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A MARKOVIAN FLOW MODEL: THE ANALYSIS OF MOVEMENT IN LARGE-SCALE (MILITARY) PERSONNEL SYSTEMS—PROGRAM LISTINGS

Kathleen Hall

A Report prepared for

UNITED STATES AIR FORCE PROJECT RAND

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PREFACE

The movement of the military population through the USAF personnel system is an unusually well-defined example of social mobility. AF managers are constantly faced with the necessity for manipulating this process in order to alter the distribution of the personnel inventory. Accurate management of the system is extremely difficult with only periodic inventories and limited, primitive information about the patterns of transitional movement that produced those inventories; evaluation is principally based upon short-term effects.

The lack of statistics on transitional behavior is a result of (1) the difficulty of obtaining information on changes of status using personnel records designed on the basis of traditional inventory concepts; and (2) the difficulty of comprehending the net impact and significance of a huge number of transition paths upon future distributions of the population.

This report is the final volume in the series R-514-PR, *A Markovian Flow Model: The Analysis of Movement in Large-Scale (Military) Personnel Systems;* R-534-PR, *A Markovian Flow Model: The Analysis of Movement in Large-Scale (Military) Personnel Systems--Program Reference Manual.* This series of reports describes a model of social mobility that can be utilized to provide the manager or analyst with information about patterns of movement, projections of the existing population into the future, and the impact produced by changes in the rates of movement (the effect of policy changes, for example). The model, derived from the mathematical concepts of Markovian processes, is presented as a series of FORTRAN subroutines capable of being used on a wide variety of contemporary computers. This report provides documentation and illustrations for the programmer.

SUMMARY

This report is designed for use by a programmer/analyst in creating and maintaining a program library for the system of programs described in R-514-PR, *A Markovian Flow Model: The Analysis of Movement in Large-Scale (Military) Personnel Systems*, and R-534-PR, *A Markovian Flow Model: The Analysis of Movement in Large-Scale (Military) Personnel Systems--Program Reference Manual*.

All subroutines are written in FORTRAN. They have been compiled (under FORTRAN H) and executed on an IBM 360/65. Except for one utility subroutine (NUDATE), which assumes that hexadecimal characters are used for the internal representation of alphameric data fields, these routines are not hardware dependent; they should run on any system for which an appropriate compiler is available.

The subroutine name, card label, number of cards, and storage required (in Hex bytes) are listed for each subroutine.

The FORTRAN source deck of each subroutine is listed and numerous comment cards are included. The comment cards contain a step-by-step natural-language description of the FORTRAN source-language statements.

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I. INTRODUCTION

This report contains listings of the subroutines described in R-514-PR, *A Markovian Flow Model: The Analysis of Movement in Large-Scale (Military) Personnel Systems* [1], and R-534-PR, *A Markovian Flow Model: The Analysis of Movement in Large-Scale (Military) Personnel Systems--Program Reference Manual* [2]. All subroutines are written in FORTRAN. They have been compiled and executed on an IBM 360/65; the FORTRAN H compiler was used.

In most instances, the average user of the Markovian Flow Model program package will not need to refer to this report. However, these program listings may be useful when:

1. The programs are to be compiled and run on another computer system.
2. A new operation using the Flow Model data has been defined and a subroutine implementing this operation is to be written.
3. There is the possibility of an error in the program. Before making this assumption, the following items should be very carefully checked--particularly if a System Completion Code is given for an abnormal end:
    a. Does the Main program contain an IMPLICIT REAL*8(A-H,O-Z) statement?
    b. Are all arrays in the argument lists dimensioned in the Main program? Is each dimension adequate for the data stored in the corresponding array?
    c. Are all control cards required for each operation present? Is the information in these cards in the proper columns and of the proper type?

d. Do the FORTRAN input/output units specified in the operation control cards correspond to the units specified in the IBM 360 Job Control Language Data Definition (JCL DD) cards?

e. Does the information in each JCL DD card correctly describe the data file?

II. INFORMATION FOR NON-RAND USERS

SYSTEM IMPLEMENTATION

The exact procedure required to create a FLOMOD program library is determined by the operating system implemented for the available computer. The procedure described below, used by the systems programming staff at Rand, may be a useful guide.

Using the *multiple-load module-processing* capability of the level F linkage editor, an output module library called SYS1.FLOMOD is created on a 2314 direct-access device. By means of the SYSLIB DD statement, this library is easily accessible through concatenation with the SYS1.FORTRAN system library. The FORTCLG cataloged procedure makes this concatenation a trivial process. The library created is a partitioned data-set requiring approximately 16 tracks, with each object module comprising one member (of the same name).

The following JCL for the linkage editor creates SYS1.FLOMOD:

```
//jobname JOB
//  EXEC PGM=LINKEDIT,REGION=104K,PARM='LIST,MAP,XREF,NCAL'
//SYSLIB DD DSNAME=SYS1.FORTLIB,DISP=SHR
//       DD DSN=SYS1.PL1LIB,DISP=SHR
//SYSPRINT DD SYSOUT=A,DCB=BLKSIZE=1210
//SYSLMOD DD DSN=SYS1.FLOMOD,DISP=(,CATLG,DELETE),
//  UNIT=2314,VOL=SER=RAND05,SPACE=(CYL,(1,1,7),RLSE),
//  DCB=(BLKSIZE=800,LRECL=80,RECFM=FB),LABEL=EXPDT=99350
//SYSLIN DD DDNAME=SYSIN
//SYSUT1 DD UNIT=(SYSDA,SEP=(SYSLIB,SYSLMOD)),
//  SPACE=(1024,(50,20))
//SYSIN DD *
     (CARDSP object deck)
 NAME CARDSP
      .
      .
      .
      (TMT2 object deck)
 NAME TMT2
/*
//
```

Only the JCL statements below are required to execute a FLOMOD program:

```
//jobname JOB
//  EXEC FORTCLG,LIB1='SYS1.FLOMOD'
//FORT.SYSIN DD *
        ...     (FLOMOD run deck)
/*
//
```

The above JCL invokes the following system-cataloged procedure (FORTCLG):

```
//FORTCLG  PROC LIB1='SYS1.NOTHING',LIB2='SYS1.NOTHING',
//             LIB3='SYS1.NOTHING'
//FORT EXEC PGM=IEYFORT,REGION=104K
//SYSPRINT DD SYSOUT=A,DCB=BLKSIZE=1680
//SYSPUNCH DD SYSOUT=B,DCB=BLKSIZE=800
//SYSLIN DD DSN=&&LOADSET,SPACE=(1600,(10,5)),DISP=(MOD,PASS),
// DCB=(BLKSIZE=1600,RECFM=FB),UNIT=SYSDA
//LKED EXEC PGM=LINKEDIT,COND=(5,LT,FORT),REGION=104K,
// PARM='LIST,MAP'
//SYSLIB DD DSN=&LIB1,DISP=SHR
// DD DSNAME=&LIB2,DISP=SHR
// DD DSNAME=&LIB3,DISP=SHR
// DD DSN=SYS1.FORTLIB,DISP=SHR
// DD DSNAME=SYS1.CSDFNLIB,DISP=SHR
//SYSPRINT DD SYSOUT=A,DCB=BLKSIZE=1210
//SYSLMOD DD DSN=&&GOSET(GO),DISP=(MOD,PASS),
// SPACE=(3072,(17,7,1)),UNIT=SYSDA,DCB=BLKSIZE=3072
//SYSLIN   DD  DSNAME=&LOADSET,DISP=(OLD,DELETE)
// DD DDNAME=SYSIN
//SYSUT1 DD UNIT=(SYSDA,SEP=(SYSLIB,SYSLMOD)),
// SPACE=(1024,(50,20))
//GO EXEC PGM=*.LKED.SYSLMOD,COND=((5,LT,FORT),(8,LT,LKED))
//FT05F001 DD DDNAME=SYSIN
//FT06F001 DD SYSOUT=A
//FT07F001 DD SYSOUT=B
//*NAME=SYSTEM,USE=FORTRAN G COMPILE, LINK EDIT, AND GO.
```

PROGRAMS IN CARD FORM

To operate with the program package in card form, include the Main program and the deck for each subroutine called. Also include the deck for each utility subroutine called, if any, by the operation subroutines. Each subroutine write-up in Ref. 2 lists the utility subroutines called.

PROGRAMMING DETAILS

A design objective of this program package was machine independence. The one known exception is subroutine NUDATE (a utility routine called by SXP), which assumes that alphameric data fields are represented in the computer in EBCDIC.†

The following programming details may be significant when this program package is used on other systems:

1. The standard FORTRAN convention in naming variables has been followed: all integer variables start with the letters I,J,K,L,M,N; all real variables start with the letters A through H, and O through Z. All literal or alphameric data are identified by integer-variable names. In each subroutine, all real variables are declared as REAL*8-type variables.

2. When a one-dimensional array is dimensioned in the Main program and included in a subroutine argument list, the array will have a dimension of one in the subroutine.

3. There are no COMMON statements in this program package.

4. All control cards (input-data cards) are read by a statement of the form

READ format, list

A statement of the form

PRINT format, list

is used for all printed output.

5. An A4 format is used for both input and output of alphameric fields.

6. Subroutine COPY may specify a read, backspace, and write sequence of operations for a single file. When this file has blocked variable-length records, the operating

---

†An abbreviation for "Extended Binary-Coded-Decimal Interchange Code"--an 8-bit code used by IBM System/360 computers.

system must execute a BACKSPACE statement as a logical rather than a physical backspace.

7. The maximum state number that may be processed by these programs is the maximum value that may be stored in a standard-length integer variable. For an IBM 360, this maximum integer value is $2^{31}-1$, or 2,147,483,647.

8. Certain inconsistencies in control-card or tape-file data detected by the FLOMOD programs cause program execution to cease. An error message is printed and a STOP statement is executed. This program package contains no CALL EXIT statements.

III. DESCRIPTION OF SOURCE-DECK FORMAT

The first card in each deck is a SUBROUTINE statement card. This is followed by comment cards containing a brief statement of the operation the subroutine will perform. The program statements and additional comment cards complete a deck.

There are no flow charts for the individual subroutines. Instead, the numerous comment cards in the program deck provide a step-by-step natural-language description of the operations performed when the statements are executed. The information in these cards defines variables and describes the data being read, written, computed, or tested at each step in the program.† A reference list of symbolic variable names is found at the end of each subroutine deck. The entries in the argument list are listed first, in the order of their appearance. These are followed by other variable names, in alphabetical order by the first letter only of the variable name.

Columns 73 through 80 of each subroutine deck contain a unique subroutine label of 3 to 5 characters and a sequential card number. The sequence numbers for each subroutine start at 10.

