J)=SUM1/(SRC(JJ,LL)*CGPH(LL,1))
177 GO TO 322
178 290 IT=3*11-3
DISPLAY ON
179 SRX=1.0/(CGPH(LL)*SRC(JJ,LL))
180 FFC(1,IT*0,J)=SUM1*SRX
181 FFC(1,IT*1,J)=SUM2*SRX
182 FFC(1,IT*2,J)=SUM3*SRX
DISPLAY OFF
183 300 JC=IKK+1
184 310 CONTINUE
185 NGRC(1)=SAV
186 320 CONTINUE
DISPLAY OFF
187 RETURN
188 END

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FTRCOL 458
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SUBROUTINE COLAP

SINGLY REFERENCED VARIABLES

ABS	=	1250	COLAP	=	150	HOLDN	110	400	160	=	1	400	105	=	1	300	109	=	1	300	NAPN	=	1	300
ALL	=	700	COINCS	=	400	IC	=	1	300	INITC	=	750	106	=	1	300	INGT	=	1	300	RETURN	=	1070	
ALOG	=	9150	FTF	=	400	ICOUNT	=	1	155	103	=	1	300	107	=	1	100	NE	=	1	139	TFM	110	400
ATW	110	400	FTMC	=	400	IE	=	1	300	104	=	1	300	108	=	1	300	N150	=	1	300	X150	110	300

MULTIPLY-REFERENCED VARIABLES

1*	=	1700	23*																					
2*	=	900	11*																					
3*	=	4000	45*																					
4*	=	40	48*																					
5*	=	3700	49*																					
6*	=	5700	5000																					
7*	=	5600	4000																					
8*	=	73	74*																					
9*	=	75	77*																					
10*	=	8200	84*																					
11*	=	7800	86*																					
12*	=	7100	88*																					
13*	=	6800	89																					
14*	=	9100	95*																					
15*	=	9000	97*																					
16*	=	11300	114*																					
17*	=	11100	121*																					
18*	=	12700	128*																					
19*	=	110	140*																					
20*	=	113	140*																					
21*	=	12500	147*																					
22*	=	142	143*																					
23*	=	142	145*																					
24*	=	142	147*																					
25*	=	142	148*																					
26*	=	144	149*																					
27*	=	166	149*																					
28*	=	16500	149																					
29*	=	175	174*																					
30*	=	169	174																					
31*	=	15400	180*																					
32*	=	14000	181																					

A (1R 200 500 410 81 930 99 100 141 103 103 107
 CGPH (1R 300 50 87 103 103 170 170
 COINCS = 20 3F 4F 5F 6F
 CPH = 20 240 25 26 27 28 29 30 370 410 41 45 57
 DELTA = 20 171 172 173
 FG (1R 300 91 91
 FF (1R 400 167 170 171 172
 FFC (1R 500 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200
 FGPH (1R 300 18 19 19 20 20 21 21 22 22 23 23 24 24 25 25 26 26 27 27 28 28 29 29 30 30 31 31 32 32 33 33 34 34 35 35 36 36 37 37 38 38 39 39 40 40 41 41 42 42 43 43 44 44 45 45 46 46 47 47 48 48 49 49 50 50 51 51 52 52 53 53 54 54 55 55 56 56 57 57 58 58 59 59 60 60 61 61 62 62 63 63 64 64 65 65 66 66 67 67 68 68 69 69 70 70 71 71 72 72 73 73 74 74 75 75 76 76 77 77 78 78 79 79 80 80 81 81 82 82 83 83 84 84 85 85 86 86 87 87 88 88 89 89 90 90 91 91 92 92 93 93 94 94 95 95 96 96 97 97 98 98 99 99 100 100 101 101 102 102 103 103 104 104 105 105 106 106 107 107 108 108 109 109 110 110 111 111 112 112 113 113 114 114 115 115 116 116 117 117 118 118 119 119 120 120 121 121 122 122 123 123 124 124 125 125 126 126 127 127 128 128 129 129 130 130 131 131 132 132 133 133 134 134 135 135 136 136 137 137 138 138 139 139 140 140 141 141 142 142 143 143 144 144 145 145 146 146 147 147 148 148 149 149 150 150 151 151 152 152 153 153 154 154 155 155 156 156 157 157 158 158 159 159 160 160 161 161 162 162 163 163 164 164 165 165 166 166 167 167 168 168 169 169 170 170 171 171 172 172 173 173 174 174 175 175 176 176 177 177 178 178 179 179 180 180 181 181 182 182 183 183 184 184 185 185 186 186 187 187 188 188 189 189 190 190 191 191 192 192 193 193 194 194 195 195 196 196 197 197 198 198 199 199 200 200 201 201 202 202 203 203 204 204 205 205 206 206 207 207 208 208 209 209 210 210 211 211 212 212 213 213 214 214 215 215 216 216 217 217 218 218 219 219 220 220 221 221 222 222 223 223 224 224 225 225 226 226 227 227 228 228 229 229 230 230 231 231 232 232 233 233 234 234 235 235 236 236 237 237 238 238 239 239 240 240 241 241 242 242 243 243 244 244 245 245 246 246 247 247 248 248 249 249 250 250 251 251 252 252 253 253 254 254 255 255 256 256 257 257 258 258 259 259 260 260 261 261 262 262 263 263 264 264 265 265 266 266 267 267 268 268 269 269 270 270 271 271 272 272 273 273 274 274 275 275 276 276 277 277 278 278 279 279 280 280 281 281 282 282 283 283 284 284 285 285 286 286 287 287 288 288 289 289 290 290 291 291 292 292 293 293 294 294 295 295 296 296 297 297 298 298 299 299 300 300 301 301 302 302 303 303 304 304 305 305 306 306 307 307 308 308 309 309 310 310 311 311 312 312 313 313 314 314 315 315 316 316 317 317 318 318 319 319 320 320 321 321 322 322 323 323 324 324 325 325 326 326 327 327 328 328 329 329 330 330 331 331 332 332 333 333 334 334 335 335 336 336 337 337 338 338 339 339 340 340 341 341 342 342 343 343 344 344 345 345 346 346 347 347 348 348 349 349 350 350 351 351 352 352 353 353 354 354 355 355 356 356 357 357 358 358 359 359 360 360 361 361 362 362 363 363 364 364 365 365 366 366 367 367 368 368 369 369 370 370 371 371 372 372 373 373 374 374 375 375 376 376 377 377 378 378 379 379 380 380 381 381 382 382 383 383 384 384 385 385 386 386 387 387 388 388 389 389 390 390 391 391 392 392 393 393 394 394 395 395 396 396 397 397 398 398 399 399 400 400 401 401 402 402 403 403 404 404 405 405 406 406 407 407 408 408 409 409 410 410 411 411 412 412 413 413 414 414 415 415 416 416 417 417 418 418 419 419 420 420 421 421 422 422 423 423 424 424 425 425 426 426 427 427 428 428 429 429 430 430 431 431 432 432 433 433 434 434 435 435 436 436 437 437 438 438 439 439 440 440 441 441 442 442 443 443 444 444 445 445 446 446 447 447 448 448 449 449 450 450 451 451 452 452 453 453 454 454 455 455 456 456 457 457 458 458 459 459 460 460 461 461 462 462 463 463 464 464 465 465 466 466 467 467 468 468 469 469 470 470 471 471 472 472 473 473 474 474 475 475 476 476 477 477 478 478 479 479 480 480 481 481 482 482 483 483 484 484 485 485 486 486 487 487 488 488 489 489 490 490 491 491 492 492 493 493 494 494 495 495 496 496 497 497 498 498 499 499 500 500 501 501 502 502 503 503 504 504 505 505 506 506 507 507 508 508 509 509 510 510 511 511 512 512 513 513 514 514 515 515 516 516 517 517 518 518 519 519 520 520 521 521 522 522 523 523 524 524 525 525 526 526 527 527 528 528 529 529 530 530 531 531 532 532 533 533 534 534 535 535 536 536 537 537 538 538 539 539 540 540 541 541 542 542 543 543 544 544 545 545 546 546 547 547 548 548 549 549 550 550 551 551 552 552 553 553 554 554 555 555 556 556 557 557 558 558 559 559 560 560 561 561 562 562 563 563 564 564 565 565 566 566 567 567 568 568 569 569 570 570 571 571 572 572 573 573 574 574 575 575 576 576 577 577 578 578 579 579 580 580 581 581 582 582 583 583 584 584 585 585 586 586 587 587 588 588 589 589 590 590 591 591 592 592 593 593 594 594 595 595 596 596 597 597 598 598 599 599 600 600 601 601 602 602 603 603 604 604 605 605 606 606 607 607 608 608 609 609 610 610 611 611 612 612 613 613 614 614 615 615 616 616 617 617 618 618 619 619 620 620 621 621 622 622 623 623 624 624 625 625 626 626 627 627 628 628 629 629 630 630 631 631 632 632 633 633 634 634 635 635 636 636 637 637 638 638 639 639 640 640 641 641 642 642 643 643 644 644 645 645 646 646 647 647 648 648 649 649 650 650 651 651 652 652 653 653 654 654 655 655 656 656 657 657 658 658 659 659 660 660 661 661 662 662 663 663 664 664 665 665 666 666 667 667 668 668 669 669 670 670 671 671 672 672 673 673 674 674 675 675 676 676 677 677 678 678 679 679 680 680 681 681 682 682 683 683 684 684 685 685 686 686 687 687 688 688 689 689 690 690 691 691 692 692 693 693 694 694 695 695 696 696 697 697 698 698 699 699 700 700 701 701 702 702 703 703 704 704 705 705 706 706 707 707 708 708 709 709 710 710 711 711 712 712 713 713 714 714 715 715 716 716 717 717 718 718 719 719 720 720 721 721 722 722 723 723 724 724 725 725 726 726 727 727 728 728 729 729 730 730 731 731 732 732 733 733 734 734 735 735 736 736 737 737 738 738 739 739 740 740 741 741 742 742 743 743 744 744 745 745 746 746 747 747 748 748 749 749 750 750 751 751 752 752 753 753 754 754 755 755 756 756 757 757 758 758 759 759 760 760 761 761 762 762 763 763 764 764 765 765 766 766 767 767 768 768 769 769 770 770 771 771 772 772 773 773 774 774 775 775 776 776 777 777 778 778 779 779 780 780 781 781 782 782 783 783 784 784 785 785 786 786 787 787 788 788 789 789 790 790 791 791 792 792 793 793 794 794 795 795 796 796 797 797 798 798 799 799 800 800 801 801 802 802 803 803 804 804 805 805 806 806 807 807 808 808 809 809 810 810 811 811 812 812 813 813 814 814 815 815 816 816 817 817 818 818 819 819 820 820 821 821 822 822 823 823 824 824 825 825 826 826 827 827 828 828 829 829 830 830 831 831 832 832 833 833 834 834 835 835 836 836 837 837 838 838 839 839 840 840 841 841 842 842

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SUBROUTINE INITC

SINGLY REFERENCED VARIABLES													
COMMON	=	2F	FTRC	=	2CN	INITC	=	1SU	NGAP	(11	2CO	NGEC	(11 2CO
MULTIPLY-REFERENCED VARIABLES													
1A	=	300	400	90									
2A	=	600	700	800	90								
3A	=	1000	1100	1200									
FFC	(1R	200	300										
I	-I	300	5	600	9	1000	12						
J	-I	400	5	700	9	1100	12						
K	-I	800	9										
SMC	(1R	200	120										
SRC	(1R	200	50										

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SUBROUTINE RITPUN

1	SUBROUTINE RITPUN	FTRCOL	507
2	WRITE STANDARD CCCC FILES IF DESIRED-TSOTXS AND RPKQXS	FTRCOL	508
3	COMMON /ALL/ IU3,IU4,IU5,IU6,IU7,IUA,IUG,NGPS,NXNN,IWGT,NCR,NISO,I	FTRCOL	509
4	IC,IE,FC(100),NFIR(100),XISO(100),FGPHI(100),CRPHI(100)	FTRCOL	510
5	COMMON /CCCC/ IUI2,IUI1,KRR,HISONM,HIDENT,HMAT,EFTSS,ECAPT	FTRCOL	511
6	COMMON /FISINF/ CHISO(100)	FTRCOL	512
7	COMMON /TSLAP/ IR	FTRCOL	513
8	IF (IC.EQ.0) RETURN	FTRCOL	514
9	READ (IUE,20)KRR,HISONM,HIDENT,HMAT,EFTSS,ECAPT	FTRCOL	515
10	DO 10 I=1,NCR	FTRCOL	516
11	CHISO(I)=0.0	FTRCOL	517
12	IF (EFTSS.GT.0.0) READ (IU5+40) (CHISO(I),I=1,NCR)	FTRCOL	518
13	WRITE (IUA,30)KRR,HISONM,HIDENT,HMAT,EFTSS,ECAPT	FTRCOL	519
14	IF (IH.EQ.1) CALL RITNW	FTRCOL	520
15	FIRST WRITE ISOTXS FILE	FTRCOL	521
16	CALL RITISO (IU6,IUG)	FTRCOL	522
17	NOW WRITE RPKQXS FILE	FTRCOL	523
18	CALL RITRKK (IUI0,IUI1)	FTRCOL	524
19	IR=0	FTRCOL	525
20	SWITCH UNITS SO THAT MORE MATERIALS CAN BE PUT ONTO TAPE	FTRCOL	526
21	IU=IU0	FTRCOL	527
22	IUG=IUG0	FTRCOL	528
23	IUA=IUA	FTRCOL	529
24	IT=IUI1	FTRCOL	530
25	IUI1=IUI2	FTRCOL	531
26	IUI2=IT	FTRCOL	532
27	RETURN	FTRCOL	533
28	20 FORMAT (15,1A6,2F12.5)	FTRCOL	534
29	30 FORMAT (40 INPUT VALUE FOR VERSION IIT CCCC INTERFACE FILES*/5X,*K	FTRCOL	535
30	1R *12/5X,*HISONM *46/5X,*HIDENT *46/5X,*HMAT	FTRCOL	536
31	20 *A6/5X,*EFTSS *12/5X,*FCAPT *12/5X	FTRCOL	537
32	40 FORMAT (4F12.5)	FTRCOL	538
33	END	FTRCOL	539
34	RCU FUS	FTRCOL	540

