```
=========================================================================MIXER
                                                                        MIXER
     PROGRAM MIXER                                                      MIXER
     =============                                                      MIXER
     VERSION 76-1 (NOVEMBER 1976)                                       MIXER
     VERSION 81-1 (APRIL 1981)  *IBM VERSION                            MIXER
     VERSION 82-1 (AUGUST 1982) *COMPUTER INDEPENDENT VERSION           MIXER
     VERSION 84-1 (JUNE 1984)   *SPECIAL I/O ROUTINES TO GUARANTEE      MIXER
                                 ACCURACY OF ENERGY.                    MIXER
                                *DOUBLE PRECISION TREATMENT OF ENERGY   MIXER
                                 (REQUIRED FOR NARROW RESONANCES).      MIXER
     VERSION 86-1 (JANUARY 1986)*FORTRAN-77/H VERSION                   MIXER
     VERSION 88-1 (JULY 1988)   *OPTION...INTERNALLY DEFINE ALL I/O     MIXER
                                 FILE NAMES (SEE, SUBROUTINE FILIO1     MIXER
                                 AND FILIO2 FOR DETAILS).               MIXER
                                *IMPROVED BASED ON USER COMMENTS.       MIXER
     VERSION 89-1 (JANUARY 1989)*PSYCHOANALYZED BY PROGRAM FREUD TO     MIXER
                                 INSURE PROGRAM WILL NOT DO ANYTHING    MIXER
                                 CRAZY.                                 MIXER
                                *UPDATED TO USE NEW PROGRAM CONVERT     MIXER
                                 KEYWORDS.                              MIXER
                                *ADDED LIVERMORE CIVIC COMPILER         MIXER
                                 CONVENTIONS.                           MIXER
     VERSION 92-1 (JANUARY 1992)*UPDATED BASED ON USER COMMENTS         MIXER
                                *ADDED PHOTON CROSS SECTIONS            MIXER
                                *ADDED FORTRAN SAVE OPTION              MIXER
                                *OUTPUT IN ENDF/B-VI FORMAT             MIXER
                                *COMPLETELY CONSISTENT I/O ROUTINES -   MIXER
                                 TO MINIMIZE COMPUTER DEPENDENCE.       MIXER
                                *NOTE, CHANGE IN INPUT PARAMETER        MIXER
                                 FORMAT.                                MIXER
     VERSION 94-1 (JANUARY 1994)*VARIABLE ENDF/B DATA FILENAMES         MIXER
                                 TO ALLOW ACCESS TO FILE STRUCTURES     MIXER
                                 (WARNING - INPUT PARAMETER FORMAT      MIXER
                                 HAS BEEN CHANGED)                      MIXER
                                *CLOSE ALL FILES BEFORE TERMINATING     MIXER
                                 (SEE, SUBROUTINE ENDIT)                MIXER
                                *INCREASED INCORE PAGE SIZE FROM        MIXER
                                 1002 TO 4008.                          MIXER
     VERSION 96-1 (JANUARY 1996) *COMPLETE RE-WRITE                     MIXER
                                 *IMPROVED COMPUTER INDEPENDENCE        MIXER
                                 *ALL DOUBLE PRECISION                  MIXER
                                 *ON SCREEN OUTPUT                      MIXER
                                 *UNIFORM TREATMENT OF ENDF/B I/O       MIXER
                                 *IMPROVED OUTPUT PRECISION             MIXER
                                 *DEFINED SCRATCH FILE NAMES            MIXER
                                 *INCREASED INCORE PAGE SIZE FROM       MIXER
                                  4008 TO 12000.                        MIXER
     VERSION 99-1 (MARCH 1999)   *CORRECTED CHARACTER TO FLOATING       MIXER
                                  POINT READ FOR MORE DIGITS            MIXER
                                 *UPDATED TEST FOR ENDF/B FORMAT        MIXER
                                  VERSION BASED ON RECENT FORMAT CHANGE MIXER
                                 *GENERAL IMPROVEMENTS BASED ON         MIXER
                                  USER FEEDBACK                         MIXER
     VERSION 99-2 (JUNE 1999)    *ASSUME ENDF/B-VI, NOT V, IF MISSING   MIXER
                                  MF=1, MT-451.                         MIXER
     VERS. 2000-1 (FEBRUARY 2000)*GENERAL IMPROVEMENTS BASED ON         MIXER
                                  USER FEEDBACK                         MIXER
     VERS. 2002-1 (MAY 2002)     *OPTIONAL INPUT PARAMETERS             MIXER
     VERS. 2004-1 (MARCH 2004)   *ADDED INCLUDE FOR COMMON             MIXER
                                 *INCREASED INCORE PAGE SIZE FROM       MIXER
                                  12000 TO 60000.                       MIXER
     VERS. 2005-1 (OCT. 2005)    *CORRECTED MERGE ERROR                 MIXER
     VERS. 2007-1 (JAN. 2007)    *CHECKED AGAINST ALL ENDF/B-VII        MIXER
                                 *INCREASED INCORE PAGE SIZE FROM       MIXER
                                  60,000 TO 240,000.                    MIXER
     VERS. 2007-2 (DEC. 2007)    *72 CHARACTER FILE NAMES.              MIXER
     VERS. 2008-1 (JUNE 2008)    *ADDED GRAMS OR ATOMS INPUT            MIXER
     VERS. 2010-1 (Apr. 2010)    *General update based on user feedbackMIXER
     VERS. 2012-1 (Aug. 2012)    *Added CODENAME                        MIXER
                                 *32 and 64 bit Compatible              MIXER
```