---

†D matrices, S vectors, and P matrices are typically referred to as "files" in these source decks; it should be clear from the context that we are not referring to system files.

IV. LIST OF SUBROUTINES

Subroutine Name	Subroutine Label in Cards	Number of Cards in Deck	Storage Required in Hexadecimal Bytes†	Page
CARDSP	CARD	259	BF6	10
CLLAPS	CLLA	318	AF6	15
COPY	COPY	200	878	21
DSPRNT	DSP1	492	12E8	25
DSPRN2	DSP2	669	1610	34
DXCOST	DXCO	294	9DA	46
FCHANG	FCH	1403	2BD6	52
FILE	FILE	64	1DE	77
FREQ1	FRQ1	211	7FA	79
FREQ2	FRQ2	226	85A	83
GENDSP	GEND	775	1C84	87
LSTPAT	LSTP	261	99A	101
NUDATE	NUDA	113	342	106
POSFWD	POSF	42	1F2	108
POSINP	POSI	101	3C0	109
PRINTD	PRNTD	64	1E4	111
PRINTP	PRNTP	73	2B6	113
PRINTS	PRNTS	51	218	115
READIN	RDIN	31	180	116
READSP	RDSP	141	404	117
SELPAT	SELP	388	B96	120
SMATXP	SMAT	300	C96	127
SMINUS	SMIN	301	B98	133
SPAIRS	SPAIR	67	272	139
STDES	STDE	227	7BA	141
STSORT	STSO	205	894	145
SXP	SXP	409	DEA	149
TMT	TMT	24	12E	157
TMT2	TMT2	29	144	158

†For FORTRAN IV H LEVEL 17 compiler on an IBM 360/65.

V. PROGRAM LISTINGS

```
      SUBROUTINE CARDSP (ISN,ISVEC,P)                                   CARD0010
C                                                                       CARD0020
C                        THIS ROUTINE WILL READ D, S AND/OR P ARRAYS    CARD0030
C                        PUNCHED IN CARDS AND WRITE THEM ON TAPE IN THE CARD0040
C                        FLOMOD FORMAT.                                 CARD0050
C                                                                       CARD0060
      IMPLICIT REAL*8(A-H,O-Z,$)                                        CARD0070
      DIMENSION ISN(1),ISVEC(1),P(1),NAME(6),LABEL(30)                  CARD0080
C                                                                       CARD0090
C                        INITIALIZE RECORD TYPE VARIABLES.              CARD0100
C                        D BEGINNING LABEL.                             CARD0110
      KDBEG=1                                                           CARD0120
C                        D DATA RECORD.                                 CARD0130
      KDDAT=21                                                          CARD0140
C                        D END LABEL.                                   CARD0150
      KDEND=31                                                          CARD0160
C                        S BEGINNING LABEL.                             CARD0170
      KSBEG=2                                                           CARD0180
C                        S DATA RECORD.                                 CARD0190
      KSDAT=22                                                          CARD0200
C                        S END LABEL.                                   CARD0210
      KSEND=32                                                          CARD0220
C                        P BEGINNING LABEL.                             CARD0230
      KPBEG=3                                                           CARD0240
C                        P LIST RECORD.                                 CARD0250
      KPLST=13                                                          CARD0260
C                        P DATA RECORD.                                 CARD0270
      KPDAT=23                                                          CARD0280
C                        P END LABEL.                                   CARD0290
      KPEND=33                                                          CARD0300
C                        FLOMOD END OF FILE RECORD.                     CARD0310
      KNEXT=40                                                          CARD0320
C                        NL= NUMBER OF WORDS IN LABEL.                  CARD0330
      NL=30                                                             CARD0340
C                        FILLER VARIABLE.                               CARD0350
      NFILL=1                                                           CARD0360
      DATA KBLANK/4H     /                                              CARD0370
C                        READ OUTPUT UNIT NUMBER.                       CARD0380
      READ 5,KOUT                                                       CARD0390
C                        REWIND OUTPUT UNIT.                            CARD0400
      REWIND KOUT                                                       CARD0410
C                        SET COUNT OF FILES ON OUTPUT UNIT TO ZERO.     CARD0420
      NFILES=0                                                          CARD0430
C                        READ ARRAY TYPE.                               CARD0440
   50 READ 5,KTYPE                                                      CARD0450
C                        BRANCH ON ARRAY TYPE.                          CARD0460
      GO TO (100,200,300,400),KTYPE                                     CARD0470
C                                                                       CARD0480
C                        D MATRIX.                                      CARD0490
  100 CONTINUE                                                          CARD0500
C                        READ MATRIX NAME AND LABEL.                    CARD0510
      READ 10,NAME,LABEL                                                CARD0520
C                        PRINT TYPE AND NAME                            CARD0530
      PRINT 2,KTYPE,NAME                                                CARD0540
C                        WRITE BEGINNING LABEL ON OUTPUT UNIT.          CARD0550
      WRITE(KOUT)KDBEG,NAME,NL,LABEL                                    CARD0560
```

```
C                       READ ARRAY ELEMENTS. THEY MUST BE IN ORDER BY   CARD0570
C                       ROW AND BY COLUMN WITHIN ROW.                   CARD0580
C                       INITIALIZE ELEMENT SUBSCRIPT FOR THIS ROW.      CARD0590
      K=1                                                               CARD0600
C                       INITIALIZE NUMBER OF ELEMENTS COUNT FOR THE     CARD0610
C                       MATRIX.                                         CARD0620
      KSUM=0                                                            CARD0630
C                       NUMBER OF ROWS COUNT FOR THE MATRIX.            CARD0640
      ISCNT=0                                                           CARD0650
C                       READ FIRST ELEMENT CARD.                        CARD0660
      READ 5,IROW,ISN(1),ISVEC(1)                                       CARD0670
C                       UPDATE ROW SUBSCRIPT.                           CARD0680
  130 K=K+1                                                             CARD0690
C                       READ ADDITIONAL ELEMENT CARD.                   CARD0700
      READ 5,IROWX,ISN(K),ISVEC(K)                                      CARD0710
C                       WAS ROW NUMBER JUST READ SAME AS FOR PREVIOUS   CARD0720
C                       READ?                                           CARD0730
C                       YES. GO TO READ NEXT CARD.                      CARD0740
      IF(IROW.EQ.IROWX) GO TO 130                                       CARD0750
C                       THERE WAS A CHANGE IN ROW NUMBER. WRITE THE     CARD0760
C                       RECORD FOR THE ROW COMPLETED ON THE OUTPUT UNIT.CARD0770
C                       LET ICNT = NUMBER OF ELEMENTS IN THE ROW.       CARD0780
      ICNT=K-1                                                          CARD0790
      WRITE(KOUT)KDDAT,IROW,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT)  CARD0800
C                       UPDATE MATRIX ROW COUNT.                        CARD0810
      ISCNT=ISCNT+1                                                     CARD0820
C                       ACCUMULATE COUNT OF D ELEMENTS FOR THIS MATRIX. CARD0830
      KSUM=KSUM+ICNT                                                    CARD0840
C                       HAVE ALL ELEMENTS FOR THIS MATRIX BEEN READ?    CARD0850
C                       YES - GO TO WRITE ARRAY END LABEL.              CARD0860
      IF(IROWX.EQ.-1) GO TO 150                                         CARD0870
C                       NO.                                             CARD0880
C                       DATA FROM LAST CARD READ IS TO BE SHOWN AS FIRSTCARD0890
C                       ENTRY IN A NEW ROW.                             CARD0900
      IROW=IROWX                                                        CARD0910
      ISN(1)=ISN(K)                                                     CARD0920
      ISVEC(1)=ISVEC(K)                                                 CARD0930
      K=1                                                               CARD0940
C                       GO TO READ NEXT CARD.                           CARD0950
      GO TO 130                                                         CARD0960
C                                                                       CARD0970
C                       ALL ELEMENTS FOR THE MATRIX HAVE BEEN READ.     CARD0980
C                       WRITE END LABEL.                                CARD0990
  150 WRITE(KOUT) KDEND,NFILL,NFILL,ISCNT,KSUM                          CARD1000
C                       UPDATE NUMBER OF OUTPUT FILES.                  CARD1010
      NFILES=NFILES+1                                                   CARD1020
C                       GO TO READ NEXT ARRAY TYPE CARD.                CARD1030
      GO TO 50                                                          CARD1040
C                                                                       CARD1050
C                                                                     ***CARD1060
C                                                                       *CARD1070
C                       S VECTOR.                                       CARD1080
  200 CONTINUE                                                          CARD1090
C                       READ VECTOR NAME AND LABEL.                     CARD1100
      READ 10,NAME,LABEL                                                CARD1110
C                       PRINT TYPE AND NAME.                            CARD1120
      PRINT 2,KTYPE,NAME                                                CARD1130
```

```
C                         WRITE BEGINNING LABEL ON OUTPUT UNIT.          CARD1140
      WRITE(KOUT)KSBEG,NAME,NL,LABEL                                     CARD1150
C                         READ S VECTOR ELEMENTS. THEY MUST BE IN ORDER. CARD1160
C                         INITIALIZE S VECTOR SUBSCRIPT.                 CARD1170
      ISCNT=1                                                            CARD1180
C                         INITIALIZE S VECTOR SUM.                       CARD1190
      ISUM=0                                                             CARD1200
C                         READ AN ELEMENT.                               CARD1210
  220 READ 15,ISN(ISCNT),ISVEC(ISCNT)                                    CARD1220
C                         HAVE ALL ELEMENTS FOR THE VECTOR BEEN READ?    CARD1230
