02-2113

5
18-76

LA-6219-MS

Informal Report

UC-34c and UC-80

Reporting Date: January 1976

Issued: February 1976

LINX and BINX: CCCC Utility Codes for the MINX Multigroup Processing Code

by

R. E. MacFarlane

R. B. Kidman

NOTICE

PORTIONS OF THIS REPORT ARE ILLEGIBLE. It
has been reproduced from the best available
copy to permit the broadest possible avail-
ability.

los alamos
scientific laboratory

of the University of California

LOS ALAMOS, NEW MEXICO 87545

An Affirmative Action/Equal Opportunity Employer

MASTER

In the interest of prompt distribution, this report was not edited by the Technical Information staff.

This work was supported by the US Energy Research and Development Administration, Division of Reactor Research and Development.

Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22151
Price: Printed Copy \$4.50 Microfiche \$2.25

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights.

LINK AND BINX: CCCC UTILITY CODES FOR THE
MINX MULTIGROUP PROCESSING CODE

by

R. E. MacFarlane and R. B. Kidman

ABSTRACT

The LINK and BINX codes have been written to manipulate multigroup cross-section libraries in the CCCC format. The LINK code is used to merge two ISOTXS or BRKXNS libraries. The BINX code is used to convert any ISOTXS, BRKXNS, or DLAYXS library from binary to BCD mode or back with the option to list all or any part of the library. These codes are utilities for the MINX multigroup processing system.

I. INTRODUCTION

The new MINX code, a Multigroup Interpretation of Nuclear Cross Sections, was designed to produce libraries of multigroup constants for the CCCC interface system.¹ A Los Alamos Scientific Laboratory report on MINX is in preparation and will soon be published. The CCCC system is an ambitious attempt by the Division of Reactor Research and Development (DRRD) of the Energy Research and Development Agency (ERDA) to provide a set of specifications to make reactor design codes more transportable between installations, and to provide a set of interface files which can facilitate communication between these reactor codes. An important sub-class of these interface files is the cross-section interfaces: ISOTXS -- cross sections, scattering matrices, and other constants at zero temperature and infinite dilution;^{*} BRKXNS -- self-shielding factors and associated cross sections; and DLAYXS -- delayed neutron yields and spectra by time group. The MINX code produces the first two files using the latest version of the CCCC formats.² The DLAYXS files can be generated using NUJOY.³ The LINK and BINX codes are used to manipulate these interface files.

* Or any other single temperature and composition or geometry.

II. THE LINK CODE

When neutron multigroup cross sections are generated using MINX, only one isotope is processed at a time. It is necessary, therefore, to have a program which can merge a new isotope into an existing library. Also, for storage limitations, convenience, or historical reasons, separate libraries with different groups of isotopes may exist. The library maintenance program must be able to merge two multi-isotope libraries. Following the general philosophy of the CCCC interface system, these libraries will be in binary mode.

The code which was designed to meet these requirements is called LINK (Library Utility for MINX). It takes as input two ISOTXS or BRKXNS files in binary mode and produces a new merged ISOTXS or BRKXNS file, also in binary mode. No user input is required. The code automatically determines the file type and makes certain consistency checks between the two files. See Table I for operating information.

III. THE BINX CODE

Binary input/output is clearly more efficient than BCD mode. However, it is rare to find two computers that can read each others binary tapes. Therefore, a set of BCD formats was specified for

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

MASTER

TABLE I

LINK OPERATING INFORMATION

Input/Output Units

- 3 -- primary binary input file.^a
- 4 -- secondary binary input file.
- 5 -- final binary output file.^b
- 6 -- listing of messages and diagnostics.

User's Input

None.

^a ISOTXS or BRKXS only.^b User identification, version, and library identifier are taken from the primary input file.

the CCCC-III interface files to facilitate communication between installations. The BINX code (Bin/BCD Utility for MINX) was designed to fill this role. It converts the binary files produced by MINX or LINK into BCD form, converts BCD files back to binary mode, or lists the library file selectively. Input and output units and user input are summarized in Table II. Note that the selective listing capability allows the user to list, for example, only the "file identification," "file control," and "file data" records from an ISOTXS library.

IV. CODING DETAILS

The LINK and BINX codes are listed in Appendix A and Appendix B, respectively. The codes are completely variably dimensioned and storage requirements can be increased or decreased by changing the size of blank common in each main routine. The flow of logic is made clear by the comment cards. As much as possible, CCCC names have been used for variables.

The coding is compatible with both CDC and IBM machines. To convert to an IBM machine, change the program cards and search for comment cards with "IBM" starting in column 3. These indicate changing the "MULT" parameter from 1 to 2 and changing all Hollerith variables (initial letter "H") to double precision. The "COPYER" and "IESM" routines in LINK call on LASH system routines. Replace these calls with equivalent operations on the new system.

The codes reported here are very different from the early versions.^{4,5} Errors have been corrected, extensive new capabilities were added, and IBM compatibility changes were included.

TABLE II

BINX OPERATING INFORMATION

Input/Output Units

- 3 -- input binary (BCD) unit.^a
- 4 -- output BCD (binary) unit.
- 5 -- system input for user's input.
- 6 -- system output for listing and diagnostics.

User's Input

One card (1215): MODE, NTYPE, IRD(1:40)

MODE = 1 means binary input and BCD output.

MODE = 2 means BCD input and binary output.

NTYPE = 1 means ISOTXS.

NTYPE = 2 means BRKXS.

NTYPE = 3 means DLAYXS.

IRD(1) = 1 means print the 1st record type.

^a ISOTXS, BRKXS, or DLAYXS only.

REFERENCES

1. B. M. Carmichael, D. A. Meneley, and D. E. Gandy, "Report of the Subcommittee on Standard Interface Files," prepared for the Committee on Computer Code Coordination, Los Alamos Scientific Laboratory report LA-5322-MS (1973).
2. B. M. Carmichael, "Standard Interface Files and Procedures for Reactor Physics Code, Version III," Los Alamos Scientific Laboratory report LA-5486-MS (1974).
3. R. E. MacFarlane and R. M. Boicourt, "RIGV: A Neutron and Photon Cross Section Processing System," Trans. Am. Nucl. Soc. 22, 720 (1975).
4. P. D. Soran, "LINK" Library Interpretation of Neutron X-Sections," Los Alamos Scientific Laboratory report LA-5629-MS (1974).
5. P. D. Soran, "BINX-BCD Interpretation of Neutron X-Sections," Los Alamos Scientific Laboratory report LA-5644-MS (1974).

APPENDIX A

LISTING OF LINK CODE

LAST Identification No. LP-0314

PROGRAM LINK (INP,OUT,FSEIS,FSEIN,FSEIA,FSEYS=INP,FSEY=OUT)	LINE	2
C *****	LINK	1
C MERGE TWO ISOTXS ON MARKS CELL FILES	LINK	2
C BINARY INPUT FILES ARE UNIT 1 AND UNIT 2	LINK	3
C BINARY OUTPUT FILE IS UNIT 3	LINK	4
C ERROR MESSAGES AND PRINT OUT ARE ON UNIT 5	LINK	5
C VERSION 111 RECC FOR CMC-7000 AUG 1974	LINK	6
C GROUP 1-2, LOS ALAMOS SCIENTIFIC LABORATORY	LINK	7
C *****	LINK	8
C COMMON A(10000),M(10000),C(10000),MULT	LINK	9
C IN* DIMENSION NISO,MNOX,NO,MM,MC	LINK	10
C DIMENSION I(1),I2(1),I3(1),M(1),M2(1),MC(1)	LINK	11
C EQUIVALENCE (A,I,M), (M,I2,M2), (C,I,MC)	LINK	12
C DATA NISO,MNOX/MISOXS,MMNOXS/	LINK	13
C MULT=1	LINK	14
C IN* MULT=2	LINK	15
C	LINK	16
C SET-UP I/O UNITS	LINK	17
C IUS=3	LINK	18
C IUS=4	LINK	19
C IUS=5	LINK	20
C IUS=6	LINK	21
C IUS=7	LINK	22
C REMIND IUS	LINK	23
C REMIND IUS	LINK	24
C REMIND IUS	LINK	25
C	LINK	26
C PRINT HEADER	LINK	27
C WRITE (IUS,50)	LINK	28
C	LINK	29
C READ FILE IDENTIFICATION RECORDS AND DETERMINE TYPE	LINK	30
C NISO=1,MULT=1	LINK	31
C CALL READ (IUS,1,A(1),NISO,1)	LINK	32
C CALL READ (IUS,1,B(1),MNO,1)	LINK	33
C IF (A(1),NE,I2(1)) GO TO 36	LINK	34
C WRITE (IUS,60)A(1)	LINK	35
C CALL WRTF (IUS,1,A(1),NISO,1)	LINK	36
C IF (A(1),EQ,NISO) GO TO 38	LINK	37
C IF (A(1),EQ,MNO) GO TO 38	LINK	38
C GO TO 40	LINK	39
C	LINK	40
C MERGE TWO ISOTXS FILES	LINK	41
C 10 CALL MISOX (IUS,I2,I3,I4)	LINK	42
C RETURN	LINK	43
C	LINK	44
C MERGE TWO MNOXS FILES	LINK	45
C 20 CALL MNOXS (IUS,I2,I3,I4,I5,I6)	LINK	46
C RETURN	LINK	47
C	LINK	48
C FORMER FILES	LINK	49
C 30 WRITE (IUS,70)M(1),M2(1)	LINK	50
C STOP 1	LINK	51
C 40 WRITE (IUS,80)A(1)	LINK	52
C STOP 2	LINK	53
C	LINK	54
C 50 FORMAT (3X//LINE...MERGE ISOTXS ON MARKS FILES)	LINK	55
C 60 FORMAT (3X//FILE IS ,A6)	LINK	56
C 70 FORMAT (3X//*****ERROR*****INPUT FILES ARE DIFFERENT,2(2X,A6))	LINK	57
C 80 FORMAT (3X//*****ERROR*****LINK WILL NOT PROCESS ,A6)	LINK	58
C END	LINK	59
	LINK	60
	LINK	61

