**=======================================================================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**

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 **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 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 CAPTUREFIXUP**

 **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 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 FORFIXUP**

 **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 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 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**

 **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**

 **=================== 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**