```
=========================================================================FIXUP
                                                                        FIXUP
     PROGRAM FIXUP                                                      FIXUP
     =============                                                      FIXUP
     VERSION 84-1 (NOVEMBER 1984)                                       FIXUP
     VERSION 86-1 (JANUARY 1986) *IMPROVED BASED ON USER COMMENTS       FIXUP
                                 *FORTRAN-77/H VERSION                  FIXUP
     VERSION 86-2 (JUNE 1986)    *ALLOW CREATION OF SECTIONS OF CROSS   FIXUP
                                  SECTIONS WHICH ARE NOT PRESENT IN     FIXUP
                                  THE ORIGINAL EVALUATION               FIXUP
     VERSION 88-1 (JULY 1988)    *OPTION...INTERNALLY DEFINE REA I/O    FIXUP
                                  FILE NAMES (SEE, SUBROUTINE FILEIO    FIXUP
                                  FOR DETAILS).                         FIXUP
                                 *IMPROVED BASED ON USER COMMENTS.      FIXUP
     VERSION 89-1 (JANUARY 1989) *PSYCHOANALYZED BY PROGRAM FREUD TO    FIXUP
                                  INSURE PROGRAM WILL NOT DO ANYTHING   FIXUP
                                  CRAZY.                                FIXUP
                                 *UPDATED TO USE NEW PROGRAM CONVERT    FIXUP
                                  KEYWORDS.                             FIXUP
                                 *ADDED LIVERMORE CIVIC COMPILER        FIXUP
                                  CONVENTIONS.                          FIXUP
     VERSION 89-2 (MARCH 1989)   *ADDED ENDF-6 SUMMATION RULES AND      FIXUP
                                  DEFINED MF AND MT NUMBERS. PROGRAM    FIXUP
                                  WILL NOW USE MF=1, MT=451 TO DEFINE   FIXUP
                                  THE ENDF FORMAT OF THE DATA (E.G.,    FIXUP
                                  ENDF-6 OR EARLIER) AND USE THE        FIXUP
                                  CORRECT SUMMATION RULES FOR EACH      FIXUP
                                  VERSION OF THE ENDF FORMAT. IF        FIXUP
                                  MF=1, MT=451 IS NOT PRESENT PROGRAM   FIXUP
                                  WILL USE ENDF-6 SUMMATION             FIXUP
                                  CONVENTIONS AS A DEFAULT.             FIXUP
     VERSION 90-1 (JUNE 1990)    *UPDATED BASED ON USER COMMENTS        FIXUP
                                 *ADDED PHOTON INTERACTION, MF=23       FIXUP
     VERSION 91-1 (JUNE 1991)    *ADDED FORTRAN SAVE OPTION             FIXUP
                                 *NEW MORE CONSISTENT ENERGY OUTPUT     FIXUP
                                  ROUTINE                               FIXUP
     VERSION 92-1 (JANUARY 1992) *ADDED OPTION TO CALCULATE RATIOS,     FIXUP
                                  E.G., CAPTURE/FISSION AND PRODUCTS,   FIXUP
                                  NU-BAR*FISSION - AND OUTPUT THE       FIXUP
                                  RESULTS IN THE ENDF FORMAT (SEE,      FIXUP
                                  BELOW - CREATING RATIOS AND PRODUCTS) FIXUP
                                 *ALLOW TOTAL NU-BAR (MF=1, MT=452) TO  FIXUP
                                  BE USED IN DEFINING RATIOS OR         FIXUP
                                  PRODUCTS.                             FIXUP
                                 *ALLOW ALL CROSS SECTIONS TO BE PUT    FIXUP
                                  ON A UNIFORM ENERGY GRID.             FIXUP
                                 *NOTE, CHANGE IN INPUT FORMAT FOR      FIXUP
                                  RANGES OF MT NUMBERS                  FIXUP
                                 *COMPLETELY CONSISTENT I/O ROUTINES -  FIXUP
                                  TO MINIMIZE COMPUTER DEPENDENCE.      FIXUP
     VERSION 93-1 (JULY 1993)    *CORRECTED ALGORITHM TO CREATE UNIFORMFIXUP
                                  ENERGY GRID.                          FIXUP
     VERSION 94-1 (JANUARY 1993) *VARIABLE ENDF/B DATA FILENAMES        FIXUP
                                  TO ALLOW ACCESS TO FILE STRUCTURES    FIXUP
                                  (WARNING - INPUT PARAMETER FORMAT     FIXUP
                                  HAS BEEN CHANGED)                     FIXUP
                                 *INCREASED PAGE SIZE FROM 1002 TO      FIXUP
                                  12000 DATA POINTS.                    FIXUP
                                 *CLOSE ALL FILES BEFORE TERMINATING    FIXUP
                                  (SEE, SUBROUTINE ENDIT)               FIXUP
     VERSION 96-1 (JANUARY 1996) *COMPLETE RE-WRITE                     FIXUP
                                 *IMPROVED COMPUTER INDEPENDENCE        FIXUP
                                 *ALL DOUBLE PRECISION                  FIXUP
                                 *ON SCREEN OUTPUT                      FIXUP
                                 *UNIFORM TREATMENT OF ENDF I/O         FIXUP
                                 *IMPROVED OUTPUT PRECISION             FIXUP
                                 *DEFINED SCRATCH FILE NAMES            FIXUP
                                 *INCREASED PAGE SIZE FROM 12000 TO     FIXUP
                                  36000 DATA POINTS.                    FIXUP
     VERSION 99-1 (MARCH 1999)   *CORRECTED CHARACTER TO FLOATING       FIXUP
                                  POINT READ FOR MORE DIGITS            FIXUP
```

```
                          *UPDATED TEST FOR ENDF FORMAT         FIXUP
                           VERSION BASED ON RECENT FORMAT CHANGEFIXUP
                          *GENERAL IMPROVEMENTS BASED ON        FIXUP
                           USER FEEDBACK                        FIXUP
VERSION 99-2 (JUNE 1999)  *ASSUME ENDF-6, NOT 5, IF MISSING     FIXUP
                           MF=1, MT-451.                        FIXUP
                          *FIXED CREATION OF SECTIONS           FIXUP
VERS. 2000-1 (FEBRUARY 2000)*GENERAL IMPROVEMENTS BASED ON      FIXUP
                           USER FEEDBACK                        FIXUP
VERS. 2002-1 (MAY 2002)   *OPTIONAL INPUT PARAMETERS            FIXUP
                          *SUMMATION RULES ARE DEFINED BASED    FIXUP
                           ON CONTENTS OF TABLES.               FIXUP
VERS. 2004-1 (JAN. 2004)  *GENERAL UPDATE BASED ON USER FEEDBACKFIXUP
                          *INCREASED PAGE SIZE FROM 36000 TO    FIXUP
                           60000 DATA POINTS.                   FIXUP
VERS. 2005-1 (JAN. 2005)  *UPDATED MT CREATION TO ALLOW MAT =0  FIXUP
                           INDICATING CREATE FOR ALL MATS.      FIXUP
VERS. 2007-1 (JAN. 2007)  *CHECKED AGAINST ALL ENDF/B-VII DATA  FIXUP
                          *INCREASED PAGE SIZE FROM 60,000 TO   FIXUP
                           600,000 DATA POINTS.                 FIXUP
VERS. 2007-2 (OCT. 2007)  *ADDED MT=16 AS SUM MT=875 THRU 891   FIXUP
                          *72 CHARACTER FILE NAMES              FIXUP
VERS. 2010-1 (Apr. 2010)  *Defining cross sections by summation FIXUP
                           to now mandatory - either build-in   FIXUP
                           rules or by user input.              FIXUP
VERS. 2011-1 (March 2011) *Added new MT # to allowed and        FIXUP
                           summation rules.                     FIXUP
VERS. 2012-1 (Aug.  2012) *Corrected definition of MT=3 to avoidFIXUP
                           double counting of MT=18.            FIXUP
                          *Extended incident particle list to   FIXUP
                           include photon (ZA = 0).             FIXUP
                          *Added CODENAME                       FIXUP
                          *32 and 64 bit Compatible             FIXUP
                          *Added ERROR stops.                   FIXUP
VERS. 2015-1 (Jan.  2015) *Extended OUT9.                       FIXUP
                          *Replaced ALL 3 way IF Statements     FIXUP
                                                                FIXUP
VERS. 2015-2 (Oct.  2015) *Threshold Correction no longer       FIXUP
                           allowed = TOO DANGEROUS!!!           FIXUP
VERS. 2017-1 (May   2017) *Updated based on user feekback       FIXUP
                          *Increased tables to 3,000,000.       FIXUP
                          *All floating input parameters changedFIXUP
                           to character input + IN9 conversion. FIXUP
                          *Ignore attempts to "correct" reactionFIXUP
                           threshold = cannot be done for       FIXUP