	SUBROUTINE MISDIX(IU3,IU4,IU5,IU6)	LINE	62
C	*****	LINE	63
C	MERGE TWO ISOTXS FILES	LINE	64
C	BINARY INPUT FILES ARE ON UNITS AND UNIT4	LINE	65
C	BINARY OUTPUT FILE IS ON UNIT4	LINE	66
C	PRINT OUT AND ERROR MESSAGES APPEAR ON UNIT 6	LINE	67
C	VERSION III CCCC FOR CDC-7600 AUG 1974	LINE	68
C	*****	LINE	69
	COMMON A(10000),B(10000),C(10000),MULT	LINE	70
C IBM	DOUBLE HA,HB,HC	LINE	71
	DIMENSION IAF(1),IBF(1),IC(1),HA(1),HB(1),HC(1)	LINE	72
	EQUIVALENCE (A,IA,HA),(B,IB,HB),(C,IC,HC)	LINE	73
C		LINE	74
C	FILE IDENTIFICATION READ IN CALLING PROGRAM	LINE	75
	IREF=1	LINE	76
C		LINE	77
C	COUNT NUMBER OF RECORDS ON FIRST INPUT FILE	LINE	78
C		LINE	79
	NREC=0	LINE	80
	10 NREC=NREC+1	LINE	81
	CALL NFEED (IU3,NREC,A(1),1,1)	LINE	82
	IF (IEND(IU3).EQ.0) GO TO 10	LINE	83
	NREC=NREC-1	LINE	84
	REWIND IU3	LINE	85
	CALL NFEED (IU3,1,A(1),1,1)	LINE	86
C		LINE	87
C	FILE CONTROL	LINE	88
C		LINE	89
	IREF=IREF+1	LINE	90
	CALL NFEED (IU3,IREF,A(1),A,1)	LINE	91
	NISU3=IA(2)*MULT	LINE	92
	ICHIS3=IA(6)	LINE	93
	NSCM3=IA(7)	LINE	94
	NGROUP=IA(1)	LINE	95
	NAD3=IA(2)+1*MULT*(IA(2)+12)+(A(1)*(2+IA(6)*(2/(IA(6)+1)))	LINE	96
	CALL NFEED (IU4,IREF,H(1),A,1)	LINE	97
	NAD4=IB(2)+1*MULT*(IB(2)+12)+(B(1)*(2+IB(6)*(2/(IB(6)+1)))	LINE	98
	IF (IA(1).NE.IB(1)) GO TO 100	LINE	99
	NISU4=IB(2)*MULT	LINE	100
	NSCH4=IB(7)	LINE	101
	ICHIS4=IB(6)	LINE	102
	NISU=IA(2)+IB(2)	LINE	103
	IA(2)=NISU	LINE	104
	IA(3)=MAX0(IA(3),IB(3))	LINE	105
	IA(4)=MAX0(IA(4),IB(4))	LINE	106
	IA(5)=MAX0(IA(5),IB(5))	LINE	107
	IA(6)=MAX0(IA(6),IB(6))	LINE	108
	ICHIS=IA(6)	LINE	109
	IA(7)=MAX0(IA(7),IB(7))	LINE	110
	NSCMAX=IA(7)	LINE	111
	NSBLOCK=IA(8)	LINE	112
	CALL NTF (IU5,IREF,A(1),B,1)	LINE	113
C		LINE	114
C	READ FILE DATA FROM MASTER AND NEW TAPE	LINE	115
C		LINE	116
	IREF=IREF+1	LINE	117
	CALL NFEED (IU3,IREF,A(1),NWD3,1)	LINE	118
	CALL NFEED (IU4,IREF,H(1),NWD4,1)	LINE	119
	NEX=12*MULT	LINE	120
	CALL STOW (A(1),C(1),NEX)	LINE	121
	NEX3=NEX+1	LINE	122
	NEX4=NEX3	LINE	123
	NEX8=NEX3	LINE	124
C	ISOTOPIC LABELS	LINE	125
	CALL STOW (A(NEX3),C(NEX8),NISU3)	LINE	126
	NEX3=NEX3+NISU3	LINE	127
	NEX8=NEX8+NISU3	LINE	128
	CALL STOW (C(NEX4),L(NEX8),NISU4)	LINE	129
	NEX4=NEX4+NISU4	LINE	130
	NEX8=NEX8+NISU4	LINE	131
	WRITE (IU6,IU5)	LINE	132
	WRITE (IU6,IU5) (I,HC(I+NEX),I=1,NISU)	LINE	133

C	SET CHI	LINX	134
	IF (ICHISA.EQ.1.AND.ICHISB.EQ.0) CALL STOW (A(NEX3),C(NEX8),NGROUP	LINX	135
	1)	LINX	136
	IF (ICHISB.EQ.1.AND.ICHISA.LE.1) CALL STOW (B(NEX4),C(NEX8),NGROUP	LINX	137
	1)	LINX	138
	IF (ICHISA.EQ.1) NEX3=NEX3+NGROUP	LINX	139
	IF (ICHISB.EQ.1) NEX4=NEX4+NGROUP	LINX	140
	IF (ICHIS1.EQ.1) NEX8=NEX8+NGROUP	LINX	141
C	NEUTRON VELOCITY	LINX	142
	CALL STOW (A(NEX3),C(NEX8),NGROUP)	LINX	143
	NEX3=NEX3+NGROUP	LINX	144
	NEX4=NEX4+NGROUP	LINX	145
	NEX8=NEX8+NGROUP	LINX	146
C	MAX ENERGY BOUNDARIES	LINX	147
	CALL STOW (A(NEX3),C(NEX8),NGROUP)	LINX	148
	NEX3=NEX3+NGROUP	LINX	149
	NEX4=NEX4+NGROUP	LINX	150
	NEX8=NEX8+NGROUP	LINX	151
C	MINIMUM ENERGY	LINX	152
	CALL STOW (A(NEX3),C(NEX8),1)	LINX	153
	NEX3=NEX3+1	LINX	154
	NEX8=NEX8+1	LINX	155
	NEX4=NEX4+1	LINX	156
C	RECORDS TO BE SKIPPED	LINX	157
	NIS03=NIS03/MULT	LINX	158
	NIS04=NIS04/MULT	LINX	159
	CALL STOW (A(NEX3),C(NEX8),NIS03)	LINX	160
	NEX8=NEX8+NIS03	LINX	161
	NEXR=NEXR-2	LINX	162
	DO 20 I=1,NIS04	LINX	163
20	IC(NEXR+I-1)=NEXR+I+(NEX4+I-1)	LINX	164
	NWDS=NEXR+NIS04-1	LINX	165
	CALL RTTE (IUB,IREF,C(1),NWDS,1)	LINX	166
C		LINX	167
C	SET CHI DATA	LINX	168
	IF (ICHIST.LE.1) GO TO 30	LINX	169
	IREF=IREF+1	LINX	170
	NWD3=NGROUP*(ICHISA+1)	LINX	171
	NWD4=NGROUP*(ICHISB+1)	LINX	172
	IF (ICHISA.GT.1) CALL REED (IUB,IREF,A(1),NWD3,1)	LINX	173
	IF (ICHISB.GT.1) CALL REED (IUB,IREF,B(1),NWD4,1)	LINX	174
	IF (ICHISA.GT.ICHISB) CALL RTTE (IUB,IREF,A(1),NWD3,1)	LINX	175
	IF (ICHISA.LE.ICHISB) CALL RTTE (IUB,IREF,B(1),NWD4,1)	LINX	176
30	CONTINUE	LINX	177
C		LINX	178
C	LOOP OVER ISOTOPES ON BOTH TAPES	LINX	179
C		LINX	180
	IUN=IUB	LINX	181
	NSCMN=NSCMN	LINX	182
	NISON=NIS03	LINX	183
	IREF=IREF	LINX	184
	NWD8=3*MULT+17+NSCMN*(2*NGROUP+2)	LINX	185
40	CONTINUE	LINX	186
	IREFN=IREF	LINX	187
	DO 100 I=1,NISON	LINX	188
C		LINX	189
C	ISOTOPE CONTROL AND GROUP INDEPENDENT DATA	LINX	190
C		LINX	191
	IREFN=IREFN+1	LINX	192
	NWDN=3*MULT+17+NSCMN*(2*NGROUP+2)	LINX	193
	CALL REED (IUN,IREFN,A(1),NWDN,1)	LINX	194
	NN=3*MULT+17	LINX	195
	DO 50 I=1,NN	LINX	196
50	IC(I)=IA(I)	LINX	197
	ICM1=IA(3*MULT+1)	LINX	198
	IN=NN	LINX	199
	IR=NN	LINX	200
C	IUSCT	LINX	201
	DO 60 I=1,NSCMN	LINX	202
	IF (I.LE.NSCMN) IC(IR+I)=IA(IN+I)	LINX	203
	IF (I.GT.NSCMN) IC(IR+I)=0	LINX	204

60	CONTINUE	LINX	205
	IR=IR+NSCMAX	LINX	206
	IN=IN+NSCMN	LINX	207
C	LORD	LINX	208
	DO 70 I=1,NSCMAX	LINX	209
	IF (I.LE.NSCMN) TC(IA+I)=IA(IN+I)	LINX	210
	IF (I.GT.NSCMN) TC(IA+I)=0	LINX	211
70	CONTINUE	LINX	212
	IR=IR+NSCMAX	LINX	213
	IN=IN+NSCMN	LINX	214
	K0=IR	LINX	215
	KN=IN	LINX	216
C	JBAND	LINX	217
	DO 80 I=1,NSCMAX	LINX	218
	DO 80 J=1,NGROUP	LINX	219
	K0=K0+1	LINX	220
	IF (I.LE.NSCMN) KN=KN+1	LINX	221
	IF (I.LE.NSCMN) TC(K0)=IA(KN)	LINX	222
	IF (I.GT.NSCMN) TC(K0)=0	LINX	223
80	CONTINUE	LINX	224
	IR=IR+NSCMAX+NGROUP	LINX	225
	IN=IN+NSCMN+NGROUP	LINX	226
	K0=IR	LINX	227
	KN=IN	LINX	228
C	IJJ	LINX	229
	DO 90 I=1,NSCMAX	LINX	230
	DO 90 J=1,NGROUP	LINX	231
	K0=K0+1	LINX	232
	IF (I.LE.NSCMN) KN=KN+1	LINX	233
	IF (I.LE.NSCMN) TC(K0)=JA(KN)	LINX	234
	IF (I.GT.NSCMN) TC(K0)=0	LINX	235
90	CONTINUE	LINX	236
	CALL XIF (IIR,IIECA,C(1),NWDN,1)	LINX	237
C		LINX	238
C	PRINCIPAL CROSS SECTIONS	LINX	239
C		LINX	240
	IIECA=IIECA+1	LINX	241
	CALL COPYR (IUN,IIR,1)	LINX	242
C		LINX	243
C	ISOIPE CHI DATA	LINX	244
C		LINX	245
	IF (JCH1.LE.1) GO TO 120	LINX	246
	IIECA=IIECA+1	LINX	247
	CALL COPYR (IUN,IIR,1)	LINX	248
100	CONTINUE	LINX	249
C		LINX	250
C	SCATTERING SUB-ROCKS	LINX	251
C		LINX	252
	DO 130 I=1,NSCMN	LINX	253
	LORDN=IA(NN+NSCMN+I)	LINX	254
	K=2+NSCMN+NN+(I-1)*NGROUP	LINX	255
	INC=(NGROUP-1)/NSBLUK+1	LINX	256
	DO 120 J=1,NSBLUK	LINX	257
	JL=(J-1)*INC+1	LINX	258
	JU=J+INC	LINX	259
	KMAX=0	LINX	260
	DO 110 JJ=JL,JU	LINX	261
110	KMAX=KMAX+IA(K+JJ)	LINX	262
	KMAX=KMAX+1	LINX	263
	IF (NWDN.EQ.0) GO TO 120	LINX	264
	IIECA=IIECA+1	LINX	265
	CALL COPYR (IUN,IIR,1)	LINX	266
120	CONTINUE	LINX	267
130	CONTINUE	LINX	268
140	CONTINUE	LINX	269
	IF (IUN.EJ.114) GO TO 150	LINX	270
	IUN=104	LINX	271
	NSCMN=NSCM4	LINX	272
	NISDN=NIS04	LINX	273
	GO TO 40	LINX	274
150	CONTINUE	LINX	275