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SUBROUTINE RITPUN

SINGLY REFERENCED VARIABLES													
ALL	=	2CN	FGPHI	(1R	2CO	IU3	-I	2CO	NFIR	(11	2CO	RITRKK	= 14SU
CCCC	=	3CN	FISINF	=	4CN	IU4	-I	2CO	NGPS	-I	2CO	RITISO	= 13SU
CRPHI	(1R	2CO	IE	-I	2CO	IU7	-I	2CO	NISO	-I	2CO	RITNW	= 12SU
FC	(1R	3CN	TSLAP	=	6CN	IWGT	-I	2CO	NXNN	-I	2CO	RITPUN	= 1SU
MULTIPLY-REFERENCED VARIABLES													
1A	=	300	90										
2A	=	700	230										
3A	=	1100	240										
4A	=	1000	250										
CHISO	(1R	400	90	1000									
COMMON	=	2F	3F	4F	5F								
ECAPT	=R	300	700	1100									
EFTSS	=R	300	700	10	1100								
FORMAT	=	23F	24F	25F									
HIDENT	=R	300	700	1100									
HISONM	=R	300	700	1100									
HMAT	=R	300	700	1100									
I	=I	800	9	1000	1000								
1A	=I	500	12	150									
1B	=I	200	6										
1C	=I	160	18	190	21								
1D	=I	300	1400	20	210								
1E	=I	300	1400	19	200								
1F	=I	200	700	1000									
1G	=I	200	1100										
1H	=I	200	1300	17	180								
1I	=I	200	1300	16	170								
1J	=I	300	700	1100									
1K	=I	200	800	1000									
1L	=	7F	10F										
1M	=	6F	22F										

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1      SUBROUTINE RITISO(NIN,NOUT)
2      ROUTINE TO READ AND ARRANGE DATA FOR ISOTXS-III FILE
3      DIMENSION IA(1), IR(1), IRAND(100)
4      COMMON /PCCC/ IU(10),IUI(1),KBR,HISONM,HINFNT,HMAT,EFISS,ECAPT
5      COMMON /PTR/ MOLN(1),ATW(1),NT(1),NGR(1),NGF(1),NPFF(4,1),TEM(3,1)
6      COMMON /PTP/ NGHC(1),NGFC(1),FFC(4,300,8),SR(9,100),SM(100,840),IGH,NXCMR
7      COMMON /POTXS/ STRC(100),SHCN2N(100)
8      COMMON /PSTNF/ CHTSO(100)
9      COMMON A(7000),B(3000)
10     EQUIVALENCE (A(1),IA(1))
11     EQUIVALENCE (B(1),IB(1))
12     AT THIS POINT ASSUME THAT ON UNIT NIN EXISTS FILE IDENTIFICATION
13     FILE CONTROL, FILE DATA, AND SET CHT DATA ALTHOUGH SAME WILL BE
14     UPDATED
15     RE-IND NIN
16     RE-IND NOUT
17     MULT=1
18     IREC=1
19     MODF=1
20     MODF=1
21     FILE IDENTIFICATION
22     CALL OPEN (NIN,IREC,A(1),4,MODE)
23     CALL RITE (NOUT,IREC,A(1),4,MODF)
24     IREC=IREC+1
25     FILE CONTROL
26     CALL OPEN (NIN,IREC,A(1),8,MODE)
27     NGROUP=IA(1)
28     NISO=IA(2)
29     IA(2)=IA(2)+1
30     MAXUP=IA(3)
31     MAXDN=IA(4)
32     MAXORN=IA(5)
33     ICHIST=IA(6)
34     NSCMAX=IA(7)
35     NS=LOK=IA(8)
36     CALL RITE (NOUT,IREC,A(1),8,MODF)
37     FILE DATA
38     NWD5=(NISO-1)*MULT+1+NISO*NGROUP*(2+ICHIST*(2/(ICHIST+1)))
39     CALL OPEN (NIN,IREC,A(1),NWD5,MODE)
40     CALL STOW (A(1)+8(1),12)
41     ADD NEW NAME
42     BINISO(12)=HISONM
43     SKIP TO DATA POSITION
44     NEX4=14+NISO
45     NEX2=HFX4-1
46     NMORE=NWD5-12
47     CALL STOW (A(NEX3),B(NFX4),NMORE)
48     NWD5=NWD5+2
49     I9(NWD5)=3
50     CALL RITE (NOUT,IREC,B(1),NWD5,MODF)
51     NO COPY REMAINING DATA ONTO NEW ISOTXS SET
52     CALL COPYF (NIN,NOUT,1)
53     NO4 NOTIC ISOTOPE CONTROL, PRINCIPAL CROSS SECTIONS, ISOTOPE CHI
54     AND SCATTERING SUB-BLOCK
55     NWD5=9*MULT+17+NSCMAX*(2*NGROUP+2)
56     A(1)=HISONM
57     A(2)=HINFNT
58     A(3)=HMAT
59     A(4)=ATW(1)
60     A(5)=FFICS
61     A(6)=FFADT
62     A(7)=TEM(1,1)
63     A(8)=1,0E+10
64     A(9)=0,0
65     IA(10)=KBR
66     IA(11)=1
67     IA(12)=1
68     DO 10 I=1,17
69     10 IA(I)=1
70     IA(15)=1
71     IA(18)=1
72     IA(19)=1
73     IA(20)=0
74     ONLY SETUP FOR PO EXPANSION AND TOTAL SCATTERING MATRIX
75     IA(21)=0
76     IA(22)=1
77     DETERMINE THE BANDWIDTH FOR THE TOTAL MATRIX
78     DO 20 N=1,NGROUP
79     IT=N
80     NN=N
81     KK=1
82     DO 20 K=1,N
83     IF (SM(NN,KK).GT.0.0) IT=K
84     NN=NN+1
85     KK=KK+1
86     IRAND(10)=IT
87     IA(N+20)=IT
88     DETERMINE IN GROUP SCATTER POSITION
89     NFX3=20+NGROUP
90

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FTRCOL 542
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FTRCOL 630
FTRCOL 631

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76      DO 30 N=1,NGROUP                                FTRCOL 632
77      30 IAT(NEXT+1)=1                                  FTRCOL 633
78      CALL RTE (NOUT,IREC,A(1),NWDS*MODF)             FTRCOL 634
79      LTOT=TA(1+J)                                     FTRCOL 635
80      LTOT=TA(1+J)                                     FTRCOL 636
81      IF IS=TA(1+J)                                     FTRCOL 637
82      IF IS=TA(1+J)                                     FTRCOL 638
83      ICHI=TA(1+J)                                       FTRCOL 639
84      NWDS=(1+IRN*LTOT)*IFIS+ICHI*NGROUP              FTRCOL 640
85      POINTS FOR FIRST FIVE CROSS SECTIONS            FTRCOL 641
86      NC1=NGROUP                                          FTRCOL 642
87      NC2=2*NGROUP                                        FTRCOL 643
88      NC3=3*NGROUP                                        FTRCOL 644
89      NC4=4*NGROUP                                        FTRCOL 645
90      NC5=5*NGROUP                                        FTRCOL 646
91      NC6=NGC+NGROUP                                      FTRCOL 647
92      DO 40 J=1,NGROUP                                    FTRCOL 648
93      A(J)=STRC(J)                                       FTRCOL 649
94      A(J+NC1)=SPC(1+J)                                  FTRCOL 650
95      A(J+NC2)=SPC(4+J)                                  FTRCOL 651
96      A(J+NC3)=SPC(12+J)                                FTRCOL 652
97      A(J+NC4)=SPC(13+J)                                FTRCOL 653
98      A(J+NC5)=CHISO(J)                                 FTRCOL 654
99      A(J+NC6)=SRPN2N(J)                                FTRCOL 655
100     40 CONTINUE                                       FTRCOL 656
101     CALL RTE (NOUT,IREC,A(1),NWDS*MODF)              FTRCOL 657
102     ICHI IS IF 1 SO NEVER ANY ISOTOPE CHG DATA SO ON TO SCATTERING FTRCOL 658
103     SUB=RI*NC6                                          FTRCOL 659
104     DO 60 N=1,NGROUP                                    FTRCOL 660
105     NS=IBAND(N)                                         FTRCOL 661
106     NWDS=1                                              FTRCOL 662
107     NEXT=1                                              FTRCOL 663
108     IF (NS.LT=0) GO TO 60                               FTRCOL 664
109     NN=NN+1                                             FTRCOL 665
110     KK=1                                                FTRCOL 666
111     DO 50 K=1,NWDS                                       FTRCOL 667
112     NEXT=NEXT+1                                         FTRCOL 668
113     NWDS=NWDS+1                                         FTRCOL 669
114     A(NEXT)=CWC(NN,KK)                                  FTRCOL 670
115     NN=NN+1                                             FTRCOL 671
116     50 KK=KK+1                                          FTRCOL 672
117     CALL RTE (NOUT,IREC,A(1),NWDS*MODF)              FTRCOL 673
118     60 CONTINUE                                       FTRCOL 674
119     RETURN                                              FTRCOL 675
120     END                                                FTRCOL 676
121     RCU FUS                                           FTRCOL 677

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SINGLY REFERENCED VARIABLES																			
COCC	-	3CN	FFC	(1R	4C0	IGM	-1	4C0	MAXIP	-1	24=	NPPF	(11	4C0	RETISO	-	1SU		
COPYF	-	42SH	FISINF	-	7CN	IUI0	-1	3C0	NGR	(11	4C0	NSRLK	-1	29=	SP	(1R	4C0		
CONTR5	-	5CN	FTR	-	4CN	IUI1	-1	3C0	NGR	(11	5C0	NT	(11	4C0	SW	(1R	4C0		
DIMENSI	-	2F	FTRC	-	5CN	MAXAN	-1	25=	NGE	(11	4C0	NACWR	-1	4C0	SR	(1R	4C0		
FF	(1R	4C0	HOLN	(1R	4C0	MAXARD	-1	26=	NGE	(11	5C0	RETURN	-	11AF					
MULTIPLY-REFERENCED VARIABLES																			
1=	-	5600	57=																
2=	-	6400	6800	73=															
3=	-	7500	76=																
4=	-	8000	97=																
51=	-	10600	111=																
64=	-	9900	113=																
A	(1R	8C0	9EU	174=	184=	20AG	36AG	32AG	33AG	36AG	44=	45=	46=	47=	48=	49=	50=	51=	
		57=	77AG	02=	91=	92=	93=	94=	05=	96=	98AG	109=	112AG						
ATM	(1R	4C0	47																
B	(1R	8C0	1nEQ	33AG	34=	38AG	41AG												
CHISO	(1R	7C0	95																
COMMON	-	3F	4F	5F	6F	7F	8F												
ECANT	-R	3C0	49																
FFISS	-R	3C0	4R																
EQUIVA	-	9F	10F																
EIDENT	-R	3C0	45																
WISONM	-R	3C0	34	44															
WHAT	-R	3C0	46																
I	-1	6500	47																
TA	(11	201	9EO	21	22	23=	23	24	25	26	27	28	29	53=	54=	55=	57=	58=	
		59=	60=	61=	62=	63=	73=	76=	77	79	80	81	82						
1H	(11	201	1nEQ	68=															
IRAND	(11	201	72=	100															
ICHI	-1	81=	82																
ICHI5T	-1	27=	31	31															
IFIS	-1	80=	82																
IREC	-1	14=	17AG	18AG	19=	19	26AG	30AG	32AG	41AG	77AG	98AG	112AG						
IT	-1	65=	69=	72	73														
J	-1	8700	88	90	91	91	92	92	93	93	94	94	95	95	96	96			
K	-1	6800	89	3=800															
KNR	-1	3C0	43																
KK	-1	67=	69	71=	71	105=	109	111=	111										
LTOT	-1	79=	82																
LTAN	-1	78=	82																
MODE	-1	15=	17AG	20AG	20AG														
MODF	-1	16=	18AG	20AG	21AG	77AG	98AG	112AG											
MULT	-1	13=	31	43															
N	-1	6400	66	6800	72	73	7500	76	8400	106	106								
NC1	-1	83=	91																
NC2	-1	86=	92																
NC3	-1	85=	93																
NC4	-1	86=	94																
NC5	-1	87=	95	95															
NC6	-1	88=	96																

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NEXT -1 107 107 100
NEXT -1 106 106 74
NEXT -1 105 105 74
NGROUP -1 21 31 43 6400 74 7500 82 83 84 85 86 87 88 8900 9000
NIN -1 100 11 1700 2800 3200 4700
NISQ -1 22 31 34 35
NHOSH -1 37 3800
NN -1 66 69 70 75 104 109 110 112
NOUT -1 100 12 1800 2800 4100 4200 7700 8800 11200
NS -1 100 103 14000
NSCHAX -1 28 47
NHDS -1 31 3200 37 39 39 40 4100 41 7700 82 8800 101 108 108 11200
OPEN -1 175 2950 3250
REFIND -1 12 125
RITE -1 185 1150 4150 7750 9450 11250
SMC IIR 500 60 100
SHC IIR 500 91 92 93 94
SCHNPN IIR 400 96
STOW -1 335 3050
STR -1 600 90
TEM IIR 400 50

