```
======================================================================= 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 ALL 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 UNIFORM Fixup
                                  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 CHANGE Fixup
                          *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 FEEDBACK Fixup
                          *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 avoid Fixup
                           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 changed Fixup
                           to character input + IN9 conversion.  Fixup
                          *Ignore attempts to "correct" reaction Fixup
                           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 ENDERROR Fixup
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
                                                                 Fixup
OWNED, MAINTAINED AND DISTRIBUTED BY                             Fixup
-----------------------------------                              Fixup
```

THE NUCLEAR DATA SECTION
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PURPOSE
=======
THIS PROGRAM IS DESIGNED TO READ EVALUATED DATA IN THE ENDF FORMAT, PERFORM CORRECTIONS AND OUTPUT THE RESULT IN THE ENDF FORMAT. TWO TYPES OF CORRECTIONS ARE POSSIBLE (1) AUTOMATIC AND (2) OPTIONAL (BASED ON USER INPUT) CORRECTIONS.

ONE OF THE MOST IMPORTANT FUNCTIONS OF THIS PROGRAM IS TO RE-DEFINE ALL REDUNDANT CROSS SECTIONS (E.G. TOTAL) TO BE EXACTLY EQUAL TO THE SUM OF ITS PARTS. THIS PROCEDURE ELIMINATES THE PROBLEM WITH MANY ENDF EVALUATIONS, WHERE DUE TO THE USE OF NON-LINEAR INTERPOLATION LAWS THE TOTAL MAY BE EQUAL TO THE SUM OF ITS PARTS AT ALL TABULATED ENERGIES, BUT BASED ON THE INTERPOLATION LAWS IT CAN BE QUITE DIFFERENT AT ENERGIES BETWEEN TABULATED ENERGIES.

AUTOMATIC CHECKS/CORRECTIONS
============================
(1) CHECK THAT MAT/MF/MT DOES NOT CHANGE UNLESS A MEND/FEND/SEND LINE IS READ. IF MAT/MF/MT CHANGES A WARNING MESSAGE IS PRINTED BUT NO CORRECTIVE ACTION IS TAKEN.
(2) ALL LINES WITHIN A GIVEN MAT WILL BE SEQUENTIALLY NUMBERED ON OUTPUT.

OPTIONAL CHECKS/CORRECTIONS
===========================
THE FOLLOWING NUMBERS CORRESPOND TO THE INPUT DATA OPTION COLUMNS (SEE THE DESCRIPTION OF THE INPUT BELOW)

(1) CORRECT ZA AND AWR IN ALL SECTIONS. CHECK TO INSURE THAT THE C1 AND C2 VALUES (ZA AND AWR) ARE THE SAME IN ALL SECTIONS. THE C1 AND C2 OF THE FIRST SECTION READ ARE ASSUMED TO BE CORRECT AND ARE USED FOR COMPARISON. IF THE C1 AND/OR C2 OF THE FIRST SECTION ARE NOT POSITIVE AN ERROR MESSAGE IS OUTPUT AND THE MATERIAL IS COPIED WITHOUT CHANGE.
NOTE....TO CHANGE THE ZA AND/OR AWR OF ANY MATERIAL IT IS MERELY NECESSARY TO CHANGE THE ZA AND/OR AWR IN THE FIRST SECTION OF THE MATERIAL AND USE THIS OPTION TO AUTOMATICALLY CHANGE ALL OTHER SECTIONS.

2017/5/20 - This option (2) is no longer allowed

WARNING: Threshold Correction is no longer allowed.
This option has resulted in far too much misinterpretation and as such it is judged to be too dangerous to be allowed in this code.
For example, the Laboratory frame of reference threshold is temperature dependent = it is not uniquely defined by Q value and atomic weight.
ThIS OPTION is IGNORED.

