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EDITOR, A Processing Code for ENDF/B Format Data

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ABSTRACT

EDITOR is a FORTRAN IV computer code designed to print, in readable form, the contents of ENDF/B format nuclear cross-section data tapes. In addition, EDITOR allows copying, altering mode, merging, punching and otherwise manipulating the data which appears on one or more ENDF tapes.

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CONTENTS

I. Introduction

The Evaluated Nuclear Data File (ENDF)[1] library is a data collection normally stored on binary magnetic tape in a format that can be used as input to cross-section processing codes. A BCD (card image) format is also defined so that data may be more easily translated into the ENDF library, and for exchanging cross-section data between various laboratories.

The FORTRAN IV code, EDITOR, was written for the IBM 360 to present the information found on ENDF/B format tapes in a readable form; this is referred to as an edit of ENDF data. In addition, EDITOR provides a simple method of copying, converting, punching, merging and adding to ENDF/B data on tapes or cards. It is assumed throughout the report that the user is somewhat familiar with the data formats and procedures of the ENDF/B cross-section library. The term "files" will refer to ENDF/B files unless otherwise noted.

II. Function of Program EDITOR

Input to EDITOR may be one or more BCD or binary (primary format) tapes or card sets. Output may be on BCD or binary tapes or cards, or may be a printed edit of the data requested. Program EDITOR accepts any neutron or gamma-ray data defined by ENDF/B and for which data has been available. Files 6, 16 and 24-27 may appear but will be ignored by the code, files 1-5, 7, 12-15 and 23 will be processed.

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[1] H. C. Honeck, "ENDF/B - Specifications for an Evaluated Nuclear Data file for Reactor Specification," BNL-50066 (ENDF-102)(1967).

The user may reference materials, files or sections (reaction types) from the input tapes but may not reference subsections. Materials are requested by the assigned material number (MAT) or (Z, A) designation. EDITOR processes materials in batches, each batch defined by designation of input and output tapes (Card A). A maximum of fifty materials may be requested in each batch. A maximum of five files per material and fifteen sections per file may be requested in each batch. In one batch, one may choose to process, alternatively, all materials, all files in a material, all of specific files of all materials, all sections of a file, or all of specific sections of specific files in all materials, or may choose to explicitly request the material, file and sections to be processed. The comments and dictionary from file 1 may be requested thereby providing a listing of the contents of ENDF/B tapes. EDITOR can process files and sections separately and can be used to insert or delete sections within a file or files within materials.

The tape label record (TPID) on the output tape may be transferred from the input tape or defined by the user.

The present version of EDITOR processes files 1-5, 7, 12-15 and 23. Other files are passed over by the program, but provision has been made for future additions of subroutine sets dealing with file 6, 16, and 24-27. If EDITOR encounters one of these files it skips over it and prints a message.

Within a section data are assumed to be in the correct format and sequence. The files and sections need not be in increasing order on the input cards but should conform to ENDF standards on the input tapes if the output tape is to conform to standards. EDITOR processes materials, files and sections as they appear on the input tape.

For data written in BCD Format EDITOR uses a 1P scaling factor in E type format statements, since, in Fortran IV, to do otherwise causes the loss of one significant figure. For positive values, 1PE11.5 is used where six significant figures may be of value, otherwise, 1PE11.4.

If a material, file or section not present on the input tape is requested the request will be ignored. When an option other than the edit feature is selected, a list of all materials files and sections processed is printed (see Appendix A, figure 2). If, within any material, particular sections are requested, and none of them appear on the input tape a FEND record may be written on the output tape, but if the entire file is not present no such record will appear.

One may use EDITOR to append materials to an existing tape by using the DISP = (, MOD) feature of the tape DD card. In this case one sets IWRS = -1 so that the code will backspace over the TEND record at the end of the old tape. Backspacing tapes with blocked records (where there is more than one logical record in a physical record) will not work on an IBM 360, therefore this option cannot be used for tapes with blocked records. A description of the processing of a material appears in Appendix D. Examples of EDITOR options and capabilities appear in Appendix F.

