======================================================================= Sixpak

 Sixpak

 PROGRAM SIXPAK Sixpak

 ============== Sixpak

 VERSION 92-1 (JANUARY 1992) Sixpak

 VERSION 92-2 (FEBRUARY 1992)\*INCREASED CORE ALLOCATION TO Sixpak

 ACCOMMODATE JEF AND EFF EVALUATIONS. Sixpak

 VERSION 92-3 (APRIL 1992) \*ADDED ADDITIONAL DATA TESTS. Sixpak

 VERSION 92-4 (SEPT. 1992) \*CORRECTED KALBACH-MANN CALCULATIONS. Sixpak

 \*FOR PHOTON PRODUCTION OUTPUT MF=12 Sixpak

 (MULTIPLICITY), MF=14 (ISOTROPIC Sixpak

 ANGULAR DISTRIBUTIONS) AND MF=15 Sixpak

 (SPECTRA) - PREVIOUSLY ONLY MF=15. Sixpak

 \*FIRST ORDER CORRECTIONS TRANSFORMING Sixpak

 CENTER-OF-MASS SPECTRA TO LAB SYSTEM Sixpak

 FOR OUTPUT IN MF=5 Sixpak

 \*CORRECTED ISOTROPIC ANGULAR Sixpak

 DISTRIBUTION FLAG (LI) Sixpak

 VERSION 94-1 (JANUARY 1994) \*VARIABLE ENDF/B INPUT DATA FILENAME Sixpak

 TO ALLOW ACCESS TO FILE STRUCTURES Sixpak

 (WARNING - INPUT PARAMETER FORMAT Sixpak

 HAS BEEN CHANGED) Sixpak

 \*CLOSE ALL FILES BEFORE TERMINATING Sixpak

 (SEE, SUBROUTINE ENDIT) Sixpak

 \*INCREASED MAXIMUM TABLE SIZE FROM Sixpak

 2000 TO 6000. Sixpak

 VERSION 96-1 (JANUARY 1996) \*COMPLETE RE-WRITE Sixpak

 \*IMPROVED COMPUTER INDEPENDENCE Sixpak

 \*ALL DOUBLE PRECISION Sixpak

 \*ON SCREEN OUTPUT Sixpak

 \*UNIFORM TREATMENT OF ENDF/B I/O Sixpak

 \*IMPROVED OUTPUT PRECISION Sixpak

 VERSION 99-1 (MARCH 1999) \*CORRECTED CHARACTER TO FLOATING Sixpak

 POINT READ FOR MORE DIGITS Sixpak

 \*UPDATED TEST FOR ENDF/B FORMAT Sixpak

 VERSION BASED ON RECENT FORMAT CHANGE Sixpak

 \*GENERAL IMPROVEMENTS BASED ON Sixpak

 USER FEEDBACK Sixpak

 VERSION 99-2 (JUNE 1999) \*ASSUME ENDF/B-VI, NOT V, IF MISSING Sixpak

 MF=1, MT-451. Sixpak

 VERS. 2000-1 (FEBRUARY 2000)\*GENERAL IMPROVEMENTS BASED ON Sixpak

 USER FEEDBACK Sixpak

 VERS. 2002-1 (JANUARY 2002) \*CORRECTED ANGULAR DISTRIBUTION (MF=4) Sixpak

 OUTPUT TO INSURE USED FIELDS ARE 0 Sixpak

 (MAY 2002) \*OPTIONAL INPUT PARAMETERS Sixpak

 (NOV. 2002) \*EXTENDED TO ALLOW CHARGED PARTICLE Sixpak

 ANGULAR DISTRIBUTION IN MF=4 - Sixpak

 WARNING - STRICTLY SPEAKING THIS IS Sixpak

 NOT LEGAL, SINCE MF=4 IS SUPPOSED TO Sixpak

 BE USED ONLY FOR NEUTRON ANGULAR Sixpak

 DISTRIBUTIONS - BUT WHERE MT MAKES Sixpak

 IT OBVIOUS THAT THE OUTGOING PARTICLE Sixpak

 IS NOT A NEUTRON HOPEFULLY IT WILL Sixpak

 NOT CAUSE A PROBLEM IF MF=4 IS USED Sixpak

 FOR CHARGED PARTICLES. Sixpak

 VERS. 2004-1 (MARCH 2004) \*ADDED INCLUDE FOR COMMON Sixpak

 \*INCREASED MAXIMUM TABLE SIZE FROM Sixpak

 6,000 TO 12,000. Sixpak

 \*ADDED DUMMY A FOR ELEMENTS Sixpak

 \*CORRECTED OUTPUT INTERPOLATON LAWS Sixpak

 VERS. 2007-1 (JAN. 2007) \*CHECKED AGAINST ALL ENDF/B-VII. Sixpak

 \*INCREASED MAXIMUM TABLE SIZE FROM Sixpak

 12,000 TO 120,000. Sixpak

 VERS. 2007-2 (DEC. 2007) \*72 CHARACTER FILE NAMES. Sixpak

 VERS. 2010-1 (Apr. 2010) \*General update based on user feedback Sixpak

 VERS. 2011-1 (May 2011) \*Added MF/MT=9/5 yield output starting Sixpak

 from MF/MT=6/5 distributions. Sixpak

 \*Increased maximum Legendre order from Sixpak

 30 to 1,000 - WARNING - using more Sixpak

 than 30 results in NONSENSE = NOISE!! Sixpak

 VERS. 2012-1 (Oct. 2012) \*Increased max. point count to 500,000 Sixpak

 \*Added CODENAME Sixpak

 \*32 and 64 bit Compatible Sixpak

 \*Added ERROR stop Sixpak

 \*For photons, combine discrete and Sixpak

 continuum into tabulated increasing Sixpak

 energy order. Sixpak

 \*Check energy output order increasing. Sixpak

 Print WARNING if not increasing - do Sixpak

 not STOP- stopping would prevent ALL Sixpak

 output - the user may not be at all Sixpak

 interested in the BAD data, but may Sixpak

 be interested in other output data Sixpak

 that is o.k. Sixpak

 VERS. 2015-1 (Jan. 2015) \*Extended OUT9. Sixpak

 \*Replaced ALL 3 way IF Statements. Sixpak

 \*Deleted unused coding. Sixpak

 Sixpak

 OWNED, MAINTAINED AND DISTRIBUTED BY Sixpak

 ------------------------------------ Sixpak

 THE NUCLEAR DATA SECTION Sixpak

 INTERNATIONAL ATOMIC ENERGY AGENCY Sixpak

 P.O. BOX 100 Sixpak

 A-1400, VIENNA, AUSTRIA Sixpak

 EUROPE Sixpak

 Sixpak

 ORIGINALLY WRITTEN BY Sixpak

 ------------------------------------ Sixpak

 Dermott E. Cullen Sixpak

 Sixpak

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 Sixpak

 COLLABORATION Sixpak

 ================================================================== Sixpak

 DEVELOPED IN COLLABORATION WITH, Sixpak

 Sixpak

 \*THE NATIONAL NUCLEAR DATA CENTER, BROOKHAVEN NATIONAL LAB Sixpak

 Sixpak

 \*THE NUCLEAR DATA SECTION, IAEA, VIENNA, AUSTRIA Sixpak

 Sixpak

 \*CENTRO TECNICO AEROSPACIAL, SAO JOSE DOS CAMPOS, BRAZIL Sixpak

 Sixpak

 AS A PART OF AN INTERNATIONAL PROJECT ON THE EXCHANGE OF Sixpak

 NUCLEAR DATA Sixpak

 Sixpak

 ACKNOWLEDGEMENT (VERSION 92-1) Sixpak

 ================================================================== Sixpak

 THE AUTHOR THANKS SOL PEARLSTEIN (BROOKHAVEN NATIONAL LAB) FOR Sixpak

 SIGNIFICANTLY CONTRIBUTING TOWARD IMPROVING THE ACCURACY AND Sixpak

 COMPUTER INDEPENDENCE OF THIS CODE - THANKS, SOL Sixpak

 Sixpak

 ACKNOWLEDGEMENT (VERSION 92-4) Sixpak

 ================================================================== Sixpak

 THE AUTHOR THANKS BOB MACFARLANE (LOS ALAMOS) FOR SUGGESTING HOW Sixpak

 TO PROPERLY OUTPUT THE PHOTON PRODUCTION DATA TO PUT IT INTO Sixpak

 EXACTLY THE FORM NEEDED FOR USE IN PROCESSING CODES. Sixpak

 Sixpak

 THE AUTHOR THANKS CHRIS DEAN (WINFRITH) FOR POINTING OUT ERRORS Sixpak

 IN THE EARLIER TREATMENT OF THE KALBACH-MANN FORMALISM AND IN Sixpak

 THE DEFINITION OF THE ISOTROPIC ANGULAR DISTRIBUTION FLAG (LI). Sixpak

 Sixpak

 AUTHORS MESSAGE Sixpak

 ================================================================== Sixpak

