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**The COVERX Service Module
of the FORSS System**

J. D. Drischler

OPERATED BY
UNION CARBIDE CORPORATION
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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J. D. Drischler

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ABSTRACT

The COVERX Service Module includes seven execution paths to aid in understanding and using multigroup cross-section covariance matrices contained in the standard interface file COVERX. The execution paths provide the following operations on COVERX file(s):

1. List the contents of a COVERX file.
2. Allow adding new multigroup cross-section covariance matrices to an existing COVERX file.
3. Allow deletion of multigroup covariance matrices from an existing COVERX file.
4. Merge two COVERX files and creates a new file.
5. Change the mode of a file from unformatted to formatted and conversely.
6. Allow modification of the records contained in a COVERX file.
7. Selectively edits or copies a file.

I. INTRODUCTION

Multigroup cross-section covariance matrices are created using the PUFF covariance file processing code¹ and placed on a proposed CCCC² file, COVERX.³ Each covariance matrix is identified by the matrix control record of the COVERX file. The material and reaction type identification numbers are the MAT and MT numbers used in the ENDF/B⁴ files. Libraries⁵ of multigroup matrices in COVERX format are currently available through the Engineering Physics Information Center (EPIC) at Oak Ridge National Laboratory and the National Nuclear Data Center (NNDC) at Brookhaven National Laboratory. The COVERX format is described in Appendix A. A sample problem utilizing the seven execution paths of the COVERX Service Module is described in Appendix B.

When the generation of a COVERX file(s) is complete for a study, a careful review is recommended before it is used. The COVERX service module is available to aid in this review. If identification problems or errors are detected, they can often be quickly corrected by the COVERX service module. At present, the module has seven execution paths which perform the following tasks:

1. Lists the contents of a COVERX file.
2. Allows additional multigroup cross-section covariance matrices to be added to an existing COVERX file.
3. Allows deletions of multigroup cross-section covariance matrices from an existing COVERX file.
4. Merges two COVERX files and creates a new file.
5. Changes the mode of a file from unformatted to formatted and conversely.

6. Allows modification of the records contained in the COVERX file.
7. Selectively edits or copies a file.

The user selects the desired execution path by entering one of the following words on a card beginning in column 1: LIST, ADD, DELETE, MERGE, CONVERT, FIX, EDIT. Additional FIDO⁶ input requirements are described for each execution path.

II. COVERX FILE EXECUTION PATHS

A. List

Input Data

LIST

1\$\$ Integer Parameter [1]

NBIN - Unit number of the COVERX file, if NBIN < 0, only the matrix control records will be listed.

T

B. Add

This execution path allows multigroup cross-section covariance matrices to be added by creating a new file from the card input. The existing and newly created files are then merged producing a new COVERX file.

Input Data

ADD

1\$\$ Integer Parameters [4]

NOLD - Unit number of existing COVERX file

NADD - The number of covariance matrices to be added

NEW - Unit number of new COVERX file

NSSS - Unit number of a scratch device (default = 31)

T

2\$\$ Integer Parameters [4]. The MATRIX CONTROL record of the COVERX file.

MAT1 - Material 1 ID

MT1 - Reaction type 1 ID

MAT2 - Material 2 ID

MT2 - Reaction type 2 ID

T

3** Floating Point Parameters [NG]. The MATERIAL REACTION TYPE CROSS SECTION AND STANDARD DEVIATIONS record of the COVERX file. NG is the number of groups of the existing COVERX file. The standard deviations are automatically calculated by the code.

(CRS(J),J=1,NG)

CRS - Cross sections (from $E_{\max}$ - $E_{\min}$)

T

[The 3** card is omitted if (MAT1.NE.MAT2.OR.MT1.NE.MT2)]

4\$\$ Integer Parameters [NG*2+1]. The BLOCK CONTROL record of the COVERX file.

Block control = (JBAND(J),IJJ(J),J=1,NG),(LGRP(N),N=1,NBLOK)

For simplicity in creating the block control record of a covariance matrix, let NG equal the number of groups of the existing COVERX file and let NBLOK=1. The current version of FORSS⁷ requires that NBLOK=1.

Then: the 4\$\$ card for a three-group problem with NBLOK=1 would be:

4\$\$ 3 1 3 2 3 3 3

OR: using the improved FIDO

4\$\$ 0 1 [NG-1]Q2 A1 [NG] 1 10 [NG-1]Q2 00 [NG]

This is especially useful if matrices are large.

5** Floating Point Parameters [NG*NG]. The MATRIX DATA record of the COVERX FILE. If the preceding scheme for blocking is exercised, then the entire matrix can be input in one block.

COV - Matrix data (input by col.)

T

The 2\$\$, 3**, 4\$\$, and 5** sequence is repeated until NADD entries are complete.

C. Delete

This execution path allows multigroup cross-section covariance matrices to be deleted from a COVERX file.

Input Data

DELETE

1\$\$ Integer Parameters [3]

NBIN - Unit number of existing COVERX file

NEW - Unit number of new COVERX file

NDEL - The number of covariances to be deleted

T

2\$\$ Integer Parameters [4*NDEL]. The MATRIX CONTROL record of the COVERX FILE.

MAT1 - Material 1 ID

MT1 - Reaction type 1 ID

MAT2 - Material 2 ID

MT2 - Reaction type 2 ID

.

.

.

Sequence is repeated for each covariance to be deleted

T

D. Merge

This execution path merges two existing COVERX files and creates a third file.