III. Input

Input card formats and parameter definitions are:

```
                  a    b    c    d    e    f    g    h    i
CARD A:  FORMAT (I5, I5, I5, I5, I5, I5, I5, I5, I5)
```

a. INTAP = logical unit number of the input tape

b. INMDE = 1 if INTAP is in BCD format

= 3 if INTAP is binary

c. IOTAP = logical unit number of output tape

d. IOMDE = 2 if IOTAP is to be in BCD form

= 4 if IOTAP is to be binary

= 5 if an edit is to be performed.

e. NLABEL, the tape identification number of IOTAP,

= 0 the TPID record is copied from INTAP

> 0 the tape number is set to NLABEL and the Hollerith description is copied from the TPID record on INTAP.

< 0 the tape number is set to -NLABEL and the Hollerith description is read from CARD C.

f. IRWS = 0 rewind IOTAP and write TPID record before processing this batch of requests.

> 0 do not rewind IOTAP nor write TPID record. This option is used to add to a tape written in a previous batch.

< 0 do not rewind IOTAP nor write TPID record, backspace IOTAP|IRWS| times. This option allows a tape written in a previous run to be added to by using the DISP = (OLD,MOD) option on the DD card for IOTAP. To use this option, unblocked BCD or binary tapes must be used.

g. IRWE = 0 write TEND record, end of file tape mark and rewind IOTAP at the end of this batch.

$\neq 0$ do not.

h. INRWND = 0 rewind INTAP and read TPID record before processing of this batch.

< 0 do not rewind INTAP but read TPID record before processing this batch

> 0 do not rewind INTAP, do not read TPID

NOTE: If |INRWND| = 9 INTAP will be rewound after processing a batch.

i. IFILE1 = 0 begin by processing File 1 information for each material in this batch, this is the normal option, as File 1 always appears in an ENDF material.

> 0 skip processing file 1, this option allows EDITOR to process ENDF files, and sections separately.

< 0 skip processing file 1, file 1 not present on INTAP.

CARD(s) B: FORMAT (I5,F10.0,5(I3,3I3)) — fields: a (I5), b (F10.0), c (I3), d (3I3)

a. MATN = material number of requested material.

If MATN = 0 the material is requested by (Z,A) designation.

b. ZAN = the (Z,A) designation of the material.

NOTE: if MATN = 0 and ZAN = 0 all materials on INTAP will be processed according to c and d. Only one Card B appears in this case.

c. The file numbers requested for this material

= 0 all files and sections will be processed

> 0 all sections of this file will be processed

< 0 only specifically requested sections of this file will be processed.

d. the sections requested by number.

One Card B is required for each material explicitly requested. A card with MATN and ZAN zero indicates the end of a batch. If IFILE1 = 0 file 1 is always processed and need not be requested.

As a special option, if MATN and ZAN are zero for the first (and only) Card B and parameter c = -1 (-1 in columns 17 and 18) File 1 section 451 will be processed for all materials on INTAP. This produces a listing of all materials, files and sections which appear on INTAP.

CARD C: FORMAT (16A4,A2)

The Hollerith description on the TPID record to be written on IOTAP. Card C appears only when NLABEL 0.

The input card sequence is:

A, B, B .... B(MATN = ZAN = 0), C (if NLABEL < 0), A ...

this series may be repeated indefinitely. A blank card A will terminate processing.

EDITOR uses as standard input/output units logical numbers 5 and 6, as variables INPUT and IOPUT which are set in a BLOCK DATA statement so that they may be easily changed.

Appendix A

A page of sample output from the edit function of the code is shown in Figure 1. The output of a tape to tape conversion problem is shown in Figure 2.