 THE COMMENTS BELOW SHOULD BE CONSIDERED THE LATEST DOCUMENTATION Sixpak

 INCLUDING ALL RECENT IMPROVEMENTS. PLEASE READ ALL OF THESE Sixpak

 COMMENTS BEFORE IMPLEMENTING AND USING THESE CODES. Sixpak

 Sixpak

 AT THE PRESENT TIME WE ARE ATTEMPTING TO DEVELOP A SET OF COMPUTER Sixpak

 INDEPENDENT PROGRAMS THAT CAN EASILY BE IMPLEMENTED ON ANY ONE Sixpak

 OF A WIDE VARIETY OF COMPUTERS. IN ORDER TO ASSIST IN THIS PROJECT Sixpak

 IT WOULD BE APPECIATED IF YOU WOULD NOTIFY THE AUTHOR OF ANY Sixpak

 COMPILER DIAGNOSTICS, OPERATING PROBLEMS OR SUGGESTIONS ON HOW TO Sixpak

 IMPROVE THIS PROGRAM. HOPEFULLY, IN THIS WAY FUTURE VERSIONS OF Sixpak

 THIS PROGRAM WILL BE COMPLETELY COMPATIBLE FOR USE ON YOUR Sixpak

 COMPUTER. Sixpak

 Sixpak

 PURPOSE Sixpak

 ================================================================== Sixpak

 1) CHECK ALL DOUBLE-DIFFERENTIAL DATA (MF=6) Sixpak

 Sixpak

 2) OUTPUT EQUIVALENT MF = 4, 5, 12, 14 AND 15 DATA. Sixpak

 Sixpak

 DATA CHECKING Sixpak

 ================================================================== Sixpak

 ALL OF THE ENDF/B-VI MF=6 DATA IS CHECKED - FOR DETAILS SEE BELOW. Sixpak

 Sixpak

 THE MF=6 DATA IS NOT CORRECTED AND OUTPUT IN THE ENDF/B FORMAT. Sixpak

 IT IS MERELY CHECKED. IF ERRORS ARE FOUND IT IS UP TO THE USER Sixpak

 TO TAKE CORRECTIVE ACTION ON THE MF=6 DATA. Sixpak

 Sixpak

 IN CONTRAST WHEN PROBLEMS ARE FOUND IN DATA WHICH WILL BE OUTPUT Sixpak

 IN THE ENDF/B FORMAT (MF=4, 5, 12, 14 AND 15), WHENEVER POSSIBLE Sixpak

 CORRECTIVE ACTION WILL BE TAKEN. Sixpak

 Sixpak

 FURTHER CHECKS AND CORRECTIONS Sixpak

 ================================================================== Sixpak

 ONCE THE DATA HAS BEEN OUTPUT IN MF = 4, 5, 12, 14 AND 15 FORMATS Sixpak

 FURTHER CORRECTIVE ACTION CAN BE TAKEN AS FOLLOWS, Sixpak

 Sixpak

 PROGRAM LEGEND Sixpak

 ============== Sixpak

 CAN BE USED TO CORRECT ANGULAR DISTRIBUTIONS WHICH ARE NEGATIVE, Sixpak

 TO CONVERT FROM LEGENDRE COEFFICIENTS TO TABULATED ANGULAR Sixpak

 DISTRIBUTIONS AND GENERALLY PERFORM MORE EXTENSIVE TESTS OF Sixpak

 ALL MF=4 DATA. Sixpak

 Sixpak

 PROGRAM EVALPLOT Sixpak

 ================ Sixpak

 VERSION 92-1 AND LATER VERSIONS CAN PLOT ALL OF THE MF=4, 5 AND 15 Sixpak

 DATA OUTPUT BY THIS CODE. EARLIER VERSIONS CAN PLOT MF=4 AND 5. Sixpak

 GRAPHICS IS AN EXCELLENT WAY TO CHECK THIS DATA. Sixpak

 Sixpak

 PROGRAM PLOTTAB Sixpak

 =============== Sixpak

 THIS IS A GENERAL PLOTTING PROGRAM AND THERE IS AN INTERFACE IN Sixpak

 THIS CODE TO PRODUCE OUTPUT FOR ANY MF=6 DATA IN THE PLOTTAB Sixpak

 INPUT FORMAT. THIS PROGRAM CAN BE USED TO CHECK ALL OF THE MF=6 Sixpak

 DATA AS WELL AS THE EQUIVALENT MF=4, 5, 12, 14 AND 15 DATA - AS Sixpak

 WELL AS COMPARING THE ORIGINAL MF=6 AND EQUIVALENT DATA. Sixpak

 Sixpak

 DATA OUTPUT Sixpak

 ================================================================== Sixpak

 THE ENDF/B MF=4, 5, 12, 14 AND 15 FORMATS ONLY ALLOW FOR NEUTRONS Sixpak

 INCIDENTS Sixpak

 Sixpak

 THE ENDF/B MF=4 AND 5 FORMATS ONLY ALLOW FOR NEUTRONS OUTGOING. Sixpak

 Sixpak

 THE ENDF/B MF=12, 14 AND 15 ONLY ALLOWS FOR PHOTONS OUTGOING. Sixpak

 Sixpak

 THESE ARE THE ONLY COMBINATIONS OF DATA OUTPUT BY THIS CODE. Sixpak

 Sixpak

 ALL OTHER COMBINATIONS OF INCIDENT AND OUTGOING PARTICLES ARE Sixpak

 CHECKED, BUT THE RESULTS CANNOT BE OUTPUT IN THE ENDF/B FORMAT. Sixpak

 HOWEVER, USING THE PLOTTAB INTERFACE BUILT INTO THIS CODE THIS Sixpak

 DATA CAN, AND HAS BEEN, OUTPUT AND CHECKED. Sixpak

 Sixpak

 THE NEUTRON DATA IN MF=4 CAN BE IN THE FORM OF EITHER TABULATED Sixpak

 ANGULAR DISTRIBUTIONS OR LEGENDRE COEFFICIENTS. Sixpak

 Sixpak

 THE NEUTRON (MF=5) OR PHOTON (MF=15) SPECTRA ARE BOTH IN EXACTLY Sixpak

 THE SAME FORMAT = ARBITRARY TABULATED FUNCTIONS - ENDF/B OPTION Sixpak

 LF=1. Sixpak

 Sixpak

 ENDF/B DATA OUTPUT ORDER Sixpak

 ================================================================== Sixpak

 ENDF/B DATA IS OUTPUT IN ASCENDING MAT, MF, MT ORDER. IN ORDER TO Sixpak

 ALLOW THIS PROGRAM TO PRODUCE ALL OUTPUT IN A SINGLE PASS THROUGH Sixpak

 THE MF=6 DATA, OUTPUT FOR EACH (MAT, MT) IS OUTPUT TO SEPERATE Sixpak

 FILES FOR MF=4, 5, 12, 14 AND 15. Sixpak

 Sixpak

 FOR SUBSEQUENT USE THE ENDF/B FORMATTED DATA OUTPUT BY THIS CODE Sixpak

 CAN BE MERGED TOGETHER USING PROGRAM MERGER (CONTAIN THE AUTHOR Sixpak

 OF THIS CODE FOR A COPY OF MERGER), E.G., MERGE MF=12, 14 AND 15 Sixpak

 DATA IN ORDER TO THEN CALCULATE PHOTON PRODUCTION DATA OR MF=4 Sixpak

 AND 5 CAN BE MERGED TOGETHER TO CALCULATE NEUTRON TRANSFER - OR Sixpak

 ALL OF THEM CAN BE MERGED TOGETHER TO PERFORM NEUTRON AND PHOTON Sixpak

 CALCULATIONS. Sixpak

 Sixpak

 CORRELATED (MF=6) VS. UNCORRELATED (MF=4 AND 5) DATA Sixpak

 ================================================================== Sixpak

 THE ENDF/B DOUBLE DIFFERENTAL = CORRELATED - DATA IN MF=6 Sixpak

 REPRESENTS DATA IN THE FORM, Sixpak

 Sixpak

 F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F(E,EP,COS) Sixpak

 Sixpak

 SIG(E) = MF=3 CROSS SECTIONS Sixpak

 Y(E) = YIELD (MULTIPLICITY) Sixpak

 G0(E,EP) = ENERGY SPECTRUM Sixpak

 F(E,EP,COS) = ANGULAR DISTRIBUTION Sixpak

 Sixpak

 IN A SITUATION WHERE YOU HAVE MONOENERGETIC AND MONODIRECTIONAL Sixpak

 NEUTRONS INCIDENT YOU WILL BE ABLE TO OBSERVE CORRELATION EFFECTS Sixpak

 IN THE NEUTRON SPECTRUM AND ANGULAR DISTRIBUTION. Sixpak

 Sixpak

 EVEN IN SITUATIONS WHERE YOU HAVE A NARROW SPECTRUM OF NEUTRONS Sixpak

 THAT ARE HIGHLY DIRECTIONALLY ORIENTED YOU MAY BE ABLE TO OBSERVE Sixpak

 THESE CORRELATION EFFECTS, E.G., A NARROW 14 MEV FUSION SOURCE Sixpak

 INCIDENT ON THE FIRST WALL OF A CTR DEVICE. Sixpak

 Sixpak

 FOR SUCH SITUATIONS USE OF THE CORRELATED (MF=6) DATA IS REQUIRED Sixpak

 IN CALCULATIONS. Sixpak