Input Data

MERGE

1\$\$ Integer Parameters [3]

N1 - Unit number of original COVERX file

If identical matrix control records are encountered on both the original files (N1) and the file to be merged (N2), the matrix found on unit (N2) is written on unit (N3), and the matrix found on unit (N1) is skipped.

E. Format Conversion

This execution path implements features of the COVERT⁸ code which converts the COVERX file from unformatted (binary) to formatted card images and conversely, and also lists a COVERX file.

CONVERT

1\$\$ Integer Parameters [4]

NBE - Select conversion mode

= 0, unformatted to formatted

≠ 0, formatted to unformatted

NIN - Unit number of existing COVERX file (DEFAULT = 23)

NOUT - Unit number of COVERX file to be prepared by COVERT
(DEFAULT = 24)

N06 - Print option

> 0, file is printed on unit N06

≤ 0, reduced file edit on unit |N06|

T

F. Record Modification

This execution path allows modification to the records contained in a COVERX file. FIX modifies only those covariances which have been selected by previously using EDIT and updates the existing COVERX file by using MERGE.

Input Data

FIX

1\$\$ Integer Parameter [5]

NOLD - Unit number of existing COVERX file

> 0, complete listing

< 0, reduced listing

NEW - Unit number of new COVERX file

NFIX - Number of covariance matrices to be repaired

NHOL - Modify file description record

= 0, file description record not modified

≠ 0, prepare 2## card

NSSS - Unit number of a scratch device (default = 31)

T

2##

Doubled Precision Parameters [200(A6) words max.]. The FILE DESCRIPTION record of the COVERX file (omit if NHOL = 0).

NUNIT - Unit number where Hollerith description of file is input

NH - Number of (A6) words in Hollerith description

Then: using the improved FIDO

[NUNIT]G[NH] 6H(12A6) 6Hbbbbbb E T (b = blank)

would allow NH (A6) words to be input from unit NUNIT.

3\$\$

Integer Parameters [8]

NMAT1 - Material 1 ID

NMT1 - Reaction type 1 ID

NMAT2 - Material 2 ID

NMT2 - Reaction type 2 ID

NCRS - Modify cross sections

= 0, do not modify cross sections

≠ 0, prepare 4** card

NMT - Modify matrix control record

= 0, no modification

≠ 0, prepare 5\$\$ card

NBLK - Modify block control record

= 0, no modification

≠ 0, prepare 6\$\$ card

NCOV - Modify matrix data record

< 0, switch rows and columns

= 0, no modification

> 0, prepare 7** card

T

4** Floating Point Parameters [NG]. The MATERIAL-REACTION TYPE CROSS SECTIONS record of the COVERX file (omit if NCRS = 0). NG is the number of groups of the existing COVERX file. The standard deviations are automatically calculated by the code.

(CRS(J), J=1, NG)

CRS - Cross sections (from $E_{\max}$ - $E_{\min}$).

T

5\$\$ Integer Parameters [4]. The MATRIX CONTROL record of the COVERX file (omit if NMT = 0).

MAT1 - Material 1 ID

MT1 - Reaction type 1 ID

MAT2 - Material 2 ID

MT2 - Reaction type 2 ID

6\$\$ Integer Parameters [NG*2+1]. The BLOCK CONTROL record of the COVERX file (omit if NBLK = 0).

Block control = (JBAND(J),IJJ(J),J=1,NG),(LGRP(N),N=1,NBLOK)

JBAND(J) - Band for group (J)

IJJ(J) - Position of diagonal element for group (J)

LGRP(N) - Number of groups in block (N)

For simplicity in creating the block control record of a covariance matrix, let NG equal the number of groups of the existing COVERX file and let NBLOK = 1. The current version of FORSS requires that NBLOK = 1.

Then: the 6\$\$ card for a three-group problem with NBLOK = 1 would be:

6\$\$ 3 1 3 2 3 3 3

OR: using the improved FIDO

6\$\$ 0 1 [NG-1]Q2 A1 [NG] 1 1@ [NG-1]Q2 0@ [NG]

This is especially useful if matrices are large.

7** Floating Point Parameters [NG*NG]. The MATRIX DATA record of the COVERX file (omit if NCOV = 0). If the preceding scheme for blocking is exercised, then the entire matrix can be input in one block.

COV - Matrix data (input by col.)

T

The 3\$\$ through 7** sequence if repeated until NFIX entries are complete.

G. File Edit/Copy

This execution path permits selective listing and copying of a COVERX file. Each multigroup cross-section covariance matrix in a COVERX file is identified by the COVERX matrix control record. This record contains five

numbers: Material 1 (MAT1), reaction type 1 (MT1), Material 2 (MAT2), reaction type 2 (MT2), and the number of blocks into which matrix is subdivided (not used as input). Correlations between material-reaction types are extracted from the COVERX file using MAT1, MT1 as the first material-reaction type (column designation), and MAT2, MT2 the second material-reaction type (row designation).

As each covariance matrix is read from the COVERX file, its first four identifiers are compared with the corresponding identifiers in each edit command. If equality is found between all of the identifiers in an edit command and the corresponding identifiers from the matrix control record of the COVERX file, the multigroup cross-section covariance matrix qualifies for the edit/copy operation.