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SUBROUTINE RITBRK(NIN,NOUT)

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1 SUPROUTINE RITBRK(NIN,NOUT) FTRCOL 673
2 ROUTINE TO READ AND ARRANGE DATA FOR BPKXIS-IIT FILE FTRCOL 679
3 DIMENSION IA(1), IR(1) FTRCOL 680
4 COMMON /CCCC/ IUI0,IUI1,KRR,HISONM,HINENT,HMAT,EFISS,ECAPT FTRCOL 681
5 COMMON /FTR/ HOLN(1),ATW(1),NT(1),NCR(1),NGE(1),NPF(4,1),TEM(3,1) FTRCOL 682
6 I=SF(4,1,0)+FF(4,3,0)+SR(9,100)+SM(1,1,540)+TGM+XCMR FTRCOL 683
7 COMMON /FTR/ NHGC(1),NGEC(1),FFC(1,3,0)+SR(9,100)+SM(1,1,540) FTRCOL 684
8 COMMON A(1000),B(400) FTRCOL 685
9 EQUIVALENCE (A(1),IA(1)) FTRCOL 686
10 EQUIVALENCE (B(1),IR(1)) FTRCOL 687
11 AT THIS POINT ASSUME THAT ON UNIT NIN EXISTS FILE IDENTIFICATION. FTRCOL 688
12 FILE CONTROL AND FILE DATA INFORMATION, ALTHOUGH SAME WILL BE FTRCOL 689
13 UPDATED FTRCOL 690
14 REFIND NIN FTRCOL 691
15 REFIND NOUT FTRCOL 692
16 MULT=1 FTRCOL 693
17 IREC=IREC+1 FTRCOL 694
18 FILE IDENTIFICATION FTRCOL 695
19 CALL OPEN (NIN,IREC+A(1)+4,MODE) FTRCOL 696
20 MONE=1 FTRCOL 697
21 MONE=1 FTRCOL 698
22 CALL RITE (NOUT,IREC+A(1)+4,MODE) FTRCOL 699
23 FILE CONTROL FTRCOL 700
24 CALL OPEN (NIN,IREC+A(1)+4,MODE) FTRCOL 701
25 NGROUP=IA(1) FTRCOL 702
26 NISOSH=IA(2) FTRCOL 703
27 IA(2)=IA(2)+1 FTRCOL 704
28 NSIGPT=IA(3) FTRCOL 705
29 IA(3)=IA(3)+NPF(3,1) FTRCOL 706
30 NTMP=IA(4) FTRCOL 707
31 IF (NT(1),FO,0) IA(4)=IA(4)+1 FTRCOL 708
32 IF (NT(1),GF,1) IA(4)=IA(4)+3 FTRCOL 709
33 ITEMP=1 FTRCOL 710
34 IF (NT(1),GT,0) ITEMP=1 FTRCOL 711
35 ISIG=NPF(2,1) FTRCOL 712
36 NINT=STG FTRCOL 713
37 CALL RITE (NOUT,IREC+A(1)+4,MODE) FTRCOL 714
38 FILE DATA FTRCOL 715
39 NHDS=(4*MULT)+NISOSH+NSIGPT+NTMP+NGROUP+1 FTRCOL 716
40 CALL OPEN (NIN,IREC+A(1)+NHDS+MONE) FTRCOL 717
41 ADD NEW NAME FTRCOL 718
42 CALL STOW (A(1)+H(1)+NISOSH) FTRCOL 719
43 NEXH=1 FTRCOL 720
44 B(NEXH)=ISOSH+1 FTRCOL 721
45 B(NEXH)=ISOSH+1 FTRCOL 722
46 NEXH=NEXH+1 FTRCOL 723
47 CALL STOW (A(NEXH)+B(NEXH)+NSIGPT) FTRCOL 724
48 NEXH=NEXH+NSIGPT FTRCOL 725
49 NEXH=NEXH+NSIGPT-1 FTRCOL 726
50 SAVE STOW VALUES USE TOTAL ONLY FROM FTR FTRCOL 727
51 DO 10 I=1,ISIG FTRCOL 728
52 H(NEXH,I)=A(1)+B(SF(3,1,1)+ALOG(10,2)) FTRCOL 729
53 CONTINUE FTRCOL 730
54 NEXH=NEXH+ISIG+1 FTRCOL 731
55 CALL STOW (A(NEXH)+B(NEXH)+NTMP) FTRCOL 732
56 NEXH=NEXH+NTMP FTRCOL 733
57 NEXH=NEXH+NTMP-1 FTRCOL 734
58 ISTP=1 FTRCOL 735
59 DO 20 I=1,ISTP FTRCOL 736
60 R(NEXH,I)=TEM(I,1)+273.16 FTRCOL 737
61 NEXH=NEXH+ISTP+1 FTRCOL 738
62 SAVE GROUP STRUCTURE FTRCOL 739
63 IF (NTMP,FO,0) AND (NISOSH,EO,0) NFXA=1 FTRCOL 740
64 CALL STOW (A(NEXH)+B(NEXH)+NGROUP) FTRCOL 741
65 SAVE FTR FTRCOL 742
66 NEXH=NEXH+NGROUP FTRCOL 743
67 NEXH=NEXH+NGROUP FTRCOL 744
68 H(NEXH)=A(NEXH) FTRCOL 745

```


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SUBROUTINE XS(XSPD,XSIN,XSF,XSMU,XSEN,XSXI,NGROUP)

SINGLY REFERENCED VARIABLES

```

ATN (IR 300 FTR = 30N NGR (II 300 MPFF (II 300 SF (IR 300 TEM (IR 300
DIMPNSI = 2F FTRL = 40N NGRN (II 400 NT (II 300 SM (IR 300 XS = 15U
FF (IR 300 HOLN (IP 300 NGE (II 300 MXCMB =I 300 SMC (IR 400
FFC (IR 400 IGM =I 300 NGEF (II 400 RETURN = 13F SR (IR 300

```

MULTIPLY-REFERENCED VARIABLES

```

10 = 500 120
COMMON = 3F 4F
I =I 500 4 7 7 8 8 9 9 10 10 11 11
NGROUP =I 100 500
SFC (IR 400 7 8 9 10 11
XSF (IR 100 201 8=
XSEN (IR 100 201 10=
XSIN (IR 100 201 7=
XSMU (IR 100 201 9=
XSPD (IR 100 201 6=
XSXI (IP 100 201 11=

```

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SUBROUTINE CHKDUN(INFINO)

```

1 SUBROUTINE CHKDUN(INFINO) FTRCOL 837
2 COMMON /ALL/ IU3,IU4,IU5,IU6,IU7,IU8,IU9,NGPS,NXDN,IMGT,NCR,NISO,I FTRCOL 838
3 IC=(IFR(100)+NFIN(100)+XISO(100)+FAPMT(100)+CAPHI(100) FTRCOL 839
4 COMMON VETPC/NGPC(1)+NGFC(1)+FFC(4+300+8)+SPC(9+100)+SMC(100+40) FTRCOL 840
5 COMMON /CCCC/ IU1A,IU1I,KRR,MISO,MWIMENT,MHAT,EFISS,ECAPT FTRCOL 841
6 IF INFINO.GE.NISO GO TO 10 FTRCOL 842
7 RETURN FTRCOL 843
8 10 WRITE (IU4,20)NISO FTRCOL 844
9 SWITCH UNITS BACK SINCE DONE PREVIOUSLY IN RITPUN FTRCOL 845
10 IMP=IUA FTRCOL 846
11 IU1I=IUA FTRCOL 847
12 WRITE (IU8,30)IU9,IU1I FTRCOL 848
13 CALL FRIT FTRCOL 849
14 FTRCOL 850
15 FTRCOL 851
16 FTRCOL 852
17 FTRCOL 853
18 FTRCOL 854
19 FTRCOL 855

```

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SUBROUTINE CHKDUN(INFINI)

SINGLY REFERENCED VARIABLES

```

ALL = 20N FRIT = 515U FTRN = 30N IP =I 200 IMGT =I 200 NSEC (II 300 SRC (IR 300
CCCC = 40N FFSS =R 400 MIDENT =R 400 IU3 =I 200 KRW =I 400 NGPS =I 200 XISA (IR 200
CPHNY (IP 200 FG (IR 200 MISONM =R 400 IUA =I 200 NCR =I 200 NXDN =I 200
CHKDUN = 15U FFC (IR 200 MHAT =R 400 IU5 =I 200 NFIA (II 200 RETURN = 6F
ECAPT =R 400 FGMHI (IP 200 IC =I 200 IU7 =I 200 NGRN (II 300 SMC (IR 300

```

MULTIPLY-REFERENCED VARIABLES

```

10 = 5 70
20 = 700 120
30 = 1000 130
COMMON = 2F 3F 4F
FORMAT = 12F 13F
IU10 =I 400 9
IU1I =I 400 08 10NR
IU6 =I 200 7MH 10NR
IUA =I 200 8
IU9 =I 200 88 10NR
NFIND =I 140 8
NISO =I 200 8 700
WHITE = 7F 10F

```

SUBROUTINE EDIT

1	SIMPROUTINF FDIY	FTACOL	856
2	COMMON /ALL/ IU3.IU4.IU5.IU6.IU7.IU8.IU9.NGPS.NXDN.IWGT.NCR.NISD.I	FTACOL	857
3	IC.FAFRC(100).AFIB(100).XISD(100).FAPMT(100).CPMT(100)	FTACOL	858
4	COMMON /FACCC/ IU10.IU11.K9R.MISONM.MINENT.HMAT.EFTSS.ECAPT	FTACOL	859
5	COMMON /FAPTS/ MOGE.NTYPE.IRD(100)	FTACOL	860
6	IF (IJE.EOF) STOP	FTACOL	861
7	MDP=1	FTACOL	862
8	DO I=1,10	FTACOL	863
9	IU(I)=1	FTACOL	864
10	PE=1000000	FTACOL	865
11	PE=1000000	FTACOL	866
12	WRITE (IU8,20)	FTACOL	867
13	CALL RTSATX (IU6,IU9)	FTACOL	868
14	CALL ARHWA (IU6,IU11)	FTACOL	869
15	STOP	FTACOL	870
16	PE=1000000	FTACOL	871
17	20 FORMAT (10I)	FTACOL	872
	END	FTACOL	873
		FTACOL	874

SUBROUTINE EDIT

[illegible]

SUBROUTINE BISDTX (IN\$VC,NJN)

```

1  SUBROUTINE ISOTAS (NYS,NIN)
2  .....
3  READ (NFCSSA) ISOTAS INFORMATION FROM UNIT NIN
4  .....
5  COMMON A(1)
6  DIMENSION IA(1)
7  COMMON /ADTS/ MODE,NTYPE,IRDI(1)
8  COMMON /FTR/ HOLM(1),ATW(1),NT(1),NGH(1),NGE(1),NPF(4,1),TEM(3,1)
9  ISOT(1,1)=.F(1+300+8),SR(1,1)=.F(1+8+89),TGM=NXCMR
10  FOTV(1)=.F(1+1),IA(1)
11  DATA TATPL,FLAS,AJNEL,AH2H/6HTOTAL,4HFLASTC/6HINFLAS/6H N2N/
12  DATA M*W1,40/4+1/4/
13
14  ---FILE IDENTIFICATION
15
16  IRFC=1
17  NWS=4
18  IF (MODE,FO,1) CALL REFD (NIN,IRFC,1(1),NWS,1)
19  IF (MODE,FO,2) READ (NIN,170) (IA(I),I=1,NWS)
20  FTR=1
21  MFC=1
22  MSA=1
23  MFC=1(1)
24  MSA=1(1)
25  IF (NYS,500) M,IVER,NIN
26  MFC=1(1)M,MS
27
28  ---FILE CONTROL
29
30  IRFC=IRFC+1
31  NWS=8
32  IF (MODE,FO,1) CALL REFD (NIN,IRFC,1(1),NWS,1)
33  IF (MODE,FO,2) READ (NIN,180) (IA(I),I=1,NWS)
34  NCM=1-1(1)
35  FTR=1(1)
36  MFC=1(1)
37  MSA=1(1)
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```