(2) CORRECT CROSS SECTION (MF=3) THRESHOLDS. THE Q-VALUE AND AWR ARE USED TO DERIVE THE REACTION THRESHOLD USING THE RELATION,

E-THRESHOLD = -(Q-VALUE)*(AWRE+1.0)/AWRE

IF THE THRESHOLD IS POSITIVE THE CROSS SECTION IS CHECKED TO INSURE THAT THE FIRST TABULATED POINT IS AT THE THRESHOLD AND HAS A ZERO CROSS SECTION. IF NOT, THE CROSS SECTION WILL BE CHANGED.

(A) IF THE FIRST TABULATED POINT IS ABOVE THE THRESHOLD AND HAS A ZERO CROSS SECTION, THE POINT IS DELETED AND A POINT IS INSERTED AT THE THRESHOLD.

(B) IF THE FIRST TABULATED POINT IS ABOVE THE THRESHOLD AND HAS A NON-ZERO CROSS SECTION, A POINT WITH ZERO CROSS SECTION IS INSERTED AT THE THRESHOLD.

(C) IF THE FIRST TABULATED POINT IS BELOW THE THRESHOLD AND HAS A NON-ZERO CROSS SECTION, ALL POINTS BELOW THE THRESHOLD ARE DELETED AND A POINT WITH ZERO CROSS SECTION IS INSERTED AT THE THRESHOLD.

2017/5/20 - This option (2) is no longer allowed

(3) EXTEND ALL CROSS SECTIONS (MF=3) TO 20 MEV. IF THE TABULATED CROSS SECTION ENDS BELOW 20 MEV IT WILL BE EXTENDED TO 20 MEV AS EITHER ZERO (IMOPS(3)=1) OR CONSTANT (IMOPS(3)=2) EQUAL TO THE LAST TABULATED VALUE.

(4) ALLOW REACTION (MF=3, ANY MT) DELETION. ALL SPECIFIED REACTIONS WILL BE DELETED WHEN THE DATA IS READ FROM THE INPUT ENDF DATA FILE AND WILL NOT BE IN THE OUTPUT ENDF DATA FILE. WARNING DELETED REACTIONS MAY NOT BE USED TO DEFINE ANY RECONSTRUCTED REACTIONS (I.E. REACTIONS DEFINED BY SUMMING OTHER REACTIONS). SINCE DELETED REACTIONS ARE DELETED DURING READING IT IS AS IF THEY NEVER EXISTED AND IF ANY DELETED REACTION IS REQUIRED LATER TO DEFINE ANY SUM AN ERROR WILL RESULT. THE USER MAY SPECIFY THAT THE DELETION RULES ARE TO BE READ FROM INPUT (IMOPS(4)=1) OR THAT THE BUILT IN SUMMATION RULES ARE TO BE USED (MOPS(4)=2). AT THE PRESENT TIME THE BUILT-IN DELETION RULES ARE THAT NO SECTIONS SHOULD BE DELETED (THE USER MAY OVERRIDE THIS CONVENTION BY INPUT).

(5) ALLOW REACTION (MF=3, ANY MT) RECONSTRUCTION BY SUMMING OTHER REACTIONS. IN ORDER TO OPTIMIZE THE RUNNING TIME OF THIS PROGRAM CARE SHOULD BE EXERCISED TO MINIMIZE THE NUMBER OF TIMES THAT EACH CONTRIBUTING CROSS SECTION MUST BE USED. THE USED MAY SPECIFY THAT THE SUMMATION RULES ARE TO BE READ AS INPUT (IMOPS(5)=1) OR THAT THE BUILT IN SUMMATION RULES ARE TO BE USED (IMOPS(5)=2). THE BUILT IN SUMMATION RULES ARE DESIGNED TO USE ENDF CONVENTIONS AND TO MINIMIZE THE NUMBER OF TIMES THAT EACH CROSS SECTION IS USED.