                           temperature dependent (MF=3) data.   FIXUP
VERS. 2017-2 (Oct.  2017) *Updated to insure sharp edges for    FIXUP
                           photon interaction cross sections    FIXUP
                           MF=23.                               FIXUP
                          *Updated for ELECTRONS to create,     FIXUP
                           MF/MT=23/501 = Total                 FIXUP
                           MF/MT=23/522 = Total ionization      FIXUP
                          *Updated to define MF=26 and electron FIXUP
                           Cross Sections MT=526, 527, 528 as   FIXUP
                           LEGAL MF/MT Combinations.            FIXUP
VERS. 2018-1 (Jan.  2018) *Decreased PAGE size from 2,700,000   FIXUP
                           to 1,800,000 - PAGE was too BIG for  FIXUP
                           many computers - forcing the code    FIXUP
                           to run VERY SLOWLY - smaller size    FIXUP
                           improves running time.               FIXUP
                          *Added on-line output for ALL ENDERRORFIXUP
VERS. 2019-1 (June  2019) *Additional Interpolation Law Tests   FIXUP
                          *Print WARNING if ALL MTs in any      FIXUP
                           evaluation DO NOT ALL EXTEND to the  FIXUP
                           same Maximum Tabulated Energy =      FIXUP
                           in this case data above the lowest   FIXUP
                           common energy is identied as being   FIXUP
                           UNRELIABLE.                          FIXUP
VERS. 2019-2 (Oct.  2019) *Corrected ERROR defining first point FIXUP
                           of each MT = first point was being   FIXUP
                           ERRONEOUSLY skipped (due to an ERROR FIXUP
```

```
                            in removing the previous THRESHOLD   FIXUP
                            "correction" test - which is no      FIXUP
                            longer allowed).                     FIXUP
VERS. 2020-1 (Dec.  2020)   *ZA & AWRE Correction Required.      FIXUP
                            *Extenstion to 20 MeV NOT ALLOWED.   FIXUP
                            *Threshold correction NOT ALLOWED.   FIXUP
                            *Added Target isomeric state         FIXUP
VERS. 2021-1 (Jan.  2021)   *Updated for FORTRAN 2018            FIXUP
                            *DELETED MT=3 = Nonelastic by adding FIXUP
                            it to the built-in DELETION table -  FIXUP
                            to select set option 3 = 2 (use      FIXUP
                            built-in DELETION table). MT=3 is    FIXUP
                            never used in applications, and yet  FIXUP
                            can add an enormous volume to ENDF   FIXUP
                            format files: (MT=3) = (MT-1)-(MT-2),FIXUP
                            included ALL of the resonances from  FIXUP
                            capture, fission,.....               FIXUP
VERS. 2021-2 (Aug.  2021)   *Corrected MTCHEK to check only if   FIXUP
                            using built-in tables,               FIXUP
                            IMOPS(4) = DELETION                  FIXUP
                            IMOPS(5) = SUMMATION                 FIXUP
                            ERROR = Only print WARNING - NO STOP FIXUP
VERS, 2021-3 (Nov.  2021)   *Corrected summation rules to be     FIXUP
                            identical to ENDF102, 0.4.2.11 -     FIXUP
                            WARNING - I did not check these      FIXUP
                            definitions, i.e., I believe ENDF-102FIXUP
VERS, 2021-4 (Dec.  2021)   *Check summation rules using MT.DAT  FIXUP
                            is OPTIONAL = done if MT.DAT present-FIXUP
                            otherwise skipped with WARNING.      FIXUP
                            *Cross Section Reconstruction optionalFIXUP
                            (option 5).                          FIXUP
VERS. 2023-1 (Jan.  2023)   *Increase MTREAD(2,10) to MTREAD(2,15)FIXUP
                            *Decreased in-core array size from   FIXUP
                            1,800,000 to 120,000 - enormous      FIXUP
                            arrays merely make the code run      FIXUP
                            longer I/O instead of calculations.  FIXUP
                                                                 FIXUP
2019-2 Acknowledgment                                            FIXUP
=====================                                            FIXUP
I thank Jean-Christophe Sublet (NDS, IAEA, Vienna, Austria) for  FIXUP
reporting the ERROR in FIXUP (2019-1) that led to the update in  FIXUP
FIXUP (2019-2) to correctly define the first point in each MT.   FIXUP
                                                                 FIXUP
OWNED, MAINTAINED AND DISTRIBUTED BY                             FIXUP
------------------------------------                             FIXUP
THE NUCLEAR DATA SECTION                                         FIXUP
INTERNATIONAL ATOMIC ENERGY AGENCY                               FIXUP
P.O. BOX 100                                                     FIXUP
A-1400, VIENNA, AUSTRIA                                          FIXUP
EUROPE                                                           FIXUP
                                                                 FIXUP
ORIGINALLY WRITTEN BY                                            FIXUP
---------------------------------                                FIXUP
Dermott E. Cullen                                                FIXUP
                                                                 FIXUP
PRESENT CONTACT INFORMATION                                      FIXUP
---------------------------                                      FIXUP
Dermott E. Cullen                                                FIXUP
1466 Hudson Way                                                  FIXUP
Livermore, CA 94550                                              FIXUP
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E. Mail    RedCullen1@Comcast.net                                FIXUP
Website    RedCullen1.net/HOMEPAGE.NEW                           FIXUP
                                                                 FIXUP
PURPOSE                                                          FIXUP
=======                                                          FIXUP
THIS PROGRAM IS DESIGNED TO READ EVALUATED DATA IN THE ENDF      FIXUP
FORMAT, PERFORM CORRECTIONS AND OUTPUT THE RESULT IN THE ENDF    FIXUP
FORMAT. TWO TYPES OF CORRECTIONS ARE POSSIBLE (1) AUTOMATIC AND  FIXUP
(2) OPTIONAL (BASED ON USER INPUT) CORRECTIONS.                  FIXUP
```

```
                                                                      FIXUP
ONE OF THE MOST IMPORTANT FUNCTIONS OF THIS PROGRAM IS TO             FIXUP
RE-DEFINE ALL REDUNDANT CROSS SECTIONS (E.G. TOTAL) TO BE EXACTLY FIXUP
EQUAL TO THE SUM OF ITS PARTS. THIS PROCEDURE ELIMINATES THE          FIXUP
PROBLEM WITH MANY ENDF EVALUATIONS, WHERE DUE TO THE USE OF           FIXUP
NON-LINEAR INTERPOLATION LAWS THE TOTAL MAY BE EQUAL TO THE SUM       FIXUP
OF ITS PARTS AT ALL TABULATED ENERGIES, BUT BASED ON THE              FIXUP
INTERPOLATION LAWS IT CAN BE QUITE DIFFERENT AT ENERGIES BETWEEN      FIXUP
TABULATED ENERGIES.                                                   FIXUP
                                                                      FIXUP
AUTOMATIC CHECKS/CORRECTIONS                                          FIXUP
============================                                          FIXUP
(1) CHECK THAT MAT/MF/MT DOES NOT CHANGE UNLESS A MEND/FEND/SEND      FIXUP
    LINE IS READ. IF MAT/MF/MT CHANGES A WARNING MESSAGE IS           FIXUP
    PRINTED BUT NO CORRECTIVE ACTION IS TAKEN.                        FIXUP
(2) ALL LINES WITHIN A GIVEN MAT WILL BE SEQUENTIALLY NUMBERED        FIXUP
    ON OUTPUT.                                                        FIXUP
                                                                      FIXUP
OPTIONAL CHECKS/CORRECTIONS                                           FIXUP
===========================                                           FIXUP
THE FOLLOWING NUMBERS CORRESPOND TO THE INPUT DATA OPTION COLUMNS FIXUP
(SEE THE DESCRIPTION OF THE INPUT BELOW)                              FIXUP
                                                                      FIXUP
(1) CORRECT ZA AND AWR IN ALL SECTIONS. CHECK TO INSURE THAT THE      FIXUP
    C1 AND C2 VALUES (ZA AND AWR) ARE THE SAME IN ALL SECTIONS.       FIXUP