Input Data

EDIT

1\$\$ Integer Parameters [4]

NBIN - Unit number of existing COVERX file

> 0, complete listing

< 0, file identification

NC - Number of edit commands

NEW - Copy option

> 0, the unit number of a COVERX file to be written containing only those matrices edited

$\leq$ 0, file not written

NSS - Unit number of a scratch device (default = 31)

2\$\$ Integer Parameters [4*NC]

MAT1 - Material 1 ID

MT1 - Reaction type 1 ID

MAT2 - Material 2 ID

MT2 - Reaction type 2 ID

•
•
•
•

Complete NC edit commands

T

ACKNOWLEDGEMENTS

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APPENDIX A

The Format for Standard Interface File COVERX for
Multigroup Cross-Section Covariance Matrices


```

C*****
C              REVISED 11/01/77
C
CF          COVERX
CE          THIS FILE CONTAINS CROSS SECTIONS,
CE          STANDARD DEVIATIONS, AND
CE          PY DESIGNATION EITHER COVARIANCE,
CE          RELATIVE COVARIANCE,
CE          OR CORRELATION MATRICES.
C
CE          A FILE SUCH AS THIS IS NEEDED BY ORNL - FORSS
C
C              J. L. LUCIUS
C*****

```

```

C-----
CS          FILE STRUCTURE
CS
CS          RECORD TYPE                      PRESENT IF
CS          =====
CS          FILE IDENTIFICATION              ALWAYS
CS          FILE CONTROL                     ALWAYS
CS          FILE DESCRIPTION                 NHOLL.GT.0
CS          NEUTRON GROUP BOUNDARIES         NNGRUP.GT.0
CS          GAMMA GROUP BOUNDARIES          NGGRUP.GT.0
CS          MAT - MT CONTROL                 ALWAYS
CS          ***** (REPEAT FOR ALL MATERIAL-
CS          *          REACTION TYPE PAIRS)
CS          *          MAT-MT CROSS SECTION AND    ALWAYS
CS          *          STANDARD DEVIATIONS
CS          *****
CS
CS          ***** (REPEAT FOR ALL MATPICES)
CS          *          MATRIX CONTROL              ALWAYS
CS          *          BLOCK CONTROL               ALWAYS
CS          *          ***** (REPEAT FOR ALL BLOCKS)
CS          *          MATRIX DATA                ALWAYS
CS          *****
C-----

```

```

C-----
CR          FILE IDENTIFICATION
C
CL          HNAME, (HUSE(I), I=1,2), IVERS
CW          1+3*MULT
C
CB          FORMAT(11H 0V COVERX ,A6,1H*,2A6,1H*,I6)
CD          HNAME          HOLLERITH FILE NAME-COVERX (A6)
CD          HUSE           HOLLERITH USER IDENTIFICATION (A6)
CD          IVERS          FILE VERSION NUMBER
CD          MULT           1 - A6 IS SINGLE PRECISION WORD
CD          MULT           2 - A6 IS DOUBLE PRECISION WORD
C-----

```

```

C-----
CR          FILE CONTROL
C
CL    NGROUP, NNGRUP, NGGRUP, NTYPE, NMMP, NMTRIX, NHOLL
C
CW      7
C
CB    FORMAT(4H 1D ,7I6)
C
CD    NGROUP      NUMBER OF ENERGY GROUPS
CD    NNGRUP      NUMBER OF NEUTRON GROUPS
CD    NGGRUP      NUMBER OF GAMMA GROUPS
CD    NTYPE       TYPE OF DATA
CD              1 - COVARIANCE MATRIX, STANDARD DEVIATION
CD              2 - RELATIVE COVARIANCE MATRIX,
CD                RELATIVE STANDARD DEVIATION
CD              3 - CORRELATION MATRIX, STANDARD DEVIATION
CD    NMMP        NUMBER OF MAT - MT PAIRS
CD    NMTRIX      NUMBER OF MATRICES
CD    NHOLL       NUMBER OF HOLLERITH WORDS IN DESCRIPTION
C-----

```

```

C-----
CR          FILE DESCRIPTION
C
CL    (WORDS(J), J=1, NHOLL)
CW    MULT*NHOLL
C
CB    FORMAT(4H 2D ,1H*,11A6/(11A6))
C
CD    WORDS(J)    HOLLERITH DESCRIPTION OF FILE
C-----

```

```

C-----
CR          NEUTRON GROUP BOUNDARIES
C
CL    (GPBN(J), J=1, NNGRUP), ENMIN
C
CC          PRESENT IF NNGRUP.GT.0
CW    NNGRUP+1
C
CB    FORMAT(4H 3D ,5E12.4/(6E12.4))
CD    GPBN(J)     MAXIMUM ENERGY BOUND OF NEUTRON GROUP(J) (EV)
CD    ENMIN       MINIMUM ENERGY OF NEUTRON ENERGY RANGE
C-----

```

```

C-----
CR          GAMMA GROUP BOUNDARIES
C
CL    (GPBG(J), J=1, NGGRUP), EGMIN
C
CC          PRESENT IF NGGRUP.GT.0
CW    NGGRUP+1
C
CB    FORMAT(4H 4D ,5E12.4/(6E12.4))
CD    GPBG(J)     MAXIMUM ENERGY BOUND OF GAMMA GROUP(J) (EV)
CD    EGMIN       MINIMUM ENERGY OF GAMMA ENERGY RANGE
C-----

```

```

C-----
CR          MAT - MT CONTROL
C
CL      (MATID(I) , MTID(I) , MWGT(I) , I=1, NMMP)
C
CW      3*NMMP
C
CB      FORMAT(4H 5D , 11I6/(12I6))
C
CD      MATID(I)      MATERIAL IDENTIFICATION NUMBER
CD      MTID(I)       REACTION TYPE IDENTIFICATION NUMBER
CD      MWGT(I)       CROSS SECTION WEIGHTING OPTION
CD                      1 - CONSTANT
CD                      2 - 1/E
CD                      3 - THERMAL + 1/E + FISSION
CD                      4 - ARBITRARY
CD                      5 - COMBINED CTR CRSS
C-----