C                         YES. GO TO WRITE ARRAY END LABEL.              CARD1240
      IF(ISN(ISCNT).EQ.-1) GO TO 250                                     CARD1250
C                         NO.                                            CARD1260
C                         ACCUMULATE S VECTOR SUM.                       CARD1270
      ISUM=ISUM+ISVEC(ISCNT)                                             CARD1280
C                         UPDATE S VECTOR SUBSCRIPT.                     CARD1290
      ISCNT=ISCNT+1                                                      CARD1300
C                         GO TO READ NEXT ELEMENT.                       CARD1310
      GO TO 220                                                          CARD1320
C                                                                        CARD1330
C                         ALL ELEMENTS FOR THE S VECTOR HAVE BEEN READ.  CARD1340
C                         SET ISCNT EQUAL THE NUMBER OF ELEMENTS IN S.   CARD1350
  250 ISCNT=ISCNT-1                                                      CARD1360
C                         WRITE DATA RECORD.                             CARD1370
      WRITE(KOUT)KSDAT,NFILL,ISCNT,(ISN(I),I=1,ISCNT),                   CARD1380
     1           (ISVEC(I),I=1,ISCNT)                                    CARD1390
C                         WRITE END LABEL.                               CARD1400
      WRITE(KOUT)KSEND,NFILL,NFILL,ISUM,NFILL                            CARD1410
C                         UPDATE NUMBER OF OUTPUT FILES.                 CARD1420
      NFILES=NFILES+1                                                    CARD1430
C                         GO TO READ NEXT TYPE CARD.                     CARD1440
      GO TO 50                                                           CARD1450
C                                                                       *CARD1460
C                                                                     ***CARD1470
C                                                                        CARD1480
C                         P MATRIX                                       CARD1490
C                         READ MATRIX NAME AND LABEL.                    CARD1500
  300 READ 10,NAME,LABEL                                                 CARD1510
C                         PRINT TYPE AND NAME.                           CARD1520
      PRINT 2,KTYPE,NAME                                                 CARD1530
C                         WRITE BEGINNING LABEL ON OUTPUT UNIT.          CARD1540
      WRITE(KOUT)KPBEG,NAME,NL,LABEL                                     CARD1550
C                         READ LIST OF ROWS AND MODIFY SPECIFICATIONS.   CARD1560
      READ 5,ISCNT,(ISN(I),I=1,ISCNT),MODSW,MODFAC                       CARD1570
C                         WRITE INFO JUST READ ON OUTPUT UNIT.           CARD1580
      WRITE(KOUT)KPLST,ISCNT,(ISN(I),I=1,ISCNT),MODSW,MODFAC             CARD1590
C                         READ LIST OF COLUMNS AND P MATRIX INCREMENT    CARD1600
C                         VALUES.                                        CARD1610
      READ 5,JCNT,(ISN(I),I=1,JCNT),NUMMO,NUMYR                          CARD1620
C                         WRITE INFO JUST READ ON OUTPUT UNIT.           CARD1630
      WRITE(KOUT)KPLST,JCNT,(ISN(I),I=1,JCNT),NUMMO,NUMYR                CARD1640
C                         READ ARRAY ELEMENTS. THEY MUST BE IN ORDER BY  CARD1650
C                         ROW AND BY COLUMN WITHIN ROW.                  CARD1660
C                         INITIALIZE ELEMENT SUBSCRIPT FOR THIS ROW.     CARD1670
      K=1                                                                CARD1680
C                         INITIALIZE NUMBER OF ELEMENTS COUNT FOR THE    CARD1690
C                         MATRIX.                                        CARD1700
```

```
      KSUM=0                                                            CARD1710
C                          READ FIRST ELEMENT CARD.                     CARD1720
      READ 15,IROW,ISN(1),P(1)                                          CARD1730
C                          UPDATE ROW SUBSCRIPT.                        CARD1740
  330 K=K+1                                                             CARD1750
C                          READ ADDITIONAL ELEMENT CARD.                CARD1760
      READ 15,IROWX,ISN(K),P(K)                                         CARD1770
C                          WAS ROW NUMBER JUST READ SAME AS THAT OF     CARD1780
C                          PREVIOUS READ?                               CARD1790
C                          YES - GO TO READ NEXT CARD.                  CARD1800
      IF(IROW.EQ.IROWX) GO TO 330                                       CARD1810
C                          THERE WAS A CHANGE IN ROW NUMBER. WRITE THE  CARD1820
C                          RECORD FOR THE ROW COMPLETED ON THE OUTPUT UNIT.CARD1830
C                          LET ICNT = NUMBER OF ELEMENTS IN THE ROW.    CARD1840
      ICNT=K-1                                                          CARD1850
      WRITE(KOUT)KPDAT,IROW,ICNT,(ISN(I),I=1,ICNT),(P(I),I=1,ICNT)      CARD1860
C                          ACCUMULATE COUNT OF P ELEMENTS FOR THIS MATRIX. CARD1870
      KSUM=KSUM+ICNT                                                    CARD1880
C                          HAVE ALL ELEMENTS FOR THIS MATRIX BEEN READ? CARD1890
C                          YES - GO TO WRITE ARRAY END LABEL.           CARD1900
      IF(IROWX.EQ.-1) GO TO 350                                         CARD1910
C                          NO.                                          CARD1920
C                          DATA FROM LAST CARD READ IS TO BE SHOWN AS FIRSTCARD1930
C                          ENTRY IN A NEW ROW.                          CARD1940
      IROW=IROWX                                                        CARD1950
      ISN(1)=ISN(K)                                                     CARD1960
      P(1)=P(K)                                                         CARD1970
      K=1                                                               CARD1980
C                          GO TO READ NEXT CARD.                        CARD1990
      GO TO 330                                                         CARD2000
C                                                                       CARD2010
C                          ALL ELEMENTS FOR THE MATRIX HAVE BEEN READ.  CARD2020
C                          CHANGE COUNT OF ARRAY ELEMENTS TO A REAL VALUE. CARD2030
  350 PN=KSUM                                                           CARD2040
C                          WRITE END LABEL.                             CARD2050
      WRITE(KOUT) KPEND,NFILL,NFILL,ISCNT,PN                            CARD2060
C                          UPDATE NUMBER OF OUTPUT FILES.               CARD2070
      NFILES=NFILES+1                                                   CARD2080
C                          GO TO READ NEXT ARRAY TYPE CARD.             CARD2090
      GO TO 50                                                          CARD2100
C                                                                       CARD2110
C                          ALL ARRAYS HAVE BEEN PROCESSED.              CARD2120
C                                                                       CARD2130
C                          UPDATE NUMBER OF FILES FOR END OF FILE RECORD. CARD2140
  400 NFILES=NFILES+1                                                   CARD2150
C                          CREATE A BLANK FILE NAME.                    CARD2160
      DO 410 I=1,6                                                      CARD2170
  410 NAME(I)=KBLANK                                                    CARD2180
C                          WRITE END LABEL.                             CARD2190
      WRITE(KOUT)KNEXT,NAME,NFILL,NFILES                                CARD2200
C                          REWIND OUTPUT UNIT.                          CARD2210
      REWIND KOUT                                                       CARD2220
C                          PRINT ARRAY TYPE AND NAME                    CARD2230
      PRINT 2,KTYPE,NAME                                                CARD2240
C                          PRINT END OF OPERATION MESSAGE.              CARD2250
      PRINT 1,NFILES                                                    CARD2260
C                          RETURN                                       CARD2270
```

```
      RETURN                                                            CARD2280
C                                                                       CARD2290
    1 FORMAT(46H CARDSP OPERATION COMPLETE. NUMBER OF FILES = I6)       CARD2300
    2 FORMAT(1X,7HKTYPE =,I6,5X,6A4)                                    CARD2310
    5 FORMAT(6I12)                                                      CARD2320
   10 FORMAT(6A4/20A4/10A4)                                             CARD2330
   15 FORMAT(2I12,F12.6)                                                CARD2340
C                                                                       CARD2350
C                          REFERENCE LIST.                              CARD2360
C                                                                       CARD2370
C                          SUBROUTINE ARGUMENTS.                        CARD2380
C                                                                       CARD2390
C     ISN    - THIS ARRAY WILL BE USED FOR (1) P MATRIX LIST OF ROWS,   CARD2400
C              LIST OF COLUMNS, AND LIST OF COLUMNS IN A ROW, (2) D     CARD2410
C              MATRIX LIST OF COLUMNS IN A ROW, (3) S VECTOR LIST OF    CARD2420
C              STATE NUMBERS.                                           CARD2430
C     ISVEC  - THIS ARRAY WILL BE USED FOR (1) D MATRIX ELEMENT VALUES  CARD2440
C              IN A ROW, (2) S VECTOR STATE VALUES.                     CARD2450
C     P      - THIS ARRAY WILL BE USED FOR THE P MATRIX ELEMENT VALUES  CARD2460
C              IN A ROW.                                                CARD2470
C                                                                       CARD2480
C                          OTHER VARIABLES.                             CARD2490
C                                                                       CARD2500
C     KTYPE  - 1.. D MATRIX.                                            CARD2510
C              2.. S VECTOR.                                            CARD2520
C              3.. P MATRIX.                                            CARD2530
C              4.. END OF INPUT DATA.                                   CARD2540
C     MODSW  - TRANSITION MODIFY SWITCH. SEE GENDSP FOR DETAILS.        CARD2550
C     MODFAC - TRANSITION MODIFY FACTOR. SEE GENDSP FOR DETAILS.        CARD2560
C     NUMMO  - P MATRIX MONTH INCREMENT VALUE.SEE GENDSP FOR DETAILS.   CARD2570
C     NUMYR  - P MATRIX YEAR INCREMENT VALUE. SEE GENDSP FOR DETAILS.   CARD2580
      END                                                               CARD2590
```