C	RETURN	LINX	276
C	ERROR EXITS	LINX	277
C		LINX	278
C	16P WRITE (IUB,170)	LINX	279
	STOP 1	LINX	280
		LINX	281
C		LINX	282
	17H FORMAT (42HD***ERROR***GROUP STRUCTURES ARE DIFFERENT)	LINX	283
	18H FORMAT (24HDISOTOPES ON MERGED FILE?)	LINX	284
	19H FORMAT (B1,I2,4A,A6)	LINX	285
	END	LINX	286
	SUBROUTINE MARKXS(IU3,IU4,IUB,IUB)	LINX	287
C	*****	LINX	288
C	MERGE TWO MARKXS FILES	LINX	289
C	BINARY INPUT FILES ARE ON UNITS AND UNIT4	LINX	290
C	BINARY OUTPUT FILE IS ON UNIT4	LINX	291
C	ERROR MESSAGES ARE WRITTEN UNTO UNIT4	LINX	292
C	VERSION 111 CCCC FOR CDC-7600 AUG 1974	LINX	293
C	*****	LINX	294
	COMMON A(IUBH0),R(IUBH0),C(IUBH0),MULT	LINX	295
C	10H DOUBLE MA,MB,MC	LINX	296
	DIMENSION IAC(1),IB(1),IC(1),HAC(1),HIB(1),HIC(1)	LINX	297
	EQUIVALENCE (A,IA,HA),(B,IB,HB),(C,IC,HC)	LINX	298
		LINX	299
C	FILE IDENTIFICATION READ IN CALLING PROGRAM	LINX	300
	IREC=1	LINX	301
		LINX	302
C	FILE CONTROL	LINX	303
C		LINX	304
	IREC=IREC+1	LINX	305
	CALL REED (IU3,IREC,A(1),4,1)	LINX	306
	CALL REED (IU4,IREC,R(1),4,1)	LINX	307
	IF (IAC(1).NE.IB(1)) GO TO 10	LINX	308
	NGROUP=IA(1)	LINX	309
	IC(1)=NGROUP	LINX	310
	NIS03=IA(2)	LINX	311
	NIS04=IB(2)	LINX	312
	NIS05=NIS03+NIS04	LINX	313
	IC(2)=NIS05	LINX	314
	NSIG3=IA(3)	LINX	315
	NSIG4=IB(3)	LINX	316
	NSIG5=NSIG3+NSIG4	LINX	317
	IC(3)=NSIG5	LINX	318
	NTFM3=IA(4)	LINX	319
	NTFM4=IB(4)	LINX	320
	NTFM5=NTFM3+NTFM4	LINX	321
	IC(4)=NTFM5	LINX	322
	CALL WITE (IUB,IREC,C(1),4,1)	LINX	323
		LINX	324
C	FILE DATA	LINX	325
C		LINX	326
	IREC=IREC+1	LINX	327
	NND3=(4+MULT)+NIS03+NSIG3+NTFM3+NGROUP+1	LINX	328
	NND4=(4+MULT)+NIS04+NSIG4+NTFM4+NGROUP+1	LINX	329
	CALL REED (IU3,IREC,A(1),NND3,1)	LINX	330
	CALL REED (IU4,IREC,R(1),NND4,1)	LINX	331
	NEX3=1	LINX	332
	NEX4=1	LINX	333
	NEX5=1	LINX	334
C	NIS05H	LINX	335
	NIS03=NIS03+MULT	LINX	336
	NIS04=NIS04+MULT	LINX	337
	CALL STOP (A(NEX3),L(NEX4),NTS03)	LINX	338
	NEX3=NEX3+NIS03	LINX	339
	NEX4=NEX4+NIS03	LINX	340
	CALL STOP (B(NEX4),C(NEX5),NTS04)	LINX	341

	NEX4=NEX4+NIS04	LINX	342
	NEX8=NEX8+NIS04	LINX	343
	WRITE (IU6,30)	LINX	344
	WRITE (IU6,40)(1,MC(1),J=1,NIS05H)	LINX	345
	NIS(3)=NIS03/MULT	LINX	346
	NIS04=NIS04/MULT	LINX	347
C	X	LINX	348
	CALL STOW (A(NEX3),C(NEXR),NSIG3)	LINX	349
	NEX3=NEX3+NSIG3	LINX	350
	NEX8=NEX8+NSIG3	LINX	351
	CALL STOW (D(NEX4),C(NEXR),NSIG4)	LINX	352
	NEX4=NEX4+NSIG4	LINX	353
	NEX8=NEX8+NSIG4	LINX	354
C	TO	LINX	355
	CALL STOW (A(NEX3),C(NEXR),NTEM3)	LINX	356
	NEX3=NEX3+NTEM3	LINX	357
	NEX8=NEX8+NTEM3	LINX	358
	CALL STOW (B(NEX4),C(NEXR),NTEM4)	LINX	359
	NEX4=NEX4+NTEM4	LINX	360
	NEX8=NEX8+NTEM4	LINX	361
C	EMAX	LINX	362
	CALL STOW (A(NEX3),C(NEXR),NGROUP)	LINX	363
	NEX3=NEX3+NGROUP	LINX	364
	NEX8=NEX8+NGROUP	LINX	365
	NEX4=NEX4+NGROUP	LINX	366
C	EMIN	LINX	367
	CALL STOW (A(NEX3),C(NEXR),1)	LINX	368
	NEX3=NEX3+1	LINX	369
	NEX8=NEX8+1	LINX	370
	NEX4=NEX4+1	LINX	371
C	JBFL	LINX	372
	CALL STOW (A(NEX3),C(NEXR),NIS03)	LINX	373
	NEX3=NEX3+NIS03	LINX	374
	NEX8=NEX8+NIS03	LINX	375
	CALL STOW (D(NEX4),C(NEXR),NIS04)	LINX	376
	NEX4=NEX4+NIS04	LINX	377
	NEX8=NEX8+NIS04	LINX	378
C	JBFH	LINX	379
	CALL STOW (A(NEX3),C(NEXR),NIS03)	LINX	380
	NEX3=NEX3+NIS03	LINX	381
	NEX8=NEX8+NIS03	LINX	382
	CALL STOW (B(NEX4),C(NEXR),NIS04)	LINX	383
	NEX4=NEX4+NIS04	LINX	384
	NEX8=NEX8+NIS04	LINX	385
C	NTABP	LINX	386
	CALL STOW (A(NEX3),C(NEXR),NIS03)	LINX	387
	NEX3=NEX3+NIS03	LINX	388
	NEX8=NEX8+NIS03	LINX	389
	CALL STOW (D(NEX4),C(NEXR),NIS04)	LINX	390
	NEX4=NEX4+NIS04	LINX	391
	NEX8=NEX8+NIS04	LINX	392
C	NTABT	LINX	393
	CALL STOW (A(NEX3),C(NEXR),NIS03)	LINX	394
	NEX3=NEX3+NIS03	LINX	395
	NEX8=NEX8+NIS03	LINX	396
	CALL STOW (B(NEX4),C(NEXR),NIS04)	LINX	397
	NEX4=NEX4+NIS04	LINX	398
	NEX8=NEX8+NIS04	LINX	399
C	WRITE THE RECORD	LINX	400
	NWDS=NEX8-1	LINX	401
	CALL RITE (IU8,IREC,C(1),NWDS,1)	LINX	402
C		LINX	403
C	FINISH COPYING THE FILES	LINX	404
C		LINX	405
	NREC3=2*NIS03	LINX	406
	NREC4=2*NIS04	LINX	407
	CALL COPYER (IU5,IU8,NREC3)	LINX	408
	CALL COPYER (IU4,IU8,NREC4)	LINX	409
	RETURN	LINX	410
C		LINX	411
C	ERROR EXITIS	LINX	412
C		LINX	413

Line	Address	Instruction
1	0000	START (100, 20)
2	0001	STOP 1
3	0002	IN CONTINUE
4	0003	WRITE (100, 20)
5	0004	STOP 1
6	0005	IN CONTINUE
7	0006	WRITE (100, 20)
8	0007	STOP 1
9	0008	IN CONTINUE
10	0009	WRITE (100, 20)
11	0010	STOP 1
12	0011	IN CONTINUE
13	0012	WRITE (100, 20)
14	0013	STOP 1
15	0014	IN CONTINUE
16	0015	WRITE (100, 20)
17	0016	STOP 1
18	0017	IN CONTINUE
19	0018	WRITE (100, 20)
20	0019	STOP 1
21	0020	IN CONTINUE
22	0021	WRITE (100, 20)
23	0022	STOP 1
24	0023	IN CONTINUE
25	0024	WRITE (100, 20)
26	0025	STOP 1
27	0026	IN CONTINUE
28	0027	WRITE (100, 20)
29	0028	STOP 1
30	0029	IN CONTINUE
31	0030	WRITE (100, 20)
32	0031	STOP 1
33	0032	IN CONTINUE
34	0033	WRITE (100, 20)
35	0034	STOP 1
36	0035	IN CONTINUE
37	0036	WRITE (100, 20)
38	0037	STOP 1
39	0038	IN CONTINUE
40	0039	WRITE (100, 20)
41	0040	STOP 1
42	0041	IN CONTINUE
43	0042	WRITE (100, 20)
44	0043	STOP 1
45	0044	IN CONTINUE
46	0045	WRITE (100, 20)
47	0046	STOP 1
48	0047	IN CONTINUE
49	0048	WRITE (100, 20)
50	0049	STOP 1
51	0050	IN CONTINUE
52	0051	WRITE (100, 20)
53	0052	STOP 1
54	0053	IN CONTINUE
55	0054	WRITE (100, 20)
56	0055	STOP 1
57	0056	IN CONTINUE
58	0057	WRITE (100, 20)
59	0058	STOP 1
60	0059	IN CONTINUE
61	0060	WRITE (100, 20)
62	0061	STOP 1
63	0062	IN CONTINUE
64	0063	WRITE (100, 20)
65	0064	STOP 1
66	0065	IN CONTINUE
67	0066	WRITE (100, 20)
68	0067	STOP 1
69	0068	IN CONTINUE
70	0069	WRITE (100, 20)
71	0070	STOP 1
72	0071	IN CONTINUE
73	0072	WRITE (100, 20)
74	0073	STOP 1
75	0074	IN CONTINUE
76	0075	WRITE (100, 20)
77	0076	STOP 1
78	0077	IN CONTINUE
79	0078	WRITE (100, 20)
80	0079	STOP 1
81	0080	IN CONTINUE
82	0081	WRITE (100, 20)
83	0082	STOP 1
84	0083	IN CONTINUE
85	0084	WRITE (100, 20)
86	0085	STOP 1
87	0086	IN CONTINUE
88	0087	WRITE (100, 20)
89	0088	STOP 1
90	0089	IN CONTINUE
91	0090	WRITE (100, 20)
92	0091	STOP 1
93	0092	IN CONTINUE
94	0093	WRITE (100, 20)
95	0094	STOP 1
96	0095	IN CONTINUE
97	0096	WRITE (100, 20)
98	0097	STOP 1
99	0098	IN CONTINUE
100	0099	WRITE (100, 20)

APPENDIX B
LISTING OF BINX CODE
LASL Identification No. LP-0299

PROGRAM BINX (INP,OUT,FSET3,FSET4,FSET5=INP,FSET6=OUT)	BINX	2
C *****	BINX	3
C CONVE (MODE OF ISOTXS, BRKOXS, OR DLAYXS CCCC FILE,	BINX	4
C THE INPUT (BIN OR BCD) IS ON UNIT 3	BINX	5
C THE OUTPUT (BCD OR BIN) IS ON UNIT 4	BINX	6
C PRINTED OUTPUT AND ERROR MESSAGES ARE ON UNIT 6	BINX	7
C VERSIO III CCCC FOR CDC-7600 AUG 1974	BINX	8
C GROUP 2, LOS ALAMOS SCIENTIFIC LABORATORY	BINX	9
C *****	BINX	10
C COMMON A(30000)	BINX	11
C COMMON /OPTS/ MODE,NTYPE,IRD(10),MULT	BINX	12
C MULT=1	BINX	13
C IBM MULT=2	BINX	14
C	BINX	15
C DEFINE I/O UNITS	BINX	16
C IU3=3	BINX	17
C IU8=8	BINX	18
C IU5=5	BINX	19
C IU6=6	BINX	20
C REWIND IU3	BINX	21
C REWIND IU8	BINX	22
C	BINX	23
C READ USER OPTIONS	BINX	24
C * MODE=1 MEANS BINARY INPUT AND BCD OUTPUT	BINX	25
C * MODE=2 MEANS BCD INPUT AND BINARY OUTPUT	BINX	26
C * NTYPE=1 MEANS ISOTXS FILE	BINX	27
C * NTYPE=2 MEANS BRKOXS FILE	BINX	28
C * NTYPE=3 MEANS DLAYXS FILE	BINX	29
C * IRD CONTROLS PRINTING OF THE RECORDS IN THE FILE	BINX	30
C * IRD(N)=1 MEANS PRINT THE NTH RECORD TYPE	BINX	31
C READ (IU5,10)MODE,NTYPE,IRD	BINX	32
C WRITE (IU6,20)MODE,NTYPE,IRD	BINX	33
C	BINX	34
C CONVERT MODE OF FILE	BINX	35
C IF (NTYPE.EQ.1) CALL BTISOTX (IU6,IU3,IU8)	BINX	36
C IF (NTYPE.EQ.2) CALL BBRKX (IU6,IU3,IU8)	BINX	37
C IF (NTYPE.EQ.3) CALL BDLYXS (IU6,IU3,IU8)	BINX	38
C	BINX	39
C RETURN	BINX	40
C	BINX	41
C 10 FORMAT (12T5)	BINX	42
C 20 FORMAT (35H1BINX...CONVERT MODE OF CCCC FILE//6H MODE=,11,42H (1	BINX	43
C 1MEANS BIN TO BCD, 2 MEANS BCD TO BIN)/6H TYPE=,11,50H (1 MEANS IS	BINX	44
C 2OTXS, 2 MEANS BRKOXS, 3 MEANS DLAYXS)/5H IRD=,10J4)	BINX	45
C END	BINX	46
SUBROUTINE BTISOTX(NSYS,NIN,NOUT)	BINX	47
C *****	BINX	48
C PERFORM MODE CONVERSION ON A CCCC ISOTXS FILE	BINX	49
C PRINTED OUTPUT AND ERROR MESSAGES ARE WRITTEN ONTO UNIT NSYS	BINX	50
C THE BIN OR BCD INPUT FILE IS ON UNIT NIN	BINX	51
C THE BCD OR BIN OUTPUT FILE IS ON UNIT NOUT	BINX	52
C VERSION III CCCC FOR CDC-7600 AUG 1974	BINX	53
C *****	BINX	54
C COMMON A(1)	BINX	55
C IBM DOUBLE HA,MINTL,HELAS,HINEL,HN2N,HN,HU,HS,HBLOCK	BINX	56
C IBM DOUBLE STRPL,STOTPL,SNGLH,SFIS,SNUTUT,CHISO,SNALF,SNP,SN2N,SNB	BINX	57
C IBM1,NTYPE	BINX	58
C DIMENSION HIYPE(22)	BINX	59
C DIMENSION IA(1), HA(1)	BINX	60