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                          *Added ERROR stop                       MIXER
VERS. 2015-1 (Jan. 2015)  *Extended OUT9.                         MIXER
                          *Replaced ALL 3 way IF Statements.      MIXER
VERS. 2017-1 (May  2017)  *Increse max. points to 1,200,000       MIXER
                          *updated based on user feedbsck.        MIXER
                          *All floating input parameters changed  MIXER
                           to character input + IN9 conversion.   MIXER
VERS. 2018-1 (Jan. 2018)  *Added on-line output for ALL ENDERROR  MIXER
VERS. 2019-1 (June 2019)  *Additional Interpolation Law Tests     MIXER
                          *Added WARNING if ANY MT ends below     MIXER
                           Maximum Tabulated Energy of ANY other  MIXER
                           MT = the ENDF Data is NOT uniquely     MIXER
                           defined above this energy.             MIXER
                          *Corrected ERROR that could set last    MIXER
                           (highest energy) cross section = 0.0   MIXER
                          *No longer automatically extend cross   MIXER
                           sections as constant above tabulated   MIXER
                           energy range.                          MIXER
VERS. 2020-1 (June 2020)  *Complete Re-write to allow some        MIXER
                           reactions to be missing, e.g.,         MIXER
                           define (n,t) for natural abundant      MIXER
                           element by summing over isotopes,      MIXER
                           where only some isotopes have (n,t).   MIXER
                          *Additional Interpolation Law Tests     MIXER
                          *Min 1 File allowed,e.g. select MT      MIXER
                           Previously assumed 2 or more files     MIXER
                           needed for MIX.                        MIXER
VERS. 2021-1 (Jan. 2021)  *Updated for FORTRAN 2018               MIXER
                                                                  MIXER
Acknowledgement 2019                                              MIXER
--------------------                                              MIXER
I thank Daniel Lopez Aldama (Agency of Nuclear Energy and AdvancedMIXER
Technologies, Havana, Cuba), for finding and fixing an ERROR in   MIXER
MIXER that could result in the last MIXED energy point (highest   MIXER
energy output) ERROREOUSLY setting the  cross section = 0.0. This MIXER
problem has been corrected in 2019-1.                             MIXER
                                                                  MIXER
Defining High Energy Data                                         MIXER
-------------------------                                         MIXER
Starting with MIXER (2019-1), it will no longer automatically     MIXER
extend MTs as CONSTANT above the energy range where they are      MIXER
tabulated to the Maximum Tabulated Energy of any other MT in MIX. MIXER
Above this energy the ENDF MIX is not UNIQUELY defined - in this  MIXER
case it was potentially TOTALLY MISLEADING users of MIXER in that MIXER
it was doing "invisiable evaluation"  - starting with 2019-1      MIXER
MIXER will,                                                       MIXER
1) Extend the cross section = 0.                                  MIXER
2) Print WARNING messages idenifying the Maximum Tabulated Energy MIXER
   of ANY MT - and which MTs stop below this energy.              MIXER
3) Print a final WARNING that the MIX is NO UNIQUELY defined      MIXER
   above the LOWEST common tabulated energy fot any MT.           MIXER
                                                                  MIXER
OWNED, MAINTAINED AND DISTRIBUTED BY                              MIXER
------------------------------------                              MIXER
THE NUCLEAR DATA SECTION                                          MIXER
INTERNATIONAL ATOMIC ENERGY AGENCY                                MIXER
P.O. BOX 100                                                      MIXER
A-1400, VIENNA, AUSTRIA                                           MIXER
EUROPE                                                            MIXER
                                                                  MIXER
ORIGINALLY WRITTEN BY                                             MIXER
-------------------------------------                             MIXER
Dermott E. Cullen                                                 MIXER
                                                                  MIXER
PRESENT CONTACT INFORMATION                                       MIXER
---------------------------                                       MIXER
Dermott E. Cullen                                                 MIXER
1466 Hudson Way                                                   MIXER
Livermore, CA 94550                                               MIXER
U.S.A.                                                            MIXER
Telephone  925-443-1911                                           MIXER
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E. Mail RedCullen1@Comcast.net
Website RedCullen1.net/HOMEPAGE.NEW