 Sixpak

 HOWEVER, IN MANY APPLICATIONS WHERE THERE IS A BROAD SPECTRUM OF Sixpak

 NEUTRONS AND THE NEUTRON FLUX IS NOT HIGHLY DIRECTIONALLY Sixpak

 ORIENTED, THE NEUTRON MULTIPLICATION, SPECTRUM AND ORIENTATION Sixpak

 CAN BE FAIRLY ACCURATELY CALCULATED WITHOUT CONSIDERING Sixpak

 CORRELATION EFFECTS. Sixpak

 Sixpak

 THE UNCORRELATED DATA PRODUCED BY THIS CODE REPLACES THE Sixpak

 CORRELATED DATA, Sixpak

 Sixpak

 F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F(E,EP,COS) Sixpak

 Sixpak

 BY THE UNCORRELATED DATA, Sixpak

 Sixpak

 F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F0(E,COS) Sixpak

 Sixpak

 BY INTEGRATING G0(E,EP)\*F(E,EP,COS) OVER SECONDARY ENERGY (EP) Sixpak

 TO DEFINE AN AVERAGE ANGULAR DISTRIBUTION, F0(E,COS). Sixpak

 Sixpak

 WHAT IS LOST IN THIS PROCESS IS THE CORRELATION BETWEEN EP AND COS Sixpak

 SO THAT IN A TRANSPORT CALCULATION ALL MOMENTS OF THE FLUX WILL Sixpak

 HAVE THE SAME SPECTRUM, G0(E,EP) AND EACH WILL BE EFFECTED BY THE Sixpak

 AVERAGE ANGULAR DISTRIBUTION. Sixpak

 Sixpak

 FOR APPLICATIONS TO HIGH ENERGY FUSION APPLICATIONS CORRELATED Sixpak

 DATA SHOULD BE USED. HOWEVER, FOR LOWER ENERGY APPLICATIONS, Sixpak

 SUCH AS FISSION REACTORS, IT SHOULD BE ADEQUATE TO USE THE Sixpak

 UNCORRELATED DATA - IN THIS CASE THE MOST IMPORTANT EFFECT Sixpak

 WILL BE THE OVERALL NEUTRON MULTIPLICATION AND SPECTRUM. Sixpak

 Sixpak

 AN IMPORTANT CONSIDERATION IN DESIGNING THIS PROGRAM IS THAT Sixpak

 MANY COMPUTER CODES - DATA PROCESSING AND TRANSPORT CODES - Sixpak

 CANNOT USE THE CORRELATED (MF=6) DATA - NOR ARE THEY INTENDED Sixpak

 FOR HIGH ENERGY USE. FOR THESE CODES THE UNCORRELATED DATA Sixpak

 PRODUCED BY THIS CODE SHOULD BE ADEQUATE TO MEET THEIR NEEDS. Sixpak

 Sixpak

 WARNING - IT CANNOT BE STRESSED ENOUGH THAT THE OUTPUT OF THIS Sixpak

 CODE SHOULD ONLY BE USED FOR LOW ENERGY APPLICATIONS - FAILURE Sixpak

 TO HEED THIS WARNING CAN LEAD TO COMPLETELY UNRELIABLE RESULTS. Sixpak

 Sixpak

 ENDF/B FORMAT Sixpak

 ================================================================== Sixpak

 THIS PROGRAM ONLY USES THE ENDF/B BCD OR CARD IMAGE FORMAT (AS Sixpak

 OPPOSED TO THE BINARY FORMAT) AND CAN HANDLE DATA IN ANY VERSION Sixpak

 OF THE ENDF/B FORMAT (I.E., ENDF/B-I, II,III, IV, V OR VI FORMAT). Sixpak

 Sixpak

 IT IS ASSUMED THAT THE DATA IS CORRECTLY CODED IN THE ENDF/B Sixpak

 FORMAT AND NO ERROR CHECKING IS PERFORMED. IN PARTICULAR IT IS Sixpak

 ASSUMED THAT THE MAT, MF AND MT ON EACH LINE IS CORRECT. SEQUENCE Sixpak

 NUMBERS (COLUMNS 76-80) ARE IGNORED ON INPUT, BUT WILL BE Sixpak

 CORRECTLY OUTPUT ON ALL LINES. THE FORMAT OF SECTION MF=1, MT=451 Sixpak

 AND ALL SECTIONS OF MF=6 MUST BE CORRECT. THE PROGRAM SKIPS ALL Sixpak

 OTHER SECTIONS OF DATA AND AS SUCH IS INSENSITIVE TO THE FORMAT Sixpak

 OF ALL OTHER SECTIONS. Sixpak

 Sixpak

 CONTENTS OF OUTPUT Sixpak

 ================================================================== Sixpak

 5 ENDF/B FORMATTED OUTPUT FILES ARE PRODUCED FOR NEUTRON INCIDENT Sixpak

 DATA, Sixpak

 Sixpak

 1) ENDFB.MF4 - ANGULAR DISTRIBUTIONS AND LEGENDRE COEFFICIENTS Sixpak

 FOR NEUTRONS Sixpak

 2) ENDFB.MF5 - TABULATED NEUTRON ENERGY SPECTRA Sixpak

 3) ENDFB.M12 - PHOTON EMISSION MULTIPLICITY Sixpak

 4) ENDFB.M14 - PHOTON EMISSION ANGULAR DISTRIBUTIONS (ALWAYS Sixpak

 ISOTROPIC) Sixpak

 5) ENDFB.M15 - TABULATED PHOTON EMISSION SPECTRA Sixpak

 Sixpak

 EMITTED PARTICLE YIELD Sixpak

 ================================================================== Sixpak

 NEUTRONS Sixpak

 ======== Sixpak

 IN MF=6 THE YIELD FOR EACH REACTION IS THE ACTUAL MULTIPLICITY OF Sixpak

 THE REACTION, E.G., (N,2N) = 2. IN USING MF=4 AND 5 DATA THE Sixpak

 ENDF/B CONVENTION IS THAT THE MULTIPLICITY IS IMPLIED BY THE Sixpak

 MT NUMBER, E.G., MT=16 = (N,2N) = 2. Sixpak

 Sixpak

 THE ONLY EXCEPT IN ENDF/B-VI IS MT=201 = TOTAL NEUTRON PRODUCTION Sixpak

 WHERE AN ACTUAL ENERGY DEPENDENT YIELD IS INCLUDED IN MF=6. Sixpak

 HOWEVER, IN THIS CASE THE MF=3 CROSS SECTION INCLUDES THE Sixpak

 MULTIPLICITY (S. PEARLSTEIN, PRIVATE COMMUNICATION, JAN. 1992), Sixpak

 SIG(MT=201) = 2\*SIG(N,2N)+3\*SIG(N,3N).....ETC. Sixpak

 Sixpak

 SO THAT FOR ALL ENDF/B-VI DATA AS OF JANUARY 1992 THE MF=4 AND 5 Sixpak

 DATA OUTPUT BY THIS CODE CAN BE USED IN CONJUNCTION WITH THE MF=3 Sixpak

 CROSS SECTIONS - WITHOUT ANY REFERENCE TO THE MF=6 YIELD. Sixpak

 Sixpak

 PHOTONS Sixpak

 ======= Sixpak

 UNLIKE THE NEUTRONS WHERE WITH ONLY ONE EXCEPTION (MT=201) THE Sixpak

 MF=6 YIELD IS ENERGY INDEPENDENT, IN THE CASE OF PHOTON EMISSION Sixpak

 ALMOST ALL OF THE PHOTONS HAVE AN ENERGY DEPENDENT YIELD. Sixpak

 Sixpak

 THIS PROGRAM WILL OUTPUT THE PHOTON MULTIPLICITY IN MF=12 AND Sixpak

 INDICATE THAT THERE IS A NORMALIZED DISTRIBUTION IN MF=15 Sixpak

 (LF=1 IN MF=12). Sixpak

 Sixpak

 THIS PROGRAM WILL OUTPUT THE NORMALIZED PHOTON SPECTRA IN MF=15. Sixpak

 CONTINUOUS ENERGY SPECTRA AND DISCRETE PHOTONS WILL ALL BE OUTPUT Sixpak

 AS NORMALIZED SPECTRA. Sixpak

 Sixpak

 THIS PROGRAM WILL ALSO OUTPUT MF=14 PHOTON ANGULAR DISTRIBUTION Sixpak

 DATA, ALWAYS USING THE ISOTROPIC FLAG TO MINIMIZE OUTPUT. Sixpak

 Sixpak

 WARNING OF ENERGY DEPENDENT YIELD Sixpak

 ================================= Sixpak

 THIS PROGRAM WILL PRINT A WARNING MESSAGE IF A SECTION OF DATA Sixpak

 BEING OUTPUT IN THE ENDF/B FORMAT HAS AN ENERGY DEPENDENT MF=6 Sixpak

 YIELD AND THE EMITTED PARTICLE IS A NEUTRON - SINCE THE ENDF/B Sixpak

 CONVENTION IS THAT FOR EACH MT NUMBER THE MULTIPLICITY IS IMPLIED Sixpak

 WE DO NOT EXPECT AN ENERGY DEPENDENT MULTIPLICITY FOR NEUTRON Sixpak

 EMISSION. Sixpak

 Sixpak

 USING THE OUTPUT Sixpak

 ================================================================== Sixpak