```

```

C-----
CR          MATERIAL - REACTION TYPE CROSS SECTIONS
CR          AND ERROR FILES
CL      (CRS(J) , J=1, NGROUP) , (ERROR(J) , J=1, NGROUP)
CW      2*NGROUP
C
CB      FORMAT(4H 6D , 5E12.4/(6E12.4))
C
CD      CRS           CROSS SECTION
CD      ERROR         STANDARD DEVIATION
C-----

```

```

C-----
CR          MATRIX CONTROL
CL      MAT1, MT1, MAT2, MT2, NBLOK
CW      5
C
CB      FORMAT(4H 7D , 5I6)
C
CD      MAT1          MATERIAL 1 IDENTIFICATION NUMBER
CD      MT1           REACTION TYPE 1 IDENTIFICATION NUMBER
CD      MAT2          MATERIAL 2 IDENTIFICATION NUMBER
CD      MT2           REACTION TYPE 2 IDENTIFICATION NUMBER
CD      NBLOK         NUMBER OF BLOCKS INTO WHICH MATRIX IS SUBDIVIDED
C-----

```

```

C-----
CR          BLOCK CONTROL
CL      (JBAND(J) , IJJ(J) , J=1, NGROUP) , (LGRP(N) , N=1, NBLOK)
C
CW      2*NGROUP + NBLOK
C
CB      FORMAT(4H 8D , 11I6/(12I6))
C
CD      JBAND(J)      BANDWIDTH FOR GROUP J
CD      IJJ(J)        POSITION OF DIAGONAL ELEMENT FOR GROUP J
CD      LGRP(N)       NUMBER OF GROUPS IN BLOCK(N)
C-----

```

```

C-----
CR          MATRIX DATA
CL      (COV(K),K=1,KMAX)
C
CC      KMAX=SUM OVER JBAND(J) FOR ALL J IN BLOCK N
CW      KMAX
C
CB      FORMAT(4H 9D ,5E12.4/(6E12.4))
C
C
CD      COV          NTYPE MATRIX DATA
C-----
COEF

```

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APPENDIX B.

Sample Problem

The following sample input and output problem utilizes the seven execution paths available in the COVERX Service Module. The user should be aware that although all the execution paths are utilized in the sample problem, the input parameters may vary depending on the user's requirements.

A description of the input to the sample problem follows:

1. CONVERT - The formatted card image COVERX file residing on unit 24 is converted to a binary file on unit 32, and the resulting file is listed using the reduced file edit option.
2. EDIT - The $^{235}\text{U}(n,f)$ covariance matrix is extracted from the binary COVERX file and copied to unit 33 creating a new COVERX file containing one covariance matrix. The output for EDIT gives a complete listing of the COVERX file.
3. FIX - The $^{235}\text{U}(n,f)$ covariance data residing on unit 33 is changed as follows:

The Hollerith description of the file is modified
(2##),

The cross sections were modified (4**),

The matrix control record was modified renaming the
 $^{235}\text{U}(n,f)$ covariance data (5\$\$),

The block control record was modified (6\$\$), and

The covariance data was modified (7**).

The output of FIX resides on unit 34, and a complete listing of the input plus all modifications is given.

4. EDIT - Three additional covariance matrices were extracted from unit 32 and copied to unit 35.
5. MERGE - The COVERX file residing on unit 35 and the one residing on unit 34 are merged to produce a single COVERX file on unit 33 containing four covariance matrices.
6. DELETE - The covariance matrix indicated in the 2\$\$ array is deleted from unit 33, and the remaining covariances are placed on unit 34.
7. ADD - A new covariance indicated in the 2\$\$ array was added to the COVERX file residing on unit 34 with inclusion of the Block control record (4\$\$) and covariance data (5**). This produced a new COVERX file on unit 33.
8. LIST - The entire COVERX file residing on unit 33 was listed.