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      SUBROUTINE CLLAPS(KS,LSTCOD,LDIM)                                 CLLA0010
C                                                                      *CLLA0020
C                       THIS SUBROUTINE WILL COLLAPSE A GIVEN MODEL BY  CLLA0030
C                       OMITTING OR RECODING ONE OR MORE VARIABLES IN   CLLA0040
C                       THE STATE DEFINITION.                           CLLA0050
C                       THE COLLAPSE OPERATION CAN BE PERFORMED ON A    CLLA0060
C                       STATE PATTERN FREQUENCY FILE ONLY.              CLLA0070
C                                                                       CLLA0080
C                       A DIMENSION OF 30 IS USED FOR THE VARIABLE CODE CLLA0090
C                       ARRAYS SINCE THIS IS THE MAXIMUM NUMBER OF VARI-CLLA0100
C                       ABLES THAT MAY BE USED IN DEFINING A MODEL.     CLLA0110
      DIMENSION NCODEV(30),KS(1)                                        CLLA0120
      DIMENSION NCODV2(30),NC(30),NC2(30),LOC(30),LSTCOD(1)             CLLA0130
      DIMENSION LCODE(30)                                               CLLA0140
      DIMENSION MULT(30)                                                CLLA0150
C                                                                       CLLA0160
C                       INITIALIZE CONSTANT NFILL.                      CLLA0170
      NFILL=0                                                           CLLA0180
C                       READ NV - NUMBER OF VARIABLES USED TO DEFINE    CLLA0190
C                       INPUT STATE NUMBERS - AND NCODEV(1) THRU        CLLA0200
C                       NCODEV(NV) - NUMBER OF CODES DEFINED PER VARI-  CLLA0210
C                       ABLE FOR INPUT STATE NUMBERS. THE NCODEV VALUE  CLLA0220
C                       WILL BE NEGATIVE FOR ANY VARIABLE BEING OMITTED CLLA0230
C                       IN OUTPUT STATE NUMBERS.                        CLLA0240
      READ 10,NV,(NCODEV(N),N=1,NV)                                     CLLA0250
C                       READ 'NS' - NUMBER OF STATE NUMBERS PER PATTERN.CLLA0260
      READ 10,NS                                                        CLLA0270
C                       SET UP ARRAY OF POSITIVE NUMBER OF CODES PER    CLLA0280
C                       VARIABLE FOR USE IN COMPUTING MULTIPLY FACTORS  CLLA0290
C                       AND ARRAY SUBSCRIPTS.                           CLLA0300
      DO  20 N=1,NV                                                     CLLA0310
   20 NC(N)=IABS(NCODEV(N))                                             CLLA0320
C                       INITIALIZE FOR LATER INDEX USE.                 CLLA0330
      NVM1=NV-1                                                         CLLA0340
C                       GENERATE THE MULTIPLY FACTORS USED IN DECODING  CLLA0350
C                       STATE NUMBERS.                                  CLLA0360
      MULT(NV)=1                                                        CLLA0370
      IF(NV.EQ.1) GO TO 24                                              CLLA0375
      N=NV                                                              CLLA0380
      DO  22 I=1,NVM1                                                   CLLA0390
      MULT(N-1)=MULT(N)*NC(N)                                           CLLA0400
   22 N=N-1                                                             CLLA0410
C                                                                       CLLA0420
C                       READ KOPT - SPECIFICATION OF COLLAPSE OPTION.   CLLA0430
   24 READ 10,KOPT                                                      CLLA0440
C                       BRANCH ON OPTION.                               CLLA0450
      IF(KOPT.EQ.2) GO TO 30                                            CLLA0460
C                       OPTION 1.                                       CLLA0470
C                       VARIABLE OMISSION ONLY.                         CLLA0480
C                       THE NUMBER OF CODES DEFINED PER VARIABLE FOR    CLLA0490
C                       OUTPUT STATE NUMBERS WILL BE THE SAME AS THE    CLLA0500
C                       NUMBER OF CODES DEFINED FOR THE CORRESPONDING   CLLA0510
C                       INPUT VARIABLE.                                 CLLA0520
      CALL TMT(NV,NCODV2(1),NCODEV(1))                                  CLLA0530
      GO TO 60                                                          CLLA0540
C                       30                                              CLLA0550
```

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C                       OPTION 2.                                          CLLA0560
C                       VARIABLE GROUPING ONLY OR VARIABLE GROUPING AND CLLA0570
C                       OMISSION.                                          CLLA0580
C                       READ NV - NUMBER OF VARIABLES (MUST BE THE SAME CLLA0590
C                       AS NV IN THE FIRST READ) AND NCODV2(1) THRU        CLLA0600
C                       NCODV2(NV) - THE NUMBER OF CODES PER VARIABLE      CLLA0610
C                       FOR THE NEW MODEL. THE ENTRY WILL BE ZERO FOR A CLLA0620
C                       VARIABLE BEING OMITTED AND NEGATIVE FOR A          CLLA0630
C                       VARIABLE BEING RECODED.                            CLLA0640
   30 READ 10,NV,(NCODV2(N),N=1,NV)                                        CLLA0650
C                       SET UP..                                           CLLA0660
C                       LSTCOD - ARRAY OF RECODE CODES FOR VARIABLES TO CLLA0670
C                       BE RECODED AND LOC - ARRAY OF SUBSCRIPTS -         CLLA0680
C                       BEGINNING LOCATION IN LSTCOD OF RECODE VALUES      CLLA0690
C                       FOR EACH VARIABLE.                                 CLLA0700
C                       SET INITIAL SUBSCRIPT TO ONE.                      CLLA0710
      LOCSUB=1                                                             CLLA0720
C                       DO FOR EACH VARIABLE.                              CLLA0730
      DO  50 N=1,NV                                                        CLLA0740
C                       IS THIS VARIABLE TO BE RECODED?                    CLLA0750
      IF(NCODV2(N).LT.0) GO TO 40                                          CLLA0760
C                       NO                                                 CLLA0770
C                       NO LOCATION IN LSTCOD WILL CONTAIN CODES FOR THECLLA0780
C                       N'TH VARIABLE.                                     CLLA0790
      LOC(N)=0                                                             CLLA0800
      GO TO 50                                                             CLLA0810
C                       YES                                                CLLA0820
C                       THE CODES FOR THIS VARIABLE ARE TO BE CHANGED.     CLLA0830
C                       LOC(N)=FIRST LOCATION IN LSTCOD FOR CODES FOR      CLLA0840
C                       THE NTH VARIABLE.                                  CLLA0850
   40 LOC(N)=LOCSUB                                                        CLLA0860
C                       NC(N) IS THE NUMBER OF CODES DEFINED FOR THE       CLLA0870
C                       N'TH VARIABLE IN THE INPUT MODEL.                  CLLA0880
C                       LTO IS THE LAST LOCATION IN LSTCOD FOR CODES FORCLLA0890
C                       THE N'TH VARIABLE.                                 CLLA0900
      LTO=LOCSUB+NC(N)-1                                                   CLLA0910
C                       READ NX - VARIABLE NUMBER FOR FOLLOWING LIST OF CLLA0920
C                       RECODE VALUES, AND LSTCOD(LOCSUB) THRU LSTCOD      CLLA0930
C                       (LTO) - A LIST OF NEW CODE VALUES, ONE FOR EACH CLLA0940
C                       ORIGINAL CODE VALUE.                               CLLA0950
      READ 10,NX,(LSTCOD(L),L=LOCSUB,LTO)                                  CLLA0960
C                       DOES THE VARIABLE NUMBER READ EQUAL THE CURRENT CLLA0970
C                       VARIABLE NUMBER OF THE DO LOOP CONTROLLING THE     CLLA0980
C                       RECODE INPUT?                                      CLLA0990
C                       NO. CONTROL CARD ERROR.                            CLLA1000
      IF(NX.NE.N) GO TO 220                                                CLLA1010
C                       YES                                                CLLA1020
C                       INCREMENT SUBSCRIPT VALUE FOR LOC.                 CLLA1030
      LOCSUB=LTO+1                                                         CLLA1040
C                       CONTINUE                                           CLLA1050
   50 CONTINUE                                                             CLLA1060
C                                                                          CLLA1070
C                       IS FINAL SUBSCRIPT VALUE USED GREATER THAN THE     CLLA1080
C                       DIMENSION OF THE ARRAY IN WHICH THESE NEW CODE     CLLA1090
C                       VALUES WERE STORED?                                CLLA1100
C                       YES. DIMENSION ERROR.                              CLLA1110
      IF(LOCSUB-1.GT.LDIM) GO TO 200                                       CLLA1120
```