Fig. 1

HYDROGEN FREE ATOM CROSS SECTIONS
MATERIAL= 520 ZA= 1001. AWR = 0.9992 FILE= 3 SECTION= 1

TOTAL CROSS SECTION LFS= 99

Q VALUE= 0.0
NUMBER OF POINTS= 114

ENERGY	CROSS SECTION	ENERGY	CROSS SECTION	ENERGY	CROSS SECTION	ENERGY	CROSS SECTION
1.00000E-04	2.56200E 01	1.00000E 06	4.25900E 00	7.80000E 06	1.15800E 00		
1.00000E-03	2.20100E 01	1.10000E 06	4.04500E 00	8.00000E 06	1.13500E 00		
1.00000E-02	2.08680E 01	1.20000E 06	3.85800E 00	8.20000E 06	1.11200E 00		
2.53000E-02	2.06720E 01	1.30000E 06	3.69300E 00	8.40000E 06	1.09000E 00		
1.00000E-01	2.05070E 01	1.40000E 06	3.54600E 00	8.60000E 06	1.06900E 00		
1.00000E 00	2.03930E 01	1.50000E 06	3.41400E 00	8.80000E 06	1.04900E 00		
1.00000E 01	2.03570E 01	1.60000E 06	3.29300E 00	9.00000E 06	1.02900E 00		
1.00000E 02	2.03450E 01	1.70000E 06	3.18300E 00	9.20000E 06	1.01000E 00		
1.00000E 03	2.00000E 01	1.80000E 06	3.08200E 00	9.40000E 06	9.92200E-01		
5.00000E 03	1.97100E 01	1.90000E 06	2.98900E 00	9.60000E 06	9.74500E-01		
1.00000E 04	1.92000E 01	2.00000E 06	2.90300E 00	9.80000E 06	9.57400E-01		
2.00000E 04	1.80610E 01	2.10000E 06	2.82200E 00	1.00000E 07	9.40800E-01		
3.00000E 04	1.71260E 01	2.20000E 06	2.74700E 00	1.02000E 07	9.24800E-01		
4.00000E 04	1.62840E 01	2.40000E 06	2.60900E 00	1.04000E 07	9.09200E-01		
5.00000E 04	1.55570E 01	2.60000E 06	2.48700E 00	1.06000E 07	8.94100E-01		
6.00000E 04	1.48920E 01	2.80000E 06	2.37800E 00	1.08000E 07	8.79500E-01		
7.00000E 04	1.42520E 01	3.00000E 06	2.27900E 00	1.10000E 07	8.65200E-01		
8.00000E 04	1.37450E 01	3.20000E 06	2.18800E 00	1.15000E 07	8.31400E-01		
9.00000E 04	1.32460E 01	3.40000E 06	2.10500E 00	1.20000E 07	8.00000E-01		
1.00000E 05	1.27900E 01	3.60000E 06	2.02900E 00	1.25000E 07	7.70600E-01		
1.10000E 05	1.23700E 01	3.80000E 06	1.95900E 00	1.30000E 07	7.43000E-01		
1.20000E 05	1.19820E 01	4.00000E 06	1.89300E 00	1.35000E 07	7.17200E-01		
1.30000E 05	1.16240E 01	4.20000E 06	1.83200E 00	1.40000E 07	6.92900E-01		
1.40000E 05	1.12900E 01	4.40000E 06	1.77500E 00	1.45000E 07	6.70000E-01		
1.50000E 05	1.09800E 01	4.60000E 06	1.72100E 00	1.50000E 07	6.48500E-01		
1.60000E 05	1.06900E 01	4.80000E 06	1.67000E 00	1.55000E 07	6.28100E-01		
1.70000E 05	1.04190E 01	5.00000E 06	1.62300E 00	1.60000E 07	6.08800E-01		
1.80000E 05	1.01650E 01	5.20000E 06	1.57800E 00	1.65000E 07	5.90500E-01		
1.90000E 05	9.92600E 00	5.40000E 06	1.53600E 00	1.70000E 07	5.73100E-01		
2.00000E 05	9.70000E 00	5.60000E 06	1.49500E 00	1.75000E 07	5.56600E-01		
2.25000E 05	9.19000E 00	5.80000E 06	1.45700E 00	1.80000E 07	5.40900E-01		
2.50000E 05	8.74500E 00	6.00000E 06	1.42100E 00	1.85000E 07	5.26000E-01		
2.75000E 05	8.35200E 00	6.20000E 06	1.38600E 00	1.90000E 07	5.11700E-01		
3.00000E 05	8.00300E 00	6.40000E 06	1.35300E 00	2.00000E 07	4.85100E-01		
4.00000E 05	6.91900E 00	6.60000E 06	1.32100E 00				
5.00000E 05	6.16100E 00	6.80000E 06	1.29100E 00				
6.00000E 05	5.59600E 00	7.00000E 06	1.26200E 00				
7.00000E 05	5.15600E 00	7.20000E 06	1.23500E 00				
8.00000E 05	4.80100E 00	7.40000E 06	1.20800E 00				
9.00000E 05	4.50700E 00	7.60000E 06	1.18300E 00				