PURPOSE

THIS PROGRAM IS DESIGNED TO CALCULATE THE ENERGY DEPENDENT CROSS SECTION FOR A COMPOSITE MIXTURE OF UP TO 10 DIFFERENT MATERIALS.

THE PRESENT VERSION WILL ONLY CALCULATE THE CROSS SECTION FOR ONE FINAL REACTION (ENDF/B SECTION), E.G. TOTAL CROSS SECTION, BUT NOT ANY OTHER REACTION.

NOTE, THIS PROGRAM WILL NOT COMBINE ALL REACTIONS FOR A MIXTURE OF MATERIALS DURING A SINGLE RUN - ONLY ONE REACTION WILL BE CREATED PER RUN.

EVALUATED DATA FORMAT

THE CROSS SECTIONS ARE READ FROM THE ENDF/B FORMAT AND THE COMPOSITE CROSS SECTION IS CONVERTED TO AN EQUIVALENT BARNS/ATOM FORM AND OUTPUT IN THE ENDF/B FORMAT WITH AN EQUIVALENT ATOMIC WEIGHT. THE USER MUST SPECIFY THE COMPOSITION BY GIVING THE ZA, MT AND GRAMS OR ATOMS OF EACH CONSTITUENT. IN ADDITION THE USER IDENTIFY THE COMPOSITE CROSS SECTION BY SPECIFYING THE ZA, MAT AND MT TO BE USED IN THE ENDF/B FORMATTED OUTPUT.

SINCE ONLY THE CROSS SECTIONS IN FILE 3 AND 23 ARE USED, AND THE FORMAT FOR FILE 3/23 IS THE SAME IN ALL VERSIONS ON ENDF/B, THIS PROGRAM MAY BE USED WITH ANY VERSION OF ENDF/B DATA (I.E., ENDF/B-I, II, III, IV, V OR VI). DURING A SINGLE RUN IT MAY EVEN BE USED TO READ AND COMBINE EVALUATIONS WHICH ARE IN DIFFERENT VERSIONS OF THE ENDF/B FORMAT.

ENDF/B FORMATTED OUTPUT WILL BE IN THE ENDF/B-VI FORMAT REGARDLESS OF THE FORMAT OF THE INPUT ENDF/B DATA. THIS WILL ONLY EFFECT THE HOLLERITH SECTION (MF=1, MT=451). THE FORMAT OF CROSS SECTIONS (MF=3) IS THE SAME IN ALL VERSION OF THE ENDF/B FORMAT.

IN ORDER TO GUARANTEE PROPER OPERATION OF THIS PROGRAM THE DATA MUST BE PROPERLY CODED IN THE ENDF/B FORMAT. NO ERROR CHECKING IS PERFORMED. IT IS PARTICULARLY IMPORTANT THAT THE FOLLOWING DATA BE CORRECT

(1) ZA, MF, MT - MUST BE CORRECT IN ORDER TO ALLOW PROGRAM TO SELECT THE APPROPRIATE SECTIONS TO BE COMBINED.
(2) AWRE - ATOMIC WEIGHT RATIO MUST BE CORRECT TO ALLOW PROGRAM TO CONVERT THE USER SPECIFIED GRAMS INTO ATOMS FOR PROPER ATOM RATIO MIXING.
(3) (ENERGIES, CROSS SECTIONS) - MUST BE CORRECT, LINEARLY
                                 ========
    INTERPOLABLE, IN ASCENDING ENERGY ORDER OF (E, BARNS).
    ============

    TO CONVERT ENDF/B FORMATTED DATA TO THE REQUIRED INPUT FORM THE FOLLOWING PROGRAMS MAY BE USED,
    LINEAR - CONVERT TABULATED CROSS SECTIONS TO LINEARLY INTERPOLABLE FORM.
    RECENT - RECONSTRUCT RESONANCE CONTRIBUTION, ADD TO BACKGROUND CROSS SECTION AND OUTPUT THE COMBINATION IN LINEARLY INTERPOLABLE FORM.
    SIGMA1 - DOPPLER BROADEN CROSS SECTIONS TO ANY TEMPERATURE AND OUTPUT THE RESULT IN LINEARLY INTERPOLABLE FORM.