	EQUIVALENCE (A,IA,HA)	B1NX	61
	COMMON /OPTS/ MODE,NTYPE,IRD(10),MULT	B1NX	62
	DATA MTOTL,HFLAS,HINEL,HN2N/6H TOTAL,6HELASTC,6HINELAS,6H N2N/	B1NX	63
	DATA STRPL,STOTPL,SNGLAM/6H STRPL,6HSTOTPL,6H SNGLAM/	B1NX	64
	DATA SFIS,SNITOT,CHISO/6H SFIS,6HSNITOT,6H CHISO/	B1NX	65
	DATA SNALF,SNP,SN2N/6H SNALF,6H SNP,6H SN2N/	B1NX	66
	DATA SNO-SNT/6H SNO,6H SNT/	B1NX	67
	DATA M0,M1/0,1/	B1NX	68
C		B1NX	69
C	---FILE IDENTIFICATION	B1NX	70
C		B1NX	71
	IREC1=1	B1NX	72
	NWDS=3*MULT+1	B1NX	73
	IF (MODE.EQ.1) CALL REFD (NIN,IREC1,A(1),NWDS,1)	B1NX	74
	IF (MODE.EQ.1) WRITE (NOUT,420)(HA(I),I=1,3),IA(NWDS)	B1NX	75
	IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(1),NWDS,1)	B1NX	76
	HN=HA(1)	B1NX	77
	HU=HA(2)	B1NX	78
	HS=HA(3)	B1NX	79
	IVER=IA(NWDS)	B1NX	80
	IF (TRD(1).EQ.1) WRITE (NSYS,690)HN,IVER,NIN	B1NX	81
	IF (TRD(1).EQ.1) WRITE (NSYS,700)HU,HS	B1NX	82
C		B1NX	83
C	---FILE CONTROL	B1NX	84
C		B1NX	85
	IREC1=IREC1+1	B1NX	86
	NWDS=8	B1NX	87
	IF (MODE.EQ.1) CALL REFD (NIN,IREC1,A(1),NWDS,1)	B1NX	88
	IF (MODE.EQ.2) READ (NIN,430)(IA(I),I=1,NWDS)	B1NX	89
	IF (MODE.EQ.1) WRITE (NOUT,440)(IA(I),I=1,NWDS)	B1NX	90
	IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(1),NWDS,1)	B1NX	91
	NGROUP=IA(1)	B1NX	92
	NISU=IA(2)	B1NX	93
	MAXUP=IA(3)	B1NX	94
	MAXDN=IA(4)	B1NX	95
	MAXORD=IA(5)	B1NX	96
	ICHIST=IA(6)	B1NX	97
	NSCMAX=IA(7)	B1NX	98
	NSHLOK=IA(8)	B1NX	99
	IF (IRD(1).NE.1) GO TO 10	B1NX	100
	WRITE (NSYS,540)(IA(I),I=1,NWDS)	B1NX	101
C		B1NX	102
C	---FILE DATA	B1NX	103
C		B1NX	104
	10 NWDS=NISU+1*MULT*(NISU+12)+NGROUP*(2+ICHIST*(2/(ICHIST+1)))	B1NX	105
	IREC1=IREC1+1	B1NX	106
	NDR=12+NTSO	B1NX	107
	NWR=MULT*NDK	B1NX	108
	NB=NWR	B1NX	109
	IF (ICHIST.EQ.1) NB=NWR+NGROUP	B1NX	110
	NW=2*NGROUP+1	B1NX	111
	IF (MODE.EQ.2) GO TO 20	B1NX	112
	CALL REFD (NIN,IREC1,A(1),NWDS,1)	B1NX	113
	WRITE (NOUT,450)(HA(I),I=1,NDK)	B1NX	114
	IF (ICHIST.EQ.1) WRITE (NOUT,470)(A(NWR+I),I=1,NGROUP)	B1NX	115
	WRITE (NOUT,470)(A(NH+I),I=1,NW)	B1NX	116
	WRITE (NOUT,350)(IA(NH+NW+I),I=1,NTSO)	B1NX	117
	GO TO 30	B1NX	118
	20 READ (NIN,460)(HA(I),I=1,NDK)	B1NX	119
	IF (ICHIST.EQ.1) READ (NIN,470)(A(NWR+I),I=1,NGROUP)	B1NX	120
	READ (NIN,470)(A(NH+I),I=1,NW)	B1NX	121
	READ (NIN,350)(IA(NH+NW+I),I=1,NTSO)	B1NX	122
	CALL RITE (NOUT,IREC1,A(1),NWDS,1)	B1NX	123
	30 IF (TRD(2).NE.1) GO TO 50	B1NX	124
	WRITE (NSYS,550)(HA(I),I=1,12)	B1NX	125
	WRITE (NSYS,560)	B1NX	126
	WRITE (NSYS,570)(I,HA(12+I),I=1,NISU)	B1NX	127
	IF (ICHIST.NE.1) GO TO 40	B1NX	128
	WRITE (NSYS,580)	B1NX	129
	CALL NOT (HA(NTSO+13),ICHIST,NGROUP,M1,6HIN GP,6HOUT GP,M1,NSYS)	B1NX	130
	40 WRITE (NSYS,540)	B1NX	131
	WRITE (NSYS,260)(J,A(NH+J),A(NH+NGROUP+J),J=1,NGROUP)	B1NX	132

	WRITE (NSYS,270)A(N6+2*NGROUP+1)	BINX	133
	WRITE (NSYS,600)	BINX	134
	WRITE (NSYS,280)(J,A(NP+1+2*NGROUP+J),J=1,NISO)	BINX	135
C		BINX	136
C	---SET CHI DATA	BINX	137
C		BINX	138
	50 IF (ICHTST.LE.1) GO TO 80	BINX	139
	NWDS=NGROUP*(ICHTST+1)	BINX	140
	NWCHI=ICHTST*NGROUP	BINX	141
	IREC1=IREC1+1	BINX	142
	NWCHI1=NWCHI+1	BINX	143
	IF (MODE.EQ.2) GO TO 60	BINX	144
	CALL REED (NTN,IREC1,A(1),NWDS,1)	BINX	145
	WRITE (NOUT,340)(A(I),I=1,NWCHI)	BINX	146
	WRITE (NOUT,350)(IA(I),I=NWCHI1,NWDS)	BINX	147
	GO TO 70	BINX	148
	60 READ (NIN,360)(A(I),I=1,NWCHI)	BINX	149
	READ (NIN,350)(IA(I),I=NWCHI1,NWDS)	BINX	150
	CALL RITE (NOUT,IREC1,A(1),NWDS,1)	BINX	151
	70 IF (IRD(3).NE.1) GO TO 80	BINX	152
	WRITE (NSYS,370)	BINX	153
	WRITE (NSYS,380)(I,IA(I+NWCHI),I=1,NGROUP)	BINX	154
	WRITE (NSYS,610)	BINX	155
	CALL NOT (A(1),ICHTST,NGROUP,M1,6HIN GP,6HOUT GP,M1,NSYS)	BINX	156
C		BINX	157
C	---ISOTOPE CONTROL AND GROUP INDEPENDENT DATA	BINX	158
C		BINX	159
	80 MWDS=(2*NGROUP+2)*NSCMAX+17	BINX	160
	JREAD=MWDS+3*MULT+1	BINX	161
	DO 250 M=1,NISO	BINX	162
	IREC1=IREC1+1	BINX	163
	NWDS=JREAD-1	BINX	164
	IF (MODE.EQ.1) CALL REED (NIN,IREC1,A(1),NWDS,1)	BINX	165
	IF (MODE.EQ.2) READ (NTN,400)(HA(I),I=1,3),(A(3*MULT+1),I=1,MWDS)	BINX	166
	IF (MODE.EQ.1) WRITE (NOUT,400)(HA(I),I=1,3),(A(3*MULT+1),I=1,MWDS)	BINX	167
	1) IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(1),NWDS,1)	BINX	168
	ICHI=IA(3*(MULT-1)+11)	BINX	169
	IFIS=IA(3*(MULT-1)+12)	BINX	170
	IALF=IA(3*(MULT-1)+13)	BINX	171
	INP=IA(3*(MULT-1)+14)	BINX	172
	IN2N=IA(3*(MULT-1)+15)	BINX	173
	IND=IA(3*(MULT-1)+16)	BINX	174
	INT=IA(3*(MULT-1)+17)	BINX	175
	LTOT=IA(3*(MULT-1)+18)	BINX	176
	LTRN=IA(3*(MULT-1)+19)	BINX	177
	ISTRPD=IA(3*(MULT-1)+20)	BINX	178
	IF (IRD(4).NE.1) GO TO 110	BINX	179
	WRITE (NSYS,620)M	BINX	180
	WRITE (NSYS,630)(HA(J),J=1,3),(A(J+3*MULT),J=1,6),(IA(J+3*MULT),J=	BINX	181
	17,8)	BINX	182
	WRITE (NSYS,640)(IA(J+3*MULT),J=9,17)	BINX	183
	NEX1=17+3*MULT	BINX	184
	WRITE (NSYS,650)	BINX	185
	DO 90 J=1,NSCMAX	BINX	186
	IF (IA(NEX1+J).EQ.300) HTYPE(J)=HN2N	BINX	187
	IF (IA(NEX1+J).EQ.200) HTYPE(J)=HINEL	BINX	188
	IF (IA(NEX1+J).EQ.100) HTYPE(J)=HELAS	BINX	189
	IF (IA(NEX1+J).EQ.0) HTYPE(J)=HTOTL	BINX	190
	90 CONTINUE	BINX	191
	WRITE (NSYS,290)(J,HTYPE(J),IA(NEX1+J),IA(NEX1+NSCMAX+J),J=1,NSCMAX)	BINX	192
	1X) NEX1=NEX1+NSCMAX+2	BINX	193
	WRITE (NSYS,300)(J,J=1,NSCMAX),(J,J=1,NSCMAX)	BINX	194
	DO 100 N=1,NGROUP	BINX	195
	WRITE (NSYS,310)N,(IA(NEX1+J*NGROUP-NGROUP+N),J=1,NSCMAX),(IA(NEX1	BINX	196
	+NGROUP*NSCMAX+J*NGROUP-NGROUP+N),J=1,NSCMAX)	BINX	197
	100 CONTINUE	BINX	198
C		BINX	199
C	---PRINCIPAL CROSS SECTIONS	BINX	200
C		BINX	201
	110 NWDS=(1+LTRN+LTOT+IALF+INP+IN2N+IND+INT+ISTRPD+2*IFIS+ICHI*(2/ICHT	BINX	202
		BINX	203
		BINX	204

```

11+1))) *NGROUP
IREC1=IREC1+1
NWR=NWDS+JREAD-1
IF (MODE.EQ.1) CALL REED (NIN,IREC1,A(JREAD),NWDS,1)
IF (MODE.EQ.2) READ (NIN,510)(A(I),I=JREAD,NWR)
IF (MODE.EQ.1) WRITE (NOUT,500)(A(I),I=JREAD,NWR)
IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(JREAD),NWDS,1)
IF (IRD(5),NE.1) GO TO 130
WRITE (NSYS,660)
HTYPE(1)=STRPL
HTYPE(2)=STOTPL
HTYPE(3)=SNGAM
J=3
IF (IFIS.GT.0) HTYPE(J+1)=SFIS
IF (IFIS.GT.0) HTYPE(J+2)=SNUTOT
IF (IFIS.GT.0) HTYPE(J+3)=CHISO
IF (IFIS.GT.0) J=J+3
IF (IALF.GT.0) HTYPE(J+1)=SNALF
IF (IALF.GT.0) J=J+1
IF (INP.GT.0) HTYPE(J+1)=SNP
IF (INP.GT.0) J=J+1
IF (IN2N.GT.0.OR.NRN2.GT.0) HTYPE(J+1)=SN2N
IF (IN2N.GT.0.OR.NRN2.GT.0) J=J+1
IF (IND.GT.0) HTYPE(J+1)=SND
IF (IND.GT.0) J=J+1
IF (INT.GT.0) HTYPE(J+1)=SNT
IF (INT.GT.0) J=J+1
NKIND=J
WRITE (NSYS,320)(HTYPE(J),J=1,NKIND)
DO 120 N=1,NGROUP
WRITE (NSYS,330)N,(A(JREAD-1+N*NGROUP-NGROUP),J=1,NKIND)
120 CONTINUE
C
C --- ISOTOPE CHI DATA
C
130 IF (ICHI.LE.1) GO TO 160
NWDS=NGROUP*(ICHI+1)
IREC1=IREC1+1
NWCHI=ICHI*NGROUP+JREAD-1
NWCHI1=NWCHI+1
NWCHI2=NWCHI1+NGROUP-1
IF (MODE.EQ.2) GO TO 140
CALL REED (NIN,IREC1,A(JREAD),NWDS,1)
WRITE (NOUT,340)(A(I),I=JREAD,NWCHI)
WRITE (NOUT,350)(IA(I),I=NWCHI1,NWCHI2)
GO TO 150
140 READ (NIN,360)(A(I),I=JREAD,NWCHI)
READ (NIN,350)(IA(I),I=NWCHI1,NWCHI2)
CALL RITE (NOUT,IREC1,A(JREAD),NWDS,1)
150 IF (IRD(6),NE.1) GO TO 160
WRITE (NSYS,670)
CALL WOT (A(JREAD),ICHI,NGROUP,M1,6HTN GP,6HOUT GP,M1,NSYS)
WRITE (NSYS,370)
WRITE (NSYS,380)(I,IA(I+NWCHI),I=1,NGROUP)
C
C --- SCATTERING CROSS SECTIONS
C
160 DO 250 N=1,NSCMAX
K=3*MULT+17+N
TDSCT=JA(K)
K=K+NSCMAX
LORDN=IA(K)
TDSCT=TDSCT/100+1
GO TO (170,180,190,200), TDSCT
170 HBLOCK=HTOTL
GO TO 210
180 HBLOCK=HELAS
GO TO 210
190 HBLOCK=HINEL
GO TO 210
200 HBLOCK=HN2N