    THE C1 AND C2 OF THE FIRST SECTION READ ARE ASSUMED TO BE         FIXUP
    CORRECT AND ARE USED FOR COMPARISON. IF THE C1 AND/OR C2 OF       FIXUP
    THE FIRST SECTION ARE NOT POSITIVE AN ERROR MESSAGE IS OUTPUT FIXUP
    AND THE MATERIAL IS COPIED WITHOUT CHANGE.                        FIXUP
    NOTE....TO CHANGE THE ZA AND/OR AWR OF ANY MATERIAL IT IS         FIXUP
    MERELY NECESSARY TO CHANGE THE ZA AND/OR AWR IN THE FIRST         FIXUP
    SECTION OF THE MATERIAL AND USE THIS OPTION TO AUTOMATICALLY      FIXUP
    CHANGE ALL OTHER SECTIONS.                                        FIXUP
                                                                      FIXUP
    2017/5/20 - This option (2) is no longer allowed                  FIXUP
                                                                      FIXUP
    WARNING: Threshold Correction is no longer allowed.               FIXUP
             This option has resulted in far too much                 FIXUP
             misinterpretation and as such it is judged to            FIXUP
             be too dangerous to be allowed in this code.             FIXUP
             For example, the Laboratory frame of reference           FIXUP
             threshold is temperature dependent = it is not           FIXUP
             uniquely defined by Q value and atomic weight.           FIXUP
             ThIS OPTION is IGNORED.                                  FIXUP
                                                                      FIXUP
(2) CORRECT CROSS SECTION (MF=3) THRESHOLDS. THE Q-VALUE AND AWR      FIXUP
    ARE USED TO DERIVE THE REACTION THRESHOLD USING THE RELATION,     FIXUP
                                                                      FIXUP
    E-THRESHOLD = -(Q-VALUE)*(AWRE+1.0)/AWRE                          FIXUP
                                                                      FIXUP
    IF THE THRESHOLD IS POSITIVE THE CROSS SECTION IS CHECKED TO      FIXUP
    INSURE THAT THE FIRST TABULATED POINT IS AT THE THRESHOLD AND     FIXUP
    HAS A ZERO CROSS SECTION. IF NOT, THE CROSS SECTION WILL BE       FIXUP
    CHANGED.                                                          FIXUP
    (A) IF THE FIRST TABULATED POINT IS ABOVE THE THRESHOLD AND       FIXUP
        HAS A ZERO CROSS SECTION, THE POINT IS DELETED AND A POINTFIXUP
        IS INSERTED AT THE THRESHOLD.                                 FIXUP
    (B) IF THE FIRST TABULATED POINT IS ABOVE THE THRESHOLD AND       FIXUP
        HAS A NON-ZERO CROSS SECTION, A POINT WITH ZERO CROSS         FIXUP
        SECTION IS INSERTED AT THE THRESHOLD.                         FIXUP
    (C) IF THE FIRST TABULATED POINT IS BELOW THE THRESHOLD AND       FIXUP
        HAS A NON-ZERO CROSS SECTION, ALL POINTS BELOW THE            FIXUP
        THRESHOLD ARE DELETED AND A POINT WITH ZERO CROSS SECTION FIXUP
        IS INSERTED AT THE THRESHOLD.                                 FIXUP
                                                                      FIXUP
    2017/5/20 - This option (2) is no longer allowed                  FIXUP
                                                                      FIXUP
(3) EXTEND ALL CROSS SECTIONS (MF=3) TO 20 MEV. IF THE TABULATED      FIXUP
    CROSS SECTION ENDS BELOW 20 MEV IT WILL BE EXTENDED TO 20 MEV FIXUP
    AS EITHER ZERO (IMOPS(3)=1) OR CONSTANT (IMOPS(3)=2) EQUAL        FIXUP
    TO THE LAST TABULATED VALUE.                                      FIXUP
```

```
(4) ALLOW REACTION (MF=3, ANY MT) DELETION. ALL SPECIFIED          FIXUP
    REACTIONS WILL BE DELETED WHEN THE DATA IS READ FROM THE       FIXUP
    INPUT ENDF DATA FILE AND WILL NOT BE IN THE OUTPUT ENDF        FIXUP
    DATA FILE. WARNING DELETED REACTIONS MAY NOT BE USED TO DEFINEFIXUP
    ANY RECONSTRUCTED REACTIONS (I.E. REACTIONS DEFINED BY SUMMINGFIXUP
    OTHER REACTIONS). SINCE DELETED REACTIONS ARE DELETED DURING  FIXUP
    READING IT IS AS IF THEY NEVER EXISTED AND IF ANY DELETED      FIXUP
    REACTION IS REQUIRED LATER TO DEFINE ANY SUM AN ERROR WILL     FIXUP
    RESULT. THE USER MAY SPECIFY THAT THE DELETION RULES ARE TO BEFIXUP
    READ FROM INPUT (IMOPS(4)=1) OR THAT THE BUILT IN SUMMATION    FIXUP
    RULES ARE TO BE USED (MOPS(4)=2). AT THE PRESENT TIME THE      FIXUP
    BUILT-IN DELETION RULES ARE THAT NO SECTIONS SHOULD BE DELETEDFIXUP
    (THE USER MAY OVERRIDE THIS CONVENTION BY INPUT).              FIXUP
(5) ALLOW REACTION (MF=3, ANY MT) RECONSTRUCTION BY SUMMING OTHER FIXUP
    REACTIONS. IN ORDER TO OPTIMIZE THE RUNNING TIME OF THIS       FIXUP
    PROGRAM CARE SHOULD BE EXERCISED TO MINIMIZE THE NUMBER OF     FIXUP
    TIMES THAT EACH CONTRIBUTING CROSS SECTION MUST BE USED.       FIXUP
    THE USED MAY SPECIFY THAT THE SUMMATION RULES ARE TO BE READ   FIXUP
    AS INPUT (IMOPS(5)=1) OR THAT THE BUILT IN SUMMATION RULES     FIXUP
    ARE TO BE USED (IMOPS(5)=2). THE BUILT IN SUMMATION RULES ARE FIXUP
    DESIGNED TO USE ENDF CONVENTIONS AND TO MINIMIZE THE NUMBER    FIXUP
    OF TIMES THAT EACH CROSS SECTION IS USED.                      FIXUP
(6) INSURE THAT ALL CROSS SECTIONS ARE NON-NEGATIVE (I.E. ARE      FIXUP
    ZERO OR POSITIVE). DURING READING ALL NEGATIVE CROSS SECTIONS  FIXUP
    WILL BE SET EQUAL TO ZERO AND TREATED AS SUCH DURING ALL       FIXUP
    SUBSEQUENT SUMMATIONS AND ENDF OUTPUT.                         FIXUP
    NOTE...THIS OPTION SHOULD NEVER BE USED WITH DATA CONTAINING   FIXUP
    BACKGROUND CROSS SECTIONS WHICH MAY BE NEGATIVE. ONLY AFTER    FIXUP
    THE RESONANCE CONTRIBUTION HAS BEEN ADDED TO THE BACKGROUND    FIXUP
    TO DEFINE THE ACTUAL CROSS SECTION IS IT VALID TO ELIMINATE    FIXUP
    NEGATIVE CROSS SECTIONS.                                       FIXUP
    NOTE...THIS OPTION MAY BE USED TO DELETE NEGATIVE ELASTIC      FIXUP
    CROSS SECTIONS THAT MAY RESULT FROM RECONSTRUCTING CROSS       FIXUP
    SECTIONS FROM SINGLE LEVEL BREIT-WIGNER PARAMETERS. IF THE     FIXUP
    TOTAL CROSS SECTION IS THEN RECONSTRUCTED USING THE CORRECTED  FIXUP
    ELASTIC CROSS SECTION THE TOTAL WILL BE POSITIVE DUE TO THE    FIXUP
    CONTRIBUTIONS OF CAPTURE AND FISSION (THUS AVOIDING NUMERICAL  FIXUP
    INSTABILITY PROBLEMS DURING SELF-SHIELDING CALCULATIONS).      FIXUP
(7) WITHIN EACH SECTION OF CROSS SECTIONS DELETE ENERGIES THAT     FIXUP
    ARE NOT IN ASCENDING ENERGY ORDER (ENERGY REPETITION IS O.K.)  FIXUP
(8) WITHIN EACH SECTION OF CROSS SECTIONS ELIMINATE DUPLICATE      FIXUP
    POINTS (SUCCESSIVE POINTS WITH THE SAME ENERGY-CROSS SECTION).FIXUP
(9) TEST THAT ALL SECTIONS ARE IN ASCENDING MAT/MF/MT ORDER.       FIXUP
    IF NOT, NO CORRECTIVE ACTION WILL BE TAKEN, ONLY AN ERROR      FIXUP
    MESSAGE WILL BE OUTPUT.                                        FIXUP
(10) CHECK MF/MT FOR EACH SECTION TO INSURE THAT THEY ARE DEFINED  FIXUP
    IN THE ENDF FORMAR MANUAL. IF THEY ARE NOT DEFINED AN ERROR    FIXUP
    MESSAGE IS PRINTED, BUT NO CORRECTIVE ACTION IS TAKEN.         FIXUP
(11) ALLOW SECTIONS WHICH ARE NOT PRESENT IN THE ORIGINAL (INPUT)  FIXUP
    EVALUATION TO BE CREATED. NORMALLY THIS PROGRAM WILL ONLY      FIXUP
    RECONSTRUCT AND OUTPUT SECTIONS IF THE SECTION IS PRESENT      FIXUP
    IN THE ORIGINAL EVALUATION. THIS PROCEDURE IS FOLLOWED BECAUSEFIXUP
    NORMALLY THE PROGRAM DOES NOT KNOW HOW TO DEFINE THE CONTENTS FIXUP
    OF THE FIRST TWO LINES OF THE SECTION (E.G., Q-VALUE,          FIXUP
    TEMPERATURE, INITIAL AND FINAL STATES). THIS OPTION MAY BE     FIXUP
    USED TO ALLOW THE PROGRAM TO READ AND SAVE A TABLE DEFINING    FIXUP
    THE CONTENTS OF THE FIRST TWO LINES OF EACH SECTION TO BE      FIXUP
    CREATED.                                                       FIXUP
    NOTE...IF A SECTION IS PRESENT ANY COMMAND TO CREATE IT WILL   FIXUP
    BE IGNORED.                                                    FIXUP
(12) ALLOW ENERGY POINTS TO BE INSERTED. THE PROGRAM CAN READ UP   FIXUP
    TO 50, ENERGIES, MAT, MT AND USE LINEAR INTERPOLATION TO       FIXUP
    INSERT ENERGY POINTS INTO TABLES AS THEY ARE READ, E.G.,       FIXUP
    INSERT AN ENERGY POINT AT THERMAL ENERGY (0.0253 EV). IF       FIXUP
    AN MAT AND/OR MT IS ZERO THIS IMPLIES = ALL - INSERT THE       FIXUP
    ENERGY IN ALL TABLES.                                          FIXUP
(13) PUT ALLOW CROSS SECTIONS ON A UNIFORM ENERGY GRID = EACH      FIXUP
    SECTION (MT) OF CROSS SECTIONS WILL INCLUDE ALL ENERGIES       FIXUP
    WHICH APPEAR IN AT LEAST ONE SECTION OF DATA. PARAMETERS       FIXUP
    (MT=251 THROUGH 255) ARE NOT INCLUDED IN THE UNIFORM ENERGY    FIXUP
    GRID.                                                          FIXUP
```