ENERGY INTERPOLATION TABLE
NUMBER OF INTERPOLATION REGIONS= 1

LOWER VALUE	UPPER VALUE	INTERPOLATION
1.00000E-04	2.00000E 07	2

Fig. 2

```
INTAP = 11, INMDE = 3, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS =-2, IRWE = 1, INRWND = 0 IFILE1 = 1

 MAT       ZA MF MT        MF MT       MF MT       MF MT       MF MT
 530       0. -3 67 68 69 -3 70 71 91 -3102103104 -3107  0  0  4  0  0  0
   0       0.  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
                3     67    (N,N*) MT-40
                3     68    (N,N*) MT-40
                3     69    (N,N*) MT-40
                3     70    (N,N*) MT-40
                3     71    (N,N*) MT-40
                3     91    (N,N*) MT-40
                3    102       (N,GAMMA)
                3    103           (N,P)
                3    104           (N,D)
                3    107       (N,ALPHA)
                4      2         ELASTIC
                4     16          (N,2N)
                4     28         (N,N*)P
                4     51    (N,N*) MT-40
                4     52    (N,N*) MT-40
                4     53    (N,N*) MT-40
                4     54    (N,N*) MT-40
                4     55    (N,N*) MT-40
                4     56    (N,N*) MT-40
                4     57    (N,N*) MT-40
                4     58    (N,N*) MT-40
                4     59    (N,N*) MT-40
                4     60    (N,N*) MT-40
                4     61    (N,N*) MT-40
                4     62    (N,N*) MT-40
                4     63    (N,N*) MT-40
                4     64    (N,N*) MT-40
                4     65    (N,N*) MT-40
                4     66    (N,N*) MT-40
                4     67    (N,N*) MT-40
                4     68    (N,N*) MT-40
                4     69    (N,N*) MT-40
                4     70    (N,N*) MT-40
                4     71    (N,N*) MT-40
                4     91    (N,N*) MT-40
```

Appendix B

Variable dimensioning is utilized to conserve storage space. Cross section data are temporarily stored in array STOR (blank common). The amount of storage reserved for a particular file or subset of a file is determined by the following parameter which are defined in a block data subprogram.

a.	NDH	file 1 section 1	The maximum dimension of array H. Hollerith words are assumed to contain 4 characters per word. Therefore, the dimension of array H is 17*NCD. Presently 3400.
b.	NDD	file 1 section 3	The maximum dimension of array D. Presently 480, allows 80 decay chains.
c.	NDC	file 1 section 4	The maximum dimension of array C. Presently 600, allows 300 fission products.
d.	NDT	file 1 section 4 file 3,4,5 and 7	The maximum number of energy values. The maximum number of temperature values. Presently 20.
e.	NDINT	file 1 section 2 files 3-23	The maximum number of interpolation regions given in a TAB1 or TAB2 record. Presently 20.
f.	NDXY	file 1 section 2 files 3-5, 12-15, and 23.	The maximum number of points given in a TAB1 record, presently 5000.
g.	NDL	file 2	The maximum number of L states, presently 4.
h.	NDRS	file 2	The maximum number of resonances for a given L state, presently 500.

i.	NDJ	file 2	The maximum number of J states for a given L state, presently 10.
j.	NDES	file 2	The maximum number of energy values, presently 50.
k.	NDV	file 4	The maximum dimension of array V, presently 625.
l.	NDE	file 4	The maximum number of energy values, presently 500.
m.	NDFL	file 4	The maximum number of Legendre coefficients, presently 24.
n.	NDB	file 7	The maximum number of beta values, presently 500.
o.	NDA	file 7	The maximum number of alpha values, presently 2000.
p.	NDSLC	file 7	The maximum dimension of array B, presently 46, allows 6 different scatterers.

Appendix C

The amount of storage required in array STOR (presently set at 12,500 words) for cross section data is determined by the parameters defined in the Data Statement Section. The maximum value in the following list may be used to determine the minimum dimension of array STØR.

File 1:	(a)	NDH
	(b)	4 + 2*(NDINT + NDXY)
	(c)	NDD
	(d)	NDT*(4 + NDC)
File 2:	(a)	NDL*(5 + 6*NDRS)
	(b)	NDES + 4*NDL + NDL*NDJ*(1 + MAXONDES + 6, 6*NDJ))
File 3:		2*(NDT + NDINT + NDXY)
File 4:	(a)	NDV + 2*(NDT + NDE + NDINT) + NDFL*MAXO(40,NDT)
	(b)	NDV + NDE + 2*(NDT + NDXY) + 4*NDINT
File 5:		2*(NDT + NDXY) + NDE + 4*NDINT
File 7:	(a)	NDSLC
	(b)	2*(NDT + NDA) + NDB + 4*NDINT
File 12:		2*(NDINT - NDXY)
File 14:		2*(NDE + 2*NDINT + NDXY) + NDFL*MAXO(40,NDT)
File 15:		2*(NDINT + NDXY)
File 23:		2*(NDINT + NDXY)

Appendix D

A Description of the Processing of a Material by EDITOR

The processing of a batch is controlled by subroutine EDIT, each file is processed by a set of subroutines controlled by a subroutine FILExx, where xx is the file number.

