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

 **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 POINT Fixup**

 **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 DEFINE Fixup**

 **ANY RECONSTRUCTED REACTIONS (I.E. REACTIONS DEFINED BY SUMMING Fixup**

 **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 BE Fixup**

 **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 DELETED Fixup**

 **(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 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**

 **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**

 **(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 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**