(6) INSURE THAT ALL CROSS SECTIONS ARE NON-NEGATIVE (I.E. ARE ZERO OR POSITIVE). DURING READING ALL NEGATIVE CROSS SECTIONS WILL BE SET EQUAL TO ZERO AND TREATED AS SUCH DURING ALL SUBSEQUENT SUMMATIONS AND ENDF OUTPUT.
NOTE...THIS OPTION SHOULD NEVER BE USED WITH DATA CONTAINING BACKGROUND CROSS SECTIONS WHICH MAY BE NEGATIVE. ONLY AFTER THE RESONANCE CONTRIBUTION HAS BEEN ADDED TO THE BACKGROUND TO DEFINE THE ACTUAL CROSS SECTION IS IT VALID TO ELIMINATE NEGATIVE CROSS SECTIONS.
NOTE...THIS OPTION MAY BE USED TO DELETE NEGATIVE ELASTIC CROSS SECTIONS THAT MAY RESULT FROM RECONSTRUCTING CROSS SECTIONS FROM SINGLE LEVEL BREIT-WIGNER PARAMETERS. IF THE TOTAL CROSS SECTION IS THEN RECONSTRUCTED USING THE CORRECTED ELASTIC CROSS SECTION THE TOTAL WILL BE POSITIVE DUE TO THE CONTRIBUTIONS OF CAPTURE AND FISSION (THUS AVOIDING NUMERICAL INSTABILITY PROBLEMS DURING SELF-SHIELDING CALCULATIONS).

(7) WITHIN EACH SECTION OF CROSS SECTIONS DELETE ENERGIES THAT ARE NOT IN ASCENDING ENERGY ORDER (ENERGY REPETITION IS O.K.)

(8) WITHIN EACH SECTION OF CROSS SECTIONS ELIMINATE DUPLICATE POINTS (SUCCESSIVE POINTS WITH THE SAME ENERGY-CROSS SECTION).