 NOTE, THAT IN USING THIS DATA, STARTING FROM THE RELATIONSHIP, Sixpak

 Sixpak

 F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F0(E,COS) Sixpak

 Sixpak

 USING THE ENDF/B CONVENTION THAT THE MULTIPLICITY IS EITHER Sixpak

 IMPLIED BY THE MT NUMBER (E.G., MT=16 = N,2N - MULTIPLICITY = 2) Sixpak

 OR INCLUDED IN THE CROSS SECTION (E.G., MT=201 = TOTAL NEUTRON Sixpak

 PRODUCTION) ALL THE INFORMATION REQUIRED FOR A CALCULATION IS Sixpak

 AVAILABLE IN, Sixpak

 Sixpak

 MF=3 - SIG(E) Sixpak

 MF=4 - F0(E,COS) - FOR OUTGOING NEUTRONS Sixpak

 MF=5 - G0(E,EP) - FOR OUTGOING NEUTRONS Sixpak

 MF=12 - Y(E) - FOR OUTGOING PHOTONS Sixpak

 MF=14 - F0(E,COS) - FOR OUTGOING PHOTONS (ALWAYS ISOTROPIC) Sixpak

 MF=15 - G0(E,EP) - FOR OUTGOING PHOTONS Sixpak

 Sixpak

 DOCUMENTATION Sixpak

 ================================================================== Sixpak

 ONLY SECTIONS OF MF=4, 5, 12, 14, 15 ARE OUTPUT ON A ENDF/B FILE. Sixpak

 THE ONLY DOCUMENTATION IS THE ENDF/B TAPE LABEL (FIRST RECORD OF Sixpak

 EACH FILE) WHICH IDENTIFIES THE DATA AS SIXPAK OUTPUT. Sixpak

 Sixpak

 REACTION INDEX Sixpak

 ================================================================== Sixpak

 THIS PROGRAM DOES NOT USE THE REACTION INDEX WHICH IS GIVEN IN Sixpak

 SECTION MF=1, MT=451 OF EACH EVALUATION. Sixpak

 Sixpak

 SECTION SIZE Sixpak

 ================================================================== Sixpak

 ALL OF THE DATA IN ENDF/B-VI, MF=6 ARE QUITE SMALL TABLES. AS SUCH Sixpak

 THIS PROGRAM ONLY ALLOWS TABLES OF UP TO 12000 POINTS (12,000 X, Sixpak

 Y VALUES). THIS SIZE IS MORE THAN ADEQUATE TO HANDLE ALL OF THE Sixpak

 CURRENT ENDF/B-VI DATA, AND IT CAN BE EASILY INCREASED TO HANDLE Sixpak

 ANY NEWER DATA AS IT BECOMES AVAILABLE. Sixpak

 Sixpak

 PLEASE CONTACT THE AUTHOR IF YOU HAVE AN EVALUATION WHICH EXCEEDS Sixpak

 THIS LIMIT. Sixpak

 Sixpak

 SELECTION OF DATA Sixpak

 ================================================================== Sixpak

 THE PROGRAM SELECTS DATA TO BE PROCESSED BASED ON MAT/MT RANGES Sixpak

 (MF=6 ASSUMED). THIS PROGRAM ALLOWS UP TO 100 MAT/MT RANGES TO BE Sixpak

 SPECIFIED BY INPUT PARAMETERS. THE PROGRAM WILL ASSUME THAT THE Sixpak

 ENDF/B TAPE IS IN MAT ORDER. THE PROGRAM WILL TERMINATE EXECUTION Sixpak

 WHEN A MAT IS FOUND THAT IS ABOVE ALL REQUESTED MAT RANGES. Sixpak

 Sixpak

 PROGRAM OPERATION Sixpak

 ================================================================== Sixpak

 EACH SECTION (MT) OF MF=6 DATA IS SUBDIVIDED INTO SUBSECTIONS - Sixpak

 ONE SUBSECTION FOR EACH EMITTED PARTICLE. Sixpak

 Sixpak

 EACH SUBSECTION OF DATA IS CONSIDERED SEPARATELY. EACH SUBSECTION Sixpak

 OF ENDF/B MF=6 DATA TO PROCESS IS IN THE FORM, Sixpak

 Sixpak

 F(E,EP,COS) = SIG(E)\*Y(E)\*G0(E,EP)\*F(E,EP,COS) Sixpak

 Sixpak

 SIG(E) = MF=3 CROSS SECTIONS Sixpak

 Y(E) = YIELD (MULTIPLICITY) Sixpak

 G0(E,EP) = ENERGY SPECTRUM Sixpak

 F(E,EP,COS) = ANGULAR DISTRIBUTION Sixpak

 Sixpak

 G0(E,EP) = 1 WHEN INTEGRATED OVER EP (SECONDARY ENERGY) Sixpak

 G0(E,EP)\*F(E,EP,COS) = 1 WHEN INTEGRATED OVER EP AND COS Sixpak

 Sixpak

 THIS PROGRAM WILL DEFINE THE ZEROTH ORDER MOMENTS OF THE Sixpak

 ENERGY AND ANGULAR DISTRIBUTIONS, Sixpak

 Sixpak

 G0(E,EP) = G0(E,EP)\*F(E,EP,COS) INTEGRATED OVER COS Sixpak

 F0(E,COS) = G0(E,EP)\*F(E,EP,COS) INTEGRATED OVER EP Sixpak

 Sixpak

 FOR NEUTRON INDUCED REACTIONS THE ENDF/B FORMATTED OUTPUT WILL BE Sixpak

 Sixpak

 F0(E,COS)- IN ENDFB.MF4 FOR NEUTRONS OUT OF A REACTION Sixpak

 G0(E,EP) - IN ENDFB.MF5 FOR NEUTRONS OUT OF A REACTION Sixpak

 - IN ENDFB.M15 FOR PHOTONS OUT OF A REACTION Sixpak

 Sixpak

 FOR NEUTRONS INCIDENT AND NEUTRONS EMITTED THIS DATA WILL BE Sixpak

 OUTPUT IN MF=4 AND 5 FORMATS. Sixpak

 Sixpak

 FOR NEUTRONS INCIDENT AND PHOTONS EMITTED THIS DATA WILL BE Sixpak

 OUTPUT IN MF=15 FORMAT - THE SPECTRA ARE OUTPUT AND THE Sixpak

 ANGULAR DISTRIBUTION IS IGNORED. Sixpak

 Sixpak

 ALL PHOTON EMISSION IN THE ENDF/B-VI LIBRARY AS OF JANUARY 1992 Sixpak

 IS ISOTROPIC AND AS SUCH NO DISTRIBUTION OF PHOTON ANGULAR Sixpak

 DISTRIBUTIONS NEED BE OUTPUT - IT IS ALWAYS ISOTROPIC. Sixpak

 Sixpak

 FOR ALL OTHER COMBINATIONS INCIDENT AND EMITTED PARTICLES Sixpak

 THERE WILL BE NO ENDF/B FORMATTED OUTPUT. Sixpak

 Sixpak

 VARIATIONS FROM ENDF/B MANUAL Sixpak

 ================================================================== Sixpak

 LAW=1, LANG=2 = KALBACH-MANN Sixpak

 ============================ Sixpak

 FOR THE DISTRIBUTIONS, Sixpak

 Sixpak

 F(MU,E,EP) = G0(E,EP)\*A\*(COSH(MU\*A)+R(E,EP)\*SINH(MU\*A)) Sixpak

 Sixpak

 G0(E,EP) = 1 - WHEN INTEGRATED OVER EP. Sixpak

 Sixpak

 A\*(COSH(MU\*A)+R(E,EP)\*SINH(MU\*A)) = 2 - WHEN INTEGRATD OVER MU Sixpak

 Sixpak

 THIS MEANS AS DEFINED IN THE ENDF/B MANUAL THE DISTRIBUTIONS Sixpak

 ARE NORMALIZED TO 2, INSTEAD OF 1. IN ORDER TO OBTAIN CORRECTLY Sixpak

 NORMALIZED DISTRIBUTIONS THE DISTRIBUTION SHOULD BE DEFINED Sixpak

 TO INCLUDE A FACTOR OF 1/2 MULTIPLYING THE ANGULAR PART OF Sixpak

 THE DISTRIBUTION. Sixpak

 Sixpak

 F(MU,E,EP) = G0(E,EP)\*0.5\*A\*(COSH(MU\*A)+R(E,EP)\*SINH(MU\*A)) Sixpak

 Sixpak

 THIS IS THE FORM USED IN THIS CODE Sixpak

 Sixpak

 LAW=1, ND NOT 0 = DISCRETE SECONDARY ENERGY DISTRIBUTION Sixpak

 ======================================================== Sixpak

 THE ENDF/B MANUAL SAYS THESE ARE FLAGGED WITH NEGATIVE ENERGIES. Sixpak

 IN ENDF/B-VI ALL OF THESE HAVE POSITIVE ENERGY. THIS CODE DOES Sixpak

 NOT CONSIDER THE ENDF/B-VI DATA TO BE IN ERROR. Sixpak

 Sixpak

 WITH THE CONVENTION ACTUALLY USED IN ENDF/B-VI ALL SECONDARY Sixpak

 ENERGIES SHOULD BE NON-NEGATIVE AND IN ASCENDING ENERGY ORDER Sixpak

 FOR EACH INCIDENT ENERGY. Sixpak

 Sixpak

 FROM THE ENDF/B MANUAL IT IS NOT OBVIOUS WHAT G0(E,EP) SHOULD BE Sixpak