Materials are processed in the order in which they appear on an input tape. Files and sections are processed in the order that they appear except that if File 1 appears it must be the first file in the material. EDITOR does not check the order of materials, files, or sections, the user is responsible for conforming to ENDF/B standards.

At the beginning of a material, or for the first material in a batch, EDITOR reads file 1 if IFILE1 ≥ 0, but if file 1 does not appear, or if the input tape is positioned in the middle of a material, IFILE1 must be < 0 so that the processing of File 1 will be skipped. If File 1 is present and IFILE1 = 0 all data appearing in File 1 will be reproduced or printed.

At the beginning of a file, control passes to a subroutine FILExx, and control does not return to EDIT until the entire file has been processed. FILExx processes a file until a FEND (file end) record appears, then returns control to EDIT.

Within a file, each requested section is processed completely according to the options which appear. A SEND (section end) record is not checked for, and errors in input are not checked. If a section is not requested, the input tape is read until a SEND record appears (MT = 0).

After a file has been processed control is held by EDIT, which reads the next CONT record. If this record is a MEND (material end) record processing of this material ends. If not, the CONT record is the first record of a File, and, if the File has been requested, control again passes to a subroutine FILExx.

When the processing of a material has been completed the list of materials to be processed is updated, and, if any more materials are to be processed, a new CONT record is read. If this record is not a TEND (tape end) record it is the HEAD record of a new material.

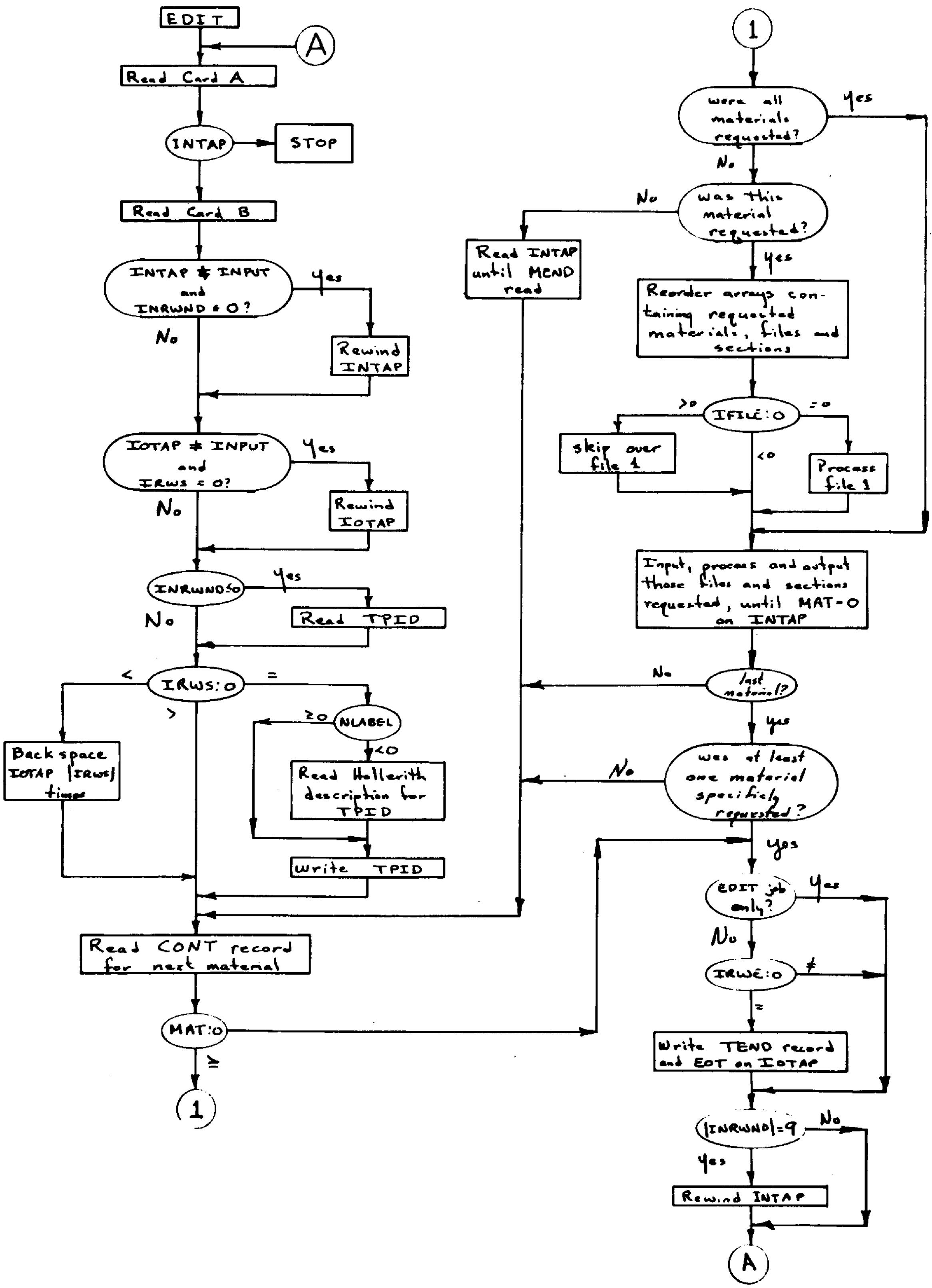
If a TEND record is encountered by EDITOR, the message "END OF TAPE" is printed and a new CARD A is read. When all materials requested on CARDS B have been processed, a new CARD A is read defining a new batch.