(14)DELETE SECTION IF CROSS SECTION = 0 AT ALL ENERGIES. THIS SOUNDS LIKE AN ABSURD OPTION, BUT IS REQUIRED BECAUSE SUCH SECTIONS EXIST IN ENDF/B-VI DATA.

CREATING RATIOS AND PRODUCTS

IN ORDER TO CREATE RATIOS AND PRODUCTS = NEW MT NUMBERS, YOU MUST DO TWO THINGS,

1) DEFINE EACH NEW MT NUMBER AS A RATIO OR PRODUCT OF TWO MT NUMBERS.

2) USE THE CREATE MT NUMBER OPTION AND INPUT THE FIRST TWO LINES OF THE SECTION

WARNING - UNLESS YOU DO BOTH OF THESE YOU WILL NOT OBTAIN OUTPUT IN THE ENDF FORMAT.

TWO SPECIAL MT NUMBERS HAVE BEEN DEFINED BY CSEWG INVOLVING RATIOS AND PRODUCTS,

ALPHA (MT=254)= CAPTURE (MT=102)/FISSION (MT=18)

ETA (MT=255) = NU-BAR (MT=452)*FISSION (MT=18)/ABSORPTION (MT=27)

ABSORPTION (MT=27) = FISSION (MT=18) + SUM (MT=102 THROUGH 116)

AS YET THERE IS NO STANDARD DEFINITION OF MT NUMBERS FOR RATIO OR PRODUCT DATA. YOU ARE FREE TO USE ANY MT NUMBERS NORMALLY NOT USED IN THE ENDF. HOWEVER, IT WILL THEN BE YOUR RESPONSIBILITY TO PROPERLY INTERPRET THE RESULTS, I.E., NOBODY ELSE WILL HAVE ANY IDEA HOW TO INTERPRET A TABLE OF DATA ASSOCIATED WITH THE MT NUMBERS YOU HAVE USED.

THIS PROGRAM CAN BE ONLY DIRECTLY DEFINE RATIOS AND PRODUCTS USING TWO MT NUMBERS = BINARY OPERATIONS, E.G., DEFINE THE CAPTURE TO FISSION RATIO, OR DEFINE THE PRODUCT NU-BAR*FISSION.

THIS PROGRAM CANNOT DIRECTLY DEFINE RATIO OR PRODUCT OF A SUM OF SECTIONS TO THE SUM OF ANOTHER SET OF SECTIONS. HOWEVER, THIS CAN BE DONE INDIRECTLY BY FIRST DEFINING A DUMMY MT NUMBER (ANY MT NUMBER NOT NORMALLY USED IN ENDF) TO BE A SUM OF SECTIONS AND A SECOND DUMMY MT NUMBER TO BE A SECOND SUM OF SECTIONS. YOU CAN THEN DEFINE RATIO OR PRODUCT YOU REQUIRE TO BE THE RATIO OF THESE TWO DUMMY MT NUMBERS.

FOR EXAMPLE, TO DEFINE ETA,
1) FIRST DEFINE (MT=27) = (MT=27) + (SUM OF MT=102 THROUGH 116)
2) NEXT DEFINE (MT=333) = (MT=452)*(MT=18)
3) LAST DEFINE (MT=255) = (MT=333)/(MT=27)
DO NOT FORGET TO TURN ON THE CREATE SECTION OPTION (ON THE FIRST INPUT LINE) AND INPUT THE FIRST TWO LINES OF SECTION MT=255 - OTHERWISE YOU WILL NOT GET ANY ENDF FORMATTED OUTPUT.

THE ONLY SPECIAL CONVENTIONS USED BY THIS PROGRAM IN CALCULATING RATIOS ARE WHEN THE DENOMINATOR OF THE RATIO IS ZERO. IN THIS CASE IF THE NUMERATOR IS ALSO ZERO THE RATIO IS DEFINED TO BE ONE. IN THIS CASE IF THE NUMERATOR IS NOT ZERO THE RATIO IS DEFINED TO BE ZERO.

ENDF FORMAT

THIS PROGRAM MAY BE USED WITH DATA IN ANY VERSION OF THE ENDF FORMAT (I.E. ENDF-1, 2, 3, 4, 5 OR 6 FORMAT). SINCE A PAGING SYSTEM IS USED STORE CROSS SECTION TABLES ON SCRATCH FILES THERE IS NO LIMIT TO THE SIZE OF TABLES (E.G. THE TOTAL CROSS SECTION MAY BE REPRESENTED BY 200,000 TABULATED POINTS).

