MASTER

AMP (Activity Manipulation Program)

W. W. Engle, Jr.

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Neutron Physics Division

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OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37830
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Introduction

AMP is a FORTRAN IV program written by G. C. Haynes to handle energy-group structured activity factors such as sources, conversion factors, and response functions, as used by ANISN, DOT III, and other nuclear reactor and shielding codes. Activities may be retrieved from ANISN-type cross-section and activity sets found on cards and tapes, and from tabular-type sets on cards. They may be altered by change of group structure, multiplication by a constant, or multiplication by delta E (the group-energy interval), and then output to ANISN-type cards or tape and tabular-type cards. A full edit of input and output activities is always printed by group and activity number.

For questions and suggestions concerning this code, please contact W. W. Engle, Jr. at 3-1435.

Options Available

1. Neutron and gamma-ray activities may be handled separately or as coupled sets.
2. Input and output group structures are independently specified for neutrons and gammas, whether they are coupled or not.
3. Table length for output ANISN-type activity sets is flexible, and table positions not occupied by activity sets are automatically padded with zeros.
4. Punched output may be produced in fixed- or free-field FIDØ format.
5. ANISN-type output sets may be written as a new data set, or they may be added to the end of an existing data set.
6. If a change of group structure is not required, energy boundaries need not be input (K2=0).
7. Input activities may be multiplied by ΔE (group interval width).
8. If input and output energy limits do not coincide, the input energy limits may be extended by setting K4=1. Otherwise, input activities are assumed to be zero outside the input boundary limits.
9. Any number of input ANISN-type data sets may be accessed by negative entries in the 13\$\$ array.
10. Default values have been placed into some input arrays. If these values are satisfactory, these arrays may be omitted. In general, any arrays not specifically required by a problem may also be omitted.
11. Multiple problems may be run by following any previous problem with the title card of a new problem. No data from the previous problem is automatically saved, and all default values apply independently to each problem.
12. ANISN-type activity sets to be output may be printed selectively via the 16\$\$ array.

Input

All input except cross-section ID and title cards are read via FIDØ input routines. The first card of a problem must be the title card identifying the job and/or any output data sets.

Title Card -- Format (20A4)

1\$\$ Array -- Control Parameters [17 entries]

1. IGMNI = No. of neutron groups input
2. IGMGI = No. of gamma groups input
3. IGMNØ = No. of neutron groups output
4. IGMGØ = No. of gamma groups output
5. ITLI = Table length of ANISN-type input activity sets
6. ITLØ = Table length of ANISN-type output activity sets
7. NASC = No. of ANISN-type activity sets input from cards
8. NAST = No. of ANISN-type activity sets input from tapes
9. NAM = No. of activities to be retrieved from ANISN-type sets
10. NAT = No. of activities to be entered in tabular format
11. NASØ = No. of ANISN-type activity sets to be output
12. K1 = ANISN-type activity output logical unit number

0 = No ANISN-type output to tape or cards

7 = Punch in fixed FIDØ format

-7 = Punch in free FIDØ format

4 = Write new data set on unit 4

-N = Add to end of old data set (KADD) and write on 4.

N may be any positive integer except zero or 7, but if KADD contains a cross-section set larger than $ITLØ * IGMØUT$ of this problem and $KADD \neq 4$, the magnitude of N should be the product of table length and no. of groups for the largest cross-section set on KADD.

(This reserves enough core storage to read all data on KADD.)

13. K2 = Group change trigger

0 = No effect (no energy boundaries required)

1 = Change group structure (2*, 3*, 4*, 5* as required)

14. K3 = ΔE multiplication trigger
 0 = No effect
 1 = Multiply input activities by ΔE
15. K4 = Energy boundary extension trigger which goes into effect if output energy boundary limits extend beyond input boundary limits
 0 = Assume input activities are zero beyond the upper and lower energy limits
 1 = Extend upper and lower input boundary limits to coincide with output boundary limits
16. KADD = Logical unit number of old ANISN library to be added onto if K1=-N. If KADD=4, the old data set is added to. If KADD $\neq$ 4, then KADD is copied onto 4 and output is added. Enter zero if not used (K1 $\neq$ -N).
17. NDS13 = Number of ANISN-type input data sets specified as negative entries is the 13\$\$ array. If NDS13=0 and NAST>0, logical unit 3 is automatically assigned for input.

Note: The 1\$\$ array is a complete data block and must be terminated with a 'T'.

2** Array -- Neutron energy boundaries for input activities [IGMNI+1 entries]
 {omit if IGMNI=0 or K2=K3=0}

3** -- Gamma energy boundaries for input activities [IGMGI+1 entries]
 {omit if IGMGI=0, IGMG0=0, or K2=K3=0}

4** -- Neutron energy boundaries for output activities [IGMN0+1 entries]
 {omit if IGMN0=0 or K2=0}

5** -- Gamma energy boundaries for output activities [IGMG0+1 entries]
 {omit if IGMG0=0, IGMGI=0, or K2=0}