Appendix E

Appendix E presents a flow chart of the logic of Subroutine EDIT, the controlling subroutine of Program EDITOR.

Fig. 3

PROGRAM EDITOR



Appendix F

In Appendix F input and some associated output is presented for several sample problems, in order to illustrate the uses of EDITOR.

Sample 1

The problem illustrated in figure 4 reads a specified material from binary input tape 11 and writes this material in BCD format on tape 13. Both tapes are rewound at the start, the TPID record is reproduced on the output tape and a TEND record and End-of-File mark are written at the end.

Fig. 4

```
INTAP = 11, INMDE = 3, IOTAP = 13, IOMDE = 2, NLABEL = 0, IRWS = 0, IRWE = 0, INRWND = 0 IFILE1 = 0

 MAT         ZA MF MT         MF MT         MF MT         MF MT         MF MT
 520         0.  0  0   0  0  0  0   0  0  0  0   0  0  0  0   0  C  0  0  0  0
   0         0.  0  0   0  0  0  0   0  0  0  0   0  0  0  0   0  C  0  0  0  0

                         TAPE LCGICAL NUMBER = 13

                      TAPE IDENTIFICATION NUMBER =     1
           YOUNG DATA CONVERTED WITH SAD TO LEGENDRE COEFF.(C.M)

                                MODE = 2

MATERIAL   (Z,A)   FILE   SECTION                  DESCRIPTICN

   520     1001.     1      451     HYDROGEN FREE ATOM CROSS SECTIONS
                     2      151       RESONANCE
                     3        1           TOTAL
                     3        2         ELASTIC
                     3      102       (N,GAMMA)
                     3      251          MU BAR
                     3      252              XI
                     3      253           GAMMA
                     4        2         ELASTIC
                     7        4       INELASTIC
                    12      102       (N,GAMMA)
                    14      102       (N,GAMMA)

                               END OF TAPE
```

Sample 2

Figure 5 illustrates the request for copying a specific file from a specific material from tape 11 to tape 12, preserving the ENDF/B tape conventions of TPID - File 1 - File 3, TEND, EOF.

Fig. 5

```
INTAP = 11, INMDE = 3, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS = 0, IRWE = 0, INRWND = 0 IFILE1 = 0

 MAT      ZA MF MT        MF MT        MF MT        MF MT        MF MT
 540      0.  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
   0      0.  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0

                         TAPE LOGICAL NUMBER = 12

                      TAPE IDENTIFICATION NUMBER =    1
           YOUNG DATA CONVERTED WITH SAD TO LEGENDRE COEFF.(C.M)

                               MODE = 4
```

