ENDF/B-V UTILITY PROGRAMS

Description and Operating Instructions

Abstract

A description and operating instructions are supplied for the following ENDF/B-V Processing Programs: CHECKER, CRECT, STNDRD, FIZCON, PSYCHE, RESEND, INTER, INTEND, SUMRIZ, PLOTEF, LSTFCV, RIGEL.

These programs can be obtained on magnetic tape, free of charge, from the IAEA Nuclear Data Section.

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March 1984

ENDF/B-V PROCESSING PROGRAMS

Introduction:

The ENDF/B-V utility programs summarized in this document have been received by the Nuclear Data Section from the National Nuclear Data Center, Brookhaven, U.S.A. These codes were up-to-date as of March 1984. Users of these codes are asked to verify that they are using the most up-to-date versions of these codes.

Summary Descriptions

CHECKER   : to check the structure, consistency and legal formats of ENDF/B data files.

CRECT   : to make corrections on an ENDF/B BCD tape.

STNDRD   : to standardize a material file to the ENDF/B-V format with options:

              a) write the tape I.D. # (IDTAPE),
              b) create a new index and delete the old one,
              c) extract all E's in the 'E' format and insert zeroes in control cards where necessary (IDLTES).

FIZCON   : to check ENDF/B data for physics consistency and to see that recommended procedures are followed.

PSYCHE   : Physics checks of ENDF/B-V.

INTER   : to calculate:

              a) the Maxwellian averaged cross section,
              b) the thermal cross section,
              c) the g-factor,
              d) the resonance integrals,
              e) 14 MeV cross section.

SUMRIZ   : to create a summary of a material in the ENDF format.

PLOTEF   : to plot the ENDF/B-V data according to material number and file number from BCD in standard format.

LSTFCV   : to produce interpreted listings of information from BCD standard arrangement ENDF/B tape.

RIGEL   : to perform any or all of the following operations on ENDF/B tapes:

              a) selectively or non-selectively retrieve ENDF/B data from one to nine ENDF/B tapes,
              b) merge retrieved ENDF/B data onto from one to eight ENDF/B result tapes,

        c) change arrangement (standards to alternate or vice
           versa),

        d) change mode (BCD to binary or vice versa).

SETMDC   : to convert programs from one cofiguration to another
         (3 versions included: for CDC, IBM, DEC).

Note: The codes RESEND and INTEND have been removed from this
       package since they were found to be deficient. The same
       functions may be performed using the codes RECENT and *GROUPIE*
       which are included in the ENDF/B preprocessing code package;
       for details contact the Nuclear Data Section.

Program Revisions and Up-dates

ENDF/B Processing Programs have been revised and updated several times:

CHECKER : Version 70-1 (June 1970)   Version 75-1 (May 1975)
            "   70-2 (Aug. 1970)   "   76-1 (Jan. 19756
            "   70-3 (Dec. 1970)   "   76-5 (May 1976)
            "   71-1 (May 1971)   "   77-1 (Jan. 1977)
            "   71-2 (Aug. 1971)   "   82-1 (May 1982)
            "   73-2 (Aug. 1973)   "   82-2 (July 1982)
            "   74-1 (Oct. 1974)

CRECT   : Version 69-1 (Apr. 1969)
            "   74-3; CDC 6600 ENDF/B-IV Production Program
            "   76-7; tested on CDC 7600 for ENDF/B-V Production

STNDRD   : Version 76-6; ENDF/B-V   Version 80-1 (Feb. 1980)
            "   77-1; ENDF/B-V   "   82-1 (May 1982)

FIZCON   : Version 76-1 (Jan. 1976)   Version 77-1 (Jan. 1977)
            "   76-2 (Apr. 1976)   "   80-1 (Feb. 1980)
            "   76-3 (June 1976)   "   82-1 (May 1982)
            "   76-4 ()ct. 1976)   "   82-2 (July 1982)

PSYCHE   : Version 77-7 (July 1977); ENDF/B-V formats
            "   78-10(Oct. 1978)
            "   80-1 (Feb. 1980)
            "   82-1 (May 1982)
             "   82-2 (Aug. 1982)

INTER   : Version 72-1 (Feb. 1972)
            "   78   updated and tested on ENDF/B-V
            "   80-1 (Feb. 1980)

SUMRIZ   : Version 77-1; ENDF/B-V
            "   80-1 (Feb. 1980)
            "   82-1 (May 1982)

PLOTEF   : Version 77-1 (Jan. 1977)   Version 78-10(Oct. 1978)
            "   77-6 (June 1977)   "   80-1 (Feb. 1978)