 FOR DISCRETE PHOTONS - PHYSICALLY THIS IS A DELTA FUNCTION. IN Sixpak

 ENDF/B-VI IT IS ENTERED AS 1.0 = INTERPRETING IT AS INTEGRATED Sixpak

 OVER SECONDARY ENERGY - IN WHICH CASE THE DELTA FUNCTION = 1.0. Sixpak

 Sixpak

 LIMITATIONS Sixpak

 ================================================================== Sixpak

 CHECKING DATA Sixpak

 ================================================================== Sixpak

 THIS PROGRAM CHECKS ALL ENDF/B-VI MF=6 DATA. THE FOLLOWING CHECKS Sixpak

 ARE PERFORMED. Sixpak

 Sixpak

 PARAMETERS Sixpak

 ========== Sixpak

 ALL PARAMETERS ARE CHECKED FOR CONSISTENCY. IF PARAMETERS ARE Sixpak

 NOT CONSISTENT THE PROGRAM MAY NOT BE ABLE TO PERFORM THE Sixpak

 FOLLOWING TESTS AND WILL MERELY SKIP A SECTION OF DATA. Sixpak

 Sixpak

 INTERPOLATION LAWS Sixpak

 ================== Sixpak

 ALL INTEGRATIONS ARE PERFORMED USING THE INTERPOLATION LAW GIVEN Sixpak

 FOR SECONDARY ENERGY AND/OR COSINE. INTEGRATIONS ARE NOT Sixpak

 PERFORMED OVER INCIDENT - ONLY INTEGRATION OVER SECONDARY ENERGY Sixpak

 AND/OR COSINE ARE PERFORMED AT EACH INCIDENT ENERGY. THEREFORE Sixpak

 THE INTERPOLATION LAW FOR INCIDENT ENERGY IS NOT USED BY THIS Sixpak

 CODE. Sixpak

 Sixpak

 ALL INTERPOLATION LAWS ARE CHECKED. ALL DATA ASSOCIATED WITH Sixpak

 INTERPOLATION LAWS ARE CHECKED, E.G., NO NON-NEGATIVE VALUES Sixpak

 REQUIRING LOG INTERPOLATION. IN ORDER TO PERFORM REQUIRED Sixpak

 INTEGRALS OVER COS AND EP IT IS IMPERATIVE THAT THE INTERPOLATION Sixpak

 LAWS BE COMPATIBLE WITH THE DATA. Sixpak

 Sixpak

 ENDF/B-VI ALLOWS NEW INTERPOLATION LAWS FOR CORRESPONDING POINT Sixpak

 AND UNIT BASE TRANSFORMATION INTERPOLATION. NONE OF THESE NEW Sixpak

 INTERPOLATION LAWS ARE USED IN THE ENDF/B-VI LIBRARY AS OF Sixpak

 JANUARY 1992 TO INTERPOLATE IN SECONDARY ENERGY OR COSINE. Sixpak

 THEREFORE THIS PROGRAM CAN PERFORM ALL OF THE REQUIRED INTEGRALS Sixpak

 OVER SECONDARY ENERGY AND/OR COSINE USING ONLY THE OLDER Sixpak

 INTERPOLATION CODES. THIS PROGRAM ONLY PERFORMS INTEGRALS FOR Sixpak

 EACH INCIDENT ENERGY, SO THAT INTERPOLATION IN INCIDENT ENERGY Sixpak

 IS NOT PERFORMED BY THIS PROGRAM. Sixpak

 Sixpak

 NEW INTERPOLATION SCHEMES ARE USED FOR INCIDENT ENERGY - FOR Sixpak

 EXAMPLE, CORRESPONDING POINT INTERPOLATION IS SPECIFIED TO ALLOW Sixpak

 INTERPOLATION IN G0(E,EP) TO SIMULATE CASES WHERE THE INPUT ENERGY Sixpak

 LIMIT IS DEFINED BY E-EP = A DIAGONAL CURVE ACROSS (E,EP) SPACE. Sixpak

 THIS INTERPOLATION CODE CANNOT BE SPECIFIED IN THE MF=5 OUTPUT Sixpak

 OF THIS CODE - MF=5 ONLY ALLOWS THE OLDER INTERPOLATION LAWS Sixpak

 INT=1 THROUGH 5. THEREFORE THIS PROGRAM WILL USE THE CLOSEST Sixpak

 CORRESPONDING INTERPOLATION CODE FOR OUTPUT TO MF=5. FOR USE Sixpak

 WHERE THE OUTPUT OF THIS CODE = LOW ENERGY APPLICATIONS - THIS Sixpak

 SHOULD HAVE LITTLE EFFECT ON RESULTS. Sixpak

 Sixpak

 FOR CONSISTENCY WITH EARLIER VERSIONS OF ENDF/B IN CREATING THE Sixpak

 ENDF/B OUTPUT, IF ANY INPUT INTERPOLATION LAW IS NOT IN THE Sixpak

 RANGE 1-5, IT WILL FIRST BE TESTED TO SEE IF MOD(10) IT IS Sixpak

 IN THIS RANGE, FINALLY IF EVEN THIS DOESN'T WORK IT IS SET Sixpak

 EQUAL TO 2 (LINEARLY INTERPOLATION). THIS METHOD WILL EFFECTIVELY Sixpak

 REPLACE CORRESPONDING POINT AND UNIT BASE TRANSFORMATION BY THE Sixpak

 CLOSEST RELATED INTERPOLATION LAW 1 THROUGH 5 - AGAIN NOTE, AS Sixpak

 OF JANUARY 1992 NONE OF THESE NEW LAWS ARE USED IN ENDF/B-VI. IF Sixpak

 THIS MUST BE DONE FOR INTERPOLATION IN SECONDARY ENERGY OR COSINE Sixpak

 AN ERROR MESSAGE WILL BE PRINTED - SINCE THIS WOULD EFFECT THE Sixpak

 ACCURACY OF THE INTEGRALS PERFORMED BY THIS PROGRAM. IF THIS MUST Sixpak

 BE DONE FOR INCIDENT ENERGY NO MESSAGE IS PRINTED - SINCE THIS Sixpak

 WILL NOT EFFECT THE ACCURACY OF THE INTEGRALS PERFORMED BY THIS Sixpak

 PROGRAM. Sixpak

 Sixpak

 SPECTRA AND ANGULAR DISTRIBUTIONS Sixpak

 ================================= Sixpak

 ALL SPECTRA AND ANGULAR DISTRIBUTIONS ARE CHECKED TO INSURE Sixpak

 THEY ARE NORMALIZED AND DO NOT INCLUDE ANY NEGATIVE VALUES. Sixpak

 Sixpak

 LEGENDRE COEFFICIENTS Sixpak

 ===================== Sixpak

 THE NORMALIZATION, F0, CANNOT BE NEGATIVE. Sixpak

 Sixpak

 LEGENDRE COEFFICIENTS IN NORMAL FORM ARE CHECKED TO INSURE Sixpak

 THEY ARE IN THE RANGE -1 TO +1 = THE LEGENDRE EXPANSION OF A Sixpak

 DELTA FUNCTION AT COS=+1 OR -1 - COEFFICIENTS SHOULD NOT Sixpak

 EXCEED WHAT YOU GET FROM A DELTA FUNCTION. Sixpak

 Sixpak

 ANGULAR DISTRIBUTIONS ARE CHECKED AT COS = -1, 0 AND +1. Sixpak

 Sixpak

 CREATING ENDF/B OUTPUT Sixpak

 ================================================================== Sixpak

 THIS PROGRAM CAN CREATE EQUIVALENT MF =4, 5, 12, 14, 15 DATA FOR Sixpak

 ALL OF THE DATA INCLUDED IN ENDF/B-VI AS OF JANUARY 1992, EXCEPT Sixpak

 FOR 1 SECTION OF LAW=6 DATA (SEE DETAILS BELOW). Sixpak

 Sixpak

 THIS PROGRAM HAS NOT BEEN TESTED ON OTHER DATA LIBRARIES, E.G., Sixpak

 JEF, JENDL, ETC. Sixpak

 Sixpak

 THE PROGRAM HAS THE FOLLOWING LIMITATION AS FAR AS CREATING Sixpak

 ENDF/B FORMATTED OUTPUT. Sixpak

 Sixpak

 ISOTROPIC PHOTON EMISSION Sixpak

 ========================= Sixpak

 FOR PHOTON EMISSION THE DISTRIBUTIONS ARE ASSUMED TO BE ISOTROPIC Sixpak

 AND ONLY THE MULTIPLICITY IS OUTPUT IN MF=12, ISOTROPIC ANGULAR Sixpak

 DISTRIBUTIONS IN MF=14 AND THE SPECTRA IN MF=15. ALL ENDF/B-VI Sixpak

 MF=6 DATA AS OF JANUARY 1992 INCLUDE ONLY ISOTROPIC PHOTON Sixpak

 EMISSION - SO THAT THIS IS NOT A LIMITATION ON TRANSLATING Sixpak

 ENDF/B-VI DATA. Sixpak

 Sixpak

 EITHER TABULATED OR LEGENDRE COEFFICIENTS Sixpak

 ========================================= Sixpak

 FOR LAW=2 THE REPRESENTATION, EITHER TABULATED OR LEGENDRE Sixpak

 COEFFICIENTS, CAN BE SPECIFIED FOR EACH INCIDENT ENERGY. Sixpak