MATERIAL	(Z,A)	FILE	SECTION	DESCRIPTICN
540	20040.	1	451	CALCIUM NEUTRON AND GAMMA RAY CROSS SECTIONS - TAKEN FROM AN
		3	1	TOTAL
		3	2	ELASTIC
		3	3	NON-ELASTIC
		3	4	INELASTIC
		3	16	(N,2N)
		3	22	(N,N*)ALPHA
		3	28	(N,N*)P
		3	51	(N,N*) MT-40
		3	52	(N,N*) MT-40
		3	53	(N,N*) MT-40
		3	54	(N,N*) MT-40
		3	55	(N,N*) MT-40
		3	56	(N,N*) MT-40
		3	57	(N,N*) MT-40
		3	58	(N,N*) MT-40
		3	59	(N,N*) MT-40
		3	60	(N,N*) MT-40
		3	61	(N,N*) MT-40
		3	62	(N,N*) MT-40
		3	63	(N,N*) MT-40
		3	64	(N,N*) MT-40
		3	65	(N,N*) MT-40
		3	91	(N,N*) MT-40
		3	102	(N,GAMMA)
		3	103	(N,P)
		3	107	(N,ALPHA)
		3	251	MU BAR

END OF TAPE

Sample 3

In Figure 6 the tape written in Sample 1 is converted to binary format. All materials from tape 13 are requested.

Fig. 6

```
INTAP = 13, INMDE = 1, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS = 0, IRWE = 0, INRWND = 0 IFILE1 = 0

  MAT        ZA MF  MT        MF  MT        MF  MT        MF  MT        MF  MT
   0         0.  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

                              TAPE LOGICAL NUMBER = 12

                              TAPE IDENTIFICATION NUMBER =     1
          YOUNG DATA CONVERTED WITH SAD TO LEGENDRE COEFF.(C.M)

                                        MODE = 4

 MATERIAL   (Z,A)   FILE   SECTION                     DESCRIPTION


   520      1001.     1      451      HYDROGEN FREE ATOM CROSS SECTIONS
                      2      151        RESONANCE
                      3        1            TOTAL
                      3        2          ELASTIC
                      3      102        (N,GAMMA)
                      3      251           MU BAR
                      3      252               XI
                      3      253            GAMMA
                      4        2          ELASTIC
                      7        4        INELASTIC
                     12      102        (N,GAMMA)
                     14      102        (N,GAMMA)

                                       END OF TAPE
```

Sample 4

Sample 4 illustrates the option of asking for specific sections from all materials appearing on an input tape. Figure 7 presents the output from such a request.

Fig. 7

```
INTAP = 11, INMDE = 3, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS = 0, IRWE = 0, INRWND = 0 IFILE1 = 0

  MAT        ZA MF MT       MF MT       MF MT       MF MT       MF MT
   0         0. -3  1  2  0  0  0  0  0  0  0  0  0  0  C  0  0  0  0  0  0

                         TAPE LOGICAL NUMBER = 12

                      TAPE IDENTIFICATION NUMBER =     1
          YOUNG DATA CONVERTED WITH SAD TO LEGENDRE COEFF.(C.M)

                                MODE = 4
```

MATERIAL	(Z,A)	FILE	SECTION	DESCRIPTION
501	8016.	1	451	OXYGEN-16 CROSS SECTIONS. PREPARED BY P YOUNG, LASL, 4/1/70.
		3	1	TOTAL
		3	2	ELASTIC
520	1001.	1	451	HYDROGEN FREE ATOM CROSS SECTIONS
		3	1	TOTAL
		3	2	ELASTIC
530	14000.	1	451	SILICON (NATURAL) NEUTRON AND GAMMA RAY PRODUCTION CROSS SECTIONS
		3	1	TOTAL
		3	2	ELASTIC
540	20040.	1	451	CALCIUM NEUTRON AND GAMMA RAY CROSS SECTIONS - TAKEN FROM AN
		3	1	TOTAL
		3	2	ELASTIC

END OF TAPE

Sample 5

Sample 5 asks for an edit of all materials appearing on input tape 13. Output goes on the standard output tape, setting IRWS = IRWE = 1 so that the program will not rewind, nor write an end of file on the output tape (Subroutine EDIT checks this automatically when INTAP = INPUT and IOTAP = IOPUT). Figure 8 presents only the input to such a problem.

Fig. 8

```
INTAP = 13, INMDE = 1, IOTAP =  6, IOMDE = 5, NLABEL = 0, IRWS = 1, IRWE = 1, INRWND = 0 IFILE1 = 0

 MAT        ZA MF  MT       MF  MT       MF  MT       MF  MT       MF  MT
   0        0.  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
```

Sample 6

Figure 9 presents the input to a problem requesting the listing of the File 1 comments and directory from all materials on binary tape 12.