WARNING

(1) FOR EACH SECTION OF CROSS SECTIONS (I.E. EACH MT, MF=3) IN

```
    THE ORIGINAL EVALUATION (I.E. ENDF/B DATA READ) ONE SECTION   FIXUP
    OF DATA WILL BE OUTPUT, UNLESS THE SECTION HAS BEEN DELETED.  FIXUP
    THIS INCLUDES ANY SECTIONS WHICH ARE NOT PRESENT IN THE       FIXUP
    ORIGINAL EVALUATION, BUT THE USER INDICATES (BY INPUT) SHOULD FIXUP
    BE CREATED.                                                   FIXUP
                                                                  FIXUP
    THE PROGRAM WILL NOT OUTPUT ANY SECTION RECONSTRUCTED BY      FIXUP
    SUMMATION UNLESS THE CORRESPONDING SECTION (MT NUMBER) IS     FIXUP
    PRESENT IN THE ORIGINAL EVALUATION OR USER INPUT INDICATES    FIXUP
    SHOULD BE CREATED AND OUTPUT. THIS IS (A) BECAUSE THE         FIXUP
    PROGRAM CANNOT DEFINE THE PARAMETERS TO APPEAR ON THE FIRST   FIXUP
    TWO LINES OF THE SECTION, (B) TO AVOID OUTPUTTING TOO MUCH    FIXUP
    DATA WHICH THE USER MAY NOT BE INTERESTED IN.                 FIXUP
                                                                  FIXUP
(2) FOR ANY SECTIONS THAT DO NOT APPEAR IN THE ORIGINAL DATA THE  FIXUP
    USER MAY SPECIFY THAT THEY BE DEFINED BY SUMMATION. ANY SUCH  FIXUP
    SECTION MAY BE USED BE DEFINE SUBSEQUENT SUMS, BUT THE SECTIONFIXUP
    ITSELF WILL NOT BE OUTPUT (E.G. GENERALLY MT=27 AND 101 ARE   FIXUP
    NOT PRESENT IN EVALUATIONS. HOWEVER, THE BUILT-IN SUMMATION   FIXUP
    RULES OF THIS PROGRAM USES THE ENDF SUMMATION RULES TO        FIXUP
    DEFINE MT=27 AND 101, WHICH IN TURN ARE USED TO DEFINE THE    FIXUP
    NON-ELASTIC CROSS SECTION, MT=3. SECTIONS MT=27 AND 101 ARE   FIXUP
    NOT OUTPUT).                                                  FIXUP
                                                                  FIXUP
(3) ALL DATA IN FILE 3 AND 23 MUST BE LINEARLY INTERPOLABLE. IF   FIXUP
    THE DATA IS NOT LINEARLY INTERPOLABLE THIS PROGRAM WILL       FIXUP
    TERMINATE.                                                    FIXUP
                                                                  FIXUP
PROGRAM OPERATION                                                 FIXUP
=================                                                 FIXUP
ALL MAT NUMBER ON AN ENDF TAPE ARE PROCESSED. EACH MAT IS         FIXUP
TREATED SEPARATELY. WITHIN EACH MAT, EACH SECTION BEFORE MF=3     FIXUP
IS READ, CHECKED/CORRECTED (BASED ON INPUT OPTIONS) AND OUTPUT.   FIXUP
WHEN MF=3 IS LOCATED ALL CROSS SECTIONS ARE READ, SECTIONS TO BE  FIXUP
DELETED ARE DELETED, SECTIONS WHICH ARE NOT PRESENTED AND USER    FIXUP
INPUT INDICATES SHOULD BE CREATED ARE CREATE, SECTIONS TO BE KEPT FIXUP
ARE CHECKED/CORRECTED (BASED ON INPUT OPTIONS) AND WRITTEN TO A   FIXUP
SCRATCH FILE. NEXT, IF THE USER SPECIFIES THAT THEY SHOULD,       FIXUP
SECTIONS ARE RECONSTRUCTED. FINALLY ALL CROSS SECTIONS (OLD AND   FIXUP
NEW) ARE OUTPUT. WITHIN THE SAME MAT, EACH SECTION AFTER MF=3 IS  FIXUP
READ, CHECKED/CORRECTED (BASED ON INPUT OPTIONS) AND OUTPUT.      FIXUP
                                                                  FIXUP
MF=3                                                              FIXUP
====                                                              FIXUP
THE TREATMENT OF THE CROSS SECTIONS REQUIRES UP TO 4 PASSES FOR   FIXUP
CROSS SECTIONS. IN THE PROGRAM THEY CORRESPOND TO SUBROUTINES     FIXUP
PASS1, PASS2, PASS3 AND PASS4. THE ORIGINAL AND FINAL ENDF DATA   FIXUP
FILES, 5 SCRATCH FILES AND 3 IN CORE ARRAYS ARE USED. OPERATIONS  FIXUP
PERFORMED DURING EACH PASS ARE,                                   FIXUP
                                                                  FIXUP
PASS1                                                             FIXUP
=====                                                             FIXUP
READ ALL CROSS SECTIONS FROM ITAPE. DELETED ANY SECTIONS. CREATE  FIXUP
ANY SECTIONS. CHECK/CORRECT THEM AND WRITE THEM TO SCRATCH FILE.  FIXUP
DATA IS READ INTO ARRAY A, TRANSFERRED TO ARRAY C (AFTER EDITING) FIXUP
AND OUTPUT TO ISCRC FROM ARRAY C.                                 FIXUP
ITAPE  - UNIT ORIGINAL ENDF DATA IS READ FROM.                    FIXUP
ISCRC  - SCRATCH UNIT THAT EDITED DATA IS WRITTEN ON.             FIXUP
TABA   - ARRAY INTO WHICH ORIGINAL DATA IS READ.                  FIXUP
TABC   - ARRAY INTO WHICH EDITED DATA IS TRANSFERRED TO AND       FIXUP
         FROM WHICH IT IS WRITTEN TO ISCRC.                       FIXUP
                                                                  FIXUP
PASS2                                                             FIXUP
=====                                                             FIXUP
IF A UNIFORM ENERGY GRID IS REQUESTED IT IS CREATED DURING THIS   FIXUP
PASS. FIRST ALL OF THE CROSS SECTIONS FROM PASS1 ARE READ AND A   FIXUP
UNIFORM ENERGY GRID IS CREATED = ALL ENERGIES THAT ARE INCLUDED   FIXUP
IN AT LEAST ONE SECTION (MT) OF CROSS SECTIONS.                   FIXUP
ISCRA  - SCRATCH UNIT CONTAINING UNIFORM ENERGY GRID.             FIXUP
ISCRB  - SCRATCH UNIT CONTAINING UNIFORM ENERGY GRID.             FIXUP
ISCRC  - SCRATCH UNIT THAT EDITED DATA IS READ FROM.              FIXUP
```

```
TABA   - ARRAY CONTAINING UNIFORM ENERGY GRID.                     FIXUP
TABB   - ARRAY CONTAINING UNIFORM ENERGY GRID.                     FIXUP
TABC   - ARRAY CONTAINING EDITED DATA.                             FIXUP
                                                                   FIXUP
THE UNIFORM ENERGY GRID ENDS UP ON ISCRB. NEXT EACH SECTION OF     FIXUP
CROSS SECTIONS FROM PASS1 IS READ FROM ISCRC, INTERPOLATED TO      FIXUP
THE UNIFORM ENERGY GRID AND OUTPUT TO ISCRA. FINALLY ISCRA AND     FIXUP
ISCRC ARE SWITCH, SO THAT AT THE END OF THIS PASS THE DATA WILL    FIXUP
AGAIN BE ON ISCRC (EXACTLY AS AT THE END OF PASS1), WITH UPDATED   FIXUP
POINT COUNTS.                                                      FIXUP
ISCRA  - SCRATCH UNIT THAT UNIFORM ENERGY GRID DATA IS WRITTEN ON. FIXUP
ISCRB  - SCRATCH UNIT CONTAINING UNIFORM ENERGY GRID.              FIXUP
ISCRC  - SCRATCH UNIT THAT EDITED DATA IS READ FROM.               FIXUP
TABA   - ARRAY CONTAINING UNIFORM ENERGY GRID DATA.                FIXUP
TABB   - ARRAY CONTAINING UNIFORM ENERGY GRID.                     FIXUP
TABC   - ARRAY CONTAINING EDITED DATA.                             FIXUP
                                                                   FIXUP
PASS3                                                              FIXUP
=====                                                              FIXUP
SUMMATION CROSS SECTIONS ARE DEFINED BY READING DATA FROM ISCRC    FIXUP
AND MERGING THEM ONTO ISCRA. THE FIRST SECTION THAT CONTRIBUTES    FIXUP
TO A SUM IS MERELY COPIED FROM C TO A. IF MORE SECTIONS WILL       FIXUP
CONTRIBUTE TO THE SUM THE DATA IN A IS TRANSFERRED TO B, A         FIXUP
SECTION OF DATA FROM C IS ADDED TO THE DATA IN B AND STORED IN     FIXUP
A. THE CYLE OF ADDED C AND B TO A, FOLLOWED BY MOVING A TO B       FIXUP
IS CONTINUED UNTIL ALL CONTRIBUTING SECTIONS HAVE BEEN ADDED.      FIXUP
THE SUM IS THEN COPIED FROM A TO D. IF NEWLY CONSTRUCTED SECTION   FIXUP
IS REQUIRED FOR ANY LATER SUMMUATIONS IT IS ALSO COPIED TO E.      FIXUP
THE CYCLE OF ADDED SECTIONS FROM C AND B TO A IS REPEATED FOR      FIXUP
EACH REQUIRED SUMMATION REACTION. IN ADDITION TO SECTIONS FROM     FIXUP
C, AFTER THE FIRST SUMMATION SECTIONS MAY ALSO BE ADDED TO A       FIXUP
FROM E (THE CONTRIBUTION OF NEW RECONSTRUCTED CROSS SECTIONS).     FIXUP
WHEN ALL REQUIRED SECTIONS HAVE BEEN RECONSTRUCTED THE NEW         FIXUP
SECTIONS WILL BE ON E AND THE ORIGINAL SECTIONS ON C.              FIXUP
ISCRC  - SCRATCH FILE FROM WHICH ORIGINAL DATA IS READ.            FIXUP
ISCRA  - SCRATCH FILE ONTO WHICH SUM FOR ONE SECTION IS WRITTEN.   FIXUP