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C                                                                       CLLA1130
C                       60                                              CLLA1140
C                       DIMENSION OF CODE VALUE ARRAY HAS NOT BEEN      CLLA1150
C                       EXCEEDED.                                       CLLA1160
C                       OPTIONS 1 AND 2.                                CLLA1170
C                       CREATE AN ARRAY OF POSITIVE NUMBER OF CODES PER CLLA1180
C                       VARIABLE FOR USE IN CODING THE OUTPUT STATE     CLLA1190
C                       NUMBERS.                                        CLLA1200
   60 DO 65 N=1,NV                                                      CLLA1210
   65 NC2(N)=IABS(NCODV2(N))                                            CLLA1220
C                       INITIALIZATION FOR RECODING COMPLETE.           CLLA1230
C                                                                       CLLA1240
C                       READ KOUT - OUTPUT UNIT ID.                     CLLA1250
   70 READ 10,KOUT                                                      CLLA1260
C                       REWIND OUTPUT UNIT.                             CLLA1270
      REWIND KOUT                                                       CLLA1280
C                                                                       CLLA1290
C                       READ KINP - INPUT UNIT ID.                      CLLA1300
   75 READ 10,KINP                                                      CLLA1310
C                       IS THIS A RETURN CARD?                          CLLA1320
C                       YES. GO TO REWIND OUTPUT UNIT.                  CLLA1330
      IF(KINP.EQ.0) GO TO 190                                           CLLA1340
C                       NO                                              CLLA1350
C                       REWIND INPUT UNIT.                              CLLA1360
      REWIND KINP                                                       CLLA1370
C                                                                     ***CLLA1380
C                                                                      *CLLA1390
C                       PROCESS STATE NUMBER PATTERN RECORDS.           CLLA1400
C                       READ A RECORD: MODL,KS(1) THRU KS(NS),IFREQ.    CLLA1410
   80 READ(KINP,END=100)MODL,(KS(N),N=1,NS),IFREQ                       CLLA1420
C                       NO EOF                                          CLLA1430
C                                                                    **CLLA1440
C                                                                     *CLLA1450
C                       RECODE.                                         CLLA1460
C                       EACH INPUT STATE NUMBER IS DECODED TO ITS       CLLA1470
C                       ORIGINAL VARIABLE CODE VALUES. THESE CODE VALUESCLLA1480
C                       ARE GROUPED AND/OR OMITTED AS SPECIFIED INCODINGCLLA1490
C                       EACH OUTPUT STATE NUMBER.                       CLLA1500
C                                                                       CLLA1510
C                       STATE NUMBER = (A-1)*KB*KC*...*KR               CLLA1520
C                                    + (B-1)*KC*KD*...*KR               CLLA1530
C                                    + ...                              CLLA1540
C                                    + (Q-1)*KR                         CLLA1550
C                                    + R                                CLLA1560
C                       WHERE A,...,R ARE VARIABLE CODES.               CLLA1570
C                       AND KA,...,KR ARE VARIABLE RANGES.              CLLA1580
C                                                                       CLLA1590
C                       DECODE-RECODE LOOP.                             CLLA1600
C                       DO FOR EACH STATE NUMBER IN PATTERN.            CLLA1610
      DO 1100 K=1,NS                                                    CLLA1620
C                       IS THIS STATE NUMBER ZERO?                      CLLA1630
C                       YES. OUTPUT STATE NUMBER WILL ALSO BE ZERO. GO  CLLA1640
C                       TO NEXT STATE NUMBER.                           CLLA1650
      IF(KS(K).EQ.0) GO TO 1100                                         CLLA1660
C                       NO                                              CLLA1670
C                       LK = KS(K) = STATE NUMBER BEING RECODED.        CLLA1680
      LK=KS(K)                                                          CLLA1690
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C                         DECODE.                                          CLLA1700
C                         DECODE THE ORIGINAL STATE NUMBER AND PLACE THE   CLLA1710
C                         CODE VALUES IN LCODE.                            CLLA1720
      IF(NV.EQ.1) GO TO 1062                                               CLLA1725
      DO 1060 N=1,NVM1                                                     CLLA1730
      LWK=(LK-1)/MULT(N)                                                   CLLA1740
      LK=LK-LWK*MULT(N)                                                    CLLA1750
 1060 LCODE(N)=LWK+1                                                       CLLA1760
 1062 LCODE(NV)=LK                                                         CLLA1770
C                         RECODE.                                          CLLA1780
C                         RECODE THE NEW STATE NUMBER AND PUT IT IN KS(K).CLLA1790
C                         SET WORKING LOCATION FOR GENERATION OF NEW STATECLLA1800
C                         NUMBER TO ZERO.                                  CLLA1810
      LWK=0                                                                CLLA1820
C                         DO FOR ALL VARIABLES.                            CLLA1830
      DO 1080 N=1,NV                                                       CLLA1840
C                         IS THIS VARIABLE BEING OMITTED?                  CLLA1850
C                         YES. GO TO NEXT VARIABLE.                        CLLA1860
      IF(NCODEV(N).LT.0) GO TO 1080                                        CLLA1870
C                         NO                                               CLLA1880
C                         IS THIS VARIABLE BEING RECODED?                  CLLA1890
C                         NO. KEEP CURRENT CODE FOR THIS VARIABLE.         CLLA1900
      IF(NCODV2(N).GT.0) GO TO 1075                                        CLLA1910
C                         YES                                              CLLA1920
C                         PICK UP CODE SUBSCRIPT AND VALUE. PLACE NEW CODECLLA1930
C                         VALUE IN LCODE.                                  CLLA1940
      L=LOC(N)-1+LCODE(N)                                                  CLLA1950
      LCODE(N)=LSTCOD(L)                                                   CLLA1960
C                         ACCUMULATE CONTRIBUTION OF THIS CODE TO STATE    CLLA1970
C                         NUMBER.                                          CLLA1980
 1075 LWK=LWK*NC2(N)+LCODE(N)-1                                            CLLA1990
C                         CONTINUE                                         CLLA2000
 1080 CONTINUE                                                             CLLA2010
C                         ADJUST FOR 1 SUBTRACTED FOR RTH VARIABLE.        CLLA2020
      KS(K)=LWK+1                                                          CLLA2030
C                                                                          CLLA2040
C                         CONTINUE                                         CLLA2050
 1100 CONTINUE                                                             CLLA2060
C                                                                         *CLLA2070
C                                                                        **CLLA2080
C                         WRITE: MODL,KS(1) THRU KS(NS),IFREQ.             CLLA2090
      WRITE(KOUT) MODL,(KS(N),N=1,NS),IFREQ                                CLLA2100
C                         GO TO READ AN INPUT RECORD.                      CLLA2110
      GO TO 80                                                             CLLA2120
C                                                                         *CLLA2130
C                                                                       ***CLLA2140
C                         END OF FILE ON READ.                             CLLA2150
C                         REWIND INPUT UNIT.                               CLLA2160
  100 REWIND KINP                                                          CLLA2170
C                         PRINT 'OPERATION COMPLETE MESSAGE' FOR THIS      CLLA2180
C                         INPUT UNIT.                                      CLLA2190
      PRINT 240,KINP                                                       CLLA2200
C                         GO TO READ A CONTROL CARD.                       CLLA2210
      GO TO 75                                                             CLLA2220
C                         YES - A RETURN CARD WAS READ.                    CLLA2230
C                         REWIND OUTPUT UNIT.                              CLLA2240
  190 REWIND KOUT                                                          CLLA2250
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C                       PRINT 'OPERATION COMPLETE MESSAGE' FOR THIS     CLLA2260
C                       OUTPUT UNIT.                                    CLLA2270
      PRINT 250,KOUT                                                    CLLA2280
C                       RETURN                                          CLLA2290
      RETURN                                                            CLLA2300
C                                                                       CLLA2310
C                       YES                                             CLLA2320
C                       DIM ERROR FOR LSTCOD.                           CLLA2330
C                       PRINT ERROR MESSAGE.                            CLLA2340
  200 PRINT 210,LDIM,LOCSUB                                             CLLA2350
C                       EXIT                                            CLLA2360
      STOP                                                              CLLA2370
C                       NO - CONTROL CARD VARIABLE NUMBER DOES NOT EQUALCLLA2380
C                       DO LOOP VARIABLE NUMBER.                        CLLA2390
C                       PRINT ERROR MESSAGE.                            CLLA2400
  220 PRINT 230,NX,N                                                    CLLA2410
C                       EXIT                                            CLLA2420
      STOP                                                              CLLA2430
C                                                                       CLLA2440
   10 FORMAT(6I12)                                                      CLLA2450
  210 FORMAT(52H DIMENSION OF LSTCOD - CODE LIST VECTOR - TOO SMALL./   CLLA2460
     1       30H VALUES OF LDIM AND LOCSUB ARE,2I12)                    CLLA2470
  230 FORMAT(52H CLLAPS...CONTROL CARD ERROR. CARD VARIABLE NUMBER = ,  CLLA2480
     1I12/27X,25HDO LOOP VARIABLE NUMBER = ,I12)                        CLLA2490
  240 FORMAT(//45H CLLAPS...OPERATION COMPLETE FOR INPUT UNIT  ,I6)     CLLA2500
  250 FORMAT(//45H CLLAPS...OPERATION COMPLETE FOR OUTPUT UNIT ,I6)     CLLA2510
C                                                                       CLLA2520
C                       REFERENCE LIST.                                 CLLA2530
C                                                                       CLLA2540
C                       SUBROUTINE ARGUMENTS.                           CLLA2550
C                                                                       CLLA2560
C     KS      - ARRAY FOR NS STATES -- A STATE NUMBER PATTERN.          CLLA2570
C                                                                       CLLA2580
C                                                                       CLLA2590
C     LSTCOD - THE NEW CODE VALUES. THERE IS A NEW CODE FOR EACH OLD    CLLA2600
C              CODE IN THE OLD CODE SEQUENCE - FOR ONLY THOSE VARIABLES CLLA2610
C              BEING CHANGED.                                           CLLA2620
C     LSTCOD(1) - NEW CODE VALUE FOR FIRST OLD CODE VALUE FOR FIRST     CLLA2630
C              VARIABLE THAT HAS A NEGATIVE ENTRY IN NCODV2.            CLLA2640
C     LSTCOD(2) - NEW CODE VALUE FOR SECOND OLD CODE VALUE FOR FIRST    CLLA2650
C              VARIABLE THAT HAS A NEGATIVE ENTRY IN NCODV2.            CLLA2660
C        .                                                              CLLA2670
C        .                                                              CLLA2680
C        .                                                              CLLA2690
C     LSTCOD(NCODEV(I)) - NEW CODE VALUE FOR LAST OLD CODE VALUE FOR    CLLA2700
C              FIRST VARIABLE THAT HAS A NEGATIVE ENTRY IN NCODV2.      CLLA2710