DOCUMENTATION

THE FACT THAT THIS PROGRAM HAS COMBINED THE DATA IS DOCUMENTED IN THE OUTPUT ENDF/B FORMAT IN THE HOLLERITH SECTION BY FIRST IDENTIFYING THE VERSION OF THIS PROGRAM THAT WAS USED, IN THE FORM

**********(PROGRAM MIXER 2021-1) **********

```
THIS IS FOLLOWED BY THE TWO LINE IDENTIFICATION INPUT BY THE USER.MIXER
THIS IS FOLLOWED BY COMPOSITION INPUT BY THE USER.               MIXER
                                                                 MIXER
NEUTRON OR PHOTON DATA                                           MIXER
----------------------                                           MIXER
THIS PROGRAM WILL ALLOW YOU TO PROCESS EITHER NEUTRON OR PHOTON  MIXER
CROSS SECTIONS - BUT YOU CANNOT MIX THE TWO TYPES TOGETHER. BY   MIXER
INPUT YOU CAN SPECIFY THE OUTPUT MF = 3 (NEUTRONS) OR 23 (PHOTONS)MIXER
WHATEVER TYPE YOU SPECIFIED FOR OUTPUT IS THE ONLY TYPE OF DATA  MIXER
WHICH WILL BE PROCESSED BY THIS PROGRAM.                         MIXER
                                                                 MIXER
DEFINING THE COMPOSITION                                         MIXER
------------------------                                         MIXER
THE USER MAY SPECIFY UP TO 10 DIFFERENT SECTIONS OF DATA TO BE   MIXER
COMBINED, EACH SECTION IDENTIFIED BY ZA AND MT NUMBER. THE       MIXER
AMOUNT OF EACH MATERIAL IS SPECIFIED BY DEFINING THE NUMBER OF   MIXER
GRAMS OF EACH MATERIAL IN THE COMPOSITE MIXTURE. THIS CAN BE     MIXER
DERIVED FROM THE VOLUME FRACTION SIMPLY BY MULTIPLYING THE STP   MIXER
DENSITY OF EACH MATERIAL BY ITS VOLUME FRACTION. NOTE, DO NOT    MIXER
INPUT ATOM FRACTIONS.                                            MIXER
                                                                 MIXER
THE LIST OF SECTIONS TO BE COMBINED MAY BE SPECIFIED IN ANY      MIXER
ORDER, I.E. THEY NEED NOT BE IN ZA ORDER OR THE ORDER THAT THE   MIXER
EVALUATED DATA APPEARS ON THE ENDF/B FORMATTED TAPE.             MIXER
                                                                 MIXER
IF ANY REQUESTED SECTION OF DATA IS NOT FOUND ON THE ORIGINAL    MIXER
ENDF/B FORMATTED FILE, THE PROGRAM WILL PRINT A LIST OF THE      MIXER
MISSING SECTIONS AND TERMINATE. IF ALL REQUESTED SECTIONS ARE    MIXER
FOUND THE PROGRAM WILL PRODUCE A COMPOSITE SECTION USING THE     MIXER
UNION OF ALL ENERGIES FOUND IN ANY SECTION. THE COMPOSITE SECTION MIXER
WILL NOT BE THINNED.                                             MIXER
                                                                 MIXER
PRIOR TO LATER USE IN ANY APPLICATION THE NUMBER OF ENERGY POINTS MIXER
IN THE COMPOSITE CROSS SECTION MAY BE MINIMIZED BY USING PROGRAM  MIXER
LINEAR, UCRL-50400, VOL. 17, PART B TO THIN THE DATA.            MIXER
                                                                 MIXER
ONLY LINEARLY INTERPOLABLE DATA                                  MIXER
-------------------------------                                  MIXER
THE CROSS SECTIONS TO BE COMBINED MUST BE IN LINEARLY INTERPOLABLEMIXER
TABULATED FORM (I. E., FILE 3 OR 23, INTERPOLATION LAW 2).       MIXER
                                                                 MIXER
TO CONVERT TABULATED CROSS SECTIONS TO LINEARLY INTERPOLABLE FORM MIXER
SEE, PROGRAM LINEAR, UCRL-50400, VOL. 17, PART A.                MIXER
                                                                 MIXER
TO CONVERT RESONANCE PARAMETERS TO LINEARLY INTERPOLABLE FORM SEE,MIXER
PROGRAM RECENT, UCRL-50400, VOL. 17, PART C.                     MIXER
                                                                 MIXER
TO DOPPLER BROADEN LINEARLY INTERPOLABLE DATA TO ANY TEMPERATURE  MIXER
SEE PROGRAM SIGMA1, UCRL-50400, VOL. 17, PART B.                 MIXER
                                                                 MIXER
PAGING SYSTEM                                                    MIXER
-------------                                                    MIXER
THERE IS NO LIMIT TO THE THE NUMBER OF DATA POINTS IN EACH OF THE MIXER
SECTIONS TO BE COMBINED, NOR IS THERE A LIMIT TO THE NUMBER OF   MIXER
DATA POINTS IN THE COMPOSITE MIXTURE CROSS SECTION.              MIXER
                                                                 MIXER
ALL REQUIRED SECTIONS OF DATA ARE READ FROM THE ORIGINAL ENDF/B  MIXER
FORMATTED FILE. ANY SECTION OF 60000 OR FEWER POINTS WILL BE     MIXER
TOTALLY CORE RESIDENT. LARGER SECTIONS ARE LOADED INTO A PAGING  MIXER
SYSTEM USING A SCRATCH FILE WITH ONLY 60000 POINTS PER SECTION   MIXER
CORE RESIDENT AT ANY ONE TIME. SIMILARLY THE COMPOSITE SECTION   MIXER
WILL BE TOTALLY CORE RESIDENT IF IT CONTAINS 60000 OR FEWER POINTSMIXER
AND LARGER COMPOSITE SECTIONS WILL BE LOADED INTO A PAGING       MIXER
SYSTEM WHERE ONLY 60000 POINTS ARE CORE RESIDENT AT ANY TIME. SINCMIXER
A PAGING SYSTEM MAY BE USED BY ANY SECTION OF DATA THERE IS NO   MIXER
LIMIT TO THE SIZE OF EITHER THE ORIGINAL SECTIONS, NOR TO THE    MIXER
COMPOSITE SECTION, E.G. A SECTION MAY CONTAIN 100,000 ENERGIES   MIXER
AND CROSS SECTIONS TO DESCRIBE A GIVEN REACTION.                 MIXER
                                                                 MIXER
PAGE SIZE                                                        MIXER
---------                                                        MIXER
```