```

```

BINX 205
BINX 206
BINX 207
BINX 208
BINX 209
BINX 210
BINX 211
BINX 212
BINX 213
BINX 214
BINX 215
BINX 216
BINX 217
BINX 218
BINX 219
BINX 220
BINX 221
BINX 222
BINX 223
BINX 224
BINX 225
BINX 226
BINX 227
BINX 228
BINX 229
BINX 230
BINX 231
BINX 232
BINX 233
BINX 234
BINX 235
BINX 236
BINX 237
BINX 238
BINX 239
BINX 240
BINX 241
BINX 242
BINX 243
BINX 244
BINX 245
BINX 246
BINX 247
BINX 248
BINX 249
BINX 250
BINX 251
BINX 252
BINX 253
BINX 254
BINX 255
BINX 256
BINX 257
BINX 258
BINX 259
BINX 260
BINX 261
BINX 262
BINX 263
BINX 264
BINX 265
BINX 266
BINX 267
BINX 268
BINX 269
BINX 270
BINX 271
BINX 272
BINX 273
BINX 274
BINX 275

```

210 IF (LORDN,NE,0) GO TO 220	BTNX	276
IF (TRD(7),EQ,1) WRITE (NSYS,600)N,HBLOCK	BTNX	277
GO TO 250	BTNX	278
220 CONTINUE	BTNX	279
K=2*NSCMAX+17+3*MULT+(N-1)*NGROUP	BTNX	280
INC=(NGROUP-1)/NSBLOCK+1	BTNX	281
NPT=JREAD	BTNX	282
IF (TRD(7),EQ,1) WRITE (NSYS,400)	BTNX	283
IF (TRD(7),EQ,1) WRITE (NSYS,410)N,HBLOCK,LORDN	BTNX	284
DO 240 J=1,NSBLOCK	BTNX	285
JL=(J-1)*INC+1	BTNX	286
JU=J*INC	BTNX	287
NWDS=0	BTNX	288
DO 230 JJ=JL,JU	BTNX	289
L=K+JJ	BTNX	290
NWDS=NWDS+IA(L)	BTNX	291
230 CONTINUE	BTNX	292
NWDS=NWDS*LORDN	BTNX	293
IF (NWDS,EQ,0) GO TO 240	BTNX	294
IREC1=IREC1+1	BTNX	295
NWR=NPT*NWDS-1	BTNX	296
IF (MODE,EQ,1) CALL REED (NIN,IREC1,A(NPT),NWDS,1)	BTNX	297
IF (MODE,EQ,2) READ (NIN,510)(A(I),I=NPT,NWR)	BTNX	298
IF (MODE,EQ,1) WRITE (NOUT,520)(A(I),I=NPT,NWR)	BTNX	299
IF (MODE,EQ,2) CALL RITE (NOUT,IREC1,A(NPT),NWDS,1)	BTNX	300
IF (TRD(7),NE,1) GO TO 240	BTNX	301
WRITE (NSYS,530)J	BTNX	302
CALL WGT (A(NPT),IA(L),LORDN,M1,6H POSN ,6H ORDER,M1,NSYS)	BTNX	303
240 CONTINUE	BTNX	304
250 CONTINUE	BTNX	305
RETURN	BTNX	306
C	BTNX	307
260 FORMAT (1X,15,1P2E21.5)	BTNX	308
270 FORMAT (27X,1PE21.5)	BTNX	309
280 FORMAT (3X,13,5X,116)	BTNX	310
290 FORMAT (1X,15,3X,A6,219)	BTNX	311
300 FORMAT (1HR,53HSCATTERING HANDWIDTH AND IN-GROUP SCATTERING POSITI	BTNX	312
10N//1X,11HGROUP/HBLOCK,3X,2015)	BTNX	313
310 FORMAT (1X,15,9X,2015)	BTNX	314
320 FORMAT (6H0GROUP,10(3X,A10))	BTNX	315
330 FORMAT (3X,13,1P10F13.5)	BTNX	316
340 FORMAT (4H 3D ,1P5E12.5/(6E12.5))	BTNX	317
350 FORMAT (12I6)	BTNX	318
360 FORMAT (4X,1P5F12.5/(6E12.5))	BTNX	319
370 FORMAT (1HR,35HSPECTRUM DESIGNATION FOR EACH GROUP/)	BTNX	320
380 FORMAT (1X,5HGROUP,5X,8HSPECTRUM/(1X,14,8X,14))	BTNX	321
390 FORMAT (4H 6D ,1P5F12.5/(6E12.5))	BTNX	322
400 FORMAT (1H1)	BTNX	323
410 FORMAT (6H0HBLOCK,13,2X,A6,14H SCATTERING, ORDER,13)	BTNX	324
420 FORMAT (1,H 0V ISOTXS ,A6,1H*,2A6,1H*,16)	BTNX	325
430 FORMAT (4X,8I6)	BTNX	326
440 FORMAT (4H 1D ,8I6)	BTNX	327
450 FORMAT (4H 2D ,1H*,11A6,1H*/1H*,A6,1H*,9(1X,A6)/(10(1X,A6)))	BTNX	328
460 FORMAT (4X,1X,11A6,1X/1X,A6,1X,9(1X,A6)/(10(1X,A6)))	BTNX	329
470 FORMAT (1P6E12.5)	BTNX	330
480 FORMAT (4H 4D ,3(1X,A6)/1P6E12.5/(12I6))	BTNX	331
490 FORMAT (4X,3(1X,A6)/1P6E12.5/(12I6))	BTNX	332
500 FORMAT (4H 5D ,1P5F12.5/(6E12.5))	BTNX	333
510 FORMAT (4X,1P5F12.5/(6E12.5))	BTNX	334
520 FORMAT (4H 7D ,1P5E12.5/(6F12.5))	BTNX	335
530 FORMAT (1H ,6X,5HGROUP,14)	BTNX	336
540 FORMAT (24H0FILE CONTROL PARAMETERS//51H NGROUP NUMBER OF ENR BTNX		337
16V GROUPS IN SET 112/51H NISO NUMBER OF ISOTOPES IN BTNX		338
25ET 112/51H MAXUP MAXIMUM NUMBER OF UPSCATTER GR BTNX		339
30UPS 112/51H MAXDN MAXIMUM NUMBER OF DOWNSCATTER GROUPS BTNX		340
4 112/51H MAXORD MAXIMUM SCATTERING ORDER 112/51H BTNX		341
5 1CHIST SET FISSION SPECTRUM FLAG 112/51H BTNX		342
6 1CHIST=1 SET VECTOR /51H BTNX		343
7 =NGROUP, SET MATRIX /51H NSCMAX MAXIMUM NUMBER OF BTNX		344
8BLOCKS OF 112/51H SCATTERING DATA BTNX		345
9 /51H NSBLOCK BLOCKING CONTROL FOR SCATTERING DATA BTNX		346
5 112)	BTNX	347