31      WRITE (NCRS+270) (IA(I),I=1,NWDS)
32      ---FIF DATA
33      MULT=7
34      NWDS=(NICH+12)*MULT*NISO+1*NGROUP*(2+ICHIST*(2/(ICHIST+1)))
35      IRFC1=IRFC1+1
36      NW=1+1*NISO
37      IF (MODE.FO.1) CALL REFD (NIN,IRFC1,A(1),NWDS,1)
38      IF (MODE.FO.2) READ (NIN,190) (A(I),I=1,NW)
39      WRITE (NCRS+280) (A(I),I=1,12)
40      DO 10 I=1,NISO
41      J=1+12
42      10 WRITE (NCRS+300) I,A(J)
43      NEXT=J+1*NISO
44      IF (ICHIST.NF.1) GO TO 20
45      NWR=NEXT*NGROUP-1
46      IF (MODE.FO.2) READ (NIN,200) (A(I),I=NEXT,NWR)
47      WRITE (NCRS+310)
48      CALL WRT (A(NEXT),ICHIST*NGROUP*M1+AMIN GP +6HOUT GP*M1*NSYS)
49      NEXT=NEXT+NGROUP*ICHIST
50      20 WRITE (NCRS+320)
51      NWR=NEXT*NGROUP+NGROUP*NISO
52      IF (MODE.FO.2) READ (NIN,200) (A(I),I=NEXT,NWR)
53      CALL WRTA (A(NEXT),NGROUP,A,M0,A,M1,A,M2,A,M3,A,M4,A,M5,A,M6,A,M7,A,M8,A,M9,NSYS)
54      NWT=NEXT
55      NEXT=NEXT+NGROUP
56      WRITE (NCRS+330)
57      CALL WRTA (A(NEXT),NGROUP,A,M0,A,M1,A,M2,A,M3,A,M4,A,M5,A,M6,A,M7,A,M8,A,M9,NSYS)
58      NEXT=NEXT+NGROUP
59      WRITE (NCRS+340) A(NEXT)
60      NEXT=NEXT+1
61      WRITE (NCRS+350)
62      CALL WRTA (A(NEXT),NISO+1+6HISOTOP,AMNUMBER+1,NSYS)
63      NWP=NEXT+NISO-1
64      ---SET CH1 DATA
65      IF (ICHIST.FO.0) GO TO 40
66      NWDS=NGROUP*(1+ICHIST)
67      NPT=1
68      DO 30 I=1,NCALOK
69      IRFC1=IRFC1+1
70      CALL REFD (NIN,IRFC1,A(NPT),NWDS,1)
71      30 NPT=NPT+NWDS
72      WRITE (NCRS+360)
73      CALL WRT (A(1),ICHIST*NGROUP*M1+AMIN GP +6HOUT GP*M1*NSYS)
74      ---ISOTOP CONTROL AND GROUP INDEPENDENT DATA
75      40 DO 15 I=1,NISO
76      IF (I.EQ.1) WRITE (NSYS+160)
77      NWDS=3*MULT+1+NSCMAX*(2+NGROUP*2)
78      IRFC1=IRFC1+1
79      IF (MODE.FO.1) CALL REFD (NIN,IRFC1,A(1),NWDS,1)
80      IF (MODE.FO.2) READ (NIN,210) (A(I),I=1,NWDS)
81      JREFAN=1+NWDS
82      ICH1=TA(11)
83      IFS=1+12
84      IAF=1A(11)
85      INP=1A(12)
86      INM=1A(13)
87      INO=1A(14)
88      INI=1A(15)
89      WRITE (NCRS+370) I
90      WRITE (NCRS+380) (A(I),I=1,6)
91      WRITE (NCRS+390) (A(I),I=7,11)
92      WRITE (NCRS+400) (A(I),I=12+17)
93      NEXT=21
94      LTO=1A(18)
95      LTRAN=1A(19)
96      ISTRPN=1A(20)
97      WRITE (NCRS+410) LTO,LTRAN
98      WRITE (NCRS+420)
99      CALL WRTA (A(NEXT),NSCMAX,A,M0,A,M1,A,M2,A,M3,A,M4,A,M5,A,M6,A,M7,A,M8,A,M9,NSYS)
100     NEXT=NEXT+NSCMAX
101     WRITE (NCRS+430)
102     CALL WRTA (A(NEXT),NSCMAX,A,M0,A,M1,A,M2,A,M3,A,M4,A,M5,A,M6,A,M7,A,M8,A,M9,NSYS)
103     J1=NEXT+NSCMAX
104     WRITE (NCRS+440)
105     CALL WRTA (A(J1),NGROUP+NSCMAX*M1+AMIN GP +6H BLOCK*M1*NSYS)
106     J1=J1+NGROUP+NSCMAX
107     WRITE (NCRS+450)
108     CALL WRTA (A(J1),NGROUP+NSCMAX*M1+AMIN GP +6H BLOCK*M1*NSYS)
109     ---PRINT OUT CHOSS SECTIONS
110     NWDS=(2+1*TPAY+LTOT*2+IFS+ICH1)*NGROUP
111     IRFC1=IRFC1+1
112     NW=NWDS+JREFAN-1
113     IF (I.EQ.1) WRITE (NSYS+160)
114     NWDS=3*MULT+1+NSCMAX*(2+NGROUP*2)
115     IRFC1=IRFC1+1
116     IF (MODE.FO.1) CALL REFD (NIN,IRFC1,A(1),NWDS,1)
117     IF (MODE.FO.2) READ (NIN,210) (A(I),I=1,NWDS)
118     JREFAN=1+NWDS
119     ICH1=TA(11)
120     IFS=1+12
121     IAF=1A(11)
122     INP=1A(12)
123     INM=1A(13)
124     INO=1A(14)
125     INI=1A(15)
126     WRITE (NCRS+370) I
127     WRITE (NCRS+380) (A(I),I=1,6)
128     WRITE (NCRS+390) (A(I),I=7,11)
129     WRITE (NCRS+400) (A(I),I=12+17)
130     NEXT=21
131     LTO=1A(18)
132     LTRAN=1A(19)
133     ISTRPN=1A(20)
134     WRITE (NCRS+410) LTO,LTRAN
135     WRITE (NCRS+420)
136     CALL WRTA (A(NEXT),NSCMAX,A,M0,A,M1,A,M2,A,M3,A,M4,A,M5,A,M6,A,M7,A,M8,A,M9,NSYS)
137     NEXT=NEXT+NSCMAX
138     WRITE (NCRS+430)
139     CALL WRTA (A(NEXT),NSCMAX,A,M0,A,M1,A,M2,A,M3,A,M4,A,M5,A,M6,A,M7,A,M8,A,M9,NSYS)
140     J1=NEXT+NSCMAX
141     WRITE (NCRS+440)
142     CALL WRTA (A(J1),NGROUP+NSCMAX*M1+AMIN GP +6H BLOCK*M1*NSYS)
143     J1=J1+NGROUP+NSCMAX
144     WRITE (NCRS+450)
145     CALL WRTA (A(J1),NGROUP+NSCMAX*M1+AMIN GP +6H BLOCK*M1*NSYS)

```

```

110 IF (MODE.FO.1) CALL REFD (MIN,IRFC1,A(JREAD),NWDS,1) FTRCOL 1006
111 IF (MODE.FO.2) READ (NTN,220) (A(I),I=JREAD,NWR) FTRCOL 1007
112 NKIND=NWNS/NGROUP FTRCOL 1008
113 WRITE (NYS,46) FTRCOL 1009
114 WRITE (NYS,47) FTRCOL 1010
115 NKIND=NWNS/NGROUP FTRCOL 1011
116 CALL WRT (A(JREAD),NGROUP,NKIND,M1,6H GROUP,6H TYPE ,M1,NSYS) FTRCOL 1012
117 C FTRCOL 1013
118 C FTRCOL 1014
119 C FTRCOL 1015
120 IF (TCHI,LF.1) GO TO 65 FTRCOL 1016
121 IF (IFS,LT.1) GO TO 65 FTRCOL 1017
122 IF (TCHI,LT.1) GO TO 65 FTRCOL 1018
123 NWNS=NGROUP*(TCHI+1) FTRCOL 1019
124 NPT=JREAD FTRCOL 1020
125 DO 50 N=1,NCHLK FTRCOL 1021
126 IRFC1=IRFC1+1 FTRCOL 1022
127 NCHNKPT=NWNS-1 FTRCOL 1023
128 IF (MODE.FO.1) CALL REFD (MIN,IRFC1,A(NPT),NWNS,1) FTRCOL 1024
129 IF (MODE.FO.2) READ (NTN,230) (A(I),I=NPT,NWR) FTRCOL 1025
130 NPT=NPT+NWNS FTRCOL 1026
131 WRITE (NYS,48) FTRCOL 1027
132 CALL WRT (A(JREAD),TCHI,NGROUP,M1,6H IN GP ,6H OUT GP,M1,NSYS) FTRCOL 1028
133 C FTRCOL 1029
134 C FTRCOL 1030
135 C FTRCOL 1031
136 60 DO 150 K=1,NSCMAX FTRCOL 1032
137 K=N+2 FTRCOL 1033
138 ISCT=IA(K) FTRCOL 1034
139 K=K+NSCMAX FTRCOL 1035
140 LORON=IA(K) FTRCOL 1036
141 ISCT=ISCT/100 FTRCOL 1037
142 GO TO (75,80,90,100), ISCT FTRCOL 1038
143 70 BLOCK=TOTAL FTRCOL 1039
144 GO TO 117 FTRCOL 1040
145 80 BLOCK=CLAS FTRCOL 1041
146 GO TO 117 FTRCOL 1042
147 90 BLOCK=AINFL FTRCOL 1043
148 GO TO 117 FTRCOL 1044
149 100 BLOCK=ANON FTRCOL 1045
150 IF (LORON,NF.0) GO TO 120 FTRCOL 1046
151 WRITE (NYS,49) N,BLOCK FTRCOL 1047
152 GO TO 150 FTRCOL 1048
153 120 KMAX=7 FTRCOL 1049
154 K=2*NSCMAX+20*(N-1)*NGROUP FTRCOL 1050
155 INFC=(NGROUP-1)/NSBLOCK+1 FTRCOL 1051
156 NPT=JREAD FTRCOL 1052
157 WRITE (NYS,50) N,BLOCK FTRCOL 1053
158 DO 140 J=1,NSRLOC FTRCOL 1054
159 JL=(J-1)*INFC+1 FTRCOL 1055
160 JU=J*INFC FTRCOL 1056
161 NWNS=7 FTRCOL 1057
162 DO 130 J1=JU,JU FTRCOL 1058
163 L=J1 FTRCOL 1059
164 NWNS=NWNS+IA(L) FTRCOL 1060
165 KMAX=KMAX+IA(L) FTRCOL 1061
166 NWNS=NWNS+LORON FTRCOL 1062
167 IF (NWNS,FO.0) GO TO 140 FTRCOL 1063
168 IRFC1=IRFC1+1 FTRCOL 1064
169 NCHNKPT=NWNS-1 FTRCOL 1065
170 IF (MODE.FO.1) CALL REFD (MIN,IRFC1,A(NPT),NWNS,1) FTRCOL 1066
171 IF (MODE.FO.2) READ (NTN,240) (A(I),I=NPT,NWR) FTRCOL 1067
172 C FTRCOL 1068
173 C FTRCOL 1069
174 IF (J,FO.1) WRITE (NYS,51) FTRCOL 1070
175 WRITE (NYS,52) J FTRCOL 1071
176 CALL WRT (A(NPT),LORON,IA(L),M1,6H ORDER,6H POSN ,M1,NSYS) FTRCOL 1072
177 140 CONTINUE FTRCOL 1073
178 RETURN FTRCOL 1074
179 C FTRCOL 1075
180 160 FORMAT (1H) FTRCOL 1076
181 170 FORMAT (1X,A6,1X,2A6,1X,16) FTRCOL 1077
182 180 FORMAT (4X,9I6) FTRCOL 1078
183 190 FORMAT (4X,1X,14X,1X,1X,A6,1X,9X,1X,A6)/(10(1X,A6)) FTRCOL 1079
184 200 FORMAT (11P,F12.5) FTRCOL 1080
185 210 FORMAT (4X,A6,1P,F12.5/(12I6)) FTRCOL 1081
186 220 FORMAT (4X,1P,F12.5/(6F12.5)) FTRCOL 1082
187 230 FORMAT (4X,1P,F12.5/(6F12.5)) FTRCOL 1083
188 240 FORMAT (4X,1P,F12.5/(6F12.5)) FTRCOL 1084
189 250 FORMAT (1H,4X,5HGROUP,14) FTRCOL 1085
190 260 FORMAT (1H NOTE THAT THE IN-GROUP SCATTERING TERM HAS BEEN ADJUST FTRCOL 1086
191 10 TO GIVE BALANCE WITH THE TRANSPORT (CROSS SECTION) FTRCOL 1087
192 270 FORMAT (16H) FILE CONTROL PARAMETERS//51H NGROUP NUMBER OF ENER FTRCOL 1088
193 16Y GROUPS IN SET 112/51H NISO NUMBER OF ISOTOPES IN FTRCOL 1089
200 ZSET 112/51H MAXUP MAXIMUM NUMBER OF UPSCATTER GR FTRCOL 1090
210 3NUPS 112/51H MAXDN MAXIMUM NUMBER OF DOWNSCATTER GROUPS FTRCOL 1091
220 4 112/51H MAXORD MAXIMUM SCATTERING ORDER 112/51H FTRCOL 1092
230 5 TCHIST SET FISSION SPECTRUM FLAG 112/51H FTRCOL 1093
240 6 TCHIST=1 SET VECTOR /51H FTRCOL 1094
250 7 =NGROUP, SET MATRX /* *.TAX.*=0 ISOTOPES SET*/51 FTRCOL 1095
260 8 NSCMAX MAXIMUM NUMBER OF BLOCKS OF 112/51H FTRCOL 1096
270 9 SCATTERING DATA /51H NSRLOC BLOCK1 FTRCOL 1097
280 5NG CONTROL FOR SCATTERING DATA 1121 FTRCOL 1098