ISCRD  - SCRATCH FILE ONTO WHICH ALL SUM CROSS SECTIONS ARE        FIXUP
         WRITTEN.                                                  FIXUP
ISCRE  - SCRATCH FILE ONTO WHICH ALL SUM CROSS SECTIONS WHICH      FIXUP
         ARE REQUIRED FOR LATER SUMS ARE WRITTEN.                  FIXUP
ISCRB  - UTILITY SCRATCH FILE USED TO CREATE SUM CROSS SECTIONS.   FIXUP
TABA   - ARRAY INTO WHICH SUMS ARE WRITTEN.                        FIXUP
TABB   - ARRAY INTO WHICH PARTIAL SUMS ARE WRITTEN.                FIXUP
TABC   - ARRAY INTO WHICH ORIGINAL DATA IS READ.                   FIXUP
                                                                   FIXUP
PASS4                                                              FIXUP
=====                                                              FIXUP
CROSS SECTIONS ARE READ FROM ISCRC (ORIGINAL) AND ISCRD (NEW)      FIXUP
AND ARE WRITTEN IN THE ENDF FORMAT ON OTAPE. THE BEGINNING OF      FIXUP
EACH SECTION OF ORIGINAL DATA IS READ FROM ISCRC (TO DEFINE        FIXUP
SECTION HEADER INFORMATION). IF THIS MT HAS NOT BEEN RECOSTRUCTED  FIXUP
ON ISCRD THE ORIGINAL SECTION IS OUTPUT. IF THE SECTION HAS BEEN   FIXUP
RECONSTRUCTED THE ORIGINAL SECTION IS SKIPPED AND THE NEW SECTION  FIXUP
IS OUTPUT.                                                         FIXUP
OTAPE  - OUTPUT DATA IN THE ENDF FORMAT.                           FIXUP
ISCRC  - SCRATCH FILE FROM WHICH ORIGINAL DATA IS READ.            FIXUP
ISCRD  - SCRATCH FILE FROM WHICH NEW DATA IS READ.                 FIXUP
TABC   - ARRAY INTO WHICH CROSS SECTIONS ARE READ FROM SCRATCH     FIXUP
         AND WRITTEN TO OTAPE                                      FIXUP
                                                                   FIXUP
I/O FILE DEFINITIONS                                               FIXUP
====================                                               FIXUP
UNIT   DESCRIPTION                                                 FIXUP
====   ===========                                                 FIXUP
  2    INPUT PARAMETERS.                                           FIXUP
  3    OUTPUT REPORT.                                              FIXUP
 10    ORIGINAL DATA IN THE ENDF FORMAT.                           FIXUP
 11    FINAL DATA IN THE ENDF FORMAT.                              FIXUP
 12    SCRATCH FILE                                                FIXUP
 14    SCRATCH FILE                                                FIXUP
 15    SCRATCH FILE                                                FIXUP
```

```
 16    SCRATCH FILE                                                  FIXUP
 17    SCRATCH FILE                                                  FIXUP
                                                                     FIXUP
 OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILIO1 AND FILIO2)     FIXUP
 ============================================================        FIXUP
 UNIT  FILE NAME   FORMAT                                            FIXUP
 ====  ==========  ======                                            FIXUP
   2   FIXUP.INP    BCD                                            FIXUP
   3   FIXUP.LST    BCD                                            FIXUP
  10   ENDFB.IN     BCD                                            FIXUP
  11   ENDFB.OUT    BCD                                            FIXUP
12-17  (SCRATCH)   BINARY                                          FIXUP
                                                                    FIXUP
 INPUT LINES                                                        FIXUP
 ===========                                                        FIXUP
 LINE  COLUMNS  FORMAT  DESCRIPTION                                 FIXUP
 ====  =======  ======  ===========                                 FIXUP
   1    1-14     14I1   INPUT OPTIONS AS DESCRIBED ABOVE.           FIXUP
                        EACH COLUMN OF THE INPUT LINE CONTROLS      FIXUP
                        ONE OF THE TESTS/CORRECTIONS DESCRIBED      FIXUP
                        ABOVE. TESTS/CORRECTION 1-14 (NOT ALL       FIXUP
                        IMPLEMENTED YET) CORRESPOND TO COLUMNS      FIXUP
                        1-14 OF THIS INPUT LINE AND ARE TREATED     FIXUP
                        AS FOLLOWS,                                 FIXUP
                        = 0 - DO NOT PERFORM TEST/CORRECTION.       FIXUP
                        = 1 - PERFORM TEST/CORRECTION.              FIXUP
                        FOR MT EXCLUSION FROM THRESHOLD TESTS       FIXUP
                        (COLUMN 2), DELETION (COLUMN 4), OR         FIXUP
                        SUMMATION (COLUMN 5) THE INPUT OPTION       FIXUP
                        MAY BE,                                     FIXUP
                        = 1 - READ RULES FROM INPUT                 FIXUP
                        = 2 - USE BUILT-IN RULES                    FIXUP
   2    1-72      A72   ENDF INPUT DATA FILENAME                   FIXUP
                        (STANDARD OPTION = ENDFB.IN)                FIXUP
   3    1-72      A72   ENDF OUTPUT DATA FILENAME                  FIXUP
                        (STANDARD OPTION = ENDFB.OUT)               FIXUP
 4-M    1-5      FREE   CHARACTER (S,D,T,R,*) FOLLOWED BY BLANK OR FIXUP
                 FORM   MT NUMBER                                   FIXUP
                        - THE ALLOWED CHARACTERS ARE,               FIXUP
                        - S OR BLANK = SUM (OR DIFFERENCES)         FIXUP
                        - D = DELETE                                FIXUP
                        - T = NO THRESHOLD ENERGY CORRECTIONS       FIXUP
                        - R = RATIO                                 FIXUP
                        - * = PRODUCT                               FIXUP
        6-72     FREE   UP TO 10 LOWER AND UPPER MT RANGES WHICH    FIXUP
                 FORM   WILL BE USED TO DEFINE THE RECONSTRUCTED    FIXUP
                        CROSS SECTION OR TO DEFINE MT RANGES WHICH  FIXUP
                        ARE EXCLUDED FROM THRESHOLD TESTS.          FIXUP
                                                                    FIXUP
                        EACH MT NUMBER IS DEFINED BY A CONTINUOUS   FIXUP
                        STRING OF DIGITS, POSSIBILITY PRECEEDED BY  FIXUP
                        A - (MINUS SIGN). EACH MT NUMBER MUST BE    FIXUP
                        BLANK OR OTHERWISE (NOT A DIGIT) DELIMITED. FIXUP
                                                                    FIXUP
                        COLUMNS 6-72 MAY CONTAIN STRINGS OF DIGITS  FIXUP
                        THE FIRST DIGIT STRING OF EACH PAIR MAY BE  FIXUP
                        PRECEEDED BY A - (MINUS SIGN).              FIXUP
                                                                    FIXUP
                        EACH LINE WILL BE INTERPRETED AS FOLLOWS,   FIXUP
                                                                    FIXUP
                       *SUMMATION (OR DIFFERENCES)                  FIXUP
                        -------------------------                   FIXUP
                        COLUMNS 1-5 = S OR BLANK FOLLOWED BY THE    FIXUP
                        MT NUMBER TO BE DEFINED BY SUMMATION        FIXUP
                                                                    FIXUP
                        COLUMNS 6-72 = UP TO 10 MT RANGE (PAIRS OF  FIXUP
                        MT NUMBERS) TO BE USED TO DEFINED THE SUM.  FIXUP
                        IF THE FIRST MT NUMBER OF A PAIR IS         FIXUP
                        NEGATIVE THE RANGE OF MT NUMBERS IS         FIXUP
                        SUBTRACTED - AT LEAST ONE RANGE MUST BE     FIXUP
                        SPECIFIED.                                  FIXUP
```