APPENDIX B.1. Job Control Cards for Local Use and Sample Input for the COVERX Service Module

```
//JDDDD0002 JCE (18075),'J DRISCHLER, 6025'
//*CLASS CPU91=10S,IC=02.0,R=270K
//STEP1 EXEC FCRTHLG,FARM.LKED='NOMAP,NOLIST',REGION.GO=270K
//LKED.COVERX.CC UNIT=3330,VCL=SER=ZX0000,DISP=SHR,
// DSN=JDD.JAN2180.COVERX.SERVICE
//LKED.SYSIN CC *
INCLUDE COVERX
/*
//GO.FT24F001 DD UNIT=SPDA,DISP=(SHR,CATLG),VCL=,
// DCR=(RECFM=FB,LRECL=80,BLKSIZE=3120),
// SPACE=(TRK,(20,20),RLSE),
// DSN=T.JDD18075.TEMP1.JAN1780
//GO.FT31F001 DD UNIT=SYSDA,SPACE=(TRK,(010,010)),
// DCB=(RECFM=VBST,LRECL=X,BLKSIZE=3120)
//GO.FT32F001 DD UNIT=SYSDA,SPACE=(TRK,(010,010)),
// DCB=(RECFM=VBST,LRECL=X,BLKSIZE=3120)
//GO.FT33F001 DD UNIT=SYSDA,SPACE=(TRK,(010,010)),
// DCB=(RECFM=VBST,LRECL=X,BLKSIZE=3120)
//GO.FT34F001 DD UNIT=SYSDA,SPACE=(TRK,(010,010)),
// DCB=(RECFM=VBST,LRECL=X,BLKSIZE=3120)
//GO.FT35F001 DD UNIT=SYSDA,SPACE=(TRK,(010,010)),
// DCB=(RECFM=VBST,LRECL=X,BLKSIZE=3120)
//GO.FT41F001 DD UNIT=SYSDA,
// SPACE=(TRK,(05,05)),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//GO.FT42F001 DD UNIT=SYSDA,
// SPACE=(TRK,(05,05)),
// DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//GO.FT05F001 DD *
CONVERT
0
1** 1 24 32 0 T
EDIT
1** 32 1 33 0 T
2** 1261 18 1261 18 T
FIX
1** 33 34 1 1 0 T
2**
SG4 6H(12A6) 6+ E T
THIS IS A SAMPLE PRCELEM
3** 1261 18 1261 18 1 1 1 1 T
4** F1.0 T
5** 1266 18 1266 18
6** 0 1 502 A1 6 1 12 502 02 6
7** 1Z 3S 3Z 3S 3Z 3S 3Z 3S 3Z 3S 3Z 3S 2Z T
EDIT
1** 32 3 35 0 T
2**
1262 18 1262 18
1264 18 1264 18
1262 18 1264 18
T
MERGE
1** 35 34 33 T
DELETE
1** 33 34 1 T
2** 1262 18 1264 18 T
ADD
1** 34 1 33 0 T
2** 1261 452 1266 452 T
4** 0 1 502 A1 6 1 12 502 02 6
5** F1.33226-5 T
LIST
1** 33 T
/*
//
IHC002I STCP 0
```


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APPENDIX B.2. Sample Output for the COVERX Service Module

I. CONVERT OUTPUT

COVERX EXECUTION PATH SELECTED... CONV

PRT CN 0C
115 1 24 32 0 T

15 ARRAY 4 ENTRIES READ

OT

IN CONV. CORE AVAILABLE 25000 CORE NEEDED 127
A CROSS-SECTION COVARIANCE FILE IN COVERX FORMAT WILL BE READ IN RECDID FROM UNIT 24
AND WILL BE WRITTEN IN BINARY CNTC UNIT 32

*****AN EDIT OF THE COVERX CROSS-SECTION COVARIANCE FILE IS PRINTED HERE*****
FILE IDENTIFICATION RECORD..... 0V COVERX COVERX*CRNL - FORSS* 1 32 11
FILE CONTROL RECORD..... 1D 6 6 3 13 32 11
FILE DESCRIPTION..... 2D *FISSION SPECTRUM COVARIANCE MATRIX LIBRARY (CODIVA WEIGHTING).

NEUTRON GROUP BOUNDARIES..... 3D 2.0000E 07 3.6720E 06 1.3530E 06 4.9750E 05 1.8320E 05

4.0870E D4 1.0000E-05

MATRIX CONTROL RECCRC.....NO.	1.. 7D	1261	18	1261	18	1
MATRIX CONTROL RECCRC.....NO.	2.. 7D	1261	452	1261	452	1
MATRIX CONTROL RECCRC.....NO.	3.. 7D	1261	102	1261	102	1
MATRIX CONTROL RECCRC.....NO.	4.. 7D	1261	18	1262	18	1
MATRIX CONTROL RECCRC.....NO.	5.. 7D	1261	18	1264	18	1
MATRIX CONTROL RECCRC.....NO.	6.. 7D	1261	452	1262	452	1
MATRIX CONTROL RECCRC.....NO.	7.. 7D	1261	452	1264	452	1
MATRIX CONTROL RECCRC.....NO.	8.. 7D	1261	452	1265	452	1
MATRIX CONTROL RECCRC.....NO.	9.. 7D	1261	452	1266	452	1
MATRIX CONTROL RECCRC.....NO.	10.. 7D	1262	18	1262	18	1
MATRIX CONTROL RECCRC.....NO.	11.. 7D	1262	452	1262	452	1
MATRIX CONTROL RECCRC.....NO.	12.. 7D	1262	51	1262	51	1
MATRIX CONTROL RECCRC.....NO.	13.. 7D	1262	52	1262	52	1
MATRIX CONTROL RECCRC.....NO.	14.. 7D	1262	53	1262	53	1
MATRIX CONTROL RECCRC.....NO.	15.. 7D	1262	54	1262	54	1
MATRIX CONTROL RECCRC.....NO.	16.. 7D	1262	102	1262	102	1
MATRIX CONTROL RECCRC.....NO.	17.. 7D	1262	18	1264	18	1
MATRIX CONTROL RECCRC.....NO.	18.. 7D	1262	452	1264	452	1
MATRIX CONTROL RECCRC.....NO.	19.. 7D	1262	452	1265	452	1
MATRIX CONTROL RECCRC.....NO.	20.. 7D	1262	452	1266	452	1
MATRIX CONTROL RECCRC.....NO.	21.. 7D	1264	18	1264	18	1
MATRIX CONTROL RECCRC.....NO.	22.. 7D	1264	452	1264	452	1
MATRIX CONTROL RECCRC.....NO.	23.. 7D	1264	102	1264	102	1
MATRIX CONTROL RECCRC.....NO.	24.. 7D	1264	18	1264	102	1
MATRIX CONTROL RECCRC.....NO.	25.. 7D	1264	452	1265	452	1
MATRIX CONTROL RECCRC.....NO.	26.. 7D	1264	452	1266	452	1
MATRIX CONTROL RECCRC.....NO.	27.. 7D	1265	452	1265	452	1
MATRIX CONTROL RECCRC.....NO.	28.. 7D	1265	102	1265	102	1
MATRIX CONTROL RECCRC.....NO.	29.. 7D	1265	452	1266	452	1
MATRIX CONTROL RECCRC.....NO.	30.. 7D	1266	18	1266	18	1
MATRIX CONTROL RECCRC.....NO.	31.. 7D	1266	452	1266	452	1
MATRIX CONTROL RECCRC.....NO.	32.. 7D	1266	102	1266	102	1

