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