THE PAGE SIZE USED IN THIS PROGRAM IS DEFINED BY THE PARAMETER NPAGE AND THE DIMENSIONS OF THE ARRAYS XTAB AND YTAB. IN ORDER TO ADAPT THIS PROGRAM FOR USE ON ANY COMPUTER THE PAGE SIZE MAY BE INCREASED OR DECREASED BUT THE FOLLOWING RULES MUST BE FOLLOWED

(1) NPAGE - MUST BE A MULTIPLE OF 3 IN ORDER TO ALLOW THE PROGRAM TO READ FULL CARDS OF ENDF/B DATA (3 POINTS PER LINE). FAILURE TO FOLLOW THIS RULE CAN LEAD TO LOSS OF DATA AND/OR PROGRAM ERRORS DURING EXECUTION.
(3) YTAB - THE DIMENSION OF YTAB MUST BE (NPAGE,11).
(4) XTAB - THE DIMENSION OF XTAB MUST BE (NPAGE,11).

DOPPLER BROADENING

THE COMPOSITE CROSS SECTION OUTPUT FROM THIS PROGRAM SHOULD NOT BE DOPPLER BROADENED USING PROGRAM SIGMA1, OR THE EQUIVALENT. THE ATOMIC WEIGHT USED TO IDENTIFY THE COMPOSITE MIXTURE IS BASED ON THE ATOM FRACTION OF EACH CONSTITUENT AND CANNOT BE USED TO CHARACTERIZE THE BROADENING OF ANY GIVEN RESONANCE IN THE MIXTURE DUE TO THE CONTRIBUTION OF ONE CONSTITUENT. IN ORDER TO CONSIDER DOPPLER BROADENING FIRST USE PROGRAM SIGMA1 TO BROADEN THE CROSS SECTION FOR EACH OF THE CONSTITUENTS AND THEN COMBINE THE BROADENED DATA USING PROGRAM MIXER.