 Sixpak

 IN ORDER TO OBTAIN CORRECT ENDF/B OUTPUT THE REPRESENTATION Sixpak

 MUST BE THE SAME FOR ALL INCIDENT ENERGIES = MF=4 DATA CAN ONLY Sixpak

 BE TABULATED OR LEGENDRE OVER THE ENTIRE ENERGY RANGE. Sixpak

 Sixpak

 YIELD AND OUTPUT NORMALIZATION Sixpak

 ============================== Sixpak

 THE YIELD INCLUDED WITH EACH SECTION OF DATA IS NOT USED FOR Sixpak

 OUTPUT FOR NEUTRONS, BUT IS INCLUDED IN THE OUTPUT FOR PHOTONS. Sixpak

 IN ALL CASES THE ANGULAR DISTRIBUTIONS AND SPECTRA OUTPUT ARE Sixpak

 NORMALIZED TO UNITY. Sixpak

 Sixpak

 LAW=0 Sixpak

 ===== Sixpak

 NO OUTPUT - INCIDENT NEUTRON - EMITTED PHOTON OR NEUTRON Sixpak

 REACTIONS ARE NOT EXPECTED. Sixpak

 Sixpak

 LAW=1 Sixpak

 ===== Sixpak

 FOR EACH INCIDENT ENERGY DISCRETE AND CONTINUOUS EMISSION SPECTRA Sixpak

 CANNOT BE MIXED TOGETHER - THEY MUST BE ALL EITHER DISCRETE OR Sixpak

 CONTINUOUS. IF DISCRETE EMISSION IS GIVEN ONLY 1 SECONDARY Sixpak

 ENERGY (NEP=1) MAY BE GIVEN = A NORMALIZED DISTRIBUTION FOR A Sixpak

 SINGLE DISCRETE EMISSION ENERGY. ALL OF THE ENDF/B-VI DATA AS Sixpak

 OF JANUARY 1992 CONFORM TO THESE LIMITATIONS. Sixpak

 Sixpak

 SINCE THE FLAG NA, TO INDICATE ISOTROPIC DISTRIBUTIONS, IS ONLY Sixpak

 GIVEN FOR EACH SECONDARY ENERGY (EP) THE PROGRAM CANNOT DECIDE Sixpak

 IN ADVANCE WHETHER OR NOT THE DISTRIBUTION WILL BE ISOTROPIC Sixpak

 AT ALL INCIDENT ENERGIES. THEREFORE ISOTROPIC DISTRIBUTIONS Sixpak

 WILL BE OUTPUT EITHER: LANG = 1 - AS 1 LEGENDRE COEFFICIENT = 0.0 Sixpak

 OR LANG = NOT 1 - AS A 2 POINT ANGULAR DISTRIBUTION AT COS = -1.0 Sixpak

 AND +1.0 WITH BOTH VALUES EQUAL TO 0.5 (A NORMALIZED ISOTROPIC Sixpak

 DISTRIBUTION). Sixpak

 Sixpak

 DISCRETE PHOTONS ARE OUTPUT IN MF=15 AS 3 POINT DISTRIBUTIONS Sixpak

 WITH SECONDARY ENERGY POINTS AT EP-DEP, EP, EP+DEP, WHERE Sixpak

 DEP=0.001\*EP. THE VALUES AT EP-DEP AND EP+DEP ARE 0.0, AND Sixpak

 AT EP THE VALUE IS 1000.0/EP TO NORMALIZE THE DISTRIBUTION. Sixpak

 Sixpak

 LAW=2 Sixpak

 ===== Sixpak

 NO LIMITATION ON REPRESENTATIONS. Sixpak

 Sixpak

 LAW=3 Sixpak

 ===== Sixpak

 NO LIMITATION ON REPRESENTATIONS. Sixpak

 Sixpak

 LAW=4 Sixpak

 ===== Sixpak

 NO OUTPUT - INCIDENT NEUTRON - EMITTED PHOTON OR NEUTRON Sixpak

 REACTIONS ARE NOT EXPECTED. Sixpak

 Sixpak

 LAW=5 Sixpak

 ===== Sixpak

 NO OUTPUT - INCIDENT NEUTRON - EMITTED PHOTON OR NEUTRON Sixpak

 REACTIONS ARE NOT EXPECTED. Sixpak

 Sixpak

 LAW=6 Sixpak

 ===== Sixpak

 NO OUTPUT - ENDF/B-VI ONLY INCLUDES 1 SECTION OF THIS TYPE OF DATA Sixpak

 FOR (N,D) 2N,P. Sixpak

 Sixpak

 LAW=7 Sixpak

 ===== Sixpak

 FOR EACH INCIDENT ENERGY THE REPRESENTATION MUST BE EITHER, Sixpak

 Sixpak

 1) SQUARE = FOR EACH INCIDENT COSINE EXACTLY THE SAME SECONDARY Sixpak

 ENERGIES. Sixpak

 Sixpak

 2) LINEAR = FOR EACH INCIDENT COSINE THE INTERPOLATION LAW Sixpak

 BETWEEN SECONDARY ENERGIES MUST BE LINEAR. Sixpak

 Sixpak

 THESE 2 PRESENTATIONS ARE THE ONLY ONES PRESENTED IN ENDF/B-VI Sixpak

 AS OF JANUARY 1992 - SO THIS PROGRAM CAN TRANSLATED ALL LAW=7 Sixpak

 DATA FOR ENDF/B-VI. Sixpak

 Sixpak

 LABORATORY VS. CENTER-OF-MASS SYSTEM Sixpak

 ================================================================== Sixpak

 IN MANY CASES PEOPLE ASSUME THAT FOR HEAVY (HIGH ATOMIC WEIGHT) Sixpak

 MATERIALS THE CENTER-OF-MASS AND LAB SYSTEMS ARE ALMOST IDENTICAL, Sixpak

 SINCE IN THIS CASE THE CENTER-OF-MASS ENERGY WILL BE MUCH SMALLER Sixpak

 THAN THE INCIDENT ENERGY. FOR A PROCESS SUCH AS ELASTIC SCATTERING Sixpak

 WHERE FOR HEAVY MATERIALS THE SECONDARY ENERGY, EP, WILL ALWAYS Sixpak

 BE A LARGE FRACTION OF THE INCIDENT ENERGY, THIS ASSUMPTION IS Sixpak

 VALID. HOWEVER, FOR THE TYPICAL REACTIONS INCLUDED IN MF=6 THIS Sixpak

 IS NOT ALWAYS TRUE - IN MANY OF THESE CASES THE SECONDARY ENERGY Sixpak

 CAN EXTEND ALL THE WAY DOWN TO ZERO, AND IN PARTICULAR IT CAN Sixpak

 BE SMALL COMPARED TO THE CENTER-OF-MASS ENERGY - WHICH MAKES THE Sixpak

 TRANSFORMATION FROM CENTER-OF-MASS TO LAB IMPORTANT. THEREFORE Sixpak

 GENERALLY TO TREAT MF=6 DATA WE MUST CONSIDER THIS TRANSFORMATION. Sixpak

 Sixpak

 THE FOLLOWING DISCUSSING ONLY APPLIES TO SPECTRA THAT MAY BE Sixpak

 OUTPUT IN MF=5 = ONLY DATA FOR NEUTRONS INCIDENT AND EMITTED - Sixpak

 IN PARTICULAR THE FOLLOWING DEFINITIONS ARE NOT GENERAL - THEY Sixpak

 ARE ONLY VALID FOR INCIDENT AND EMITTED NEUTRONS. Sixpak

 Sixpak

 DOUBLE DIFFERENTIAL DATA IN MF=6 MAY BE GIVEN IN EITHER THE LAB Sixpak

 OR C.M. SYSTEM. SIMILARLY ANGULAR DISTRIBUTIONS IN MF=4 MAY BE Sixpak

 GIVEN IN EITHER THE LAB OR C.M. SYSTEM. IN CONTRAST ENERGY Sixpak

 SPECTRA IN MF=5 CAN ONLY BE GIVEN IN THE LABORATORY SYSTEM. Sixpak

 Sixpak

 THE ANGULAR DISTRIBUTIONS OUTPUT BY THIS CODE IN MF=4 ARE IN THE Sixpak

 SAME SYSTEM IN WHICH THEY ARE GIVEN IN MF=6 - EITHER LAB OR Sixpak

 CENTER-OF-MASS SYSTEM. Sixpak

 Sixpak

 THE ENERGY SPECTRA OUTPUT BY THIS CODE IN MF=5 MUST BE IN THE LAB Sixpak

 SYSTEM - THIS IS THE ONLY ALLOWED FORM FOR MF=5 DATA. Sixpak

 Sixpak

 FOR MF=6 SPECTRA GIVEN IN THE LAB SYSTEM THIS MERELY REQUIRES Sixpak

 COPYING THE GIVEN SPECTRA TO MF=5 OUTPUT. Sixpak

 Sixpak

 FOR MF=6 SPECTRA GIVEN IN THE CENTER-OF-MASS SYSTEM ONLY FIRST Sixpak

 ORDER CORRECTIONS IN THE SPECTRA AND USED AND THEY ARE THEN Sixpak

 OUTPUT IN MF=5 AS IN THE LAB SYSTEM - THE FIRST ORDER CORRECTIONS Sixpak

 ARE DESCRIBED BELOW. Sixpak

 Sixpak

 DEFINING, Sixpak

 MM = CENTER OF MASS MOTION Sixpak

 CM = OUTGOING (EMITTED) PARTICLE IN CENTER OF MASS Sixpak

 LAB = OUTGOING (EMITTED) PARTICLE IN LAB Sixpak

 THETA = CM SCATTERING ANGLE RELATIVE TO INCIDENT DIRECTION Sixpak

 COS(CM) = COSINE OF THE CM SCATTERING ANGLE Sixpak

 Sixpak

 FOR NEUTRONS INCIDENT WITH AN ENERGY, E, AND THEREFORE A SPEED, Sixpak