- 6\$\$ -- Input set numbers for ANISN-type activities (used in conjunction with 7\$\$ array). Set numbers 1 through NAST come from cards, and set numbers NASC+1 through NAST come from tapes in orders of input. [NAM entries]
{omit if NASC+NAST=0}
- 7\$\$ -- Input table positions for ANISN-type activities (used in conjunction with 6\$\$ array). Activities 1 through NAM are defined by coincident pairs of entries in the 6\$\$ and 7\$\$ arrays, in the order in which the entries appear. [NAM entries]
{omit if NASC+NAST=0}
- 8\$\$ -- Identifies each activity as a source or a response, where a 1 means a source and a 2 means a response. [NAM+NAT entries]
{omit if all are 1's or K2=0}
- 9\$\$ -- Constant multipliers (for all groups) of the input activities. No effect for a constant of 1.0 [NAM+NAT entries]
{omit if all 1.0's}
- 10\$\$ -- Output set numbers for ANISN-type activity sets (used in conjunction with the 11\$\$ array). A zero entry is made for an activity which is not output to an ANISN-type set. Numbers range from 0 through NASØ. [NAM+NAT entries]
{omit if NASØ = 0}
- 11\$\$ -- Output table positions for ANISN-type activity sets (used in conjunction with the 10\$\$ array). These numbers may range from 0 through ITLØ, and coincident pairs of entries in the 10\$\$ and 11\$\$ arrays define the output activity sets. Zeros

should occur in coincident pairs.

[NAM+NAT entries]

{omit if NASØ=0}

12\$\$ -- Tabular-type output control array. A zero entry prevents output of that activity; a +1 entry causes that activity to be punched in fixed field FIDØ. A -1 entry for free field.

[NAM+NAT entries]

{omit if all zeros}

13\$\$ -- Input ID numbers (and data set numbers if NDS13>0) for ANISN-type activity sets from tapes. Negative entries are made for data set logical unit numbers, each followed by ID's pertinent to it. If the first entry is positive, it is assumed that all ID's before the first negative entry are found on logical unit 3.

[NAST+NDS13 entries]

{omit if NAST=0}

14\$\$ -- ANISN-type output activity set print control, one entry for each set. A zero means do not print, and a 1 means print.

[NASØ entries]

{omit if all zeros}

Note: Arrays 2 through 14 are members of a data block and this block must be terminated with a "T".

24* and/or 24** -- ANISN-type activity sets on cards. Both free field and fixed field FIDØ formats may be input, but each time the format changes a new array designator (24* or 24**) must precede that data. Although the array number 24 is used here, any number from 1 through 99 would be acceptable for input. Each activity set must begin on a separate card, and not on the last card of a previous set.

[ITLI*(IGMNI+IGMGI)*NASC entries]

Note: This is a separate block of data, and it must be terminated with a "T".

{omit this block if NASC=0}

25* or 25** -- Tabular activities to be input on cards. Unlike the 24* array, this entire array is read at one time so that one activity may follow another on the same card. Although the array number 25 is used here, any number (1-99) would suffice.

[(IGMNI+IGMGI)*NAT entries]

Note: This is a separate block of data, and it must be terminated with a "T".

{omit this block if NAT=0}

If K1=4, or -N, then NASØ cards of format (18X,I6,I2A4) must follow the last array block of a problem. These cards contain the ID numbers and titles of ANISN-type sets to be output to unit 4 or N.

Job Termination

The next problem, if any, is defined by a new title card and its associated data. To terminate the job by a STOP or call to EXIT, punch "STOP" or "EXIT" in Col. 1-4 on a separate card following the last card of the input data. Otherwise, the job will terminate by end of record on unit 5.

Storage Requirements

AMP uses flexible dimensioning, and the COMMON block storage in words may be determined by the following equations. This gives the value to be used as the DUMMY(XXXX) dimension and ISIZE=XXXX statement in the main program:

$ISIZE = 57 + 7 * NAM + 5 * NAT + NAST + NDS13 + NAS0$
 $+ MAXO[ITLI * IGMIN, (IGMOUT + 1) * NA]$
 $+ MAXO[ITL0 * IGMOUT, (IGMIN + 1) * NA, LADD]$
 (If $K2=1$, add $IGMIN + IGMOUT + MAXO(IGMNI, IGMGI)$
 $+ MAXO(IGMN0, IGMG0) + 6$)
 (If $K2=0$ and $K3=1$, add $IGMIN + 2$)
 where $IGMIN = IGMNI + IGMGI$, the no. of input groups
 $IGMOUT = IGMN0 + IGMG0$, the no. of output groups;
 $NA = NAM + NAT$, the total no. of activities;
 and $LADD =$ table length times no. of groups for the largest
 cross-section set on $KADD$.

Then $REGION.G0 > 80 + 8 * NEDS + ISIZE / 256$ (K bytes)
 where $NEDS =$ No. of extra data sets (other than 5 and 6),
 and it is assumed that each data set required 8K
 for buffers.
 Note: $ISIZE / 256$ should be rounded up to the nearest higher even
 integer.

Data Set Requirements

Log Unit No.

3	ANISN-type input tape default - required if $NAST > 0$ and
the first entry of the 13\$\$ array is positive
4	ANISN-type output tape - required if $K1=4$ or $-N$
5	Card input - <u>always required</u>
6	Printed output - <u>always required</u>
7	Card output - required for punched output only
Others	As specified in the 13\$\$ array or by $KADD$

AMP Special Option

A special option now in AMP allows a user to convert the group structure of a DOT III boundary flux tape by setting NAST=-1 and re-defining ITLI and ITLØ (ITLØ=ITLI) as the product of the no. of angles and no. of intervals of the boundary fluxes. The group definitions remain the same, but fill the l\$\$ array with zeroes after NAST.

Other input arrays to be considered are 2* through 5**, and all others are omitted.

Fluxes for each input and each output group are printed for interval 1 angle 1, and the sum of these is also printed.

Storage required is:

ITLI*(MAXO(IGMIN,IGMØUT)+1)
 + IGMNI+IGMGI+IGMNØ+IGMGØ+89
 + MAXO(IGMNI,IGMGI)+MAXO(IGMNØ,IGMGØ)

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