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184 280 FORMAT (14H,12(A6)) FTRCOL 1099
185 290 FORMAT (14H,4X,7HISOTOPE,4X,4HNAME) FTRCOL 1100
186 300 FORMAT (12H,13,6X,A6) FTRCOL 1101
187 310 FORMAT (17H,FISSION SPECTRUM) FTRCOL 1102
188 320 FORMAT (17H,NEUTRON VELOCITY IN GROUP J,9X,1HJ) FTRCOL 1103
189 330 FORMAT (17H,MAXIMUM ENERGY BOUND,3X,4HGROUP,1HJ) FTRCOL 1104
190 340 FORMAT (17H,MINIMUM ENERGY BOUND OF SET,11,16X,F12.5) FTRCOL 1105
191 350 FORMAT (14H,NUMBER OF RECORDS TO BE SKIPPED*) FTRCOL 1106
192 360 FORMAT (13H,SET FISSION SPECTRUM) FTRCOL 1107
193 370 FORMAT (14H,ISOTOPE,13) FTRCOL 1108
194 380 FORMAT (17H,ISOTOPE CONTROL PARAMETERS//51H MASS NO ABSOLUTE ISOT
10FF LABEL 2X,4X,0 HIDENT 118H,0Y IDENTIFIER * FTRCOL 1109
2,24X,44X,0 HAT ISOTOPE IDENTIFICATION,20X,4X,1H AMASS GRA FTRCOL 1110
3H ATOMIC WEIGHT F12.5/51H FFISS TOTAL T FTRCOL 1111
4H,4H,1H ENERGY YIELD/FISSION F12.5/51H FFISS (H,SEC/FISS FTRCOL 1112
5) /* ECAPT TOTAL THERMAL ENERGY YIEL FTRCOL 1113
6H/CAPTURE *E12.5/* (H,SEC/CAPT)* FTRCOL 1114
195 390 FORMAT (14H TEMP TEMPERATURE (DEG K) E12. FTRCOL 1115
15,41H STANT AV POTENTIAL SCATTERING (BARN5/ATOM) F12.5/51H FTRCOL 1116
2 AMFNS REFERENCE ATOM DENSITY F12.5/51H KHR FTRCOL 1117
3 ISOTOPE CLASSIFICATION 112/51H * FTRCOL 1118
4H,0FF,1H /51H /51H 2FFRITILE FTRCOL 1119
5 /51H /51H 3EOTHEO ACTININE FTRCOL 1120
6 /51H 4EFISSION PRODUCT /51H FTRCOL 1121
7 /51H 5ESTRUCTURE /51H 6E FTRCOL 1122
8 9CCLANT /* ICHT ISOTOPE FISSION SPECTRUM FLAG FTRCOL 1123
9 10,19X,15/12X,00 USE SET CHI*/12X,001 ISOTOPE CHI VECTOR*/12X,0GT FTRCOL 1124
$1 ISOTOPE CHI MATRIX*) FTRCOL 1125
196 400 FORMAT (14H IFISS (N,F) X-SECTION PRESENT (1=Y/5/0=N) 112/ FTRCOL 1126
151H YALE (N,4H,PHAS) X-SECTION PRESENT (1=Y/5/0=N) 112/51H 14P FTRCOL 1127
2 (N,0) X-SECTION PRESENT (1=Y/5/0=N) 112/51H 142N (N, FTRCOL 1128
3PH X-SECTION PRESENT (1=Y/5/0=N) 112/51H 14N (N,0) X-SE FTRCOL 1129
4CTION PRESENT (1=Y/5/0=N) 112/51H 14T (N,1) X-SECTION PR FTRCOL 1130
5ESENT (1=Y/5/0=N) 112/ FTRCOL 1131
197 410 FORMAT (14H 14UT NO,OF MOMENTS OF TOTAL CROSS SECTION,12X,15/ FTRCOL 1132
1 LION NO,OF MOMENTS OF TRANSDUCT CROSS SECTION,12X,15/ FTRCOL 1133
198 420 FORMAT (14H,SCATTERING TYPE FOR BLOCK N/9X,1H,6X,4H,TYPE) FTRCOL 1134
199 430 FORMAT (14H,NUMBER OF SCATTERING CROSS IN BLOCK N/9X,1H,6X,4H,TYPE FTRCOL 1135
1F) FTRCOL 1136
200 440 FORMAT (14H,SCATTERING BANDWIDTH FOR GROUP J, SCATTERING BLOCK N) FTRCOL 1137
201 450 FORMAT (14H,POSITION OF IN-GROUP SCATTERING CROSS SECTION IN SCATT FTRCOL 1138
1ERING DATA FOR GROUP J, SCATTERING BLOCK N) FTRCOL 1139
202 460 FORMAT (14H,PRINCIPAL CROSS-SECTIONS) FTRCOL 1140
203 470 FORMAT (14H,THE FOLLOWING TYPE DEFINITION IS EMPLOYED/* TYPE 1-TR FTRCOL 1141
1ANSPODY CROSS SECTION/* TYPE 2-TOTAL CROSS SECTION/* TYPE 3- FTRCOL 1142
2IN,4H,VAL CROSS SECTION/* TYPE 4-(N,F) CROSS SECTION/* TYPE FTRCOL 1143
3S-TOTAL NEUTRON YIELD/FISSION/* TYPE 6-ISOTOPE CHI/* TYPE 7- FTRCOL 1144
4(N,2N) CROSS SECTION) FTRCOL 1145
204 480 FORMAT (14H,ISOTOPE FISSION SPECTRUM) FTRCOL 1146
205 490 FORMAT (14H,BLOCK,13,2X,44,1H SCATTERING OMITTED) FTRCOL 1147
206 500 FORMAT (14H,000 FILE,44,11H -- VPOSITION,13,8H -- UNIT,13,3H,000) FTRCOL 1148
207 510 FORMAT (14H,005FW IDENTIFICATION,00,44,3X,A6) FTRCOL 1149
208 520 FORMAT (14H SCATTERING TYPE *A6) FTRCOL 1150
209 FND FTRCOL 1151

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SUMMARY OF ISOTOPES AND NUCLEI

SINGLY REFERENCED VARIABLES

ATM	(1R)	ACN	PTH	=	ACN	IMP	=	I	83*	MASS	=	I	26*	NCINLK	=	I	122ND	NTYPE	=	I	4CD	SW	(1R)	4CD
BISOTY	=	15U	HOLN	(1R)	4CD	INT	=	I	84*	MASS	=	I	27*	NCB	(1I)	SCD	NTY	=	I	54*	SW	(1R)	4CD	
DIFFUSI	=	3V	HOLF	=	I	85*	INZN	=	I	86*	MASS	=	I	28*	NCB	(1I)	SCD	NTY	=	I	55*	SW	(1R)	4CD
EQUIVAL	=	AF	IGH	=	I	87*	INH	(1I)	ACD	NO	=	I	88*	MPFF	(1I)	4CD	OPTS	=	I	4CD	TEW	(1R)	5FO	
FF	(1R)	4CD	IND	=	I	89*	INTSPD	=	I	90*	NCB	=	I	67ND	NT	(1I)	4CD	RETURN	=	I	17IF			

MULTIPLY-REFERENCED VARIABLES

1R	=	42ND																					
2R	=	44																					
3R	=	47ND																					
4R	=	44																					
5R	=	122ND																					
6R	=	117																					
7R	=	136																					
8R	=	136																					
9R	=	136																					
10R	=	136																					
11R	=	136																					
12R	=	144																					
13R	=	156ND																					
14R	=	152ND																					
15R	=	73ND																					
16R	=	74ND																					
17R	=	120ND																					
18R	=	22ND																					
19R	=	37ND																					
20R	=	46ND																					
21R	=	78ND																					
22R	=	113ND																					
23R	=	126ND																					
24R	=	145ND																					
25R	=	167ND																					
26R	=	166ND																					
27R	=	31ND																					
28R	=	37ND																					
29R	=	36ND																					
30R	=	42ND																					

SUBROUTINE BNRKX(MSYS,NIN)

FTACOL	1155
FTACOL	1156
FTACOL	1157
FTACOL	1158
FTACOL	1159
FTACOL	1160
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FTACOL	1177
FTACOL	1178
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FTACOL	1190
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FTACOL	1199
FTACOL	1200
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FTACOL	1232
FTACOL	1233
FTACOL	1234
FTACOL	1235
FTACOL	1236
FTACOL	1237
FTACOL	1238
FTACOL	1239
FTACOL	1240
FTACOL	1241
FTACOL	1242
FTACOL	1243

77	150	NAME=NM.1	FTACOL	1244
78	NAME=NAME+M1SOSH	FTACOL	1245	
79	LL=NAME+M1SOSH	FTACOL	1246	
80	WRITE (NAME,31)	FTACOL	1247	
81	NAME=1	FTACOL	1248	
82	IF (MONE.FO.2) READ (NTN,170) (IA(I),I=NAME,LL)	FTACOL	1249	
83	DO 60 NAME=LL	FTACOL	1250	
84	WRITE (NAME,29) NM,IA(I)	FTACOL	1251	
85	60 NAME=1	FTACOL	1252	
86	NAME=NAME+M1SOSH	FTACOL	1253	
87	LL=NAME+M1SOSH	FTACOL	1254	
88	WRITE (NAME,32)	FTACOL	1255	
89	NAME=1	FTACOL	1256	
90	IF (MONE.FO.2) READ (NTN,170) (IA(I),I=NAME,LL)	FTACOL	1257	
91	DO 70 NAME=LL	FTACOL	1258	
92	WRITE (NAME,29) NM,IA(I)	FTACOL	1259	
93	70 NAME=1	FTACOL	1260	
94	NAME=NAME+M1SOSH	FTACOL	1261	
95	LL=NAME+M1SOSH	FTACOL	1262	
96	WRITE (NAME,32)	FTACOL	1263	
97	NAME=NAME+M1SOSH	FTACOL	1264	
98	NAME=NAME+M1SOSH	FTACOL	1265	
		FTACOL	1266	
	---SELF-CHIPPING FACTORS	FTACOL	1267	
		FTACOL	1268	
99	JSSF=NAME+M1SOSH	FTACOL	1269	
100	DO 90 JSSF=NAME+M1SOSH	FTACOL	1270	
101	WRITE (NAME,42) JSSF(I)	FTACOL	1271	
102	IF (JSSF(I) .GT. 0) WRITE (NAME,43)	FTACOL	1272	
103	WRITE (NAME,43)	FTACOL	1273	
104	K=JSSF(I)-1	FTACOL	1274	
105	NAME=NAME+K	FTACOL	1275	
106	K=NAME-1	FTACOL	1276	
107	NAME=NAME+K	FTACOL	1277	
108	K=NAME-1	FTACOL	1278	
109	JSSF=NAME+K	FTACOL	1279	
110	K=NAME-1	FTACOL	1280	
111	JSSF=NAME+K	FTACOL	1281	
112	NDIFF=JSSF-JSSF(I)	FTACOL	1282	
113	NAME=NAME+NDIFF	FTACOL	1283	
114	NAME=NAME+NDIFF	FTACOL	1284	
115	IF (NAME,44) GO TO 90	FTACOL	1285	
116	NAME=NAME+NDIFF	FTACOL	1286	
117	NAME=NAME+NDIFF	FTACOL	1287	
118	IF (NAME,45) CALL REFD (NTN,IPR,NAME,NDIFF,NAME,NAME,NAME,NAME)	FTACOL	1288	
119	IF (NAME,46) READ (NTN,180) (IA(I),I=JSSF,NAME)	FTACOL	1289	
120	J2=JSSF+NAME	FTACOL	1290	
121	J3=J2+NAME	FTACOL	1291	
122	J4=J3+NAME	FTACOL	1292	
123	J5=J4+NAME	FTACOL	1293	
124	WRITE (NAME,47)	FTACOL	1294	
125	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1295	
126	WRITE (NAME,48)	FTACOL	1296	
127	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1297	
128	WRITE (NAME,49)	FTACOL	1298	
129	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1299	
130	WRITE (NAME,50)	FTACOL	1300	
131	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1301	
132	WRITE (NAME,51)	FTACOL	1302	
133	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1303	
134	90 CONTINUE	FTACOL	1304	
	---CROSS SECTIONS	FTACOL	1305	
		FTACOL	1306	
135	NAME=NAME+NDIFF	FTACOL	1307	
136	IF (NAME,52) CALL REFD (NTN,IPR,NAME,NDIFF,NAME,NAME,NAME,NAME)	FTACOL	1308	
137	IF (NAME,53) READ (NTN,190) (IA(I),I=JSSF,NAME)	FTACOL	1309	
138	J2=JSSF+NAME	FTACOL	1310	
139	J3=J2+NAME	FTACOL	1311	
140	J4=J3+NAME	FTACOL	1312	
141	J5=J4+NAME	FTACOL	1313	
142	J6=J5+NAME	FTACOL	1314	
143	J7=J6+NAME	FTACOL	1315	
144	J8=J7+NAME	FTACOL	1316	
145	J9=J8+NAME	FTACOL	1317	
146	J10=J9+NAME	FTACOL	1318	
147	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1319	
148	CALL WOT (NAME,NDIFF,NAME,NAME,NAME,NAME,NAME,NAME)	FTACOL	1320	
149	90 CONTINUE	FTACOL	1321	
	RETURN	FTACOL	1322	
		FTACOL	1323	
		FTACOL	1324	
		FTACOL	1325	
150	100 FORMAT (1H)	FTACOL	1326	
151	110 FORMAT (1H)	FTACOL	1327	
152	120 FORMAT (1H) FOLLOWING IS THE TABLE OF THE GROUP NUMBERS	FTACOL	1328	
153	130 FORMAT (1H) GROUP NUMBER	FTACOL	1329	
154	140 FORMAT (1H) GROUP NUMBER	FTACOL	1330	
155	150 FORMAT (1H) GROUP NUMBER	FTACOL	1331	
156	160 FORMAT (1H) GROUP NUMBER	FTACOL	1332	
157	170 FORMAT (1H) GROUP NUMBER	FTACOL	1333	
158	180 FORMAT (1H) GROUP NUMBER	FTACOL	1334	
159	190 FORMAT (1H) GROUP NUMBER	FTACOL	1335	
160	200 FORMAT (1H) GROUP NUMBER	FTACOL	1336	
161	210 FORMAT (1H) GROUP NUMBER	FTACOL	1337	
162	220 FORMAT (1H			