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LSTFCV     :  Version 69-1 (Apr.  1969)
                  "    70-1 (Aug.  1970)
                  "    70-2 (Dec.  1970) PDP 10 version
                  "    73-2 (July  1973) PDP 10 update ENDF/B-IV
                  "    74-2 (Feb.  1974) include error files
                  "    74-3 (Oct.  1974) corrections
                  "    76-1 (July  1976) update to ENDF/B-V
                  "    77-1 (May   1977) corrections to file 8 and common
                                         plus I/O changes
                  "    77-2 (June  1972) changes to MFID and MTID
                  "    78-1 (Sep.  1978) corrected file 4 Lab/cm comment
                  "    80-1 (Feb.  1980)

RIGEL      :  Version 69-1 (Apr.  1969)
                  "    70-1 (Mar.  1970)
                  "    70-2 (Dec.  1970) 5000 points arrays
                  "    71-1 (Aug.  1971) Version III formats
                  "    73-2 (Sep.  1973) ENDF/B-IV updates
                  "    74-1 (Oct.  1974) correction
                  "    76-1 (Feb.  1976) ENDF/B-V updates
                  "    77-1 (Jan.  1977) ENDF/B-V updates
                  "    80-1 (Feb.  1980)

SETMDC     :  Version  3-1 (Dec.  1977)
                  "     3-2 (Aug.  1978)
                  "     3-3 (Feb.  1980)
                  "     4-4 (June  1981)
                  "     5-5 (Aug.  1982)
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Program CHECKER

Purpose: Check ENDF/B data files for legal formats.

Units:	Function	Internal Name
5	Card input	NIN
6	Execution & error messages	NOUT
11	ENDF tape	NT

Operation: Card input (Unit 5)

Card 1 (6I11)

NT	Input data file unit	11
LABEL	Tape number (if zero, omits label checking)	0/1
NOPT	Reduced listing option (if zero, lists entire file)	
IRDHOL	Hollerith read (if zero, read integer and floating point format; if one, reads 80A1 format and converts data fields to integer and floating point).	0/1

Card 2 (6I11)

MAT1 --- Starting mat no.
MF1 --- No longer used
MT1 --- No longer used
MAT2 --- Ending mat no.
MF2 --- No longer used
MT2 --- No longer used

Related program:

Part of CHECKR(4) with format update and added tests.

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Program CRECT

Purpose: Correct data on an ENDF tape.

Units:	Function	Internal Name
5	Card input	NIN
6	Execution & error messages	NOUT
11	ENDF input tape	LIBO
12	ENDF output tape	LIBN

Operation: See ENDF-110 - Description of the ENDF/B processing codes and
           retrieval subroutines.

Related program:

   Unchanged from CRECT(4).

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Program STNDRD

Purpose: To standardize ENDF/B-V data formats (i.e. to remove E's in
exponential format), resequence file and create or update the
dictionary for all materials.

Units:	Function	Internal Name
5	Card input	INPUT
6	Execution & error messages	OUTPUT
20	ENDF input tape	ITAPE
21	ENDF output tape	OTAPE
22	Scratch	ISCR

Operation: Card input (Unit=5)

Card 1 (16A4,A2,I4)

Sixty six columns available for tape label text, four columns
available for tape label (right justified).

Card 2 (2A3,2I2)

Function	RESPONSE
Create new index	YES/NO
Standardize ENDF data format	YES/NO
Input tape unit	20
Output unit	21

Related program:

Replaces DICTION(4) and provides additional capabilities.

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Program FIZCON

Purpose: Check ENDF/B data for physics consistency and to see that
            recommended procedures are followed.

Units:	Function	Internal Name
5	Card input	NIN
6	Execution & error messages	NOUT
11	ENDF tape	NT
21	Scratch	ISCRX
22	Scratch	ISCRY
23	Scratch	ISCRXY

Operation: Card input (Unit=5)

   Card 1 (7I11, 5X, E11.4)

NT	ENDF input tape	11	
ICKT	Deviant point test option	If 0 will do, is 1 will omit	
ISUM	SUMUP TEST option	If 0 will omit, if 1 will do	
ISCRX	Scratch unit	21	
ISCRY	Scratch unit	22	
ISCRXY	Scratch unit	23	
ISCS4	Scratch unit	24	
EPSILN	Percentage error allowances .1% = .001 is default		

   Card 2 (6I11)

MAT1 --- Starting mat no.
MFL   --- Starting file no. (not used)
MT1   --- Starting reaction no. (not used)
MAT2 --- Ending mat no.
MF2   --- Ending file no. (not used)
MT2   --- Ending reaction no. (not used)

Related program:

     Includes most of VIXEN and parts of CHECKR(4) not in CHECKR(5) and
SUMUP. Formats upgraded and tests added.