				FIXUP
			*DELETIONS	FIXUP
			---------	FIXUP
			COLUMNS 1-5 = D FOLLOWED BY BLANKS	FIXUP
				FIXUP
			COLUMNS 6-72 CONTAIN UP TO 10 MT RANGE	FIXUP
			(PAIRS OF MT NUMBERS), EACH RANGE DEFINING	FIXUP
			A RANGE OF MT NUMBERS TO BE DELETED - AT	FIXUP
			LEAST ONE RANGE MUST BE SPECIFIED.	FIXUP
				FIXUP
			*EXCLUSION FROM THRESHOLD TESTS	FIXUP
			------------------------------	FIXUP
			COLUMNS 1=5 = T FOLLOWED BY BLANKS	FIXUP
				FIXUP
			COLUMNS 6-72 CONTAIN UP TO 10 MT RANGE	FIXUP
			(PAIRS OF MT NUMBERS), EACH RANGE DEFINING	FIXUP
			A RANGE OF MT NUMBERS WHOSE THRESHOLD	FIXUP
			ENERGY WILL NOT BE CHECKED - AT LEAST ONE	FIXUP
			RANGE MUST BE SPECIFIED.	FIXUP
				FIXUP
			*RATIO	FIXUP
			-----	FIXUP
			COLUMNS 1-5 = R FOLLOWED BY THE MT NUMBER	FIXUP
			TO BE DEFINED BY A RATIO	FIXUP
				FIXUP
			COLUMNS 6-72 CONTAINS 2 MT NUMBERS TO BE	FIXUP
			USED TO DEFINE THE RATIO.	FIXUP
				FIXUP
			*PRODUCT	FIXUP
			-----	FIXUP
			COLUMNS 1-5 = * FOLLOWED BY THE MT NUMBER	FIXUP
			TO BE DEFINED BY A PRODUCT	FIXUP
				FIXUP
			COLUMNS 6-72 CONTAINS 2 MT NUMBERS TO BE	FIXUP
			USED TO DEFINE THE PRODUCT.	FIXUP
				FIXUP
			CONVENTIONS	FIXUP
			----------	FIXUP
			*UP TO 20 DELETIONS AND 20 SUMMATIONS OR	FIXUP
			RATIOS OR PRODUCTS MAY BE SPECIFIED.	FIXUP
			*ONLY 1 EXCLUSION FROM THRESHOLD TESTS	FIXUP
			MAY BE SPECIFIED (THE 1 LINE MAY CONTAIN	FIXUP
			UP TO 10 MT RANGES TO EXCLUDE FROM TESTS).	FIXUP
			*INPUT IS TERMINATED BY INPUTTNG 0 OR	FIXUP
			BLANK IN COLUMNS 1-72 (I.E. THE LAST	FIXUP
			INPUT LINE MUST BE BLANK).	FIXUP
			*THE UPPER LIMIT OF EACH RANGE MUST BE AT	FIXUP
			LEAST AS BIG AS THE LOWER LIMIT (IN	FIXUP
			ABSOLUTE VALUE).	FIXUP
			*FOR RECONSTRUCTION POSITIVE MT RANGES WILL	FIXUP
			BE ADDED TO THE SUM AND NEGATIVE MT RANGES	FIXUP
			WILL BE SUBTRACTED.	FIXUP
			*IF INPUT OPTION 2 (FIRST INPUT LINE) IS	FIXUP
			0 THRESHOLD EXCLUSION IS NOT ALLOWED.	FIXUP
			*IF INPUT OPTION 4 (FIRST INPUT LINE) IS	FIXUP
			0 DELETIONS ARE NOT ALLOWED.	FIXUP
			*IF INPUT OPTION 5 (FIRST INPUT LINE) IS	FIXUP
			0 SUMMATIONS AND RATIOS ARE NOT ALLOWED.	FIXUP
N-K			IF THE USER SPECIFIES THAT SECTIONS WHICH	FIXUP
			ARE NOT PRESENT IN THE ORIGINAL EVALUATION	FIXUP
			MAY BE CREATED, TWO LINES MUST BE INPUT FOR	FIXUP
			EACH SECTION TO BE CREATED. THE TWO LINES	FIXUP
			DEFINE (C1, C2, L1 AND L2) FOR EACH OF THE	FIXUP
			FIRST TWO LINES OF THE SECTION TO BE	FIXUP
			CREATED. THE FIRST LINE ALSO DEFINES (MAT	FIXUP
			AND MT). (N1, N2) ARE ALWAYS ZERO ON THE	FIXUP
			FIRST LINE AND WILL BE CALCULATED BY THE	FIXUP
			PROGRAM FOR THE SECOND LINE.	FIXUP
FIRST	1-11	E11.4	ZA OF SECTION TO BE CREATED	FIXUP
LINE	12-22	E11.4	AWRE OF SECTION TO BE CREATED	FIXUP
	23-33	I11	L1 OF SECTION TO BE CREATED	FIXUP