[illegible]

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SUBROUTINE FILE(NOUT1,NOUT2)

1	SUBROUTINE FILE(NOUT1,NOUT2)		
2	DATA HNAME1,HNAME2/6HISQTXS,6HHRKQXS/	FTPCOL	1391
3	DATA HUSE1,HUSE2/6HSIMMER,6HFTR3R*/	FTPCOL	1392
4	DISPLAY ON	FTPCOL	1393
5	IVERS=1	FTPCOL	1394
6	RE=IND NOUT1	FTPCOL	1395
7	RE=IND NOUT2	FTPCOL	1396
8	WRITE (NOUT1)HNAME1,HUSE1,HUSE2,IVERS	FTPCOL	1397
9	WRITE (NOUT2)HNAME2,HUSE1,HUSE2,IVERS	FTPCOL	1398
10	RETURN	FTPCOL	1399
	END	FTPCOL	1400
		FTPCOL	1401

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SUBROUTINE FILE(NOUT1,NOUT2)

SINGLY REFERENCED VARIABLES

FILE = 1SU RETURN = 9F

MULTIPLY-REFERENCED VARIABLES

DATA	=	2F	3F
HNAME1	=R	2DA	7WR
HNAME2	=R	2DA	6WR
HUSE1	=R	3DA	7WR
HUSE2	=R	3DA	7WR
IVERS	=I	4=	7WR
NOUT1	=I	1AG	5
NOUT2	=I	1AG	6
HNAME	=	5F	6F
WRITE	=	7F	8F

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SUBROUTINE ISFC(NOUT)

1	SUBROUTINE ISFC(NOUT)	FTPCOL	1402
2	COMMON /ALL/ IU3,IU4,IU5,IU6,IU7,IU8,IU9,NGPS,NXON,IWGT,NCR,NISO,I	FTPCOL	1403
	IC,IF,FC(100),NFIB(100),XISO(100),FAPHI(100),CGPHI(100)	FTPCOL	1404
3	DISPLAY ON	FTPCOL	1405
4	NISX=0	FTPCOL	1406
5	MAXORD=0	FTPCOL	1407
6	ICMIST=0	FTPCOL	1408
7	NSCMAX=1	FTPCOL	1409
8	NSCLOK=NAH	FTPCOL	1410
9	WRITE (NOUT)NCR,NISA,MAXUP,NCR,MAXORD,ICMIST,NSCMAX,NSCLOK	FTPCOL	1411
10	RETURN	FTPCOL	1412
11	END	FTPCOL	1413
		FTPCOL	1414

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SUBROUTINE ISFC(NOUT)

SINGLY REFERENCED VARIABLES

ALL	=	2CN	FAPHI	(1R	2CO	IU3	=I	2CO	IU7	=I	2CO	NFIB	(1I	2CO	RETURN	=	10F
CGPHI	(1R	2CO	IC	=I	2CO	IU4	=I	2CO	IU8	=I	2CO	NGPS	=I	2CO	WRITE	=	9F
COMMON	=	2F	IE	=I	2CO	IU5	=I	2CO	IU9	=I	2CO	NISO	=I	2CO	XISO	(1R	2CO
FC	(1R	2CO	ISFC	=	1SU	IU6	=I	2CO	IWGT	=I	2CO	NXON	=I	2CO			

MULTIPLY-REFERENCED VARIABLES

ICMIST	=I	6=	qWR
MAXORD	=I	5=	qWR
MAXUP	=I	4=	qWR
NCR	=I	2CO	qWR
NISX	=I	3=	qWR
NOUT	=I	1AG	qWR
NSCLOK	=I	8=	qWR
NSCMAX	=I	7=	qWR

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SUBROUTINE ISFD(NIN,NOUT)

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1      SUBROUTINE ISFD(NIN,NOUT)
2      COMMON A(1)
3      COMMON /ALL/ IU3,IU4,IU5,IU6,IU7,IU8,IU9,NGPS,NXON,IWGT,NCR,NISO,I
      IC,IE,EG(100),NFIR(100),XISO(100),FGPHI(100),CGPHI(100)
4      C      DISPLAY ON
5      C      READ (NIN,30) (A(I),I=1,12)
6      C      VELOCITY V=SQRT(2E/MASS)
7      C      APU=2.7/1.38E+06
8      C      NX=1
9      C      DO 10 I=1,NCR
10      C      NY=NFIH(I)+1
11      C      EM=EG(NX)
12      C      EL=EG(NY)
13      C      NX=NY
14      C      DELTA=EM-EL
15      C      A(I+12)=DELTA/(APU*(SQRT(EM)-SQRT(EL)))
16      C      CONTINUE
17      C      NEXT=12+NCR
18      C      NX=1
19      C      DO 20 I=1,NCR
20      C      A(I+NEXT)=EG(NX)
21      C      NX=NFIH(I)+1
22      C      NEXT=NEXT+NCR+1
23      C      NX=NFIH(NCR)+1
24      C      A(NEXT)=EG(NX)
25      C      CALL RITE (NOUT,2,A(1),NEXT,1)
26      C      RETURN
27      C      30 FORMAT (12A6)
28      C      END

```

FTRCOL 1415
 FTRCOL 1416
 FTRCOL 1417
 FTRCOL 1418
 FTRCOL 1419
 FTRCOL 1420
 FTRCOL 1421
 MAR21 2
 FTRCOL 1423
 FTRCOL 1424
 FTRCOL 1425
 FTRCOL 1426
 FTRCOL 1427
 FTRCOL 1428
 FTRCOL 1429
 MAR21 3
 FTRCOL 1431
 FTRCOL 1432
 FTRCOL 1433
 FTRCOL 1434
 FTRCOL 1435
 MAR21 4
 FTRCOL 1437
 MAR21 5
 MAR21 6
 FTRCOL 1440
 FTRCOL 1441
 FTRCOL 1442
 FTRCOL 1443
 FTRCOL 1444

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SUBROUTINE ISFD(NIN,NOUT)

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SINGLY REFERENCED VARIABLES

ALL	=	3CN	IC	=	-1	3CO	IU4	=	-1	3CO	IUR	=	-1	3CO	NISO	=	-1	3CO	RITE	=	23SU
CGPHI	(1R	3CO	IE	=	-1	3CO	IU5	=	-1	3CO	IUR	=	-1	3CO	NXON	=	-1	3CO	XISO	(1R	3CO
FGPHI	(1R	3CO	ISFD	=	1SU	IU6	=	-1	3CO	IWGT	=	-1	3CO	READ	=	4F					
FORMAT	=	25F	IU3	=	-1	3CO	IU7	=	-1	3CO	NGPS	=	-1	3CO	RETURN	=	24F				

MULTIPLY-REFERENCED VARIABLES

10	=	700	14*																	
20	=	1700	19*																	
30	=	4RU	25*																	
A	(1R	2CO	4RD	13*	18*	22*	23AG													
APU	=R	5*	13																	
COMMON	=	2F	3F																	
DELTA	=R	12*	13																	
EG	(1H	3CO	9	14	18	22														
EM	=R	9*	12	13																
EL	=R	14*	12	13																
I	=1	4RD	4RD	700	8	13	1700	18	19											
NCR	=1	3CO	700	15	1700	20	21													
NEXT	=1	15*	18	23*	20	22	23AG													
NFIH	(11	3CO	8	19	21															
NIN	=1	1AG	4RD																	
NOUT	=1	1AG	23AG																	
NX	=1	6*	9	11*	16*	18	19*	21*	22											
NY	=1	8*	14	11																
SQRT	=	13SU	13SU																	

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SUBROUTINE BRFC(NOUT)