*****END CF EDIT OF COVERX COVARIANCE MATRIX FILE*****

THE FILE HAS BEEN SUCCESSFULLY COPIED.

II. EDIT OUTPUT

COVERX EXECUTION PATH SELECTED... EDIT

195 32 1 33 0 T

15 ARRAY 4 ENTRIES READ

OT

IN EDIT. CORE AVAILABLE 25000 CORE NEEDED

149

215 1261 13 1261 13 T

25 ARRAY 4 ENTRIES READ

OT

MMMP= 15 NMTFIX= 32 NC= 1
1261 1P 1261 1P

FILE ID. COVERXCRNL - FORSS 1

FILE CONTROL 6 6 0 2 15 32 11

FILE DESCRIPTION
FISSION SPECTRUM COVARIANCE MATRIX LIBRARY (GODIVA WEIGHTING).

GROUP BOUNDARIES
2.0000E 07 3.6790E 06 1.3530E 06 4.9790E 05 1.8320E 05 4.0870E 04
1.0000E-05

MAT-MT CONTROL
1261 18 4

MAT - MT TYPE CROSS SECTIONS AND STANDARD DEVIATIONS
1.22100E 00 1.25800E 00 1.18600E 00 1.25500E 00 1.56000E 00 2.23600E 00 3.08300E-02 2.34200E-02 2.67800E-02 2.81100E-02
2.69500E-02 3.29000E-02

MATRIX CONTROL
1261 18 1261 18 1

BLOCK CONTROL
6 6 6 2 6 3 6 4 6 5
6 6 6

RELATIVE COVARIANCE MATRIX

9.50400E-04	3.54100E-04	1.51900E-04	4.25900E-05	8.14900E-06	0.0
3.74100E-04	5.48400E-04	7.24000E-04	1.59900E-04	4.56900E-05	0.0
1.51900E-04	3.24000E-04	7.17300E-04	5.63900E-04	2.24700E-04	0.0
4.29900E-05	1.59900E-04	5.63900E-04	7.90100E-04	3.90600E-04	2.60900E-04
8.14900E-06	4.56900E-05	2.24700E-04	3.90600E-04	7.26200E-04	5.40300E-04
0.0	0.0	0.0	2.60900E-04	5.40300E-04	1.08200E-03

III. FIX OUTPUT

COVERX EXECUTION PATH SELECTED... FIX

1?? 33 34 1 1 0 T

1# ARRAY 5 ENTRIES READ

0T

2##
EG4 6F(1245) 6H E T

2# ARRAY 200 ENTRIES READ

0T

IN PREFIX, CORE AVAILABLE 25000 CORE NEEDED

123

NUMPR 1 NMTRIX 1 NC 1

FILE ID, COVERXCNL - FCRES 2

3?? 1261 18 1261 18 1 1 1 1 T

3# ARRAY 8 ENTRIES READ

0T

4## F1.0 T

4# ARRAY 6 ENTRIES READ

0T

5?? 1266 18 1266 18
6?? 0 1 502 A1 6 1 12 502 00 6

5# ARRAY 4 ENTRIES READ

7## 1Z 3S 1Z 3S 3Z 3S 3Z 3S 3Z 3S 3Z 3S 2Z T

6# ARRAY 13 ENTRIES READ

7# ARRAY 36 ENTRIES READ

III. FIX OUTPUT (cont'd.)

```

DT
FILE CONTROL      6      6      0      2      1      1      4

FILE DESCRIPTION
THIS IS A SAMPLE PROGRAM

GROUP BOUNDARIES
2.0000E-07 3.6790E-06 1.3530E-06 4.9790E-05 1.8320E-05 4.0970E-04
1.0000E-05

MAT-MT CONTROL
1266      18      4

MAT - MT TYPE CROSS SECTIONS AND STANDARD DEVIATIONS
1.00000E-06 1.00000E-00 1.00000E-00 1.00000E-00 1.00000E-00 1.00000E-00 0.0
0.0
0.0

MATRIX CONTROL
1266      18      1266      18      1

BLOCK CONTROL
6      1      6      2      6      3      6      4      6      5

RELATIVE COVARIANCE MATRIX
0.0      0.0      0.0      0.0      0.0      0.0
3.24100E-04 5.48400E-04 3.24000E-04 1.59900E-04 4.56900E-05 0.0
1.51900E-04 3.24000E-04 7.17300E-04 5.63900E-04 2.24700E-04 0.0
4.22900E-05 1.59900E-04 5.63900E-04 7.50100E-04 3.90600E-04 2.63900E-04
0.0      0.0      0.0      0.0      0.0      0.0
0.0      0.0      0.0      0.0      0.0      0.0

```

IV. EDIT OUTPUT

COVERX EXECUTION PATH SELECTED... EDIT

183 32 3 35 0 T

18 ARRAY 4 ENTRIES READ

DT

IN EDIT, CORR AVAILABLE 25000 CORR NEEDED

181
285
1262 18 1262 18
1264 18 1264 18
1262 18 1264 18
T

28 ARRAY 12 ENTRIES READ

DT

NMND= 18 18 NMND= 32 NC= 18 1264 3 18 1262 18 1264 18

FILE ID, COVERXORNL - FORSS 1

FILE CONTROL 6 6 0 2 18 32 11

FILE DESCRIPTION
FISSION SPECTRUM COVARIANCE MATRIX LIBRARY (GODIVA WEIGHTING).