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          34-44      I11   L2 OF SECTION TO BE CREATED                FIXUP
          45-48      I4    MAT OF SECTION TO BE CREATED               FIXUP
          49-51      I3    MT OF SECTION TO BE CREATED                FIXUP
SECOND     1-11     E11.4  C1 OF SECTION TO BE CREATED                FIXUP
 LINE     12-22     E11.4  C2 OF SECTION TO BE CREATED                FIXUP
          23-33      I11   L1 OF SECTION TO BE CREATED                FIXUP
          34-44      I11   L2 OF SECTION TO BE CREATED                FIXUP
                           *PAIRS OF LINES MAY BE IN ANY MAT/MT ORDER  FIXUP
                            (E.G., THEY NEED NOT BE IN ASCENDING       FIXUP
                             MAT/MT ORDER).                            FIXUP
                           *UP TO 50 PAIRS OF LINES MAY BE USED TO     FIXUP
                            DEFINE SECTIONS TO BE CREATED. THE LIST    FIXUP
                            IS TERMINATED WHEN THE FIRST LINE OF A     FIXUP
                            PAIR CONTAINS A ZERO (OR BLANK) MAT AND/OR FIXUP
                            MT.                                        FIXUP
   M-N                      IF THE USER SPECIFIES THAT ENERGIES WHICH  FIXUP
                            ARE NOT PRESENT IN THE ORIGINAL EVALUATION FIXUP
                            MAY BE INSERTED, ONE LINE MUST BE INPUT FORFIXUP
                            EACH ENERGY TO BE INSERTED.                FIXUP
           1-11    E11.4   ENERGY TO BE INSERTED                      FIXUP
          12-15     I4     MAT IN WHICH TO INSERT ENERGY = 0 = ALL    FIXUP
          16-18     I3     MT IN WHICH TO INSERT ENERGY = 0 = ALL     FIXUP
                           *UP TO 50 (ENERGY, MAT, MT) LINES MAY BE   FIXUP
                            USED. THE LIST IS TERMINATED BY A BLANK    FIXUP
                            LINE.                                      FIXUP
                           *INPUT MAY BE IN ANY (ENERGY, MAT, MT)     FIXUP
                            ORDER.                                     FIXUP
                           *ENERGY POINTS CAN ONLY BE INSERTED WITHIN  FIXUP
                            THE ORIGINAL ENERGY RANGE OF A SECTION -   FIXUP
                            THIS OPTION CANNOT BE USED TO EXTEND THE   FIXUP
                            CROSS SECTION EITHER BELOW OR ABOVE THE    FIXUP
                            ORIGINAL TABULATED ENERGY RANGE.           FIXUP
                                                                       FIXUP
   EXAMPLE INPUT NO. 1                                                 FIXUP
   ==================                                                  FIXUP
   (1) USE OPTIONS 1-11 (ALL OPTIONS, EXCEPT INSERT ENERGY POINTS)     FIXUP
   (2) DELETE MT=900 (FOR EXAMPLE PURPOSES ONLY)                       FIXUP
   (3) DEFINE THE FOLLOWING MT NUMBERS TO BE RECONSTRUCTED,            FIXUP
       (MT=  4) = THE SUM OF MT= 51 THROUGH  91                        FIXUP
       (MT=103) = THE SUM OF MT=700 THROUGH 718 (NOT 719)              FIXUP
       (MT=104) = THE SUM OF MT=720 THROUGH 738 (NOT 739)              FIXUP
       (MT=105) = THE SUM OF MT=740 THROUGH 758 (NOT 759)              FIXUP
       (MT=106) = THE SUM OF MT=760 THROUGH 778 (NOT 779)              FIXUP
       (MT=107) = THE SUM OF MT=780 THROUGH 798 (NOT 799)              FIXUP
NEW    (MT= 16) = THE SUM OF MT=875 THROUGH 891                        FIXUP
       (MT=101) = THE SUM OF MT=102 THROUGH 114                        FIXUP
       (MT= 18) = (MT=19) + (MT=20 AND 21) + (MT=38)                   FIXUP
                  (IF TOTAL FISSION, MT=18, IS NOT PRESENT, DEFINE     FIXUP
                  IT BY SUMMING FIRST, SECOND, ETC. CHANCE - NOTE      FIXUP
                  THAT THIS MUST BE DONE IN THIS ORDER, SINCE THE      FIXUP
                  NEXT SUM INVOLVES USING MT=18.                       FIXUP
       (MT= 27) = THE SUM OF MT= 18 AND 101                            FIXUP
                  (MT=101 RECONSTRUCTED ABOVE USED IN SUM).            FIXUP
       (MT=  3) = THE SUM OF (MT=4)+(MT=6-9)+(MT=16-17)+(MT=22-37)+    FIXUP
                  (MT=41-45)                                           FIXUP
                  (MT=4 AND 27 RECONSTRUCTED ABOVE USED IN SUM).       FIXUP
       (MT= 19) = (MT=18) - (MT=20 AND 21) - (MT=38)                   FIXUP
                  (DEFINE FIRST CHANCE FISSION BY SUBTRACTION TO       FIXUP
                  ALLOW RESONANCE CONTRIBUTION FROM MT=18 TO BE        FIXUP
                  INCLUDED IN MT=19).                                  FIXUP
       (MT=  1) = THE SUM OF MT=2 AND 3                                FIXUP
                  (MT=3 RECONSTRUCTED ABOVE USED IN SUM).              FIXUP
   (4) THRESHOLD ENERGIES OF THE FOLLOWING MT NUMBERS WILL NOT BE      FIXUP
       TESTED OR CORRECTED.                                            FIXUP
       MT=1, 4, 18, 19, 91, 103 THROUGH 114.                           FIXUP
   (5) DEFINE MT=254 TO BE THE CAPTURE TO FISSION RATIO (MT=102/18)    FIXUP
   (6) CREATE MAT=1300/MT=254 - NOTE, THIS IS NECESSARY IN ORDER TO    FIXUP
       HAVE THE CAPTURE TO FISSION RATIO OUTPUT IN THE ENDF FORMAT     FIXUP
                                                                       FIXUP
   NOTE, ON THE FOLLOWING INPUT LINES THE CHARACTERS = ( ) + , HAVE    FIXUP
   BEEN USED ONLY TO MAKE THE INPUT MORE READABLE - THESE CHARACTERS   FIXUP
```

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WILL BE SKIPPED BY THE PROGRAM IN READING INPUT - THE RESULTS     FIXUP
WOULD BE THE SAME IF THESE CHARACTERS WERE OMITTED, AS LONG AS    FIXUP
ALL OF THE MT NUMBERS ARE DELIMITED, I.E., THERE IS AT LEAST ONE  FIXUP
NON-DIGITAL CHARACTER BETWEEN MT NUMBERS. NOTE, THAT - (MINUS     FIXUP
SIGN) IS IMPORTANT AND IS USED DURING INPUT TO DEFINE MT RANGES   FIXUP
WHICH SHOULD BE SUBTRACTED, E.,G., SEE THE DEFINITION OF MT=19.   FIXUP
                                                                  FIXUP
READ FILE /ENDFB6/K300/LEAD.IN AND WRITE /ENDFB6/K300/LEAD.OUT    FIXUP
                                                                  FIXUP
THE FOLLOWING 21 INPUT LINES ARE REQUIRED.                        FIXUP
                                                                  FIXUP
11111111111                                                       FIXUP
/ENDFB6/K300/LEAD.IN                                              FIXUP
/ENDFB6/K300/LEAD.OUT                                             FIXUP
D900                                                              FIXUP
   4=( 51, 91)                                                    FIXUP
 103=(700,718)                                                    FIXUP
 104=(720,738)                                                    FIXUP
 105=(740,758)                                                    FIXUP
 106=(760,778)                                                    FIXUP
 107=(780,798)                                                    FIXUP
  16=(875,891)                                                    FIXUP
 101=(102,114)                                                    FIXUP
  18=( 19, 19)+( 20, 21)+( 38, 38)                                FIXUP
  27=( 18, 18)+(101,101)                                          FIXUP
   3=(  4,  4)+(  6,  9)+( 16, 17)+( 22, 37)+( 41, 45)           FIXUP
  19=( 18, 18)-( 20, 21)-( 38, 38)                                FIXUP
   1=(  2,  3)                                                    FIXUP
T    (  1,  1)+(  4,  4)+( 18, 18)+( 91, 91)+(103,114)           FIXUP
R254=(102/ 18)                                                    FIXUP
            (BLANK LINE TO TERMINATE SUMMATION/DELETION RULES)    FIXUP
 2.00400+ 3 0.00000+ 0          0          01300254               FIXUP
 0.00000+ 0 0.00000+ 0          0          0                      FIXUP
            (BLANK LINE TO TERMINATE SECTION CREATION RULES)      FIXUP
                                                                  FIXUP
NOTE, THE DELETION AND THRESHOLD EXCLUSION LINES MAY APPEAR IN    FIXUP
IN ANY ORDER. HOWEVER, SUMMATION AND RATIO RULES MUST APPEAR IN   FIXUP
THE ORDER IN WHICH YOU WANT THEM TO BE EXECUTED - E.G., THE       FIXUP
ABOVE INPUT WILL FIRST RECONSTRUCT MT=4, WHICH CAN THEN BE USED   FIXUP
TO CONTRIBUTE TO THE FOLLOWING SUM TO DEFINE MT=3, WHICH IN TURN  FIXUP
CAN THEN BE USED TO CONTRIBUTE TO THE FOLLOWING SUM TO DEFINE     FIXUP
MT=1. IF THE ORDER OF THE INPUT LINES IS CHANGED SUCH THAT MT=3   FIXUP
IS RECONSTRUCTED BEFORE MT=4, THE ORIGINAL MT=4 WILL BE USED IN   FIXUP
THE SUMMATION TO DEFINE MT=3. THE SAME RULES APPLY TO CALCULATING FIXUP
RATIOS, IF EITHER THE NUMERATOR OR DENOMINATOR IS TO BE DEFINED   FIXUP
BY SUMMATION, THIS SHOULD BE DONE BEFORE DEFINING THE RATIO BY    FIXUP
INPUT PARAMETERS.                                                 FIXUP
                                                                  FIXUP
EXAMPLE INPUT NO. 2                                               FIXUP
==================                                                FIXUP
(1) USE OPTIONS 1-11 (ALL OPTIONS, EXCEPT INSERT ENERGY POINTS)   FIXUP
(2) USE BUILT-IN TABLES FOR SUMMATION/DELETION/THRESHOLD EXCLUSIONFIXUP
    (THIS ONLY REQUIRES COLUMNS 2, 4 AND 5 TO BE SET =2 ON THE    FIXUP
    FIRST INPUT LINE. THE BUILT-IN RULES EXACTLY CORRESPOND TO    FIXUP
    THE INPUT ABOVE UNDER EXAMPLE NO. 1, EXCEPT THAT NO MT NUMBERSFIXUP
    WILL BE DELETED.                                              FIXUP
(3) IF NOT PRESENT, CREATE MAT=1300/MT=1                          FIXUP
                                                                  FIXUP
USE THE STANDARD FILE NAMES ENDFB.IN AND ENDFB.OUT (THIS CAN BE   FIXUP
DONE BY LEAVING THE SECOND AND THIRD INPUT LINES BLANK).          FIXUP
                                                                  FIXUP
THE FOLLOWING 6 INPUT LINES ARE REQUIRED.                         FIXUP
                                                                  FIXUP
12122111111                                                       FIXUP
                                                                  FIXUP
                                                                  FIXUP
 2.00400+ 3 0.00000+ 0          0          01300  1               FIXUP
 0.00000+ 0 0.00000+ 0          0          0                      FIXUP
            (BLANK LINE TO TERMINATE SECTION CREATION RULES)      FIXUP
                                                                  FIXUP
EXAMPLE INPUT NO. 3                                               FIXUP
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     ==================                                                 FIXUP
     (1) USE OPTIONS 1-10 (ALL OPTIONS PRESENTLY IMPLEMENTED, EXCEPT    FIXUP
         DO NOT ALLOW SECTION CREATION AND INSERT ENERGY POINTS).       FIXUP
     (2) USE BUILT-IN TABLES FOR SUMMATION/DELETION/THRESHOLD EXCLUSIONFIXUP
         (THIS ONLY REQUIRES COLUMNS 2, 4 AND 5 TO BE SET =2 ON THE     FIXUP
         FIRST INPUT LINE. THE BUILT-IN RULES EXACTLY CORRESPOND TO     FIXUP
         THE INPUT ABOVE UNDER EXAMPLE NO. 1, EXCEPT THAT NO MT NUMBERSFIXUP
         WILL BE DELETED.                                               FIXUP
     (3) DO NOT CREATE ANY SECTIONS.                                    FIXUP
                                                                        FIXUP
     READ FILE /ENDFB6/K300/LEAD.IN AND WRITE /ENDFB6/K300/LEAD.OUT     FIXUP
                                                                        FIXUP
     THE FOLLOWING 3 INPUT LINES ARE REQUIRED.                          FIXUP
                                                                        FIXUP
     1212211111                                                         FIXUP
     /ENDFB6/K300/LEAD.IN                                               FIXUP
     /ENDFB6/K300/LEAD.OUT                                              FIXUP
                                                                        FIXUP
     EXAMPLE INPUT NO. 4                                                FIXUP
     ==================                                                 FIXUP
     SAME AS EXAMPLE NO. 3, ABOVE, EXCEPT INSERT AN ENERGY POINT AT     FIXUP
     THERMAL FOR ALL REACTIONS WHICH SPAN THE THERMAL ENERGY RANGE.     FIXUP
                                                                        FIXUP
     USE THE STANDARD FILE NAMES ENDFB.IN AND ENDFB.OUT (THIS CAN BE    FIXUP
     DONE BY LEAVING THE SECOND AND THIRD INPUT LINES BLANK).           FIXUP
                                                                        FIXUP
     THE FOLLOWING 5 INPUT LINES ARE REQUIRED.                          FIXUP
                                                                        FIXUP
     121221111101                                                       FIXUP
                                                                        FIXUP
                                                                        FIXUP
      2.53000- 2   0  0                                                FIXUP
                 (BLANK LINE TO TERMINATE ENERGY INSERTS)               FIXUP
                                                                        FIXUP
     WARNING                                                            FIXUP
     =======                                                            FIXUP
     ALTHOUGH THIS PROGRAM IS DESIGNED TO ALLOW REACTIONS TO BE DEFINEDFIXUP
     BY ADDING OR SUBTRACTING REACTIONS THE USER SHOULD ALWAYS TRY TO   FIXUP
     DEFINE REACTIONS BY SUMMING TO AVOID NEGATIVE CROSS SECTIONS. FOR FIXUP
     EXAMPLE, IT IS POSSIBLE TO CALCULATE MT=3 AND DEFINE MT=1 AS THE   FIXUP
     SUM OF MT=2 AND 3 (THE RECOMMENDED APPROACH AS USED IN THE ABOVE   FIXUP
     INPUT). ALTERATIVELY IT IS POSSIBLE TO CALCULATE MT=1 AND DEFINE   FIXUP
     MT=3 AS MT=1 MINUS MT=2 (THIS APPROACH IS NOT RECOMMENDED).        FIXUP
                                                                        FIXUP
     THE ONLY BUILT-IN SUMMATION RULE THAT USES SUBTRACTION IS THE      FIXUP
     CALCULATION OF THE FIRST CHANGE FISSION (MT=19) AS THE TOTAL       FIXUP
     FISSION (MT=18) MINUS THE SECOND, THIRD AND FOURTH CHANGE FISSION FIXUP
     (MT=20, 21, 38). THIS HAS BEEN DONE TO ALLOW THE RESONANCE         FIXUP
     CONTRIBUTION, CALCULATED BY MANY CODES AND INCLUDED IN MT=18,      FIXUP
     TO BE CONSISTENTLY INCLUDED IN THE FIRST CHANCE FISSION.           FIXUP
                                                                        FIXUP
=========================================================================FIXUP
```