EXAMPLE USE

THE OUTPUT FROM THIS PROGRAM HAS BEEN FOUND TO BE EXTREMELY USEFUL IN THE FOLLOWING APPLICATIONS...

(1) CALCULATE A COMPOSITE TOTAL CROSS SECTON FOR LATER USE AS A WEIGHTING FUNCTION IN SELF-SHIELDING THE CROSS SECTIONS OF EACH CONSTITUENT OF THE MIXTURE SEPARATELY.

    PROGRAM GROUPIE CAN USE THE CALCULATED COMPOSITE TOTAL CROSS SECTION AS THE TOTAL CROSS SECTION FOR EACH CONSTITUENT OF THE MIXTURE IN ORDER TO CALCULATE SELF-SHIELDED CROSS SECTION FOR EACH CONSTITUENT OF THE MIXTURE.

(2) CALCULATE COMPOSITE TOTAL AND FISSION CROSS SECTIONS IN ORDER TO CALCULATE THE TRANSMISSION AND SELF-INDICATION THROUGH COMPOSITE MATERIALS. GENERALLY IN THIS CASE THE TOTAL CROSS SECTION WILL BE CALCULATED FOR THE COMPOSITION OF THE SAMPLE AND THE FISSION CROSS SECTION WILL BE CALCULATED FOR THE COMPOSITION OF THE FISSION CHAMBER (WHICH GENERALLY WILL HAVE A DIFFERENT COMPOSITION THAN THE SAMPLE).

    PROGRAM VIRGIN CAN USE THE OUTPUT FROM THIS PROGRAM TO PERFORM TRANSMISSION AND SELF-INDICATION CALCULATIONS. PROGRAM VIRGIN WILL ANALYTICALLY CALCULATE THE UNCOLLIDED (I.E. VIRGIN) FLUX TRANSMITTED AND REACTION RATE DUE TO ANY TABULATED LINEARLY INTERPOLABLE INCIDENT SPECTRUM. RESULTS WILL BE PRESENTLY FOR UP TO 10 DIFFERENT SAMPLE THICKNESSES AND BINNED INTO ENERGY GROUPS IN ORDER TO SIMULATE AN EXPERIMENTAL MEASUREMENT.

(3) THE OUTPUT FROM THIS PROGRAM IS VERY USEFUL TO PLOT IN ORDER TO SEE THE IMPORTANCE OF SPECIFIC CROSS SECTION FEATURES IN THE COMPOSITE CROSS SECTION.