 Sixpak

 VN(E) = 2\*SQRT(E)/MASS(IN) Sixpak

 Sixpak

 THE CENTER-OF-MASS SPEED IS GIVEN BY, Sixpak

 Sixpak

 V(MM) = VN(E)/(1 + A) Sixpak

 Sixpak

 AND THE CENTER OF MASS ENERGY BY, Sixpak

 Sixpak

 E(MM) = 1/2\*MASS(IN)\*V(MM)\*\*2 Sixpak

 = 1/2\*MASS(IN)\*VN(E)\*\*2/(1 + A)\*\*2 Sixpak

 = E/(1 + A)\*\*2 Sixpak

 Sixpak

 FOR DISTRIBUTIONS GIVEN IN MF=6 IN THE CM, THE SPEED, V(CM), Sixpak

 SHOULD BE VECTORIALLY ADDED TO THAT OF OUTGOING PARTICLES TO Sixpak

 DEFINE THE OUTGOING PARTICLES LAB VELOCITY, AND IN TURN IT'S Sixpak

 ENERGY, Sixpak

 Sixpak

 V(LAB)\*COS(LAB) = V(MM) + V(CM)\*COS(CM) Sixpak

 V(LAB)\*SIN(LAB) = V(CM)\*SIN(CM) Sixpak

 Sixpak

 V(LAB)\*\*2 = V(MM)\*\*2 + V(CM)\*\*2 + 2\*COS(CM)\*V(MM)\*V(CM) Sixpak

 Sixpak

 EP(LAB) = 0.5\*MASS(OUT)\*V(LAB)\*\*2 Sixpak

 Sixpak

 = E(MM) + EP(CM) + 2\*COS(CM)\*SQRT(E(MM)\*EP(CM)) Sixpak

 Sixpak

 WE CAN ALSO DEFINE THE REVERSE TRANSFORMATION USING, Sixpak

 Sixpak

 V(CM)\*COS(CM) = V(LAB)\*COS(LAB) - V(MM) Sixpak

 V(CM)\*SIN(CM) = V(LAB)\*SIN(LAB) Sixpak

 Sixpak

 V(CM)\*\*2 = V(MM)\*\*2 + V(LAB)\*\*2 - 2\*COS(LAB)\*V(MM)\*V(LAB) Sixpak

 Sixpak

 EP(CM) = 0.5\*MASS(OUT)\*V(CM)\*\*2 Sixpak

 Sixpak

 = E(MM) + EP(LAB) - 2\*COS(LAB)\*SQRT(E(MM)\*EP(LAB)) Sixpak

 Sixpak

 WE CAN DEFINE COS(LAB) FROM THE RELATIONSHIP, Sixpak

 Sixpak

 V(LAB)\*COS(LAB) = V(MM) + V(CM)\*COS(CM) Sixpak

 Sixpak

 COS(LAB) =[V(MM) + V(CM)\*COS(CM)]/V(LAB) Sixpak

 Sixpak

 [V(MM) + V(CM)\*COS(CM)] Sixpak

 COS(LAB) =--------------------------------------------- Sixpak

 SQRT[V(MM)\*\*2+V(CM)\*\*2+2\*COS(CM)\*V(MM)\*V(CM)] Sixpak

 Sixpak

 OR COS(CM) FROM THE RELATIONSHIP, Sixpak

 Sixpak

 V(CM)\*COS(CM) = V(LAB)\*COS(LAB) - V(MM) Sixpak

 Sixpak

 COS(CM) =[V(LAB)\*COS(LAB) - V(MM)]/V(CM) Sixpak

 Sixpak

 [V(LAB)\*COS(LAB) - V(MM)] Sixpak

 COS(CM) =------------------------------------------------ Sixpak

 SQRT[V(LAB)\*\*2+V(CM)\*\*2-2\*COS(LAB)\*V(LAB)\*V(MM)] Sixpak

 Sixpak

 THE JACOBIAN CAN BE DEFINED FROM, Sixpak

 Sixpak

 V(LAB)\*COS(LAB) = V(MM) + V(CM)\*COS(CM) Sixpak

 Sixpak

 J = D[COS(CM)]/D[COS(LAB)] = V(LAB)/V(CM) Sixpak

 = SQRT[EP(LAB)/EP(CM)] Sixpak

 Sixpak

 WITH THESE DEFINITIONS OF EP(LAB) AND COS(LAB) IN TERMS OF E(MM), Sixpak

 EP(CM) AND COS(CM) IT IS POSSIBLE TO PERFORM A POINT-BY-POINT Sixpak

 TRANSFORMATION OF DISTRIBUTIONS FROM THE CM TO LAB SYSTEM USING Sixpak

 THESE DEFINITIONS - OR IF WE WISHED WE COULD PERFORM THE REVERSE Sixpak

 TRANSFORMATION USING THE ABOVE RELATIONSHIPS AND THE IDENTITY, Sixpak

 Sixpak

 F(E,EP(LAB),COS(LAB))\*D(COS(LAB))=F(E,EP(CM),COS(CM))\*D(COS(CM)) Sixpak

 Sixpak

 THIS IS NOT WHAT WILL BE DONE HERE, SINCE WE WILL ONLY BE Sixpak

 INTERESTED IN THE ZEROTH ORDER MOMENTS OF THESE DISTRIBUTIONS, Sixpak

 BUT WE WILL BE INTERESTED IN DEFINING THOSE MOMENTS IN THE Sixpak

 LAB SYSTEM IN TERMS OF MF=6 SPECTRA GIVEN IN THE CM SYSTEM USING, Sixpak

 Sixpak

 F(E,EP(LAB),COS(LAB)) = F(E,EP(CM),COS(CM))\*J Sixpak

 Sixpak

 THE LIMITS OF EP(LAB) ARE DEFINED BY SETTING COS(CM) = +1 OR -1, Sixpak

 Sixpak

 EP(LAB) = (SQRT(EP(CM)) + SQRT(E(MM)))\*\*2 FOR COS(CM) = +1 Sixpak

 = (SQRT(EP(CM)) - SQRT(E(MM)))\*\*2 FOR COS(CM) = -1 Sixpak

 Sixpak

 IN THIS FORM WE CAN SEE THAT AS LONG AS THE SECONDARY ENERGY IN Sixpak

 THE CENTER-OF-MASS SYSTEM, EP(CM), IS MUCH LARGER THAN THE Sixpak

 ENERGY OF THE CENTER-OF-MASS, E(MM), THE CENTER-OF-MASS AND LAB Sixpak

 ENERGIES WILL BE ALMOST EQUAL - SIMILARLY FOR THE COSINE, IN Sixpak

 THIS CASE COS(LAB) AND COS(CM) WILL BE ALMOST EQUAL - HOWEVER, Sixpak

 FOR THE MF=6 DATA WE CANNOT ASSUME THAT THIS IS TRUE. Sixpak

 Sixpak

 TO FIRST ORDER THE ANGULAR DEPENDENCE CAN BE IGNORED, Sixpak

 Sixpak

 EP(LAB) = E(MM) + EP(CM) Sixpak

 Sixpak

 ALL THIS SAYS IS THAT TO FIRST ORDER THE EFFECT OF TRANSFORMING Sixpak

 FROM THE CM TO LAB SYSTEM IS TO INCREASE THE ENERGY OF THE Sixpak

 EMITTED PARTICLE IN THE CENTER-OF-MASS SYSTEM BY THE ENERGY OF Sixpak

 THE CENTER-OF-MASS TO DEFINE THE LAB ENERGY. Sixpak

 Sixpak

 NOT ONLY THE ENERGY, BUT ALSO THE SPECTRA MUST BE TRANSFORMED. Sixpak

 STARTING FROM THE DOUBLE DIFFERENTIAL DATA IN THE LAB SYSTEM, Sixpak

 F(E,EP,COS(LAB)), WE CAN DEFINE THE LAB SCALAR SPECTRUM AS, Sixpak

 Sixpak

 G0(E,EP) = INTEGRAL F(E,EP,COS(LAB))\*D(COS(LAB)) Sixpak

 Sixpak

 THIS IS THE NORMAL CALCULATION DEFINED ABOVE AND USED FOR DATA Sixpak

 GIVEN IN THE LAB SYSTEM. Sixpak

 Sixpak

 STARTING FROM DATA IN THE CENTER OF MASS SYSTEM F(E,EP,COS(CM)), Sixpak

 WE CAN USE THE RELATIONSHIP, Sixpak

 Sixpak

 F(E,EP,COS(LAB))\*D(COS(LAB)) = F(E,EP,COS(CM))\*J\*D(COS(LAB)) Sixpak

 Sixpak

 J = SQRT(EP(LAB)/EP(CM)) - THE JACOBIAN Sixpak

 Sixpak

 = E(MM)/EP(CM) + 1 + 2\*COS(CM)\*SQRT(E(MM)/EP(CM)) Sixpak

 Sixpak

 AS IN THE CASE OF THE ENERGY, IN THIS FORM WE CAN SEE THAT AS Sixpak

 LONG AS THE SECONDARY ENERGY IN THE CENTER-OF-MASS SYSTEM, Sixpak

 EP(CM), IS LARGE COMPARED TO THE CENTER-OF-MASS ENERGY, E(MM), Sixpak

 THE JACOBIAN IS ESSENTIALLY UNITY AND THE CENTER-OF-MASS AND LAB Sixpak

 SPECTRA WILL BE VERY SIMILAR - AGAIN, GENERALLY WE CANNOT Sixpak

 ASSUME THAT THIS IS TRUE FOR THE MF=6 SPECTRA. Sixpak

 Sixpak

 THEREFORE WE CAN ALSO DEFINE THE LAB SCALAR SPECTRUM IN TERMS OF Sixpak

 THE CM SPECTRUM IN THE FORM, Sixpak

 Sixpak

 G0(E,EP) = INTEGRAL F(E,EP,COS(CM))\*J\*D(COS(LAB)) Sixpak

 Sixpak

 CONSISTENT WITH THE ABOVE ASSUMPTION THAT THE ANGULAR DEPENDENCE Sixpak

 OF EP(LAB) CAN BE IGNORED THE JACOBIAN WILL NOT BE USED IN Sixpak

 PERFORMING THESE INTEGRALS - IN WHICH CASE THE INTEGRAL REDUCES Sixpak

 TO EXACTLY THE SAME FORM AS IF THE DATA WERE IN THE LAB SYSTEM. Sixpak

 Sixpak

 IT SHOULD BE NOTED THAT SINCE IN THIS CASE THE MF=4 ANGULAR Sixpak