Fig. 9

```
INTAP = 12, INMDE = 3, IOTAP =  6, IOMDE = 5, NLABEL = 0, IRWS = 1, IRWE = 1, INRWND = 0 IFILE1 = 0

  MAT         ZA MF MT        MF MT        MF MT        MF MT        MF MT
    0         0. -1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

Sample 7

Sample 7 is a three batch problem where specific sections and files are copied from binary tape 11 to binary tape 12. In this problem there are more sections and files required from material 530 than can be specified on one card B.

The first batch asks for no TEND or EOF after processing the requested sections. The second batch requires that the input tape be rewound, that the output tape be backspaced once over the MEND record written by the last batch, and that file 1 for material 530 be skipped so that file 15 can be added. Since file 1 data was to be skipped in batch 2, a third batch is required to add another material. In the third batch neither tape is rewound and the TEND and EOF are written on IOTAP to end processing of this sample problem.

Figures 10-12 illustrate this problem.

Fig. 10

```
INTAP = 11, INMDE = 3, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS = 0, IRWE = 1, INRWND = 0 IFILE1 = 0

  MAT         ZA MF MT        MF MT        MF MT        MF MT        MF MT
  501         0. -3  1  3  4 -3107  0  0 13  0  0  0  0  0  0  0  0  0  0  0
  520         0. -3  1102  0 12  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
  530         0. -3  1  4 16 -3 28102103 -3104107  0 12  0  0  0 13  0  0  0
    0         0.  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0

                              TAPE LOGICAL NUMBER = 12

                           TAPE IDENTIFICATION NUMBER =     1
            YOUNG DATA CONVERTED WITH SAD TO LEGENDRE COEFF.(C.M)

                                   MODE = 4

MATERIAL   (Z,A)   FILE   SECTION                  DESCRIPTICN


   501     8016.     1      451      CXYGEN-16 CROSS SECTICNS.  PREPARED BY P YOUNG, LASL, 4/1/70.
                     3        1          TOTAL
                     3        3      NON-ELASTIC
                     3        4        INELASTIC
                     3      107        (N,ALPHA)
                    13        4        INELASTIC
                    13      107        (N,ALPHA)
   520     1001.     1      451      HYDROGEN FREE ATOM CROSS SECTIONS
                     3        1          TOTAL
                     3      102        (N,GAMMA)
                    12      102        (N,GAMMA)
   530    14000.     1      451      SILICON (NATURAL) NEUTRON AND GAMMA RAY PRODUCTION CROSS SECTIONS
                     3        1          TOTAL
                     3        4        INELASTIC
                     3       16            (N,2N)
                     3       28           (N,N*)P
                     3      102        (N,GAMMA)
                     3      103             (N,P)
                     3      104             (N,D)
                     3      107        (N,ALPHA)
                    12      102        (N,GAMMA)
                    13        3      NON-ELASTIC
                    13        4        INELASTIC
                    13      103             (N,P)
                    13      107        (N,ALPHA)
```

Fig. 11

```
INTAP = 11, INMDE = 3, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS =-1, IRWE = 1, INRWND = 0 IFILE1 = 1

  MAT        ZA MF MT        MF MT        MF MT        MF MT        MF MT
  530        0. 15  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
    0        0.  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
                      15          3      NON-ELASTIC
```

Fig. 12

```
INTAP = 11, INMDE = 3, IOTAP = 12, IOMDE = 4, NLABEL = 0, IRWS = 1, IRWE = 0, INRWND = 0 IFILE1 = 0

  MAT        ZA MF  MT        MF  MT        MF  MT        MF  MT        MF  MT
  540        0. -3   1   3   4 -3102103   0 12   0   0   0 13   0   0   0 15   0   0   0
    0        0.  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
    540    20040.        1       451     CALCIUM NEUTRON AND GAMMA RAY CROSS SECTIONS - TAKEN FROM AN
                         3         1            TOTAL
                         3         3      NON-ELASTIC
                         3         4        INELASTIC
                         3       102        (N,GAMMA)
                         3       103            (N,P)
                        12       102        (N,GAMMA)
                        13         3      NON-ELASTIC
                        13         4        INELASTIC
                        13       103            (N,P)
                        15         3      NON-ELASTIC

                                            END OF TAPE
```

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