(9) TEST THAT ALL SECTIONS ARE IN ASCENDING MAT/MF/MT ORDER. IF NOT, NO CORRECTIVE ACTION WILL BE TAKEN, ONLY AN ERROR MESSAGE WILL BE OUTPUT.

```
(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 BECAUSE Fixup
     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      Fixup
     SOUNDS LIKE AN ABSURD OPTION, BUT IS REQUIRED BECAUSE SUCH     Fixup
     SECTIONS EXIST IN ENDF/B-VI DATA.                              Fixup
                                                                    Fixup
CREATING RATIOS AND PRODUCTS                                        Fixup
============================                                        Fixup
IN ORDER TO CREATE RATIOS AND PRODUCTS = NEW MT NUMBERS, YOU MUST   Fixup
DO TWO THINGS,                                                      Fixup
                                                                    Fixup
1) DEFINE EACH NEW MT NUMBER AS A RATIO OR PRODUCT OF TWO MT        Fixup
   NUMBERS.                                                         Fixup
                                                                    Fixup
2) USE THE CREATE MT NUMBER OPTION AND INPUT THE FIRST TWO LINES    Fixup
   OF THE SECTION                                                   Fixup
                                                                    Fixup
WARNING - UNLESS YOU DO BOTH OF THESE YOU WILL NOT OBTAIN OUTPUT    Fixup
IN THE ENDF FORMAT.                                                 Fixup
                                                                    Fixup
TWO SPECIAL MT NUMBERS HAVE BEEN DEFINED BY CSEWG INVOLVING         Fixup
RATIOS AND PRODUCTS,                                                Fixup
                                                                    Fixup
ALPHA (MT=254)= CAPTURE (MT=102)/FISSION (MT=18)                    Fixup
                                                                    Fixup
ETA (MT=255)  = NU-BAR (MT=452)*FISSION (MT=18)/ABSORPTION (MT=27)  Fixup
                                                                    Fixup
ABSORPTION (MT=27) = FISSION (MT=18) + SUM (MT=102 THROUGH 116)     Fixup
                                                                    Fixup
AS YET THERE IS NO STANDARD DEFINITION OF MT NUMBERS FOR RATIO      Fixup
OR PRODUCT DATA. YOU ARE FREE TO USE ANY MT NUMBERS NORMALLY NOT    Fixup
USED IN THE ENDF. HOWEVER, IT WILL THEN BE YOUR RESPONSIBILITY      Fixup
TO PROPERLY INTERPRET THE RESULTS, I.E., NOBODY ELSE WILL HAVE      Fixup
ANY IDEA HOW TO INTERPRET A TABLE OF DATA ASSOCIATED WITH THE MT    Fixup
NUMBERS YOU HAVE USED.                                              Fixup
                                                                    Fixup
THIS PROGRAM CAN BE ONLY DIRECTLY DEFINE RATIOS AND PRODUCTS        Fixup
USING TWO MT NUMBERS = BINARY OPERATIONS, E.G., DEFINE THE CAPTURE  Fixup
TO FISSION RATIO, OR DEFINE THE PRODUCT NU-BAR*FISSION.             Fixup
                                                                    Fixup
THIS PROGRAM CANNOT DIRECTLY DEFINE RATIO OR PRODUCT OF A SUM OF    Fixup
SECTIONS TO THE SUM OF ANOTHER SET OF SECTIONS. HOWEVER, THIS CAN   Fixup
BE DONE INDIRECTLY BY FIRST DEFINING A DUMMY MT NUMBER (ANY MT      Fixup
NUMBER NOT NORMALLY USED IN ENDF) TO BE A SUM OF SECTIONS AND       Fixup
A SECOND DUMMY MT NUMBER TO BE A SECOND SUM OF SECTIONS. YOU CAN    Fixup
THEN DEFINE RATIO OR PRODUCT YOU REQUIRE TO BE THE RATIO OF THESE   Fixup
TWO DUMMY MT NUMBERS.                                               Fixup
```

```
                                                                      Fixup
FOR EXAMPLE, TO DEFINE ETA,                                           Fixup
1) FIRST DEFINE (MT=27) = (MT=27) + (SUM OF MT=102 THROUGH 116)       Fixup
2) NEXT DEFINE (MT=333) = (MT=452)*(MT=18)                            Fixup
3) LAST DEFINE (MT=255) = (MT=333)/(MT=27)                            Fixup
DO NOT FORGET TO TURN ON THE CREATE SECTION OPTION (ON THE FIRST       Fixup
INPUT LINE) AND INPUT THE FIRST TWO LINES OF SECTION MT=255 -         Fixup
OTHERWISE YOU WILL NOT GET ANY ENDF FORMATTED OUTPUT.                 Fixup
                                                                      Fixup
THE ONLY SPECIAL CONVENTIONS USED BY THIS PROGRAM IN CALCULATING      Fixup
RATIOS ARE WHEN THE DENOMINATOR OF THE RATIO IS ZERO. IN THIS         Fixup
CASE IF THE NUMERATOR IS ALSO ZERO THE RATIO IS DEFINED TO BE ONE.    Fixup
IN THIS CASE IF THE NUMERATOR IS NOT ZERO THE RATIO IS DEFINED        Fixup
TO BE ZERO.                                                           Fixup
                                                                      Fixup
ENDF FORMAT                                                           Fixup
===========                                                           Fixup
THIS PROGRAM MAY BE USED WITH DATA IN ANY VERSION OF THE ENDF         Fixup
FORMAT (I.E. ENDF-1, 2, 3, 4, 5 OR 6 FORMAT). SINCE A                 Fixup
PAGING SYSTEM IS USED STORE CROSS SECTION TABLES ON SCRATCH FILES     Fixup
THERE IS NO LIMIT TO THE SIZE OF TABLES (E.G. THE TOTAL CROSS         Fixup
SECTION MAY BE REPRESENTED BY 200,000 TABULATED POINTS).              Fixup
                                                                      Fixup
WARNING                                                               Fixup
=======                                                               Fixup
(1) FOR EACH SECTION OF CROSS SECTIONS (I.E. EACH MT, MF=3) IN        Fixup
    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 SECTION    Fixup
    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
```

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                                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
            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 FOR    Fixup
                               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
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     (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 CHANGE 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
 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
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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 EXCLUSION Fixup
    (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 NUMBERS Fixup
    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
==================                                                 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 EXCLUSION Fixup
    (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 NUMBERS Fixup
    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 DEFINED Fixup
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
```