C     LSTCOD(NCODEV(I)+1) - NEW CODE VALUE FOR FIRST OLD CODE VALUE FOR CLLA2720
C              SECOND VARIABLE THAT HAS A NEGATIVE ENTRY IN NCODV2.     CLLA2730
C     LSTCOD(NCODEV(I)+2) - NEW CODE VALUE FOR SECOND OLD CODE VALUE FORCLLA2740
C              SECOND VARIABLE THAT HAS A NEGATIVE ENTRY IN NCODV2.     CLLA2750
C        .                                                              CLLA2760
C        .                                                              CLLA2770
C        .                                                              CLLA2780
C     LSTCOD(NCODEV(I)+NCODEV(J)) - NEW CODE VALUE FOR LAST OLD CODE    CLLA2790
C              VALUE FOR SECOND VARIABLE THAT HAS A NEGATIVE ENTRY IN   CLLA2800
C              NCODV2.                                                  CLLA2810
C                                                                       CLLA2820
```

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C        .                                                          CLLA2830
C        .                                                          CLLA2840
C     LDIM    - DIMENSION OF LSTCOD IN MAIN PROGRAM.                CLLA2850
C                                                                   CLLA2860
C                       OTHER VARIABLES.                            CLLA2870
C                                                                   CLLA2880
C     KOPT    - OPTION TYPE.                                        CLLA2890
C               1 IF VARIABLE OMISSION ONLY.                        CLLA2900
C               2 IF (A) VARIABLE GROUPING ONLY, OR                 CLLA2910
C                    (B) VARIABLE GROUPING PLUS VARIABLE OMISSION.  CLLA2920
C     LOC     - ARRAY CONTAINING FOR EACH VARIABLE, THE SUBSCRIPT VALUE  CLLA2930
C               FOR THE FIRST LOCATION IN LSTCOD CONTAINING THE CODES FORCLLA2940
C               THAT VARIABLE.                                      CLLA2950
C               THE VALUE WILL BE ZERO IF NCODV2(I) IS ZERO OR POSITIVE. CLLA2960
C               THE VALUE WILL BE 1 + (NCODEV(K) FOR EACH NEGATIVE  CLLA2970
C               NCODV2(K), K=1 THRU I-1) IF NCODV2(I) IS NEGATIVE.  CLLA2980
C     LCODE   - A WORK AREA USED FOR THE VARIABLE CODES AS EACH STATE  CLLA2990
C               NUMBER IS RECODED.                                  CLLA3000
C     MULT    - ARRAY FOR STATE NUMBER MULTIPLY FACTORS.            CLLA3010
C     NC      - ARRAY FOR ABSOLUTE VALUE OF NCODEV ENTRIES.         CLLA3020
C     NC2     - ARRAY FOR ABSOLUTE VALUE OF NCODV2 ENTRIES.         CLLA3030
C     NS      - NUMBER OF STATES PER PATTERN.                       CLLA3040
C     NV      - NUMBER OF VARIABLES.                                CLLA3050
C     NX      - VARIABLE NUMBER ASSOCIATED WITH SET OF RECODE VALUES  CLLA3060
C               CURRENTLY BEING READ.                               CLLA3070
C     NCODEV  - ARRAY FOR NUMBER OF CODES PER VARIABLE. THE ENTRY WILL BECLLA3080
C               NEGATIVE IF THE VARIABLE IS BEING COLLAPSED OUT OF THE  CLLA3090
C               MODEL.                                              CLLA3100
C     NCODV2  - AN ARRAY FOR THE NUMBER OF CODES PER VARIABLE OF THE  CLLA3110
C               INPUT MODEL REQUIRED TO DEFINE THE OUTPUT MODEL. A ZERO CLLA3120
C               SHOULD BE ENTERED FOR A VARIABLE BEING OMITTED.     CLLA3130
C               A NEGATIVE VALUE SHOULD BE ENTERED FOR A VARIABLE BEING CLLA3140
C               RECODED.                                            CLLA3150
      END                                                           CLLA3160
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      SUBROUTINE COPY(ISN,ISVEC,P,LABEL)                                COPY0010
C                                                                       COPY0020
C                       THIS IS A GENERAL PURPOSE COPY ROUTINE FOR D    COPY0030
C                       MATRICES, P MATRICES, AND S VECTORS.            COPY0040
C                                                                       COPY0050
C                       THE FIRST CONTROL CARD IDENTIFIES THE OUTPUT    COPY0060
C                       UNIT SPECIFICATIONS. THE CARD FIELDS ARE        COPY0070
C                       KOUT  - COL 1-6  (I6) FORTRAN UNIT NUMBER.      COPY0080
C                       KPOS  - COL 7-12 (I6) POSITIONING SPECIFICATION:COPY0090
C                               0 - START AT BEGINNING OF FILE.         COPY0100
C                               1 - START AT FLOMOD END OF FILE RECORD. COPY0110
C                                                                       COPY0120
C                       ONE CONTROL CARD IS REQUIRED FOR EACH SET OF    COPY0130
C                       CONSECUTIVE ARRAYS-ON AN INPUT UNIT-THAT ARE TO COPY0140
C                       BE COPIED.                                      COPY0150
C                       A BLANK CONTROL CARD IS USED TO RETURN CONTROL  COPY0160
C                       TO THE CALLING PROGRAM.                         COPY0170
C                       THE CONTROL CARD FIELDS ARE                     COPY0180
C                       IDTAPE - COL 1-6 (I6) FORTRAN INPUT UNIT NUMBER.COPY0190
C                       NFILE  - COL 7-30 (6A4) ARRAY NAME OF FIRST OF  COPY0200
C                                'NUMVC' FILES TO BE COPIED UNDER       COPY0210
C                                CONTROL OF THIS CARD.                  COPY0220
C                       NUMVC  - COL 31-36 (I6)                         COPY0230
C                                +N = THE NUMBER OF CONSECUTIVE ARRAYS  COPY0240
C                                     TO BE COPIED FROM 'IDTAPE'        COPY0250
C                                     STARTING WITH ARRAY 'NFILE'.      COPY0260
C                                 0 = COPY OPERATION COMPLETED. RETURN. COPY0270
C                                -1 = COPY ALL ARRAYS ON THE TAPE.      COPY0280
C                                                                       COPY0290
      IMPLICIT REAL*8(A-H,O-Z,$)                                        COPY0300
      DIMENSION ISN(1),ISVEC(1),P(1),LABEL(1),NFILE(6)                  COPY0310
      DATA KBLANK/4H    /                                               COPY0320
C                                                                       COPY0330
C                       INITIALIZATION                                  COPY0340
C                       RECORD TYPE FOR END OF FILE ARRAY.              COPY0350
      K40=40                                                            COPY0360
C                       FILLER VARIABLE.                                COPY0370
      NFILL=1                                                           COPY0380
C                       NUMBER OF FILES ON OUTPUT UNIT.                 COPY0390
      NFILES=0                                                          COPY0400
C                       SKIP TO NEW PAGE ON PRINTER AND PRINT HEADING.  COPY0410
      PRINT 5                                                           COPY0420
    5 FORMAT(26H1 LIST OF FILES COPIED... )                             COPY0430
C                       READ OUTPUT UNIT NUMBER AND POSITION TYPE.      COPY0440
      READ 1,KOUT,KPOS                                                  COPY0450
    1 FORMAT(2I6)                                                       COPY0460
C                       REWIND OUTPUT UNIT.                             COPY0470
      REWIND KOUT                                                       COPY0480
C                       IF OUTPUT IS TO START AT THE BEGINNING OF THE   COPY0490
C                       TAPE, NO FURTHER POSITIONING IS REQUIRED. GO TO COPY0500
C                       READ INPUT SPECIFICATION.                       COPY0510
      IF(KPOS.EQ.0) GO TO 6                                             COPY0520
C                       POSITION TO FLOMOD END OF FILE RECORD ON OUTPUT COPY0530
C                       UNIT.                                           COPY0540
    2 READ(KOUT)KTYPE                                                   COPY0550
C                       IF THIS WAS NOT THE END OF FILE RECORD, READ THECOPY0560
```

```
C                       NEXT RECORD.                                    COPY0570
      IF(KTYPE.NE.40) GO TO 2                                           COPY0580
C                       THE RECORD JUST READ WAS AN END OF FILE RECORD. COPY0590
C                       BACKSPACE THIS RECORD.                          COPY0600
      BACKSPACE KOUT                                                    COPY0610
C                       READ THE TOTAL RECORD TO OBTAIN THE NUMBER OF   COPY0620
C                       FILES COUNT.                                    COPY0630
      READ(KOUT)KTYPE,NFILE,NFILL,NFILES                                COPY0640
C                       SUBTRACT ONE FOR THE END OF FILE 'FILE' FROM THECOPY0650
C                       NUMBER OF FILES COUNT.                          COPY0660
      NFILES=NFILES-1                                                   COPY0670
C                       BACKSPACE END OF FILE RECORD SO OUTPUT UNIT IS  COPY0680
C                       IN PROPER POSITION FOR WRITING NEXT LABEL.      COPY0690
      BACKSPACE KOUT                                                    COPY0700
C                       READ FIRST COPY SPECIFICATION CARD.             COPY0710
    6 READ 11,IDTAPE,NFILE,NUMVC                                        COPY0720
C                       STORE TAPE NUMBER AS 'PREVIOUS' TAPE NUMBER.    COPY0730
C                       THIS IS TO AVOID UNNECESSARY REWINDS.           COPY0740
      IDTAPX=IDTAPE                                                     COPY0750
C                       REWIND IDTAPE.                                  COPY0760
      REWIND IDTAPE                                                     COPY0770
      GO TO 12                                                          COPY0780
C                       READ FOR ADDITIONAL COPY SPECIFICATION CARDS.   COPY0790
   10 READ 11,IDTAPE,NFILE,NUMVC                                        COPY0800
   11 FORMAT(I6,6A4,I6)                                                 COPY0810
C                       IS THE COPY RUN COMPLETE?                       COPY0820
C                       YES. GO TO WRITE END RECORD.                    COPY0830
   12 IF(NUMVC.EQ.0) GO TO 500                                          COPY0840
C                       NO                                              COPY0850
C                       IS THE CURRENT INPUT UNIT THE SAME AS THE       COPY0860
C                       PREVIOUS INPUT UNIT, AND IS THE FIRST INPUT FILECOPY0870
C                       TO BE LOCATED BY NAME?                          COPY0880
C                       YES. NO REWIND REQUIRED. GO TO POSITION INPUT BYCOPY0890
C                       FILE NAME.                                      COPY0900
      IF(IDTAPE.EQ.IDTAPX.AND.NUMVC.GT.0) GO TO 14                      COPY0910
C                       NO                                              COPY0920
C                       REWIND CURRENT INPUT UNIT.                      COPY0930
      REWIND IDTAPE                                                     COPY0940
C                       IS THE CURRENT INPUT UNIT THE SAME AS THE       COPY0950
C                       PREVIOUS INPUT UNIT?                            COPY0960
C                       YES. ALL FILES ARE TO BE COPIED. GO TO READ     COPY0970
C                       FIRST LABEL.                                    COPY0980
      IF(IDTAPE.EQ.IDTAPX) GO TO 410                                    COPY0990
C                       THERE WAS AN INPUT UNIT CHANGE. REWIND PREVIOUS COPY1000
C                       INPUT UNIT.                                     COPY1010
      REWIND IDTAPX                                                     COPY1020
C                       STORE CURRENT INPUT UNIT NUMBER AS PREVIOUS     COPY1030
C                       INPUT UNIT NUMBER.                              COPY1040
      IDTAPX=IDTAPE                                                     COPY1050
C                       ARE ALL FILES ON CURRENT INPUT UNIT TO BE       COPY1060
C                       COPIED?                                         COPY1070
C                       YES. GO TO READ FIRST LABEL.                    COPY1080
      IF(NUMVC.EQ.(-1)) GO TO 410                                       COPY1090
C                       NO                                              COPY1100
C                       CALL POSINP TO LOCATE NFILE.                    COPY1110
C                       IDTAPE,NFILE ARE INPUT ARGUMENTS.               COPY1120
C                       NL,LABEL,KTYPE ARE RETURNED.                    COPY1130
```

```
   14 CALL POSINP(IDTAPE,KTYPE,NFILE,NL,LABEL)                          COPY1140
C                        PRINT LABEL. WRITE LABEL ON OUTPUT UNIT.        COPY1150
   15 PRINT 20,NFILE,(LABEL(I),I=1,NL)                                  COPY1160
   20 FORMAT(1H ,6A4/(1X,30A4))                                         COPY1170
      WRITE(KOUT) KTYPE,NFILE,NL,(LABEL(I),I=1,NL)                      COPY1180