    PROGRAM COMPLOT CAN BE USED TO PLOT THE OUTPUT FROM THIS PROGRAM AND IF REQUIRED EXAMINE ANY PARTICULAR ENERGY RANGE IN DETAIL. IN ORDER TO DO THIS THE (ZA, MT) EQUIVALENCE OPTION OF PROGRAM COMPLOT SHOULD BE USED. TO COMPARE ANY CONSTITUENT CROSS SECTION TO THE COMPOSITE CROSS SECTION THE INPUT TO COMPLOT SHOULD EQUATE THE (ZA,MT) OF THE COMPOSITE TO THE (ZA,MT) OF ONE CONSTITUENT AND THE MULTIPLIER INPUT TO COMPLOT SHOULD BE THE ATOM FRACTION FOR THE CONSTITUENT (THE ATOM FRACTIONS ARE DEFINED IN THE OUTPUT LISTING FROM PROGRAM MIXER).

```
                                                                      MIXER
 INPUT FILES                                                          MIXER
 -----------                                                          MIXER
 UNIT  DESCRIPTION                                                    MIXER
 ----  -----------                                                    MIXER
   2   INPUT CARDS (BCD - 80 CHARACTERS/RECORD)                       MIXER
  10   ORIGINAL EVALUATED DATA IN ENDF/B FORMAT                       MIXER
                  (BCD - 80 CHARACTERS/RECORD)                        MIXER
                                                                      MIXER
 OUTPUT FILES                                                         MIXER
 ------------                                                         MIXER
 UNIT  DESCRIPTION                                                    MIXER
 ----  -----------                                                    MIXER
   3   OUTPUT LISTING (BCD - 120 CHARACTERS/RECORD)                   MIXER
  11   COMPOSITE EVALUATED DATA IN ENDF/B FORMAT                      MIXER
             (BCD - 80 CHARACTERS/RECORD)                             MIXER
                                                                      MIXER
 SCRATCH FILES                                                        MIXER
 -------------                                                        MIXER
 UNIT  DESCRIPTION                                                    MIXER
 ----  -----------                                                    MIXER
  12   SCRATCH FILE FOR EACH OF THE 10 SECTIONS WHICH                 MIXER
  13   WILL BE ADDED TOGETHER TO DEFINE THE FINAL                     MIXER
   .   SECTION (BINARY - 60000 AND 480000 WORDS/RECORD)               MIXER
   . .                                                                MIXER
   . .                                                                MIXER
  20 .                                                                MIXER
  21 .                                                                MIXER
  22   SCRATCH FILE FOR COMBINED SECTION.                             MIXER
       (BINARY - 2004 WORDS/RECORD)                                   MIXER
                                                                      MIXER
 STANDARD FILE NAMES (SEE SUBROUTINES FILIO1 AND FILIO2)              MIXER
 ------------------------------------------------------------------   MIXER
 UNIT  FILE NAME                                                      MIXER
 ----  ----------                                                     MIXER
   2   MIXER.INP                                                      MIXER
   3   MIXER.LST                                                      MIXER
  10   ENDFB.IN                                                       MIXER
  11   ENDFB.OUT                                                      MIXER
 12-22  (SCRATCH)                                                     MIXER
                                                                      MIXER
 INPUT CARDS                                                          MIXER
 -----------                                                          MIXER
 LINE  COLS.  FORMAT  NAME    DESCRIPTION                             MIXER
 ----  -----  ------  ------- ----------                              MIXER
  1-2   1-66 16A4,A2  TITLE   TWO LINE TITLE DESCRIBING PROBLEM      MIXER
                              (THIS TITLE IS USED TO IDENTIFY THE    MIXER
                              OUTPUT LISTING AND IS ALSO WRITTEN     MIXER
                              IN MF=1, MT=451 (HOLLERITH SECTION)    MIXER
                              OF THE ENDF/B FORMATTED OUTPUT TO      MIXER
                              IDENTIFY THE COMPOSITE MIXTURE).       MIXER
    3   1-72                  ENDF/B INPUT DATA FILENAME             MIXER
                              (STANDARD OPTION = ENDFB.IN)           MIXER
    4   1-72                  ENDF/B OUTPUT DATA FILENAME            MIXER
                              (STANDARD OPTION = ENDFB.OUT)          MIXER
    5   1-11    I11   IZAOUT  ZA IDENTIFICATION FOR COMBINATION      MIXER
    5  12-17    I6    MATOUT  MAT IDENTIFICATION FOR COMBINATION     MIXER
    5  18-19    I2    MFOUT   MF IDENTIFICATION FOR COMBINATION      MIXER
    5  20-22    I3    MTOUT   MT IDENTIFICATION FOR COMBINATION      MIXER
    5  23-33    I11   DEFINE INPUT DENSITY                           MIXER
                      = 0 = GRAMS = BACKWARDS COMPATIBLE             MIXER