550	FORMAT (1H0,12(A6))	B1NX	348
560	FORMAT (1H0,7HISOTOPE,15X,4HNAME)	B1NX	349
570	FORMAT (3X,13,15X,A6)	B1NX	350
580	FORMAT (17H0FISSION SPECTRUM)	B1NX	351
590	FORMAT (16H0GROUP STRUCTURE//11X,16HNEUTRON VELOCITY,9X,12HUPPER E	B1NX	352
	1ENERGY/1X,5HGROUP,13X,8H(CM/SEC),17X,4H(EV))	B1NX	353
600	FORMAT (32H0NUMBER OF RECORDS TO BE SKIPPED//1X,7HISOTOPE,12X,7HRE	B1NX	354
	CORDS)	B1NX	355
610	FORMAT (21H0SET FISSION SPECTRUM)	B1NX	356
620	FORMAT (8H0ISOTOPE,I3)	B1NX	357
630	FORMAT (27H0ISOTOPE CONTROL PARAMETERS//32H MASSID ABSOLUTE ISOT	B1NX	358
	1OPE LABEL,26X,A6/2AH MIDENT LIBRARY IDENTIFIER,30X,A6/32H MAT	B1NX	359
	2 ISOTOPE IDENTIFICATION,26X,A6/2AH MASS GRAM ATOMIC WEIGHT,2	B1NX	360
	34X,E12.5/45H FFISS THERMAL ENERGY/FISSION (M*SEC/FISS),7X,E12.5	B1NX	361
	4/45H ECAPT THERMAL ENERGY/CAPTURE (M*SEC/CAPT),7X,E12.5/37H TE	B1NX	362
	5MP ISOTOPE TEMPERATURE (DEG K),15X,E12.5/48H STGPOT AVE. POTE	B1NX	363
	6NITL SCATTERING (BARN/ATOM),4X,E12.5/41H ADENS REFERENCE ATOM	B1NX	364
	7 DENSITY (A/B*CM),11X,E12.5/32H KBR ISOTOPE CLASSIFICATION,20	B1NX	365
	8X,I12/61H ICHI FISSION SPECTRUM FLAG (0/1=N*SET CHI/VECTOR/MAT	B1NX	366
	9RIX),I3)	B1NX	367
640	FORMAT (39H IFIS (N,F) X-SEC FLAG (0/1=NO/YES),13X,I12/39H IA	B1NX	368
	11F (N,A) X-SEC FLAG (0/1=NO/YES),13X,I12/39H INP (N,P) X-S	B1NX	369
	2EC FLAG (0/1=NO/YES),13X,I12/40H IN2N (N,2N) X-SEC FLAG (0/1=N	B1NX	370
	30/YES),13X,I12/39H IN0 (N,0) X-SEC FLAG (0/1=NO/YES),13X,I12/	B1NX	371
	439H INI (N,T) X-SEC FLAG (0/1=NO/YES),13X,I12/39H LIOT NU	B1NX	372
	5MBER OF TOTAL X-SEC MOMENTS,13X,I12/43H LTRN NUMBER OF TRANSPU	B1NX	373
	6RI X-SEC MOMENTS,9X,I12/46H ISTRPD NUMBER OF TRANSPORT X-SEC DIR	B1NX	374
	7ECTIONS,I18)	B1NX	375
650	FORMAT (16H0SCATTERING BLOCKS//1X,5HBLOCK,5X,4HNAME,5X,4HTYPE,3X,6	B1NX	376
	1HORDERS)	B1NX	377
660	FORMAT (25H0PRINCIPAL CROSS SECTIONS)	B1NX	378
670	FORMAT (25H0ISOTOPE FISSION SPECTRUM)	B1NX	379
680	FORMAT (6H0BLOCK,I3,2X,A6,19H SCATTERING OMITTED)	B1NX	380
690	FORMAT (9H0*** FILE,A6,11H -- VERSION,I3,8H -- UNIT,I3,3H***)	B1NX	381
700	FORMAT (24H **USER IDENTIFICATION**,A6,3X,A6)	B1NX	382
	END	B1NX	383

	SUBROUTINE B0NXX(NSYS,MIN,NOUI)	B1NX	384
C	*****	B1NX	385
C	PERFORM MODE CONVERSION ON A CCCC B0NXXS FILE	B1NX	386
C	PRINTED OUTPUT AND ERROR MESSAGES ARE ON NSYS	B1NX	387
C	THE RIN OR BCD INPUT FILE IS ON UNIT MIN	B1NX	388
C	THE RCD OR RIN OUTPUT FILE IS ON UNIT NOUI	B1NX	389
C	VERSION YYY CCCC FOR THE CDC-7600 AUG 1974	B1NX	390
C	*****	B1NX	391
C	DOUBLE HA,MN,MU,MS	B1NX	392
C	COMMON /OPTS/ MODE,NTYPE,IRU(10),MULT	B1NX	393
	COMMON A(1)	B1NX	394
	DIMENSION IA(1), HA(1)	B1NX	395
	EQUIVALENCE (A,IA,HA)	B1NX	396
	DATA M0/0/	B1NX	397
C		B1NX	398
C	---FILE IDENTIFICATION	B1NX	399
C		B1NX	400
	IRECI=1	B1NX	401
	NMDS=3*MULT+1	B1NX	402
	IF (MODE.EQ.1) CALL WEED (MIN,IRECI,A(1),NMDS,1)	B1NX	403
	IF (MODE.EQ.2) READ (MIN,150)(HA(1),I=1,3),IA(NMDS)	B1NX	404
	MN=HA(1)	B1NX	405
	MU=HA(2)	B1NX	406
	MS=HA(3)	B1NX	407
	IVER=IA(NMDS)	B1NX	408
	IF (IMU(1).EQ.1) WRITE (NSYS,590)M0,IVER,MIN	B1NX	409
	IF (IMD(1).EQ.1) WRITE (NSYS,400)MU,MS	B1NX	410
	IF (MODE.EQ.1) WRITE (NOUI,143)(HA(1),I=1,3),IVER	B1NX	411
	IF (MODE.EQ.2) CALL WITE (NOUI,IRECI,A(1),NMDS,1)	B1NX	412
C		B1NX	413
C	---FILE CONTROL	B1NX	414
C		B1NX	415

	IREC1=IREC1+1	B1NX	416
	NWDS=0	B1NX	417
	IF (MODE.EQ.1) CALL REED (NIN,IREC1,IA,NWDS,1)	B1NX	418
	IF (MODE.EQ.2) READ (NIN,170)(IA(I),I=1,NWDS)	B1NX	419
	IF (MODE.EQ.1) WRITE (NOUT,160)(IA(I),I=1,NWDS)	B1NX	420
	IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(1),NWDS,1)	B1NX	421
	NGROUP=IA(1)	B1NX	422
	NISOSH=IA(2)	B1NX	423
	NSIGPT=IA(3)	B1NX	424
	NTEMP=IA(4)	B1NX	425
	IF (TRD(1).NE.1) GO TO 10	B1NX	426
	WRITE (NSYS,250)(IA(I),I=1,NWDS)	B1NX	427
C		B1NX	428
C	---FILE DATA	B1NX	429
C		B1NX	430
	10 NWDS=(4*MULT)*NISOSH+NSIGPT+NTEMP+NGROUP+1	B1NX	431
	IREC1=IREC1+1	B1NX	432
	NN=MULT*NISOSH+1	B1NX	433
	NEXT=NN+NSIGPT+NTEMP+NGROUP	B1NX	434
	NEX1=NEXT+1	B1NX	435
	NEX2=NEX1+NISOSH	B1NX	436
	NEX3=NEX2+NISOSH	B1NX	437
	NEX4=NEX3+NISOSH	B1NX	438
	IF (MODE.EQ.2) GO TO 20	B1NX	439
	CALL REED (NIN,IREC1,A(1),NWDS,1)	B1NX	440
	WRITE (NOUT,180)(HA(I),I=1,NISOSH)	B1NX	441
	WRITE (NOUT,190)(A(I),I=NN,NEXT)	B1NX	442
	WRITE (NOUT,200)(IA(I),I=NEX1,NWDS)	B1NX	443
	GO TO 30	B1NX	444
	20 READ (NIN,180)(HA(I),I=1,NISOSH)	B1NX	445
	READ (NIN,190)(A(I),I=NN,NEXT)	B1NX	446
	READ (NIN,200)(A(I),I=NEX1,NWDS)	B1NX	447
	CALL RITE (NOUT,IREC1,A(1),NWDS,1)	B1NX	448
	30 IF (TRD(2).NE.1) GO TO 60	B1NX	449
	WRITE (NSYS,260)	B1NX	450
	WRITE (NSYS,270)(I,HA(I),I=1,NISOSH)	B1NX	451
	WRITE (NSYS,280)	B1NX	452
	I1=1	B1NX	453
	I2=0	B1NX	454
	I3=MULT*NISOSH	B1NX	455
	DO 40 I=1,NISOSH	B1NX	456
	I2=I2+IA(I+NEXT+2*NISOSH)	B1NX	457
	WRITE (NSYS,100)I,(A(I3+J),J=1,I2)	B1NX	458
	40 I1=I2+1	B1NX	459
	WRITE (NSYS,290)	B1NX	460
	I1=1	B1NX	461
	I2=0	B1NX	462
	I3=I3+NSIGPT	B1NX	463
	DO 50 I=1,NISOSH	B1NX	464
	I2=I2+IA(I+NEXT+3*NISOSH)	B1NX	465
	WRITE (NSYS,100)I,(A(I3+J),J=1,I2)	B1NX	466
	50 I1=I2+1	B1NX	467
	WRITE (NSYS,300)	B1NX	468
	WRITE (NSYS,110)(I,A(MULT*NISOSH+NSIGPT+NTEMP+I),I=1,NGROUP)	B1NX	469
	WRITE (NSYS,120)A(NEXT)	B1NX	470
	WRITE (NSYS,310)	B1NX	471
	WRITE (NSYS,320)(I,IA(I+NEXT),IA(I+NEXT+NISOSH),IA(I+NEXT+2*NISOSH	B1NX	472
	1),IA(I+NEXT+3*NISOSH),I=1,NISOSH)	B1NX	473
	60 CONTINUE	B1NX	474
C		B1NX	475
C	---SELF-SHIELDING FACTORS	B1NX	476
C		B1NX	477
	JSSF=NEX4+NISOSH	B1NX	478
	DO 90 I=1,NISOSH	B1NX	479
	K=NEX3-I+1	B1NX	480
	NBTNT=IA(K)	B1NX	481
	K=NEX4-I+1	B1NX	482
	NBTET=IA(K)	B1NX	483
	K=NEX1-I+1	B1NX	484
	JBFLI=IA(K)	B1NX	485
	K=NEX2-I+1	B1NX	486
	JBFHI=IA(K)	B1NX	487

NDIFF=JBFLI-JBFLI+1	B1NX	488
NPRO=NRINI+NRITEM+NDIFF	B1NX	489
NWDS=5+NPRO	B1NX	490
IF (NWDS.LE.0) GO TO 70	B1NX	491
IREC1=IREC1+1	B1NX	492
NWR=JSSF+NWDS-1	B1NX	493
IF (MODE.EQ.1) CALL REED (NIN,IREC1,A(JSSF),NWDS,1)	B1NX	494
IF (MODE.EQ.2) READ (NIN,220)(A(L),L=JSSF,NWR)	B1NX	495
IF (MODE.EQ.1) WRITE (NOUT,210)(A(L),L=JSSF,NWR)	B1NX	496
IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(JSSF),NWDS,1)	B1NX	497
IF (IRD(3).NE.1) GO TO 70	B1NX	498
J2=JSSF+NPRO	B1NX	499
J3=J2+NPRO	B1NX	500
J4=J3+NPRO	B1NX	501
J5=J4+NPRO	B1NX	502
WRITE (NSYS,330)I	B1NX	503
CALL WOT (A(JSSF),NBINT,NBTEM,NDIFF,4HSIGO,4HTEMP,5HGROUP,NSYS)	B1NX	504
WRITE (NSYS,340)I	B1NX	505
CALL WOT (A(J2),NBINT,NBTEM,NDIFF,4HSIGO,4HTEMP,5HGROUP,NSYS)	B1NX	506
WRITE (NSYS,350)I	B1NX	507
CALL WOT (A(J3),NBINT,NBTEM,NDIFF,4HSIGO,4HTEMP,5HGROUP,NSYS)	B1NX	508
WRITE (NSYS,360)I	B1NX	509
CALL WOT (A(J4),NBINT,NBTEM,NDIFF,4HSIGO,4HTEMP,5HGROUP,NSYS)	B1NX	510
WRITE (NSYS,370)I	B1NX	511
CALL WOT (A(J5),NBINT,NBTEM,NDIFF,4HSIGO,4HTEMP,5HGROUP,NSYS)	B1NX	512
70 CONTINUE	B1NX	513
C	B1NX	514
C ---CROSS SECTIONS	B1NX	515
C	B1NX	516
NWDS=6+NGROUP	B1NX	517
IREC1=IREC1+1	B1NX	518
NWR=JSSF+NWDS-1	B1NX	519
IF (MODE.EQ.1) CALL REED (NIN,IREC1,A(JSSF),NWDS,1)	B1NX	520
IF (MODE.EQ.2) READ (NIN,240)(A(L),L=JSSF,NWR)	B1NX	521
IF (MODE.EQ.1) WRITE (NOUT,230)(A(L),L=JSSF,NWR)	B1NX	522
IF (MODE.EQ.2) CALL RITE (NOUT,IREC1,A(JSSF),NWDS,1)	B1NX	523
IF (IRD(4).NE.1) GO TO 90	B1NX	524
WRITE (NSYS,380)	B1NX	525
DO 80 N=1,NGROUP	B1NX	526
WRITE (NSYS,130)N,(A(JSSF=1+N+J*NGROUP+NGROUP),J=1,6)	B1NX	527
80 CONTINUE	B1NX	528
90 CONTINUE	B1NX	529
RETURN	B1NX	530
C	B1NX	531
100 FORMAT (1X,I7,1P6E15.5)	B1NX	532
110 FORMAT (1X,I7,1PE15.5)	B1NX	533
120 FORMAT (8X,1PE15.5)	B1NX	534
130 FORMAT (1X,I7,1P6E15.5)	B1NX	535
140 FORMAT (11H 0V BRKX5 ,A6,1H*,2A6,1H*,I6)	B1NX	536
150 FORMAT (11X,A6,1X,2A6,1X,I6)	B1NX	537
160 FORMAT (4H 10 ,4I6)	B1NX	538
170 FORMAT (4X,4I6)	B1NX	539
180 FORMAT (4H 20 ,9(1X,A6)/(10(1X,A6)))	B1NX	540
190 FORMAT (1PAE12.5)	B1NX	541
200 FORMAT (12I6)	B1NX	542
210 FORMAT (4H 30 ,1P5F12.5/(6E12.5))	B1NX	543
220 FORMAT (4X,1P5E12.5/(6F12.5))	B1NX	544
230 FORMAT (4H 40 ,1P5E12.5/(6E12.5))	B1NX	545
240 FORMAT (4X,1P5F12.5/(6F12.5))	B1NX	546
250 FORMAT (24H0FILL CONTROL PARAMETERS//51H NGROUP NUMBER OF FNER	B1NX	547
1GY GROUPS IN SF1 112/51H NISOSH NUMBER OF ISOTOPES WIT	B1NX	548
2H SELF= /51H SHIELDING FACTORS	B1NX	549
3 112/51H NSIGPT TOTAL NUMBER OF VALUES OF VARIABLE X /5	B1NX	550
41H WHICH ARE GIVEN. NSIGPT IS EQUAL TO /51H	B1NX	551
5 THE SUM FROM 1 TO NISOSH OF NTARP(1) 112/51H NTEMPT TOTAL	B1NX	552
6 NUMBER OF VALUES OF VARIABLE TR /51H WHICH ARE GIVE	B1NX	553
7N. NTEMPT IS EQUAL TO /51H THE SUM FROM 1 TO NISOSH	B1NX	554
80F NTARP(1) 112)	B1NX	555
260 FORMAT (RH0ISUTUPE,11X,4HNAME)	B1NX	556