```

1      SUBROUTINE BRFC(NOUT)
2      COMMON /ALL/ IU3,IU4,IU5,IU6,IU7,IU8,IU9,NGPS,NXON,IWGT,NCR,NISO,I
      IC,IE,EG(100),NFIR(100),XISO(100),FGPHI(100),CGPHI(100)
3      C      DISPLAY ON
4      C      NTSOSH=0
5      C      NSIGPT=0
6      C      NTCHPT=0
7      C      WRITE (NOUT,NCR,NISOSH,NSIGPT,NTCHPT)
8      C      RETURN
9      C      END

```

FTRCOL 1445
 FTRCOL 1446
 FTRCOL 1447
 FTRCOL 1448
 FTRCOL 1449
 FTRCOL 1450
 FTRCOL 1451
 FTRCOL 1452
 FTRCOL 1453
 FTRCOL 1454

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SUBROUTINE BRFC(NOUT)

SINGLY REFERENCED VARIABLES

ALL	=	2CN	EG	(1R	2CO	IU3	=	-1	2CO	IUR	=	-1	2CO	NFIH	(11	2CO	RETURN	=	7F		
BRFC	=	1SU	FGPHI	(1R	2CO	IU4	=	-1	2CO	IUR	=	-1	2CO	NGPS	=	-1	2CO	WRITE	=	6F	
CGPHI	(1R	2CO	IC	=	-1	2CO	IU5	=	-1	2CO	IUR	=	-1	2CO	NISO	=	-1	2CO	XISO	(1R	2CO
COMMON	=	2F	IE	=	-1	2CO	IU6	=	-1	2CO	IWGT	=	-1	2CO	NXON	=	-1	2CO			

MULTIPLY-REFERENCED VARIABLES

NCR	=1	2CO	6WR																	
NTSOSH	=1	3*	6WR																	
NOUT	=1	1AG	6WR																	
NSIGPT	=1	4*	6WR																	
NTCHPT	=1	5*	6WR																	

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FTWCOL	1455
FTWCOL	1450
FTWCOL	1457
FTWCOL	1458
FTWCOL	1459
FTWCOL	1460
FTWCOL	1461
FTWCOL	1462
MAH21	7
FTWCOL	1464
MAH21	8
MAH21	9
FTWCOL	1467
FTWCOL	1468
FTWCOL	1469

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MULTIPLY-REFERENCED VARIABLES

10	-	500	7*				
COMMON	()R	2C0	6*	10*	11AG		
G	-	2F	3F				
	()R	3C0	6	10			
CR	-I	500	6	7			
EXT	-I	3C0	500	8	9		
FIB	()I	8*	10	11AG			
OUT	()I	3C0	7	9			
X	-I	1AG	11AG				
	-I	4*	6	7*	9*	10	

ETECOL 147D

FTACOL	1470
FTACOL	1471
FTACOL	1472
FTACOL	1473
FTACOL	1474
FTACOL	1475
FTACOL	1476
FTACOL	1477
FTACOL	1478
FTACOL	1479
FTACOL	1480
FTACOL	1481
FTACOL	1482
FTACOL	1483
FTACOL	1484
FTACOL	1485
FTACOL	1486
FTACOL	1487
FTACOL	1488
FTACOL	1489
FTACOL	1490
FTACOL	1491
FTACOL	1492
FTACOL	1493
FTACOL	1494
FTACOL	1495
FTACOL	1496
FTACOL	1497
FTACOL	1498
FTACOL	1499
FTACOL	1500
FTACOL	1501
FTACOL	1502
FTACOL	1503
FTACOL	1504
FTACOL	1505
FTACOL	1506
FTACOL	1507
FTACOL	1508
FTACOL	1509
FTACOL	1510
FTACOL	1511
FTACOL	1512
FTACOL	1513
FTACOL	1514
FTACOL	1515
FTACOL	1516
FTACOL	1517

INDEX		C2/1R/75		SUBROUTINE WOT(X,II,JJ,KK,TOP1,TOP2,TOP3,NOUT)													
SINGLY REFFERENCED VARIABLES																	
APR	=	16SU	DIMENST	=	ZF	JK	=I	POD	MYNA	=	10SU	RETURN	=	3RF	WOT	=	1SU

MULTIPLY-REFFERENCED VARIABLES																	
1F	=	6	8*														
2A	=	1500	16*														
3A	=	17	20*														
4A	=	20	21*														
5A	=	23	26*														
6A	=	20	28*														
7A	=	27	31*														
8A	=	20	28	34*													
9A	=	1300	19	33	35*												
10F	=	800	24*														
11F	=	300	27*														
12F	=	1700	30*														
13F	=	1700	40*														
14F	=	3000	3400	41*													
15F	=	2600	42*														
FORMAT	=	30F	40F	41F	42F												
I	-I	1300	16	19	21	22	23	25	29	3400	3400						
II	-I	140	20I	1700	19	23											
IM1	-I	22	25	2600	2600	29	3000	3000	3000	3400	3400						
J	-I	1100	1100	1500	16	2600	2600	3000	3000	3400	3400						
JJ	-I	140	20I	5	10												
J01	-I	9	10	1100	1500	2600	3000	3400	3400	3400	3400						
J02	-I	4	9	10	1100	1500	2600	3000	3400	3400	3400						
J03	-I	5	10	1100	1500	2600	3000	3400	3400	3400	3400						
K	-I	300	140	16	2600	3000	3400	3400	3400	3400	3400						
KK	-I	140	20I	300	4												
N	-I	21	24	24	2600												
NFLAG	-I	12	18	18	20	21	32										
N0	-I	140	700	1100	2600	3000	3400	3400	3400	3400	3400						
S000	-R	14	16	16	17	23	20	33									
T001	-R	140	1100														
T002	-R	140	1100														
T003	-R	140	700														
WRITE	-	7F	11F	20F	20F	30F	30F	3400	3400	3400	3400						
X	-R	140	20I	16	2600	3000	3400	3400	3400	3400	3400						

INDEX	C2/1R/75	SUBROUTINE	WOT(A,L1,B,L2,C,L3,D,L4,E,L5,F,L6,G,L7,H,L8,NOUT)
1		SUBROUTINE WOT(A,L1,B,L2,C,L3,D,L4,E,L5,F,L6,G,L7,H,L8,NOUT)	FTRCOL 1518
		---SUBROUTINE WOTB PRINTS UP TO a ONE-DIMENSIONAL ARRAYS.	FTRCOL 1519
			FTRCOL 1520
2		D1=FUNCTION FPT(19), FNT(6), L(9), 7(R), M(8), A(1), B(1), C(1), D(1)	FTRCOL 1521
		1), F(1), G(1), H(1)	FTRCOL 1522
3		F2=IV(4),L(4),F(2,M)	FTRCOL 1523
4		DATA X,K,FPT(1),FPT(2),FPT(19)/4M, 100000+4M(10),4M(10) /	FTRCOL 1525
5		DATA FNT(1),FNT(2),FNT(3),FNT(4),FNT(5),FNT(6)/4M,F13+4M,5, 4M,18	FTRCOL 1526
		1,4,5,5, 4M,2X,4M,4 /	FTRCOL 1527
6		L(1)=1	FTRCOL 1528
7		L(2)=1	FTRCOL 1529
8		L(3)=1	FTRCOL 1530
9		L(4)=1	FTRCOL 1531
10		L(5)=1	FTRCOL 1532
11		L(6)=1	FTRCOL 1533
12		L(7)=1	FTRCOL 1534
13		L(8)=1	FTRCOL 1535
14		N=0	FTRCOL 1536
15		DO 100 I=1,N	FTRCOL 1537
16		N=MAX(N,I)	FTRCOL 1538
17		10 CONTINUE	FTRCOL 1539
18		DO 100 I=1,N	FTRCOL 1540
19		DO 100 J=1,N	FTRCOL 1541
20		IF (L(I),GF,I) GO TO (70,30,40,50,60,70,80,90), J	FTRCOL 1542
21		Z(I)=X	FTRCOL 1543
22		FPT(20,I)=FNT(5)	FTRCOL 1544
23		FPT(20,I)=FNT(6)	FTRCOL 1545
24		GO TO 100	FTRCOL 1546
25		Z(I)=A(I)	FTRCOL 1547
26		GO TO 100	FTRCOL 1548
27		Z(I)=B(I)	FTRCOL 1549
28		GO TO 100	FTRCOL 1550
29		Z(I)=C(I)	FTRCOL 1551
30		GO TO 100	FTRCOL 1552
31		Z(I)=D(I)	FTRCOL 1553
32		GO TO 100	FTRCOL 1554
33		Z(I)=E(I)	FTRCOL 1555
34		GO TO 100	FTRCOL 1556
35		Z(I)=F(I)	FTRCOL 1557
36		GO TO 100	FTRCOL 1558
37		Z(I)=G(I)	FTRCOL 1559
38		GO TO 100	FTRCOL 1560
39		Z(I)=H(I)	FTRCOL 1561
40		100 FPT(20,I)=FNT(1)	FTRCOL 1562

FTRCOL	1563
FTRCOL	1564
FTRCOL	1565
FTRCOL	1566
FTRCOL	1567
FTRCOL	1568
FTRCOL	1569
FTRCOL	1570
FTRCOL	1571
FTRCOL	1572

[illegible]

FTACOL	1573
FTACOL	1574
FTACOL	1575
FTACOL	1576
FTACOL	1577
FTACOL	1578
FTACOL	1579
FTACOL	1580
FTACOL	1581
FTACOL	1582
FTACOL	1583
FTACOL	1584
FTACOL	1585
FTACOL	1586
FTACOL	1587
FTACOL	1588
FTACOL	1589
FTACOL	1590
FTACOL	1591
FTACOL	1592
FTACOL	1593

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SUBROUTINE MOTI(I,X,II,JJ,KK,TOP1,TOP2,TOP3,NOU)

SINGLY REFERENCED VARIABLES

DIMENSI	=	2F	JK	-I	NO	MINO	=	10SU	RETURN	=	15F	MOTI	=	15U
---------	---	----	----	----	----	------	---	------	--------	---	-----	------	---	-----

MULTIPLY-REFERENCED VARIABLES

1A	=	6	8*											
2A	=	3DO	RUO	12DO	14*									
3A	=	7WH	16*											
4A	=	11WR	17*											
5A	=	13WR	18*											
FORMAT	=	16F	17F	18F										
I	=I	12DO	13WR	13WR										
II	=I	1AG	2DI	12DO										
IX	(I)	1AG	2DI	13WR										
J	=I	11WR	11WR	13WR	13WR									
JJ	=I	1AG	2DI	5	1A									
JO1	=I	9	1A	11WR	13WR									
JO2	=I	4	9	1A	11WR	13WR								
JO3	=I	5	8DO											
K	=I	3DO	7WR	13WR										
KK	=I	1AG	2DI	3DO	6									
NOU	=I	1AG	7WR	11WR	13WR									
TOP1	=R	1AG	11WR											
TOP2	=R	1AG	11WR											
TOP3	=R	1AG	7WR											
WRITE	=	7F	11F	13F										

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SUBROUTINE REED(N,I,REC,X,L,MODE)

1	SUBROUTINE REED(N,I,REC,X,L,MODE)	FTACOL	1594
2	DIMENSION X(L)	FTACOL	1595
3	IF (L.I.E.) RETURN	FTACOL	1596
4	READ (N)(X(I),I=1,L)	FTACOL	1597
5	RETURN	FTACOL	1598
6	END	FTACOL	1599

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SUBROUTINE REED(N,I,REC,X,L,MODE)

SINGLY REFERENCED VARIABLES

DIMENSI	=	2F	IREC	-I	1AR	MODE	=I	1AG	READ	=	4F	REED	=	15U
---------	---	----	------	----	-----	------	----	-----	------	---	----	------	---	-----

MULTIPLY-REFERENCED VARIABLES

I	=I	4DO	4PU											
L	=I	1AG	2DI	3	4PO									
N	=I	1AG	4PU											
RETURN	=	3F	5F											
X	(I)	1AG	2DI	4PO										

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SUBROUTINE RITE(N,I,REC,X,L,MODE)

1	SUBROUTINE RITE(N,I,REC,X,L,MODE)	FTACOL	1600
2	DIMENSION X(L)	FTACOL	1601
3	IF (L.I.E.) RETURN	FTACOL	1602
4	WRITE (N)(X(I),I=1,L)	FTACOL	1603
5	RETURN	FTACOL	1604
6	END	FTACOL	1605

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SUBROUTINE RITE(N,I,REC,X,L,MODE)

SINGLY REFERENCED VARIABLES

DIMENSI	=	2F	IREC	-I	1AR	MODE	=I	1AG	WRITE	=	15U	WRITE	=	4F
---------	---	----	------	----	-----	------	----	-----	-------	---	-----	-------	---	----

MULTIPLY-REFERENCED VARIABLES

I	=I	4DO	4WR											
L	=I	1AG	2DI	3	4WR									
N	=I	1AG	4WR											
RETURN	=	3F	5F											
X	(I)	1AG	2DI	4WR										

INDEX	02/18/75	SUBROUTINE STOW(A,R,NWDS)		
1		SUBROUTINE STOW(A,R,NWDS)	FTPCOL	1606
2		DIMENSION A(1), B(1)	FTPCOL	1607
3		IF (NWDS.I.E.O) RETURN	FTPCOL	1608
4		DO 10 I=1,NWDS	FTPCOL	1609
5	10	A(I)=A(I)	FTPCOL	1610
6		RETURN	FTPCOL	1611
7		END	FTPCOL	1612

INDEX	02/18/75	SUBROUTINE STOW(A,R,NWDS)		
SINGLE REFERENCED VARIABLES				
DIMENSION A(1), B(1)				
MULTIPLY-REFERENCED VARIABLES				
1	10	400	50	
A	10	100	201	5
B	10	100	201	50
N	10	400	5	5
NWDS	10	100	3	400
RETURN	10	30	AF	

INDEX	02/18/75	SUBROUTINE STOWI(IA,IP,NWDS)		
1		SUBROUTINE STOWI(IA,IP,NWDS)	FTPCOL	1613
2		DIMENSION IA(NWDS), IP(NWDS)	FTPCOL	1614
3		IF (NWDS.I.E.O) RETURN	FTPCOL	1615
4		DO 10 I=1,NWDS	FTPCOL	1616
5	10	IP(I)=IA(I)	FTPCOL	1617
6		RETURN	FTPCOL	1618
7		END	FTPCOL	1619

INDEX	02/18/75	SUBROUTINE STOWI(IA,IP,NWDS)		
SINGLE REFERENCED VARIABLES				
DIMENSION A(1), B(1)				
MULTIPLY-REFERENCED VARIABLES				
1	10	400	50	
IA	10	100	201	5
IP	10	100	201	50
N	10	400	5	5
NWDS	10	100	201	3 400
RETURN	10	30	AF	

INDEX	02/18/75	SUBROUTINE ARRAY(I,J,N,M,S,D)		
1		SUBROUTINE ARRAY(I,J,N,M,S,D)	FTPCOL	1620
2		DIMENSION S(1), O(1)	FTPCOL	1621
3		I=0	FTPCOL	1622
4		NWDS	FTPCOL	1623
5		NWDS=1	FTPCOL	1624
6		DO 20 I=1,J	FTPCOL	1625
7		DO 10 I=1,N	FTPCOL	1626
8		I=I+1	FTPCOL	1627
9		NWDS=I	FTPCOL	1628
10	10	S(I)=O(N)	FTPCOL	1629
11	20	NWDS=I	FTPCOL	1630
12		RETURN	FTPCOL	1631
13		END	FTPCOL	1632

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SUBROUTINE ARRAY(I,J,N,M,S,D)

SINGLY REFERENCED VARIABLES

APRA' - 1SU DIMENSI - 2F K -I 600 L -I 700 M -I 1AG RETURN - 12F

MULTIPLY-HFFERENCED VARIABLES