GROUP BOUNDARIES
2.0000E-07 3.2790E-06 1.3530E-06 4.5790E-05 1.8320E-05 4.0870E-04
1.0000E-05

MAT-MT CONTROL
1262 18 4 1264 18 4

MAT - MT TYPE CROSS SECTIONS AND STANDARD DEVIATIONS
6.43200E-01 4.70200E-01 1.53300E-02 1.04400E-04 4.43500E-05 7.01900E-05 3.12000E-02 2.45100E-02 2.59000E-02 3.14600E-02
7.82000E-02 1.07100E-00
1.82800E-00 1.90400E-00 1.69300E-00 1.53300E-00 1.55300E-00 1.69700E-00 3.09700E-02 2.37800E-02 2.73100E-02 2.84200E-02
2.77300E-02 3.40000E-02

MATRIX CONTROL
1262 18 1262 18 1

BLOCK CONTROL
1 6 2 6 3 6 4 6 5
6 6 6

IV. EDIT OUTPUT (cont'd.)

RELATIVE COVARIANCE MATRIX

```

9.73800E-04 4.14700E-04 2.19800E-04 5.19700E-05 -5.91800E-06 -3.34700E-07
4.14700E-04 6.00900E-04 3.94100E-04 1.86000E-04 6.23000E-05 2.54700E-07
2.19800E-04 3.94100E-04 6.70900E-04 2.87000E-04 8.17800E-05 -6.07900E-07
5.19700E-05 1.86000E-04 2.87000E-04 9.89500E-04 1.16800E-03 2.26700E-04
-5.91800E-06 6.23000E-05 8.17800E-05 1.16800E-03 6.11600E-03 6.46200E-04
-3.34700E-07 2.54700E-07 -6.07900E-07 2.26700E-04 6.46200E-04 1.14600E-03

```

MATRIX CONTROL
1262

19 1264 18 1

BLOCK CONTROL
6 6

1 6 2 6 3 6 4 6 5

RELATIVE COVARIANCE MATRIX

```

9.50400E-04 3.94100E-04 1.51500E-04 4.25900E-05 8.14900E-06 0.0
3.94100E-04 5.48400E-04 3.24000E-04 1.59900E-04 4.56500E-05 0.0
1.51500E-04 3.24000E-04 7.17300E-04 5.63900E-04 2.24700E-04 0.0
4.25900E-05 1.59900E-04 5.63900E-04 7.90100E-04 3.50600E-04 2.60900E-04
8.14900E-06 4.56500E-05 2.24700E-04 3.50600E-04 7.26200E-04 5.40300E-04
0.0 0.0 0.0 2.60900E-04 5.40300E-04 1.08200E-03

```

MATRIX CONTROL
1264

13 1264 18 1

BLOCK CONTROL
6 6

1 6 2 6 3 6 4 6 5

RELATIVE COVARIANCE MATRIX

```

9.59100E-04 4.00500E-04 1.55900E-04 4.46000E-05 7.99400E-06 2.28500E-07
4.00500E-04 5.65700E-04 3.31700E-04 1.63800E-04 4.88000E-05 -7.83800E-07
1.55900E-04 3.31700E-04 7.45700E-04 5.80400E-04 2.34800E-04 9.08200E-07
4.46000E-05 1.63800E-04 5.80400E-04 8.07400E-04 4.00900E-04 2.62200E-04
7.99400E-06 4.88000E-05 2.34800E-04 4.00900E-04 7.68700E-04 5.37200E-04
2.28500E-07 -7.83800E-07 2.62200E-04 5.37200E-04 1.15600E-03