                      > 0 = ATOMS = NEW IN 2008                      MIXER
  6-N   1-11    I11   IZAGET  ZA (1000*Z+A) OF MATERIAL              MIXER
  6-N  12-22    I11   MTGET   MT OF REACTION                         MIXER
  6-N  23-33  E11.4   DENSE   MATERIAL DENSITY (ATOMS OR GRAMS)      MIXER
                                                                      MIXER
 THE SIXTH LINE IS REPEATED FOR EACH SECTION (FROM 2 TO 10).          MIXER
 SINCE THE ENDF/B FORMATTED OUTPUT IS IN BARNS/ATOM FORM A MINIMUM MIXER
 OF TWO SECTIONS MUST BE COMBINED (I.E., IF ONLY ONE SECTION IS      MIXER
 SPECIFIED THE OUTPUT WOULD BE IDENTICAL TO THE INPUT AND AS SUCH    MIXER
 THE PROGRAM WILL CONSIDER THIS TO BE AN ERROR AND NOT PERFORM THE MIXER
```

```
CALCULATION). THE LIST OF SECTIONS IS TERMINATED BY A BLANK LINE. MIXER
                                                                  MIXER
THE LIST OF SECTIONS TO BE COMBINED MAY BE SPECIFIED IN ANY       MIXER
ORDER, I.E. THEY NEED NOT BE IN ZA ORDER OR THE ORDER THAT THE    MIXER
EVALUATED DATA APPEARS ON THE ENDF/B FORMATTED TAPE.              MIXER
                                                                  MIXER
EXAMPLE INPUT NO. 1                                               MIXER
-------------------                                               MIXER
CREATE THE TOTAL CROSS SECTION (MT=1) FOR STAINLESS STEEL AND     MIXER
IDENTIFY THE COMBINED MATERIAL WITH ZA=26800 AND MAT=4000,        MIXER
THE COMPOSITION BY VOLUME OF THE STEEL WILL BE...                 MIXER
                                                                  MIXER
THE DATA FROM \ENDFB6\K300\LIBRARY.DAT AND WRITE DATA TO          MIXER
\MIXER\STEEL.DAT                                                  MIXER
                                                                  MIXER
IRON      - 74.8 PER-CENT                                         MIXER
CHROMIUM  - 16.0                                                  MIXER
NICKEL    -  6.0                                                  MIXER
MANGANESE -  2.0                                                  MIXER
SILICON   -  1.0                                                  MIXER
CARBON    -  0.2                                                  MIXER
                                                                  MIXER
THE INPUT MUST SPECIFY THE COMPOSITION BY GRAMS OR ATOMS. THIS IS MIXER
DEFINED AS THE PRODUCT OF THE STANDARD DENSITY (GRAMS)            MIXER
TIMES THE VOLUME FRACTION. FOR THIS EXAMPLE THE FOLLOWING 12      MIXER
INPUT CARDS ARE REQUIRED....                                      MIXER
                                                                  MIXER
STAINLESS STEEL. COMPOSITION BY PER-CENT VOLUME IS 74.8-IRON,     MIXER
16-CHROME, 6-NICKEL, 2-MANGANESE, 1-SILICON, 0.2-CARBON           MIXER
\ENDFB6\K300\LIBRARY.DAT                                          MIXER
\MIXER\STEEL.DAT                                                  MIXER
     26800  4000 3  1          0                                 MIXER
     26000          1 5.88676    (NOTE, GRAMS INPUT FOR EACH      MIXER
     24000          1 1.150448    CONSTITUENT, E.G. FOR IRON THE  MIXER
     28000          1 0.533928    STP DENSITY IS 7.87 GRAMS.      MIXER
     25055          1 0.1486      THE INPUT VALUE OF 5.88676 IS   MIXER
     14000          1 0.0233      0.748 X 7.87,I.E.  VOLUME       MIXER
      6012          1 0.0044958   FRACTION TIMES STP DENSITY).    MIXER
                                (BLANK LINE TERMINATES INPUT LIST)MIXER
                                                                  MIXER
EXAMPLE INPUT NO. 2                                               MIXER
-------------------                                               MIXER
THE SAME EXAMPLE AS THE ABOVE PROBLEM, ONLY USE THE STANDARD      MIXER
ENDF/B DATA FILENAMES - ENDFB.IN AND ENDFB.OUT (THIS CAN BE       MIXER
DONE BY LEAVING THE THIRD AND FOURTH INPUT LINES BLANK).          MIXER
FOR THIS EXAMPLE THE FOLLOWING 12 INPUT CARDS ARE REQUIRED....    MIXER
                                                                  MIXER
STAINLESS STEEL. COMPOSITION BY PER-CENT VOLUME IS 74.8-IRON,     MIXER
16-CHROME, 6-NICKEL, 2-MANGANESE, 1-SILICON, 0.2-CARBON           MIXER
(NOTE - THIS LINE IS REALLY BLANK)                                MIXER
(NOTE - THIS LINE IS REALLY BLANK)                                MIXER
     26800  4000 3  1                                            MIXER
     26000          1 5.88676    (NOTE, GRAMS INPUT FOR EACH      MIXER
     24000          1 1.150448    CONSTITUENT, E.G. FOR IRON THE  MIXER
     28000          1 0.533928    STP DENSITY IS 7.87 GRAMS.      MIXER
     25055          1 0.1486      THE INPUT VALUE OF 5.88676 IS   MIXER
     14000          1 0.0233      0.748 X 7.87,I.E.  VOLUME       MIXER
      6012          1 0.0044958   FRACTION TIMES STP DENSITY).    MIXER
                                (BLANK LINE TERMINATES INPUT LIST)MIXER
                                                                  MIXER
==================================================================MIXER
```