```

10 = 700 10*
20 = 600 11*
D 1)R 1AG 20I 10
I -1 1AG 5 700
IJ -1 3= 8= 10
J -1 1AG 600
N -1 1AG 5
N1 -1 5= 1)
NM -1 4= 9= 9 10 11= 11
S 1)R 1AG 20I 10*

```

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MASTER INDEX

LIST OF ALL VARIABLES DEFINED IN INPUT

C MEANS VARIABLE WAS DEFINED IN COMMON IN THAT ROUTINE
 D MEANS VARIABLE WAS DEFINED IN OTHER DECLARATIONS
 NON-ALANK NUMERIC IS NUMBER OF NON-DECLARATORY REFERENCES
 S PREFIXING MEANS SUBROUTINE (PROGRAM/FUNCTION) NAME
 L PREFIXING MEANS COMMON (COMMON) NAME
 F PREFIXING MEANS FUNCTION KEYWORD
 * PREFIXING MEANS VARIABLE IS DECLARED, NOT USED ANYWHERE

VARIABLE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE	ROUTINE	TYPE
A	FLUCOL	C	UNIT	A	COLAP	10C	RITISO	27C0	RITARK	27C0	RISOTX	63C0	BARCK	42C0	ISFD	5C	BRPD	3C
S ARS	ONCT	4	STOW	2D	NOT	1												
AJAFI	RISOTX	10	COLAP	1	NOT	1												
L ALL	FLUCOL	1	UNITS	1	INPUT	1	FLUX	1	SIRCH	1	COLAP	1	RITPUN	1	CHKOUN	1	EDIT	1
S ALOC	FLUX	1	ISFC	1	ISFD	1	ARFC	1	BIPO	1								
ANDON	INPUT	2C	COLAP	1	RITARK	2												
ANDON	RISOTX	10	FLUX	C	CUFP	1C												
ADU	ISFD	2																
ADFA	ONCT	6																
S ADPAY	ONCT	1																
ADT	ONCT	2D																
AH	FLUCOL	2	SENCH	1C	COLAP	C	RITISO	7C	RITARK	C	AP	C	IS	C	RISOTX	C	BARCK	C
AH	ONCT	2	RITISO	1C	COLAP	13C0	NOTA	2D	STOW	2D								
F HICKSP	SIRCH	1																
S HARKY	FLIT	1	BARCK	1														
S HF	RITARK	1	BF	1														
S HISOTX	FLIT	1	RISOTX	1														
HICW	RISOTX	6																
S HIFC	WITNW	1	ARFC	1														
S HIFD	RITNW	1	ARFD	1														
C	WITN	2D																
L HCCC	FLUCOL	1	UNITS	1	RITPUN	1	RITISO	1	RITARK	1	CHKOUN	1	EDIT	1	RITNW	1		
S HCFE	FLUX	2	COEF	1														
CHONE	FLUCOL	C	UNITS	C	INPUT	C	FLUX	4C	SIRCH	C	COLAP	6C	RITPUN	C	CHKOUN	C	EDIT	C
CHONE	WITNW	C	ISFC	C	ISFD	C	ARFC	C	BIPO	C								
CHISA	RITPUN	2C	RITISO	1C														
S CHADON	FLUCOL	1	CHKOUN	1														
S COLAP	FLUCOL	1	COLAP	1														
F CONMAN	FLUCOL	4	UNITS	2	INPUT	3	FLUX	9	CUFP	1	SENCH	2	COLAP	3	INITC	1	RITPUN	4
F CONMAN	RITISO	4	RITARK	4	BF	1	IS	2										
S COPYE	ISFC	1	ISFD	2	ARFC	1	BIPO	2										
L COLGVS	RITISO	1	RITARK	1														
CDM	COLAP	1	RITISO	1														
D	COLAP	12																
DC	WITN	2D	ARHBY	2D														
DC	ONCT	6																
F DITA	RISOTX	2	BARCK	1	FILE	2	NOTA	2										
DFTA	COLAP	1	ISFD	2														
F DIFP-SE	ONCT	1	RITISO	1	RITARK	1	AF	1	SE	1	RISOTX	1	BARCK	2	NOT	1	NOTB	1
DI	WITN	1	REED	1	RITC	1	STOW	1	STOW	1	ARRAY	1						
DI	ONCT	6																
DIT	ONCT	2D																
E	NOTA	2D																
ECAPT	FLUCOL	C	UNITS	C	RITPUN	2C	RITISO	7C	RITARK	C	CHKOUN	C	EDIT	C	RITNW	C		
ECUT	INPUT	4C	FLUX	C	CUFP	1C												
S EDIT	CHKOUN	1	EDIT	1														
EFICF	FLUCOL	C	UNITS	C	RITPUN	3C	RITISO	7C	RITARK	C	CHKOUN	C	EDIT	C	RITNW	C	EDIT	C
EN	FLUCOL	C	UNITS	C	INPUT	2C	FLUX	4C	SIRCH	C	COLAP	2C	RITPUN	C	CHKOUN	C	EDIT	C
EN	WITNW	C	ISFC	C	ISFD	4C	ARFC	C	BIPO	2C								
EN	ISFD	3																
ENIGM	FLUX	2																
EL	ISFD	3																
ELAS	RISOTX	10																
ELDM	FLUX	2																
F ENF	FLUCOL	1																
L ENFIC	INPUT	1	FLUX	1	COEF	1												
EOS	ONCT	5																
EOST	ONCT	3D																
F EQUIVAL	RITISO	2	RITARK	2	RISOTX	1	BARCK	1	NOTA	1								
EXT	ONCT	6																
EXTI	ONCT	4																
EXTD	ONCT	4																
EXTI	ONCT	2D																
FTEMP	INPUT	3C	FLUX	C	CUFP	1C												
EX	CUFP	5																
S EXP	INPUT	1	COEF	1														
F EXTENIA	FLUX	1																
F	ONCT	4D	NOTA	2D														
FC	WF	3D																
FFL	WF	3D																
FRR	ONCT	2																
FTRCCL	FLUCOL	C	SENCH	2C	COLAP	4C	RITISO	C	RITARK	C	AP	C	IS	C	RISOTX	C	BARCK	C
FTRCCL	FLUCOL	C	COLAP	4C	INITC	1C	RITARK	C	RITARK	C	BF	C	IS	C	RISOTX	C	BARCK	C
FTRCCL	FLUCOL	C	UNITS	C	INPUT	1C	FLUX	4C	SIRCH	C	COLAP	16C	RITPUN	C	CHKOUN	C	EDIT	C
FTRCCL	WITNW	C	ISFC	C	ISFD	C	ARFC	C	BIPO	C								

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47

[illegible]

NO. OF GROUPS ON MASTER TAPE 29
 DOWNSCATTER TERMS 11
 WGT. FCN. OPTION 2
 1 1/E WEIGHT FUNCTION
 2 1/E * FISSION WEIGHT FUNCTION
 3 INPUT WEIGHTING FUNCTION
 NO. OF COLLAPSED GROUPS 5
 NO. OF ISOTOPEs FROM MASTER 15
 OUTPUT CARU/TAPE.0/1 1
 EDIT COLLAPSE 1=YES/NO 1
 FOR 1/E*FISSION SPECTRUM
 ENERGY CUT (EV) 8.2795E+05
 TEMPERATURE (EV) 1.40000E+06
 NORMALIZATION 4.17817E+08
 NEW TAPE 11507X5/BHKKX5)
 I/O (YES/NO) 1

GROUP	BOUND.
1	1.0000E+17
2	6.44650E+16
3	3.6790E+16
4	2.2310E+16
5	1.3570E+16
6	8.2090E+15
7	4.9790E+15
8	3.8770E+15
9	3.0260E+15
10	1.8320E+15
11	1.1110E+15
12	6.7380E+14
13	4.0870E+14
14	2.5540E+14
15	1.4990E+14
16	1.5000E+14
17	9.1190E+13
18	5.5310E+13
19	3.3590E+13
20	2.8400E+13
21	2.4040E+13
22	2.0350E+13
23	1.2300E+13
24	7.4650E+12
25	4.5470E+12
26	2.7540E+12
27	1.3010E+12
28	6.1440E+11
29	1.3710E+11
30	6.8260E+11

BD.GRP/NUMBR.	
1	7
2	11
3	14
4	23
5	29

LIST OF ISOTOPEs FROM TAPE
 ISOTOPE NAME

B 1155
 C 1165
 O 1134
 NA1156
 CP1121
 MN1019
 FE1180
 NI1123
 MO1111
 U 1157
 U 1158
 PU1159
 PU1105
 PU1106
 PU1161

FINE GROUP FLUXES USED IN COLLAPSING

GROUP	PHI-EV
1	4.6334E+17
2	1.76215E+18
3	3.0778E+18
4	3.2777E+18
5	2.54113E+18
6	2.06909E+18
7	1.03523E+18
8	1.03373E+18
9	2.0684E+18
10	2.06969E+18
11	2.0694E+18
12	2.0688E+18
13	1.9455E+18
14	1.0344E+18
15	1.15939E+18
16	2.06779E+18
17	2.06905E+18
18	2.06874E+18
19	6.8961E+17
20	6.89709E+17
21	6.6957E+17
22	2.07805E+18
23	2.0688E+18
24	2.0689E+18
25	2.0685E+18
26	3.1033E+18
27	3.10463E+18
28	6.2089E+18
29	1.2414E+19

COARSE GROUP FLUX VALUES USED IN COLLAPSE

GROUP	PHI-EV
1	1.42174E+19
2	7.24131E+18
3	5.04910E+18
4	1.3577E+19
5	2.89668E+19

PROCESSING ISOTOPE NAME B 1155

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 7
 NISONM R70072
 NIDENT ENDFB3
 HMAT 1165
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME C 1145

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 5
 NISONM C12052
 NIDENT ENDFB3
 HMAT 1165
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME O 1134

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 1
 NISONM O16052
 NIDENT ENDFB3
 HMAT 1134
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME N1136

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 6
 NISONM NA 052
 NIDENT ENDFB3
 HMAT 1156
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME C01121

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 5
 NISONM CR 052
 NIDENT ENDFB3
 HMAT 1121
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME M1119

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 5
 NISONM MN 052
 NIDENT ENDFB3
 HMAT 1014
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME F1110

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 5
 NISONM FE 052
 NIDENT ENDFB3
 HMAT 1180
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME N1123

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 5
 NISONM NI 052
 NIDENT ENDFB3
 HMAT 1123
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME M1111

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 5
 NISONM MO 052
 NIDENT ENDFB3
 HMAT 1111
 EFISS -0.
 ECAPT -0.
 PROCESSING ISOTOPE NAME U 1157

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 1
 NISONM U5 052
 NIDENT ENDFB3
 HMAT 1157
 EFISS 3.20000E-17
 ECAPT -0.
 PROCESSING ISOTOPE NAME U 1158

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 2
 NISONM U8 052
 NIDENT ENDFB3
 HMAT 1158
 EFISS 3.20000E-17
 ECAPT -0.
 PROCESSING ISOTOPE NAME P11159

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 1
 NISONM PU9052
 NIDENT ENDFB3
 HMAT 1159
 EFISS 3.20000E-17
 ECAPT -0.
 PROCESSING ISOTOPE NAME P11185

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 1
 NISONM PU0052
 NIDENT ENDFB3
 HMAT 1105
 EFISS 3.20000E-17
 ECAPT -0.
 PROCESSING ISOTOPE NAME P11186

INPUT VALUE FOR VERSION III CCCC INTERFACE FILES
 KBR 1
 NISONM PU1052
 NIDENT ENDFB3
 HMAT 1106

*** FILEISUTXS -- VERSION 1 -- UNIT 9***
 USER IDENTIFICATIONSIMMER FTR300

FILE CONTROL PARAMETERS

NGROUP	NUMBER OF ENERGY GROUPS IN SET	5
NISO	NUMBER OF ISOTOPES IN SET	15
MAXUP	MAXIMUM NUMBER OF UPSCATTER GROUPS	5
MAXDN	MAXIMUM NUMBER OF DOWNSCATTER GROUPS	5
MAXORD	MAXIMUM SCATTERING ORDER	5
ICHIST	SET FISSION SPECTRUM FLAG	5
	ICHIST=1 SET VECTOR	
	=NGROUP, SET MATRIX	
	=0 ISOTOPE SET	
NSCMAX	MAXIMUM NUMBER OF BLOCKS OF SCATTERING DATA	1
NSBLOK	BLOCKING CONTROL FOR SCATTERING DATA	5

5 GROUP WITH 1/E + FISSION WGT. FCN ECUT=.02 MEV THETA=1.4MEV

ISOTOPE	NAME
1	U70072
2	C12052
3	O16052
4	NA 052
5	CR 052
6	MN 052
7	FE 052
8	NI 052
9	MO 052
10	U5 052
11	U8 052
12	PU9052
13	PU0052
14	PU1052
15	PU2052

MEAN NEUTRON VELOCITY IN GROUP J

J	
1	3.02835E+09
2	6.48421E+08
3	2.86838E+08
4	1.34945E+08
5	2.54005E+07

MAXIMUM ENERGY BOUND

GROUP	J	
1	1	1.00000E+67
2	2	4.97900E+05
3	3	1.11106E+05
4	4	2.55400E+04
5	5	1.23400E+03

MINIMUM ENERGY BOUND OF SPT

.69260E+20

NUMBER OF RECORDS TO BE SKIPPED
 ISOTOP/NUMBER 1

EDIT FOR ISOTOPE NAMED B70072
 FOLLOWING IS THE TABLE INDEX
 J GROUP NUMBER
 K TEMPERATURE NUMBER
 N SIGPO NUMBER

TOTAL SELF-SHIELDING FACTORS

ISOTOPE 1

J	K	N
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
1	2	1
2	2	1
3	2	1
4	2	1
5	2	1
6	2	1
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1
1	4	1
2	4	1
3	4	1
4	4	1
5	4	1
6	4	1
1	5	1
2	5	1
3	5	1
4	5	1
5	5	1
6	5	1
1	6	1
2	6	1
3	6	1
4	6	1
5	6	1
6	6	1

CAPTURE SELF-SHIELDING FACTORS

ISOTOPE 1

J	K	N
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
1	2	1
2	2	1
3	2	1
4	2	1
5	2	1
6	2	1
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1
1	4	1
2	4	1
3	4	1
4	4	1
5	4	1
6	4	1
1	5	1
2	5	1
3	5	1
4	5	1
5	5	1
6	5	1
1	6	1
2	6	1
3	6	1
4	6	1
5	6	1
6	6	1

FISSION SELF-SHIELDING FACTORS

ISOTOPE 1

J	K	N
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
1	2	1
2	2	1
3	2	1
4	2	1
5	2	1
6	2	1
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1
1	4	1
2	4	1
3	4	1
4	4	1
5	4	1
6	4	1
1	5	1
2	5	1
3	5	1
4	5	1
5	5	1
6	5	1
1	6	1
2	6	1
3	6	1
4	6	1
5	6	1
6	6	1

TRANSPORT SELF-SHIELDING FACTORS

ISOTOPE 1

J	K	N
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
1	2	1
2	2	1
3	2	1
4	2	1
5	2	1
6	2	1
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1
1	4	1
2	4	1
3	4	1
4	4	1
5	4	1
6	4	1
1	5	1
2	5	1
3	5	1
4	5	1
5	5	1
6	5	1
1	6	1
2	6	1
3	6	1
4	6	1
5	6	1
6	6	1

ELASTIC SELF-SHIELDING FACTORS

ISOTOPE 1

J	K	N
1	1	1
2	1	1
3	1	1
4	1	1
5	1	1
6	1	1
1	2	1
2	2	1
3	2	1
4	2	1
5	2	1
6	2	1
1	3	1
2	3	1
3	3	1
4	3	1
5	3	1
6	3	1
1	4	1
2	4	1
3	4	1
4	4	1
5	4	1
6	4	1
1	5	1
2	5	1
3	5	1
4	5	1
5	5	1
6	5	1
1	6	1
2	6	1
3	6	1
4	6	1
5	6	1
6	6	1

N	K	I
1	1.00000E+00	
2	1.00000E+00	
3	1.00000E+00	
4	1.00000E+00	
5	1.00000E+00	
6	1.00000E+00	

CROSS SECTIONS

POSITION CROSS SECTION

1	POTENTIAL SCATTERING
2	INELASTIC
3	ELASTIC
4	AVERAGE COSINE OF ELASTIC SCATTERING ANGLE
5	ELASTIC DOWN-SCATTERING TO ADJACENT GROUP
6	AVERAGE ELASTIC SCATTERING LETHARGY INCREMENT

GROUP		POSITION					
1	0	3.31865E-02	2.02703E+00	1.49112E-01	1.57867E-01	1.72125E-01	
2	0	0	3.22059E+00	4.76000E-02	3.25509E-01	1.80600E-01	
3	0	0	2.39769E+00	4.76000E-02	3.33934E-01	1.80600E-01	
4	0	0	2.21744E+00	4.76000E-02	1.64991E-01	1.88600E-01	
5	0	0	2.20000E+00	4.76000E-02	3.55309E-01	1.88600E-01	