C                        ADD 1 TO NUMBER OF OUTPUT FILES.                COPY1190
      NFILES=NFILES+1                                                   COPY1200
C                        USE KTYPE FROM FILE LABEL TO BRANCH TO D, S, OR COPY1210
C                        P COPY                                          COPY1220
      GO TO (100,100,300),KTYPE                                         COPY1230
C                        D,S                                             COPY1240
C                        READ A DATA RECORD FROM THE INPUT UNIT - INT*4  COPY1250
C                        ELEMENT VALUES.                                 COPY1260
  100 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT) COPY1270
C                        WRITE THE DATA RECORD ON THE OUTPUT UNIT.       COPY1280
      WRITE(KOUT) KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT) COPY1290
C                        WAS THIS A D,S,P END OF ARRAY RECORD?           COPY1300
C                        YES. GO TO CHECK NUMBER OF FILES PROCESSED.     COPY1310
      IF(KTYPE.GT.30) GO TO 400                                         COPY1320
C                        NO                                              COPY1330
      GO TO 100                                                         COPY1340
C                                                                        COPY1350
C                        P                                               COPY1360
C                        READ AND WRITE ROW LIST RECORD.                 COPY1370
  300 READ(IDTAPE)KTYPE,ICNT,(ISN(I),I=1,ICNT),NUMMO,NUMYR              COPY1380
      WRITE(KOUT) KTYPE,ICNT,(ISN(I),I=1,ICNT),NUMMO,NUMYR              COPY1390
C                        READ AND WRITE COLUMN LIST RECORD.              COPY1400
      READ(IDTAPE)KTYPE,ICNT,(ISN(I),I=1,ICNT),NUMMO,NUMYR              COPY1410
      WRITE(KOUT) KTYPE,ICNT,(ISN(I),I=1,ICNT),NUMMO,NUMYR              COPY1420
C                        READ A DATA RECORD FROM THE INPUT UNIT - REAL*8 COPY1430
C                        ELEMENT VALUES.                                 COPY1440
  310 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(P(I),I=1,ICNT)     COPY1450
C                        WRITE THE DATA RECORD ON THE OUTPUT UNIT.       COPY1460
      WRITE(KOUT) KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(P(I),I=1,ICNT)     COPY1470
C                        WAS THIS A D,S,P END OF ARRAY RECORD?           COPY1480
C                        YES. GO TO CHECK NUMBER OF FILES PROCESSED.     COPY1490
      IF(KTYPE.GT.30) GO TO 400                                         COPY1500
C                        NO                                              COPY1510
      GO TO 310                                                         COPY1520
C                        YES                                             COPY1530
C                        END OF ARRAY                                    COPY1540
C                        DECREASE NUMBER OF FILES TO BE COPIED BY 1.     COPY1550
  400 NUMVC=NUMVC-1                                                     COPY1560
C                        HAVE ALL SPECIFIED FILES BEEN COPIED?           COPY1570
C                        YES. READ NEXT CONTROL CARD.                    COPY1580
      IF(NUMVC.EQ.0) GO TO 10                                           COPY1590
C                        NO                                              COPY1600
C                        READ A D,S,P LABEL FROM THE INPUT UNIT.         COPY1610
  410 READ(IDTAPE)KTYPE,NFILE,NL,(LABEL(I),I=1,NL)                      COPY1620
C                        WAS THIS A D,S,P END OF TAPE RECORD?            COPY1630
C                        NO. GO TO LABEL PRINT.                          COPY1640
      IF(KTYPE.NE.40) GO TO 15                                          COPY1650
C                        YES                                             COPY1660
C                        REWIND INPUT UNIT.                              COPY1670
  430 REWIND IDTAPE                                                     COPY1680
C                        GO TO READ A CONTROL CARD.                      COPY1690
      GO TO 10                                                          COPY1700
```

```
C                         YES
C                         BLANK CARD MEANS COPY OPERATION IS COMPLETE.
C                         ADD 1 TO THE OUTPUT UNIT NUMBER OF FILES COUNT.
  500 NFILES=NFILES+1
      DO 501 I=1,6
  501 NFILE(I)=KBLANK
C                         WRITE A FLOMOD END RECORD ON THE OUTPUT TAPE.
      WRITE(KOUT) K40,NFILE,NFILL,NFILES
C                         REWIND THE OUTPUT TAPE AND FINAL INPUT TAPE.
      REWIND KOUT
      REWIND IDTAPX
C                         RETURN
      RETURN
C
C                         REFERENCE LIST.
C
C                         SUBROUTINE ARGUMENTS.
C
C     ISN    - ARRAY FOR ROW OR COLUMN NUMBER LIST.
C     ISVEC  - ARRAY FOR ROW OR COLUMN VALUES - INTEGER.
C     P      - ARRAY FOR ROW OR COLUMN VALUES - REAL.
C     LABEL  - ARRAY FOR FILE LABEL.
C
C
C                         OTHER VARIABLES.
C
C     KPOS   - OUTPUT UNIT POSITIONING SPECIFICATION
C              0 - START OUTPUT AT BEGINNING OF UNIT.
C              1 - START OUTPUT AT END OF FILE RECORD.
      END
```

```
      SUBROUTINE DSPRNT(ISN,ISVEC,P,LABEL)                              DSP10010
C                                                                       DSP10020
C                       D,S,P PRINT - FORMAT 1.                         DSP10030
C                                                                       DSP10040
C                       THIS IS A GENERAL PURPOSE PRINT FOR  D AND P    DSP10050
C                       MATRICES AND S VECTORS. ONLY THE ELEMENTS IN THEDSP10060
C                       TAPE RECORDS WILL BE PRINTED. THESE ELEMENTS    DSP10070
C                       WILL USUALLY BE NON-ZERO, BUT ARRAYS GENERATED  DSP10080
C                       BY CHANGE P OR SXP OPERATIONS MAY CONTAIN ZERO  DSP10090
C                       ELEMENTS.                                       DSP10100
C                       FOR EACH D OR P MATRIX ELEMENT PRESENT, THE ROW DSP10110
C                       NUMBER, COLUMN NUMBER, AND VALUE WILL BE PRINTEDDSP10120
C                       FOR EACH S VECTOR ELEMENT PRESENT, THE STATE    DSP10130
C                       NUMBER AND VALUE WILL BE PRINTED.               DSP10140
C                       PRINTS 5 ELEMENTS PER LINE.                     DSP10150
C                                                                       DSP10160
C                                                                       DSP10170
C                       ONE CONTROL CARD IS REQUIRED FOR EACH SET OF    DSP10180
C                       CONSECUTIVE ARRAYS-ON AN INPUT UNIT-THAT ARE TO DSP10190
C                       BE PRINTED.                                     DSP10200
C                       A BLANK CONTROL CARD IS USED TO RETURN CONTROL  DSP10210
C                       TO THE CALLING PROGRAM.                         DSP10220
C                       THE CONTROL CARD FIELDS ARE                     DSP10230
C                       IDTAPE - COL 1-6 (I6) FORTRAN INPUT UNIT NUMBER.DSP10240
C                       NFILE  - COL 7-30 (6A4) ARRAY NAME OF FIRST OF  DSP10250
C                                'NUMVC' FILES TO BE PRINTED UNDER      DSP10260
C                                CONTROL OF THIS CARD.                  DSP10270
C                       NUMVC  - COL 31-36 (I6)                         DSP10280
C                                +N = THE NUMBER OF CONSECUTIVE ARRAYS  DSP10290
C                                     TO BE PRINTED FROM 'IDTAPE'       DSP10300
C                                     STARTING WITH ARRAY 'NFILE'.      DSP10310
C                                 0 = PRINT OPERATION COMPLETED. RETURN.DSP10320
C                                -1 = PRINT ALL ARRAYS ON THE TAPE.     DSP10330
C                                -2 = PRINT THE LABELS ONLY FOR ALL     DSP10340
C                                     ARRAYS ON THE TAPE.               DSP10350
C                                                                       DSP10360
      IMPLICIT REAL*8(A-H,O-Z,$)                                        DSP10370
      DIMENSION ISN(1),ISVEC(1),P(1),LABEL(1),NFILE(6)                  DSP10380
      DATA MBLANK/4H    /,MCONT/4HC   /                                 DSP10390
C                       READ INPUT UNIT NUMBER, ARRAY NAME AND NUMBER OFDSP10400
C                       ARRAYS FROM FIRST CONTROL CARD.                 DSP10410
      READ 11,IDTAPE,NFILE,NUMVC                                        DSP10420
C                       STORE UNIT NUMBER IN IDSAVE.                    DSP10430
      IDSAVE=IDTAPE                                                     DSP10440
      GO TO 12                                                          DSP10450
C                       READ INPUT UNIT NUMBER, ARRAY NAME AND NUMBER OFDSP10460
C                       ARRAYS FOR ALL CONTROL CARDS EXCEPT THE FIRST.  DSP10470
   10 READ 11,IDTAPE,NFILE,NUMVC                                        DSP10480
C                       IF CARD IS BLANK, PRINT OPERATION IS COMPLETE.  DSP10490
   12 IF(NUMVC.EQ.0) RETURN                                             DSP10500
C                       CONTINUE WITH PRINT OPERATION.                  DSP10510
C                       IS THE SAVED NUMBER EQUAL THE CURRENT UNIT      DSP10520
C                       NUMBER?                                         DSP10530
      IF(IDSAVE.EQ.IDTAPE) GO TO 13                                     DSP10540
C                       NO                                              DSP10550
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C                         REWIND UNIT IN PREVIOUS CARD.                      DSP10560
      REWIND IDSAVE                                                          DSP10570
C                         STORE LATEST UNIT NUMBER IN IDSAVE.                DSP10580
      IDSAVE=IDTAPE                                                          DSP10590
C                         YES - SAVED UNIT NUMBER EQUALS CURRENT UNIT        DSP10600
C                         NUMBER.                                            DSP10610
C                         IS THE EXACT NUMBER OF ARRAYS TO BE PRINTED        DSP10620
C                         SPECIFIED?                                         DSP10630
   13 IF(NUMVC.GT.0) GO TO 14                                                DSP10640
C                         NO                                                 DSP10650
C                         ALL ARRAYS ON THE TAPE ARE TO BE PROCESSED.        DSP10660
C                         REWIND IDTAPE                                      DSP10670
      REWIND IDTAPE                                                          DSP10680
C                         ARE THE ARRAY DATA RECORDS TO BE PRINTED?          DSP10690
C                         YES. GO TO READ FIRST LABEL.                       DSP10700
      IF(NUMVC.EQ.(-1)) GO TO 410                                            DSP10710
C                         NO                                                 DSP10720
C                         PRINT LABELS ONLY.                                 DSP10730
      GO TO 500                                                              DSP10740
C                         YES                                                DSP10750
C                         EXACT NUMBER OF ARRAYS SPECIFIED.                  DSP10760
C                         CALL POSINP TO POSITION TO NAMED ARRAY.            DSP10770
C                         IDTAPE,NFILE ARE INPUT ARGUMENTS.                  DSP10780
C                         NL,LABEL,KTYPE ARE RETURNED.                       DSP10790
   14 CALL POSINP(IDTAPE,KTYPE,NFILE,NL,LABEL)                               DSP10800
C                         USE KTYPE FROM FILE LABEL TO BRANCH TO D, S, OR    DSP10810
C                         P PRINT.                                           DSP10820
C                         BRANCH ON ARRAY TYPE.                              DSP10830
   15 GO TO (100,200,300),KTYPE                                              DSP10840
C                                                                           DDDDSP10850
C                         D MATRIX.                                          DSP10860
  100 CONTINUE                                                               DSP10870
C                         INITIALIZE KSKIP SO THAT THE FIRST DATA RECORD     DSP10880
C                         WILL BE READ.                                      DSP10890
      KSKIP=1                                                                DSP10900
C                         COMPUTE NUMBER OF PRINT LINES USED FOR HEADING.    DSP10910
  110 LCUR=NL/30+4                                                           DSP10920
C                         PRINT D MATRIX NAME AND LABEL.                     DSP10930
  112 PRINT 20,NFILE,(LABEL(I),I=1,NL)                                       DSP10940
C                         PRINT HEADING FOR D ELEMENTS.                      DSP10950