270	FORMAT (5X,13,9X,A6)	B1NX	557
280	FORMAT (41H0LN(STGPO).LN(10) VALUES FOR ALL ISOTOPES//1X,7HISOTOPE	B1NX	558
	1,6X,9H1ST VALUE,6X,9H2ND VALUE,10X,5H. . .)	B1NX	559
290	FORMAT (36H0TEMPERATURES (DEG C) FOR ALL ISOTOPES//1X,7HISOTOPE,6X	B1NX	560
	1,9H1ST VALUE,6X,9H2ND VALUE,10X,5H. . .)	B1NX	561
300	FORMAT (16H0GROUP STRUCTURE//3X,5HGROUP,5X,10HTOP ENERGY)	B1NX	562
310	FORMAT (58H0F-FACTOR START END GROUPS AND NUMBER OF SIGPO TEMP VAL	B1NX	563
	IUES//1X,7HISOTOPE,11X,4HJBPH,11X,4HJBFL,10X,5HNTABP,10X,5HNTABT)	B1NX	564
320	FORMAT (1X,17,4I15)	B1NX	565
330	FORMAT (29H0TOTAL SELF-SHIELDING FACTORS,10X,7HISOTOPE,13)	B1NX	566
340	FORMAT (31H0CAPTURE SELF-SHIELDING FACTORS,10X,7HISOTOPE,13)	B1NX	567
350	FORMAT (31H0FISSION SELF-SHIELDING FACTORS,10X,7HISOTOPE,13)	B1NX	568
360	FORMAT (33H0TRANSPORT SELF-SHIELDING FACTORS,10X,7HISOTOPE,13)	B1NX	569
370	FORMAT (31H0ELASTIC SELF-SHIELDING FACTORS,10X,7HISOTOPE,13)	B1NX	570
380	FORMAT (15H0CROSS SECTIONS//3X,5HGROUP,11X,4HXSPO,11X,4HXSIN,12X,3	B1NX	571
	1HXSE,11X,4HXSNU,11X,4HXSSED,11X,4HXSXI)	B1NX	572
390	FORMAT (9H0*** FILE,A6,11H -- VERSION,13,8H -- UNIT,13,3H***)	B1NX	573
400	FORMAT (24H **USER IDENTIFICATION**,A6,3X,A6)	B1NX	574
	END	B1NX	575

	SUBROUTINE BDLYXS(NSYS,NTN,NOUT)	B1NX	576
C	*****	B1NX	577
C	PERFORM MODE CONVERSION ON A CCCC DLYXS FILE.	B1NX	578
C	PRINTED OUTPUT AND ERROR MESSAGES ARE WRITTEN ONTO UNIT NSYS.	B1NX	579
C	THE BIN OR BCD INPUT FILE IS ON UNIT NTN.	B1NX	580
C	THE BCD OR BIN OUTPUT FILE IS ON UNIT NOUT.	B1NX	581
C	VERSION III CCCC FOR CDC-7600 (JCT 1975).	B1NX	582
C	*****	B1NX	583
C IBM	DOUBLE M0,M1,M2,M3,M4,M5	B1NX	584
	COMMON /OPTS/ MODE,NTYPE,IRD(10),MULT	B1NX	585
	COMMON A(1)	B1NX	586
	DIMENSION IA(1), MA(1)	B1NX	587
	EQUIVALENCE (A,IA,MA)	B1NX	588
	DATA M1,M2,M3,M4,M5/6H GROUP,6HFAMILY,6HISOTOP,6HNUMBER,6HVECTOR/	B1NX	589
	DATA M0,M1,M4/0,1,0/	B1NX	590
C		B1NX	591
C	---FILE IDENTIFICATION	B1NX	592
C		B1NX	593
	IREC=1	B1NX	594
	NWDS=1+3*MULT	B1NX	595
	IF (MODE.EQ.1) CALL REFD (NTN,IREC,A(1),NWDS,1)	B1NX	596
	IF (MODE.EQ.2) READ (NTN,100)(IA(I),I=1,3),IA(NWDS)	B1NX	597
	IF (MODE.EQ.1) WRITE (NOUT,100)(MA(I),I=1,3),IA(NWDS)	B1NX	598
	IF (MODE.EQ.2) CALL RTE (NOUT,IREC,A(1),NWDS,1)	B1NX	599
	IF (IRD(1).EQ.1) WRITE (NSYS,50)(MA(I),I=1,3),IA(NWDS)	B1NX	600
C		B1NX	601
C	---FILE CONTROL	B1NX	602
C		B1NX	603
	IREC=IREC+1	B1NX	604
	NWDS=4	B1NX	605
	IF (MODE.EQ.1) CALL REFD (NTN,IREC,A(1),NWDS,1)	B1NX	606
	IF (MODE.EQ.2) READ (NTN,100)(IA(I),I=1,NWDS)	B1NX	607
	IF (MODE.EQ.1) WRITE (NOUT,200)(IA(I),I=1,NWDS)	B1NX	608
	IF (MODE.EQ.2) CALL RTE (NOUT,IREC,A(1),NWDS,1)	B1NX	609
	NGROUP=IA(1)	B1NX	610
	NISOD=IA(2)	B1NX	611
	NFAM=IA(3)	B1NX	612
	IF (IRD(2).EQ.1) WRITE (NSYS,60)(IA(I),I=1,NWDS)	B1NX	613
C		B1NX	614
C	---FILE DATA	B1NX	615
C		B1NX	616
	IREC=IREC+1	B1NX	617
	NA1=NISOD*MULT	B1NX	618
	NA2=NA1+1	B1NX	619
	NA3=NA1+NFAM+NGROUP+NFAM+AGROUP+1	B1NX	620
	NA4=NA3+1	B1NX	621
	NA5=NA3+2*NISOD	B1NX	622
	NWDS=NA5	B1NX	623
	IF (MODE.EQ.1) CALL REFD (NTN,IREC,A(1),NWDS,1)	B1NX	624

IF (MODE.EQ.2) READ (NIN,210)(HA(I),I=1,NA1)	BINX	625
IF (MODE.EQ.2) READ (NIN,220)(A(I),I=NA2,NA3)	BINX	626
IF (MODE.EQ.2) READ (NIN,230)(IA(I),I=NA4,NA5)	BINX	627
IF (MODE.EQ.1) WRITE (NOUT,240)(HA(I),I=1,NA1)	BINX	628
IF (MODE.EQ.1) WRITE (NOUT,250)(A(I),I=NA2,NA3)	BINX	629
IF (MODE.EQ.1) WRITE (NOUT,260)(IA(I),I=NA4,NA5)	BINX	630
IF (MODE.EQ.2) CALL RITE (NOUT,I,REC,A(I),NWDS,1)	BINX	631
IF (TRD(3),NE,1) GO TO 30	BINX	632
WRITE (NSYS,160)	BINX	633
NEXT=NISOD	BINX	634
DO 10 I=1,NEXT	BINX	635
10 WRITE (NSYS,70)I,HA(I)	BINX	636
NEXT=MULT*NISOD	BINX	637
WRITE (NSYS,80)	BINX	638
DO 20 I=1,NFAM	BINX	639
K=NEXT+I	BINX	640
20 WRITE (NSYS,90)I,A(K)	BINX	641
NEXT=NEXT+NFAM+1	BINX	642
WRITE (NSYS,100)	BINX	643
CALL WOT (A(NEXT),NGROUP,NFAM,M1,H1,H2,M1,NSYS)	BINX	644
NEXT=NEXT+NGROUP+NFAM	BINX	645
WRITE (NSYS,110)	BINX	646
CALL WOTR (A(NEXT),NGROUP,A,M0,A,M0,A,M0,A,M0,A,M0,A,M0,A,M0,NSYS)	BINX	647
NEXT=NEXT+NGROUP	BINX	648
WRITE (NSYS,120)A(NEXT)	BINX	649
NEXT=NEXT+1	BINX	650
WRITE (NSYS,130)	BINX	651
CALL WOTI (IA(NEXT),NISOD,M1,M1,H3,H4,M1,NSYS)	BINX	652
NEXT2=NEXT+NISOD	BINX	653
WRITE (NSYS,140)	BINX	654
CALL WOTI (IA(NEXT2),NISOD,M1,M1,H3,H4,M1,NSYS)	BINX	655
30 NEXT=MULT*NISOD+(NGROUP+1)*(NFAM+1)	BINX	656
C	BINX	657
C	BINX	658
C	BINX	659
---	BINX	660
NA1=NWDS+1	BINX	661
DO 40 I=1,NISOD	BINX	662
K=NEXT+I	BINX	663
KK=IA(K)	BINX	664
NA2=NA1+1+NGROUP*KK	BINX	665
NA3=NA2+1	BINX	666
NA4=NA2+KK	BINX	667
NWDS=NA4-NA1+1	BINX	668
I,REC=I,REC+1	BINX	669
IF (MODE.EQ.1) CALL REED (NIN,I,REC,A(NA1),NWDS,1)	BINX	670
IF (MODE.EQ.2) READ (NIN,270)(A(I),I=NA1,NA2)	BINX	671
IF (MODE.EQ.2) READ (NIN,280)(IA(I),I=NA3,NA4)	BINX	672
IF (MODE.EQ.1) WRITE (NOUT,290)(A(I),I=NA1,NA2)	BINX	673
IF (MODE.EQ.1) WRITE (NOUT,300)(IA(I),I=NA3,NA4)	BINX	674
IF (MODE.EQ.2) CALL RITE (NOUT,I,REC,A(NA1),NWDS,1)	BINX	675
IF (TRD(4),NE,1) GO TO 40	BINX	676
WRITE (NSYS,150)	BINX	677
CALL WOT (A(NA1),NGROUP,KK,M1,H1,H2,M1,NSYS)	BINX	678
WRITE (NSYS,160)	BINX	679
CALL WOTI (IA(NA3),1,KK,M1,H2,H3,M1,NSYS)	BINX	680
40 CONTINUE	BINX	681
RETURN	BINX	682
C	BINX	683
50 FORMAT (32H)DELATED NEUTRON PRECURSOR DATA ,A6/20H USER IDENTIFICA	BINX	684
TION,1X,24H/20H FILE VERSION NUMBER,16)	BINX	685
60 FORMAT (24H)FILE CONTROL PARAMETERS/51H NGROUP NUMBER OF NEUT	BINX	686
RON ENERGY GROUPS IN SET ,112/51H NISOD NUMBER OF ISOTOPES IN	BINX	687
2 DELAYED ,112/51H NEUTRON SET	BINX	688
3 /51H NFAM NUMBER OF DELAYED NEUTRON FAMILIES	BINX	689
4,112/51H IN SET /51H I	BINX	690
50H QUANT TO MAKE UP GROUP RECORD ,112)	BINX	691
70 FORMAT (5X,15,74,A4)	BINX	692
80 FORMAT (54H)DELAYED NEUTRON PRECURSOR DECAY CONSTANT FOR FAMILY N/	BINX	693
16X,FAMILY,9X,10H)	BINX	694
90 FORMAT (4X,13,64,112,5)	BINX	695
100 FORMAT (45H)FRACTION OF DELAYED NEUTRONS EMITTED INTO NEUTRON ENER	BINX	696
GY GROUP FROM PRECURSOR FAMILY)	BINX	