 DISTRIBUTIONS ARE GIVEN IN THE CM SYSTEM AND WHEN USED IN ANY Sixpak

 APPLICATION THEY WILL BE TRANSFORMED TO THE LAB SYSTEM - WHEN Sixpak

 THIS IS DONE THE JACOBIAN WILL BE APPLIED. Sixpak

 Sixpak

 IN THIS CODE WHERE WE ARE MOSTLY CONCERNED WITH CONSERVING THE Sixpak

 NUMBER OF EMITTED PARTICLES AND AVERAGE ENERGIES THE NEUTRON Sixpak

 SPECTRA OUTPUT IN MF=5 WILL NOT BE COMPLETELY CONVERTED TO THE Sixpak

 LAB SYSTEM - ONLY FIRST ORDER CORRECTIONS WILL BE INCLUDED BY Sixpak

 INCREASING THE EMITTED PARTICLE ENERGY BY THE CENTER OF MASS Sixpak

 ENERGY, I.E., FOR A CENTER OF MASS SPECTRUM TABULATED AT CENTER Sixpak

 OF MASS ENERGIES EP(CM) THESE WILL ALL BE UNIFORMLY INCREASED Sixpak

 BY E(MM) TO ACCOUNT FOR THE CENTER OF MASS MOTION - THE SPECTRA Sixpak

 WILL NOT BE MODIFIED BY THE JACOBIAN FACTOR SQRT(EP(LAB)/EP(CM)) Sixpak

 SINCE THIS WOULD REQUIRE A DETAILED TRANSFORMATION IN ENERGY AND Sixpak

 COS(THETA) SPACE - WHICH IS JUDGED NOT TO BE WORTH PERFORMING Sixpak

 WITHIN THE LIMITS OF WHERE THE OUTPUT FROM THIS CODE IS INTENDED Sixpak

 TO BE USED. Sixpak

 Sixpak

 SINCE THE ANGULAR DISTRIBUTION IS ALWAYS OUTPUT IN THE SAME Sixpak

 SYSTEM AS WHICH IT IS GIVEN IN MF=6, NO TRANSFORMATION IS Sixpak

 REQUIRED FOR THE MF=4 OUTPUT. Sixpak

 Sixpak

 WHEN USED IN LOW ENERGY APPLICATIONS (E.G., FISSION REACTORS) THE Sixpak

 HIGH ENERGY SPECTRA PRESENTED IN MF=6 WILL BE MOSTLY IMPORTANT Sixpak

 SIMPLY IN CONSERVING PARTICLES, (E.G., AS IN (N,2N)) AND ENERGY Sixpak

 AND THE DETAILS OF THE CORRELATION AND GROSS ENERGY SPECTRA WILL Sixpak

 NOTE PLAY THAT IMPORTANT A ROLE. IN THIS CASE THE SPECTRA OUTPUT Sixpak

 BY THIS PROGRAM IN MF=5 SHOULD BE ADEQUATE. Sixpak

 Sixpak

 PLOTTAB FORMATTED OUTPUT Sixpak

 ================================================================== Sixpak

 THIS PROGRAM CONTAINS ROUTINES TO PRODUCE OUTPUT THAT CAN BE USED Sixpak

 AS INPUT TO THE PLOTTAB CODE TO OBTAIN GRAPHIC RESULTS. Sixpak

 Sixpak

 THESE ROUTINES ARE DESIGNED ONLY FOR USE BY THE AUTHOR TO CHECK Sixpak

 THIS CODE. USERS ARE ASKED NOT TO ACTIVATE OR TRY TO USE THESE Sixpak

 ROUTINES. UNLESS YOU COMPLETELY UNDERSTAND THIS CODE THE RESULTS Sixpak

 CAN BE UNRELIABLE IF YOU ACTIVATE THESE ROUTINES. Sixpak

 Sixpak

 INPUT FILES Sixpak

 ================================================================== Sixpak

 UNIT DESCRIPTION Sixpak

 ---- ----------- Sixpak

 2 INPUT LINES (BCD - 80 CHARACTERS/RECORD) Sixpak

 10 ORIGINAL ENDF/B DATA (BCD - 80 CHARACTERS/RECORD) Sixpak

 Sixpak

 OUTPUT FILES Sixpak

 ================================================================== Sixpak

 UNIT DESCRIPTION Sixpak

 ---- ----------- Sixpak

 3 OUTPUT REPORT (BCD - 120 CHARACTERS/RECORD) Sixpak

 11 ENDF/B DATA MF=4 (BCD - 80 CHARACTERS/RECORD) Sixpak

 12 ENDF/B DATA MF=5 (BCD - 80 CHARACTERS/RECORD) Sixpak

 14 ENDF/B DATA MF=15 (BCD - 80 CHARACTERS/RECORD) Sixpak

 17 ENDF/B DATA MF=12 (BCD - 80 CHARACTERS/RECORD) Sixpak

 18 ENDF/B DATA MF=14 (BCD - 80 CHARACTERS/RECORD) Sixpak

 15 PLOTTAB INPUT PARAMETERS (BCD - 80 CHARACTERS/RECORD) Sixpak

 16 PLOTTAB FORMATTED OUTPUT (BCD - 80 CHARACTERS/RECORD) Sixpak

 Sixpak

 SCRATCH FILES Sixpak

 ================================================================== Sixpak

 NONE Sixpak

 Sixpak

 OPTIONAL STANDARD FILE NAMES (SEE SUBROUTINE FILIO1 AND FILIO2) Sixpak

 ================================================================== Sixpak

 UNIT FILE NAME Sixpak

 ---- ---------- Sixpak

 2 SIXPAK.INP Sixpak

 3 SIXPAK.LST Sixpak

 10 ENDFB.IN Sixpak

 11 ENDFB.MF4 Sixpak

 12 ENDFB.MF5 Sixpak

 14 ENDFB.M15 Sixpak

 17 ENDFB.M12 Sixpak

 18 ENDFB.M14 Sixpak

 15 PLOTTAB.INP Sixpak

 16 PLOTTAB.CUR Sixpak

 Sixpak

 Sixpak

 INPUT PARAMETERS Sixpak

 ================================================================== Sixpak

 LINE COLS. DESCRIPTION Sixpak

 ---- ----- ----------- Sixpak

 1 1-72 ENDF/B INPUT DATA FILENAME Sixpak

 (STANDARD OPTION = ENDFB.IN) Sixpak

 2-N 1-6 MINIMUM MAT FOR REQUESTED RANGE Sixpak

 9-11 MINIMUM MT FOR REQUESTED RANGE Sixpak

 12-17 MAXIMUM MAT FOR REQUESTED RANGE Sixpak

 20-22 MAXIMUM MT FOR REQUESTED RANGE Sixpak

 Sixpak

 LEAVE THE DEFINITION OF THE FILENAME BLANK - THE PROGRAM WILL Sixpak

 THEN USE THE STANDARD FILENAME (ENDFB.IN). Sixpak

 Sixpak

 UP TO 100 MAT/MT RANGES MAY BE SPECIFIED. THE LIST OF RANGES IS Sixpak

 TERMINATED BY A BLANK LINE. IF THE FIRST INPUT LINE IS COMPLETELY Sixpak

 BLANK ALL DATA WILL BE PROCESSED. Sixpak

 Sixpak

 EXAMPLE INPUT NO. 1 Sixpak

 ------------------- Sixpak

 PROCESS ALL MF=6 DATA ON AN ENDF/B TAPE. USE THE STANDARD INPUT Sixpak

 DATA FILENAME ENDFB.IN IN THIS CASE THE USER CAN EITHER EXPLICITLY Sixpak

 SPECIFY THE FILENAME AND MAT/MT RANGE BY THE FOLLOWING 2 INPUT Sixpak

 LINES, Sixpak

 Sixpak

 ENDFB.IN Sixpak

 1 1 9999 999 Sixpak

 (BLANK LINE, TERMINATES REQUEST LIST) Sixpak

 Sixpak

 OR BY INPUTTING 2 BLANK LINE = PROCESS EVERYTHING. Sixpak

 Sixpak

 EXAMPLE INPUT NO. 2 Sixpak

 ------------------- Sixpak

 PROCESS BE-9, MAT=425, MT=16. READ THE DATA FROM ENDFB6\BE9. Sixpak

 IN THIS CASE THE FOLLOWING 3 INPUT LINES ARE REQUIRED, Sixpak

 Sixpak

 ENDFBB6\BE9 Sixpak

 425 16 425 16 Sixpak

 (BLANK LINE, TERMINATES REQUEST LIST) Sixpak

 Sixpak

 EXAMPLE INPUT NO. 3 Sixpak

 ------------------- Sixpak

 PROCESS ALL MT=16 (N,2N) DATA. THIS CAN BE DONE BY SPECIFYING THE Sixpak

 MAXIMUM MAT RANGE = 1 TO 9999, AND MT=16 FOR THE MINIMUM AND Sixpak

 MAXIMUM MT RANGE. READ THE DATA FROM ENDFB6\K300. IN THIS CASE Sixpak

 CASE THE FOLLOWING 3 INPUT LINES ARE REQUIRED, Sixpak

 Sixpak

 ENDFB6\K300 Sixpak

 1 16 9999 16 Sixpak

 (BLANK LINE, TERMINATES REQUEST LIST) Sixpak

 Sixpak

 ======================================================================= Sixpak