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Program PSYCHE

Purpose: To perform CAREN tests, Calculate resonance integrals, Check
secondary particle energy conservation, Reaction Q-value tests
and Chart of the Nuclides tests.

Units:	Function	Internal Name
5	Card input	NIN
6	PSYCHE output	NOUT
11	ENDF input tape	NT
22	Scratch	ISCR
23	Scratch	JSCR
24	Scratch	KSCR
25	Scratch	LSCR

Operation: Card input (Unit=5)

Card 1 (6I11)

MAT1 --- Starting mat no.
MF1 --- Starting file no. (not used)
MT1 --- Starting reaction no. (not used)
MAT2 --- Ending mat no.
MF2 --- Ending file no. (not used)
MT2 --- Ending reaction no. (not used)

Related program:

Parts of CAREN, VIXEN and PSYCHE with updates and corrections.

In addition, the total average neutron and photon energy is tested
against the energy available and the Q value is tested against the Q
calculated from the Chart of the Nuclides.

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Program INTER

Purpose:

The program INTER is a special version of a general purpose ENDF integration program INTEND. The purpose of Program INTER is to calculate:

a. The Maxwellian averaged cross section,
b. The thermal cross section,
c. the g-factor,
d. the infinitely dilute resonance integral,

for an ENDF material.

Note: Material must first be processed by LINEAR/RECENT, if there are resonance parameters (LRP = 0).

Units:	Function	Internal Name
5	Card input	INPUT
6	Execution & error messages	NLIB
7	ENDF input tape	NIN
8	ENDF output tape	NOUT

Operation:

Card 1   (2I4,2I1,7E10.3)

Input	Description	Units
MAT1	First material	Zero or blank
MAT2	Last material	includes all
ITHER	Do/do not perform Maxwellian integration	1/0
IRESI	Do/do not perform resonance integration	1/0
ELT	Lower Maxwellian integration limit	Electron volts
EHT	Upper " " "	"
EZERO	Temperature of Maxwellian spectrum	"
ELRI	Lower limit of resonance integration	"
EHRI	Upper " " " "	"
ERRX	Fractional error of convergence	
E14	Any energy for a single cross section	"

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Program SUMRIZ

Purpose: Create a summary of an ENDF Material.

Units:	Function	Internal Name
20	Tape summary	ITAPE
21	ENDF tape	OUTPUT
22	Scratch	ISCR

Operation: Requires no card input. Will process an entire ENDF tape.

Related program:

New program replaces ARISTO written by CCDN Saclay.

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Program PLOTEF

I.   Purpose

PLOTEF is the plotting code for ENDF/B-V. A considerable
degree of flexibility has been incorperated into this code as
compared to previous ENDF/B plotting codes.

II. Operation

Program control is via card input. Output is to TAPE11. The
user commands are given in the Miscellaneous Information section.

III. Program Characteristics

Language: FORTRAN
Core: 53K octal

IV. Devices Required

None

V.   Input

Units:
  5   Card input for program control
 10   for input of ENDF/B-V data

VI. Output

Units:
  6   Line printer for program response to user
 11   TAPE11 for plot output
 12   TAPE12 for scratch files (only used if FILE3 arrays
         have more than 5000 X,Y pairs)

Miscellaneous Information

The following is a list of commands:

Command	Operation
START	Must be the first command given. The input and output devices are initialized. The next input card is read immediately. The next card gives the tape number or 0, if the user does not wish to check the tape number, in I5 format.
REQUEST	Signals the program to expect the specification of the files and sections to be plotted. The next card is read immediately.
SUPPRESS	Command which suppresses the plotting of constant two point data sets. (Initially all requested files or sections are plotted.)
COEFFICIENT	Plots the coefficient values rather than converting them to the standard probability versus cosine representation.
INITIALIZE	Resets program to initial conditions. (i.e. no SUPPRESS and no COEFFICIENT)
INPUT	Not available in the CDC 6600 version.
REWIND	Rewind the input file.
STOP	Terminate and close out the output files.
GRID	Grid lines are drawn on the plots.
LSIZE	Specifies the height of the lettering to be used on the plots. This is intially .07 inches. The new value must immediately follow the command (i.e. LSIZE .14 would double the size of the lettering).
PSIZE	Sets the size of the plot axes in inches. The values of the x axis and the y axis immediately follow the command (i.e. PSIZE 10. 8. would setup the code to produce 10. by 8. plots). The initial values will give an 11.5 by 8.5 inch plot excluding margins and axis annotation.