110	FORMAT (21H0MAXIMUM ENERGY BOUND/7X,5HGROUP,5X,1HJ)	B1NX	697
120	FORMAT (28H0MINIMUM ENERGY BOUND OF SET//11X,1PE12.5)	B1NX	698
130	FORMAT (86H0NUMBER OF FAMILIFS TO WHICH FISSON IN ISOTOPE CONTRIB	B1NX	699
	1UTFS DELAYED NEUTRON PRECURSORS)	B1NX	700
140	FORMAT (57H0NUMBER OF RECORDS TO BE SKIPPED TO READ DATA FOR ISOTO	B1NX	701
	1PE)	B1NX	702
150	FORMAT (77H0NUMBER OF DELAYED NEUTRON PRECURSORS PRODUCED IN FAMIL	B1NX	703
	1Y PER FISSON IN GROUP)	B1NX	704
160	FORMAT (35H0FAMILY NUMBER OF K-TH YIELD VECTOR)	B1NX	705
170	FORMAT (11X,A6,1X,2A6,1X,I6)	B1NX	706
180	FORMAT (11H 0V DELAYXS ,A6,1H*,2A6,1H*,I6)	B1NX	707
190	FORMAT (4X,4I6)	B1NX	708
200	FORMAT (4H 1D ,4I6)	B1NX	709
210	FORMAT (4X,9(1X,A6)/(10(1X,A6)))	B1NX	710
220	FORMAT (6E12.0)	B1NX	711
230	FORMAT (12I6)	B1NX	712
240	FORMAT (4H 2D ,9(1X,A6)/(10(1X,A6)))	B1NX	713
250	FORMAT (1P6E12.5)	B1NX	714
260	FORMAT (12I6)	B1NX	715
270	FORMAT (4X,5E12.0/(6E12.0))	B1NX	716
280	FORMAT (12I6)	B1NX	717
290	FORMAT (4H 3D ,1P5E12.5/(6E12.5))	B1NX	718
300	FORMAT (12I6)	B1NX	719
	END	B1NX	720
	SUBROUTINE WOT(X,II,JJ,KK,TOP1,TOP2,TOP3,NOU)	B1NX	721
C	*****	B1NX	722
C	PRINTS A SINGLE ONE-, TWO-, OR THREE-DIMENSIONAL REAL ARRAY,	B1NX	723
C	*****	B1NX	724
C IBM	DOUBLE TOP1,TOP2,TOP3	B1NX	725
	DIMENSION X(II,JJ,KK)	B1NX	726
	DO 110 K=1,KK	B1NX	727
	J02=0	B1NX	728
	J03=(JJ+8)/4	B1NX	729
	IF (KK.LE.1) GO TO 10	B1NX	730
	WRITE (NOU,120)TOP3,K	B1NX	731
10	DO 100 JK=1,J03	B1NX	732
	J01=J02+1	B1NX	733
	J02=MIN0(J01+8,JJ)	B1NX	734
	WRITE (NOU,130)TOP1,(TOP2,J,J=J01,J02)	B1NX	735
	NFLAG=0	B1NX	736
	DO 90 I=1,II	B1NX	737
	SSUM=0.0	B1NX	738
	DO 20 J=J01,J02	B1NX	739
20	SSUM=SSUM+ABS(X(I,J,K))	B1NX	740
	IF (SSUM.NE.0.0) GO TO 30	B1NX	741
	NFLAG=NFLAG+1	B1NX	742
	IF (I.LT.II) GO TO 90	B1NX	743
30	IF (NFLAG-1) 80,60,40	B1NX	744
40	N=I-NFLAG	B1NX	745
	IM1=I-1	B1NX	746
	IF ((I.LT.II).OR.(SSUM.NE.0.0)) GO TO 50	B1NX	747
	N=N+1	B1NX	748
	IM1=I	B1NX	749
50	WRITE (NOU,150)N,IM1,(X(IM1,J,K),J=J01,J02)	B1NX	750
	GO TO 70	B1NX	751
60	IF (SSUM.LF.0.0) GO TO 80	B1NX	752
	IM1=I-1	B1NX	753
	WRITE (NOU,140)IM1,(X(IM1,J,K),J=J01,J02)	B1NX	754
70	CONTINUE	B1NX	755
	NFLAG=0	B1NX	756
	IF (SSUM.LF.0.0) GO TO 90	B1NX	757
80	WRITE (NOU,160)1,(X(I,J,K),J=J01,J02)	B1NX	758
90	CONTINUE	B1NX	759
100	CONTINUE	B1NX	760
110	CONTINUE	B1NX	761
	RETURN	B1NX	762

C	120 FORMAT (1H ,6X,A6,I5)	BINX	763
	130 FURMAT (1H ,6X,A6,9(4X,A6,I3))	BINX	764
	140 FORMAT (1H ,110,4X,1P9E13.5)	BINX	765
	150 FORMAT (1H ,17,3H T0,I4,1P9E13.5)	BINX	766
	END	BINX	768
	SUBROUTINE WOTR(A,L1,B,L2,C,L3,D,L4,E,L5,F,L6,G,L7,H,L8,NOU)	BINX	769
C	*****	BINX	770
C	---SUBROUTINE WOTR PRINTS UP TO 8 ONE-DIMENSIONAL ARRAYS.	BINX	771
C	*****	BINX	772
	DIMENSION FPT(19), FNT(6), L(8), Z(8), M(8), A(1), B(1), C(1), D(1	BINX	773
	1), E(1), F(1), G(1), H(1)	BINX	774
	EQUIVALENCE (Z(1),M(1))	BINX	775
	DATA A,K,FPT(1),FPT(2),FPT(19)/4H ,100000,4H(1P1,4H10 ,4H) /	BINX	776
	DATA FNT(1),FNT(2),FNT(3),FNT(4),FNT(5),FNT(6)/4H,F13,4H,5 ,4H,18	BINX	777
	1,,4H5X ,4H,9X,,4HA4 /	BINX	778
	L(1)=L1	BINX	779
	L(2)=L2	BINX	780
	L(3)=L3	BINX	781
	L(4)=L4	BINX	782
	L(5)=L5	BINX	783
	L(6)=L6	BINX	784
	L(7)=L7	BINX	785
	L(8)=L8	BINX	786
	N=0	BINX	787
	DO 10 I=1,8	BINX	788
	N=MAX0(N,L(I))	BINX	789
10	CONTINUE	BINX	790
	DO 120 I=1,N	BINX	791
	DO 110 J=1,8	BINX	792
	IF (L(J).GE.1) GO TO (20,30,40,50,60,70,80,90), J	BINX	793
	Z(J)=X	BINX	794
	FPT(2+J+1)=FNT(5)	BINX	795
	FPT(2+J+2)=FNT(6)	BINX	796
	GO TO 110	BINX	797
20	Z(J)=A(I)	BINX	798
	GO TO 100	BINX	799
30	Z(J)=B(1)	BINX	800
	GO TO 100	BINX	801
40	Z(J)=C(1)	BINX	802
	GO TO 100	BINX	803
50	Z(J)=D(1)	BINX	804
	GO TO 100	BINX	805
60	Z(J)=E(1)	BINX	806
	GO TO 100	BINX	807
70	Z(J)=F(1)	BINX	808
	GO TO 100	BINX	809
80	Z(J)=G(1)	BINX	810
	GO TO 100	BINX	811
90	Z(J)=H(1)	BINX	812
100	FPT(2+J+1)=FNT(1)	BINX	813
	FPT(2+J+2)=FNT(2)	BINX	814
	IF (K.LE.1AH5(M(J))) GO TO 110	BINX	815
	IF (Z(1).EQ.0.0) M(J)=0	BINX	816
	FPT(2+J+1)=FNT(3)	BINX	817
	FPT(2+J+2)=FNT(4)	BINX	818
110	CONTINUE	BINX	819
	WRITE (NOU,FPT)1,(Z(J),J=1,8)	BINX	820
120	CONTINUE	BINX	821
	RETURN	BINX	822
	END	BINX	823

	SUBROUTINE WOTI(IX,II,JJ,KK, TOP1, TOP2, TOP3, NOU)	BINX	824
C	*****	BINX	825
C	PRINTS A SINGLE ONE-, TWO-, OR THREE-DIMENSIONAL INTEGER ARRAY.	BINX	826
C	*****	BINX	827
C IBM	DOUBLE TOP1, TOP2, TOP3	BINX	828
	DIMENSION IX(II, JJ, KK)	BINX	829
	DO 20 K=1, KK	BINX	830
	J02=0	BINX	831
	J03=(JJ+24)/25	BINX	832
	IF (KK, LE, 1) GO TO 10	BINX	833
	WRITE (NOU, 30) TOP3, K	BINX	834
10	DO 20 JK=1, J03	BINX	835
	J01=J02+1	BINX	836
	J02=MIN0(J01+24, JJ)	BINX	837
	WRITE (NOU, 40) TOP1, TOP2, (J, J=J01, J02)	BINX	838
	DO 20 I=1, II	BINX	839
	WRITE (NOU, 50) I, (IX(I, J, K), J=J01, J02)	BINX	840
20	CONTINUE	BINX	841
	RETURN	BINX	842
C		BINX	843
	30 FORMAT (/1H0, 6X, A6, I5)	BINX	844
	40 FORMAT (/1H0, A6, 1H/, A6, 25I4)	BINX	845
	50 FORMAT (1H , I6, 7X, 25I4)	BINX	846
	END	BINX	847
	SUBROUTINE REED(N, INFC, X, L, MODE)	BINX	848
	DIMENSION X(L)	BINX	849
	IF (L, LE, 0) RETURN	BINX	850
	READ (N) X	BINX	851
	RETURN	BINX	852
	END	BINX	853
	SUBROUTINE RITE(N, IREC, X, L, MODE)	BINX	854
	DIMENSION X(L)	BINX	855
	IF (L, LE, 0) RETURN	BINX	856
	WRITE (N) X	BINX	857
	RETURN	BINX	858
	END	BINX	859
	SUBROUTINE STOW(A, B, NWDS)	BINX	860
	DIMENSION A(NWDS), B(NWDS)	BINX	861
	IF (NWDS, LE, 0) RETURN	BINX	862
	DO 10 N=1, NWDS	BINX	863
10	B(N)=A(N)	BINX	864
	RETURN	BINX	865
	END	BINX	866
	SUBROUTINE STOWI(IA, IB, NWDS)	BINX	867
	DIMENSION IA(NWDS), IB(NWDS)	BINX	868
	IF (NWDS, LE, 0) RETURN	BINX	869
	DO 10 N=1, NWDS	BINX	870
10	IB(N)=IA(N)	BINX	871
	RETURN	BINX	872
	END	BINX	873