```


V. MERGE OUTPUT

COVERX EXECUTION PATH SELECTED... MERG

116 35 34 33 T

11 ARRAY

3 ENTRIES READ

DT

IN FMERG, CORE AVAILABLE 25000 CORE NEEDED 190

MERGE 35 34 33

IFC 6 6 0 2 2 3 11

JFC 6 6 0 2 1 1 4

1262 18 4 1264 18 4 1266 19 4

VI. DELETE OUTPUT

COVERX EXECUTION PATH SELECTED... DELE

115 33 34 1 T

1* ARRAY 3 ENTRIES READ

QT

IN FDEL, CORE AVAILABLE 25000 CORE NEEDED

114

215 1262 13 1264 18 T

2* ARRAY 4 ENTRIES READ

QT

NBIN= 33 NEW= 34 NC= 1
1262 18 1264 18

***** DELETED ***** MATRIX CONTROL RECORD... NO. 2. 1262 18 1264 18

VII. ADD OUTPUT

COVERX EXECUTION PATH SELECTED... ADD

135 34 1 33 0 T

13 ARRAY 4 ENTRIES READ

OT

IN FADD, CORE AVAILABLE 25000 CORE NEEDED

84
215 1261 452 1266 452 T

25 ARRAY 4 ENTRIES READ

OT

425 0 1 502 A1 E 1 12 502 03 6
5** F1.33225-5 T

43 ARRAY 13 ENTRIES READ

52 ARRAY 36 ENTRIES READ

OT

IN FMERG, CORE AVAILABLE 25000 CORE NEEDED 190

MERGE 34 31 33

IFC 6 6 0 2 3 3 4

JFC 6 6 0 2 0 1 4
1262 18 1264 18

4 1266 19 4

VIII. LIST OUTPUT

COVERX EXECUTION PATH SELECTED... LIST

195 23 T

13 ARRAY 1 ENTRIES READ

OT

IN FLIST, CORE AVAILABLE 25000 CORE NEEDED 96

*****AN EDIT OF THE COVERX CROSS-SECTION COVARIANCE FILE IS PRINTED HERE*****

```

FILE IDENTIFICATION RECORD..... 0V COVERX COVERX*CRNL - FORSS*
FILE CONTROL RECORD..... 1D 6 6 0 2 3 4 4
FILE DESCRIPTION..... 2D *THIS IS A SAMPLE PROBLEM*
NEUTRON GROUP BOUNDARIES..... 3D 2.0000E 07 3.6790E 06 1.3530E 06 4.9790E 05 1.8320E 05
4.1270E 04 1.0000E 05
MAT-MT CONTROL RECORD..... 5D 1262 18 4 1264 13 4 1266 18 4
MAT - MT TYPE CROSS-SECTIONS & ..... 6D 6.4320E-01 4.7020E-01 1.5130E-02 1.0440E-04 4.4330E-05
STANDARD DEVIATIONS 7.0150E-05 3.1200E-02 2.4510E-02 2.5990E-02 3.1460E-02 7.8200E-02
1.0710E 00
MAT - MT TYPE CROSS-SECTIONS & ..... 6D 1.8280E 00 1.9040E 00 1.6930E 00 1.5330E 00 1.5630E 00
STANDARD DEVIATIONS 1.6570E 00 3.0970E-02 2.3780E-02 2.7310E-02 2.3420E-02 2.7730E-02
3.4000E-02
MAT - MT TYPE CROSS-SECTIONS & ..... 6D 1.0000E 00 1.0000E 00 1.0000E 00 1.0000E 00 1.0000E 00
STANDARD DEVIATIONS 1.0000E 00 0.0 2.3410E-02 2.6782E-02 2.8105E-02 0.0
0.0
MATRIX CONTROL RECORD.....NO. 1.. 7D 1262 18 1262 18 1
BLOCK CONTROL RECORD..... 8D 6 1 6 2 6 3 6 4 6 5 6
MATRIX DATA RECORD..... 9D 6.7380E-04 4.1470E-04 2.1930E-04 5.1970E-05 -5.9190E-06
-3.3470E-07 4.1470E-04 6.0090E-04 3.7410E-04 1.3600E-04 6.2300E-05
2.5470E-07 2.1980E-04 3.9410E-04 6.7090E-04 2.3700E-04 8.1790E-05
-6.0750E-07 5.1970E-05 1.8600E-04 2.9700E-04 9.3950E-04 1.1630E-03
2.2670E-04 -5.9190E-06 6.2300E-05 3.1730E-05 1.1680E-03 6.1160E-03
6.4620E-04 -3.3470E-07 2.5470E-07 -6.0790E-07 2.2670E-04 6.4620E-04
1.1460E 00
MATRIX CONTROL RECORD.....NO. 2.. 7D 1264 18 1264 18 1
BLOCK CONTROL RECORD..... 8D 6 1 6 2 6 3 6 4 6 5 6
MATRIX DATA RECORD..... 9D 6.5910E-04 4.0030E-04 1.5300E-04 4.4600E-05 7.9940E-06
2.2850E-07 4.0050E-04 5.6570E-04 3.3170E-04 1.6380E-04 4.8800E-05
-7.8880E-07 1.5590E-04 3.3170E-04 7.4570E-04 5.3040E-04 2.3430E-04
8.0820E-07 4.4600E-05 1.6380E-04 5.8040E-04 3.0740E-04 4.0090E-04
2.6220E-04 7.9940E-06 4.9800E-05 2.3430E-04 4.0050E-04 7.6870E-04
5.3720E-04 2.2850E-07 -7.8880E-07 8.0820E-07 7.6220E-04 5.3720E-04
1.1560E-03
MATRIX CONTROL RECORD.....NO. 3.. 7D 1266 18 1266 18 1
BLOCK CONTROL RECORD..... 8D 6 1 6 2 6 3 6 4 6 5 6
MATRIX DATA RECORD..... 9D 0.0 0.0 3.9410E-04 1.5190E-04 4.2990E-05 0.0
0.0 0.0 5.4840E-04 3.2400E-04 1.5990E-04 0.0
0.0 0.0 3.2400E-04 7.1730E-04 5.6390E-04 0.0
0.0 0.0 1.5990E-04 5.6390E-04 7.0010E-04 0.0
0.0 0.0 4.5690E-05 2.2470E-04 3.7060E-04 0.0
0.0 0.0 0.0 0.0 2.6090E-04 0.0
0.0
MATRIX CONTROL RECORD.....NO. 4.. 7D 1261 452 1266 452 1
BLOCK CONTROL RECORD..... 8D 6 1 6 2 6 3 6 4 6 5 6
MATRIX DATA RECORD..... 9D 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05
1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05
1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05
1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05
1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05 1.3322E-05
1.3322E-05

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