Upon processing the REQUEST command the next card is read. This card gives the material and file specifications as one input string. The first field may be given as an integer (MAT number), decimal (ZA), or alphabetic mnemonic (ALL - do all materials). The desired files (MF's) are entered as a string of MF numbers separated by commas. A range of files can be specified by separating two MF numbers with a slash. Individual sections within a file or range of files are specified by following the MF number with a set of numbers (MT's) in parenthesis.

Again individual sections or a range of sections can be specified and again they are separated by commas. The following example:

    1399 1(452/456,3(1,2,18,102),12/15

will produce plots for the following MF's and MT's if they exist for material 1399:

MF	MT
1	452,453,454,455,456
3	1,2,18,102
12	all MT's
13	all MT's
14	all MT's
15	all MT's

To initiate plotting, the command PLOT must be given. Before that command is given the user may or may not specify the plot limits for cross section versus energy plots. This line or lines of input are ordered as follow (free field formatting):

EMIN   Minimum neutron energy

EMAX   Maximum neutron energy. If both the minimum and maximum are zero, the code scales using the values in the data.

LIN/LOG   Three character code (LIN or LOG) specifying the axis type. If equal to zero, the code determines which one to use.

CSMIN   Minimum cross section

CSMAX   Maximum cross section. If minimum and maximum are both equal to zero, the code scales the plot based on the data set values.

LIN/LOG   As above for the y axis

The following example:

    0.   0.   LOG 0.   1000.

would give a plot with a log energy axis from a value corresponding to the minimum neutron energy given in the data to the maximum neutron energy and a cross section scale from 0. to 1000. barns which would have to be on a linear axis since a log scale cannot have a zero.

- 14 -

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Program LSTFCV

I. Purpose

The purpose of the program LSTFCV is to produce interpreted listings of ENDF/ data.

II. Operation

The listing is performed at the file (MAT,MF) level. The listing is nonselective within a file (i.e. all "tables" are listed). ENDF/B data which may be represented as a table of X vs. Y values are interpreted and listed. All numerical fields are translated to indicate their physical significance.

III. Program Characteristics

Language: FORTRAN
Core: 43K octal

IV. Input

Units:
5   Card input for program control
10   Tape input of ENDF/B data files

V. Output

Units:
6   Line printer for output of interpreted listings

VI. Miscellaneous Information

The current version of LISTFC, called LSTFCV, is compatible with ENDF/B-V and is based on earlier versions of the code written by D.E. Cullen. Only BCD tapes of ENDF/B-V data in the standard arrangement may be used with this code. The program does not check the ENDF/B-V format and as such this program will only work on properly structured ENDF/B tapes.

The input consists of a single card defining the run parameters. This card may be followed by up to fifty (50) request cards. If request cards are present they must be followed by a card which is blank in columns 1-15 unless the first and only request card is blank in columns 1-15. In this case the files requested on this card are listed for all materials on the tape. Each request card defines a MAT and/or ZA (1000*Z+A) and a list of files to be listed (1-10,12-16,19-27). The input cards are defined below.

Input Card 1

Columns	Contents	Internal Name
1-5	Flag to signal read option = 0 Read request cards to follow = 1 This is the only card input	IOPT
6-10	ENDF/B tape number = greater than zero - read TPID and check label = equal to zero - read TPID. Do not check label = less than zero - do not read TPID or check label (e.g. unlabelled tape).	NLABEL
11-15	Editing option = 0 minimize output with multiple sections per page = 1 edit output to one ENDF/B section per page	EDITIT

Request Cards

Columns	Contents	Internal Name
1-5	ENDF/B material number (MAT) - may be zero if ZA given	MATN
6-15	ENDF/B ZA (1000*Z+A) (A=0 for element) - may be zero if MAT given.	ZAN
21-23	List of files (MF) to be listed	MFN
24-26	List is terminated by a blank field	
27-29	All illegal numbers are automatically ignored.	
'''	Legal MF ranges are 1-10, 12-16, and 19-27.	
78-80	Error files are not listed	

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Program RIGEL

Purpose: To retrieve ENDF/B data from one to nine tapes and to merge
            onto one to eight result tapes.

Units:	Function	Internal Name
5	Card input	INPUT
6	Execution & error messages	OUTPUT
11		
12		
14	ENDF input and/or	Source-Intape(N)
15	output tapes	and
16		Result-Tapes(N)
17		
18		

Operation: See ENDF-110 - Description of the ENDF/B processing codes and
           retrieval subroutines.

Related program:

    RIGEL(4) with updated formats.