      PRINT 101                                                              DSP10960
C                         BRANCH ON KSKIP.                                   DSP10970
      GO TO (120,124,130),KSKIP                                              DSP10980
C                         KSKIP=1                                            DSP10990
C                         READ A RECORD.                                     DSP11000
  120 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT)      DSP11010
C                         IS THIS AN END RECORD?                             DSP11020
      IF(KTYPE.GT.30) GO TO 400                                              DSP11030
C                         NO                                                 DSP11040
C                         SET CONTINUE FIELD TO A BLANK CHARACTER.           DSP11050
      MPRINT=MBLANK                                                          DSP11060
C                         COMPUTE L, NUMBER OF LINES REQUIRED TO PRINT D     DSP11070
C                         ROW JUST READ.                                     DSP11080
      L=(ICNT-1)/5+1                                                         DSP11090
C                         WILL THIS ROW REQUIRE MORE LINES THAN ARE          DSP11100
C                         AVAILABLE ON THE CURRENT PAGE?                     DSP11110
  124 IF(LCUR+L+1.GT.60) GO TO 140                                           DSP11120
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C                       NO                                              DSP11130
C                       SET INDEX VALUES FOR PRINT STATEMENT SO THAT ALLDSP11140
C                       ELEMENTS IN THE ROW WILL BE PRINTED.            DSP11150
  126 IFR=1                                                             DSP11160
      ITO=ICNT                                                          DSP11170
C                 UPDATE NUMBER OF PRINT LINES USED.                    DSP11180
      LCUR=LCUR+L+1                                                     DSP11190
C                                                                       DSP11200
C                       PRINT ROW NUMBER, CONTINUE FIELD AND IFR THRU   DSP11210
C                       ITO ELEMENTS OF ROW.                            DSP11220
  130 PRINT 102,IROW,MPRINT,(ISN(I),ISVEC(I),I=IFR,ITO)                 DSP11230
C                                                                       DSP11240
C                       IF THE NUMBER OF ELEMENTS FOR A ROW ON A PAGE ISDSP11250
C                       5, THE FORMAT FOR THE ROW PRINT WILL SPACE AFTERDSP11260
C                       THIS LINE IS PRINTED.                           DSP11270
C                       IF THE NUMBER OF ELEMENTS FOR A ROW ON A PAGE ISDSP11280
C                       NOT 5, THE FORMAT FOR THE ROW PRINT WILL NOT    DSP11290
C                       SPACE AFTER THE LINE IS PRINTED.                DSP11300
C                       ADJUST THE NUMBER OF PRINT LINES USED IF        DSP11310
C                       NECESSARY.                                      DSP11320
      IF(ICNT.EQ.5.OR.(ITO-IFR+1).EQ.5) LCUR=LCUR+1                     DSP11330
C                                                                       DSP11340
C                       ARE THERE ELEMENTS IN THIS ROW WHICH HAVE NOT   DSP11350
C                       YET BEEN PRINTED?                               DSP11360
      IF(ITO.NE.ICNT) GO TO 150                                         DSP11370
C                       NO - GO TO READ A RECORD.                       DSP11380
      GO TO 120                                                         DSP11390
C                       140                                             DSP11400
C                       SPACE ON CURRENT PAGE NOT ADEQUATE FOR ENTIRE   DSP11410
C                       ROW.                                            DSP11420
C                       ROW FORMAT SPACES BEFORE FIRST PRINT LINE.      DSP11430
C                       THEREFORE IF ONLY ONE PRINT LINE IS AVAILABLE,  DSP11440
C                       NO DATA ELEMENTS FOR THE CURRENT ROW WILL BE    DSP11450
C                       PRINTED ON THE CURRENT PAGE.                    DSP11460
C                       IS THERE SPACE ON THE CURRENT PAGE FOR ANY OF   DSP11470
C                       THE CURRENT ROW?                                DSP11480
  140 IF(LCUR.GE.59) GO TO 160                                          DSP11490
C                       YES                                             DSP11500
C                       SPLIT THE ROW.                                  DSP11510
C                       SET INDEX VALUES FOR PRINTING FIRST SEGMENT OF  DSP11520
C                       THE ROW SO THAT AS MANY ELEMENTS AS POSSIBLE    DSP11530
C                       WILL BE PRINTED ON THE CURRENT PAGE.            DSP11540
      IFR=1                                                             DSP11550
      ITO=(60-(LCUR+1))*5                                               DSP11560
C                       GO TO PRINT STATEMENT.                          DSP11570
      GO TO 130                                                         DSP11580
C                       SET INDEX VALUES FOR ADDITIONAL SEGMENT.        DSP11590
C                       SET CONTINUE FIELD TO THE CHARACTER C.          DSP11600
  150 MPRINT=MCONT                                                      DSP11610
C                       RESET LCUR TO NUMBER OF LINES HEADING REQUIRES. DSP11612
      LCUR=NL/30+4                                                      DSP11614
C                       SET INDEX VALUES FOR PRINT STATEMENT SO THAT    DSP11620
C                       START WITH ELEMENT ITO + 1 AND CONTINUE THRU THEDSP11630
C                       ELEMENT WHOSE SUBSCRIPT IS (1) THE MAXIMUM TO   DSP11640
C                       VALUE FOR A FULL PAGE OR (2) THE MAXIMUM        DSP11650
C                       SUBSCRIPT FOR THIS ROW - WHICHEVER IS SMALLER.  DSP11660
      IFR=ITO+1                                                         DSP11670
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      ITO=IFR+(60-(LCUR+1))*5-1                                         DSP11680
      IF(ITO.GT.ICNT) ITO=ICNT                                          DSP11690
C                        SET LCUR = LAST PRINT LINE THAT WILL BE PRINTED DSP11700
C                        WITH INDEX VALUES JUST SET.                    DSP11710
      LCUR=LCUR+(ITO-IFR)/5+2                                           DSP11720
C                        SET KSKIP TO INDICATE CONTINUATION OF SPLIT ROW DSP11730
C                        BEING PRINTED.                                 DSP11740
      KSKIP=3                                                           DSP11750
C                        GO TO SKIP TO A NEW PAGE AND PRINT.            DSP11760
      GO TO 112                                                         DSP11770
C                        160                                            DSP11780
C                        THERE IS NO SPACE ON THE CURRENT PAGE FOR ANY OFDSP11790
C                        THE CURRENT ROW.                               DSP11800
C                        SET KSKIP TO INDICATE START NEW PAGE AND NEW ROWDSP11810
  160 KSKIP=2                                                           DSP11820
C                        GO TO SKIP TO A NEW PAGE AND PRINT.            DSP11830
      GO TO 110                                                         DSP11840
C                                                                       DSP11850
C                                                                     SSSDSP11860
C                        S VECTOR                                       DSP11870
C     L       - NUMBER OF LINES REQUIRED TO PRINT ENTIRE S.             DSP11880
C                        READ S DATA RECORD.                            DSP11890
  200 READ(IDTAPE)KTYPE,NFILL,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT)DSP11900
C                        COMPUTE LCUR, NUMBER OF LINES REQUIRED FOR LABELDSP11910
C                        HEADING.                                       DSP11920
      LCUR=NL/30+5                                                      DSP11930
C                        COMPUTE NUMBER OF LINES REQUIRED FOR THIS S    DSP11940
C                        VECTOR.                                        DSP11950
      L=(ICNT-1)/5+1                                                    DSP11960
C                        WILL THIS BE A MULTI-PAGE PRINT?               DSP11970
      IF((LCUR+L).GT.60) GO TO 205                                      DSP11980
C                        NO                                             DSP11990
C                        SET PRINT STATEMENT SUBSCRIPT RANGE FOR SINGLE DSP12000
C                        PAGE S.                                        DSP12010
      IFR=1                                                             DSP12020
      ITO=ICNT                                                          DSP12030
C                        SET LCUR = LAST PRINT LINE THAT WILL BE PRINTED DSP12040
C                        BY THESE INDEX VALUES.                         DSP12050
      LCUR=LCUR+L                                                       DSP12060
      GO TO 235                                                         DSP12070
C                        205                                            DSP12080
C                        YES                                            DSP12090
C                        THIS WILL BE A MULTI-PAGE PRINT.               DSP12100
C                        INITIALIZE SUBSCRIPT VALUE FOR FIRST PAGE OF   DSP12110
C                        MULTI-PAGE S.                                  DSP12120
  205 ITO=0                                                             DSP12130
C                        SET SUBSCRIPT RANGE FOR EACH PAGE OF A MULTI-  DSP12140
C                        PAGE S.                                        DSP12150
  215 IFR=ITO+1                                                         DSP12160
      ITO=(60-LCUR)*5+IFR-1                                             DSP12170
      IF(ITO.GT.ICNT) ITO=ICNT                                          DSP12180
C                        SET LCUR = LAST PRINT LINE THAT WILL BE PRINTED DSP12190
C                        BY THESE INDEX VALUES.                         DSP12200
      LCUR=LCUR+(ITO-IFR)/5+1                                           DSP12210
C                                                                       DSP12220
C                        PRINT A PAGE.                                  DSP12230
C                        PRINT S NAME, LABEL AND HEADING FOR ELEMENTS.  DSP12240
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  235 PRINT 20,NFILE,(LABEL(I),I=1,NL)                                  DSP12250
      PRINT 210                                                         DSP12260
C                         PRINT ELEMENTS SPECIFIED BY CURRENT INDEX     DSP12270
C                         SETTINGS.                                     DSP12280
      PRINT 230,(ISN(I),ISVEC(I),I=IFR,ITO)                             DSP12290
C                         WERE ALL ELEMENTS PRINTED?                    DSP12300
      IF(ITO.EQ.ICNT) GO TO 245                                         DSP12310
C                         NO                                            DSP12320
C                         RESET LCUR TO NUMBER OF LINES REQUIRED FOR LABELDSP12330
C                         AND HEADING.                                  DSP12340
      LCUR=NL/30+5                                                      DSP12350
      GO TO 215                                                         DSP12360
C                                                                       DSP12370
C                         YES - ALL ELEMENTS HAVE BEEN PRINTED FOR THIS S.DSP12380
C                         READ S VECTOR SUM FROM END RECORD.            DSP12390
  245 READ(IDTAPE)KTYPE,NFILL,NFILL,ISUM                                DSP12400
C                         IF THERE IS NO SPACE ON THE CURRENT PAGE FOR THEDSP12410
C                         SUM, SKIP TO A NEW PAGE AND PRINT THE S NAME ANDDSP12420
C                         LABEL.                                        DSP12430
      IF(LCUR+3.GT.60) PRINT 20,NFILE,(LABEL(I),I=1,NL)                 DSP12440
C                         PRINT THE S VECTOR SUM.                       DSP12450
      PRINT 250,ISUM                                                    DSP12460
      GO TO 400                                                         DSP12470
C                                                                       DSP12480
C                                                                     ***DSP12490
C                                                                      *DSP12500
C                         P MATRIX                                      DSP12510
  300 CONTINUE                                                          DSP12520
C                         PRINT P MATRIX NAME, LABEL, ROW LIST, MODSW,  DSP12530
C                         MODFAC, COLUMN LIST, NUMMO, NUMYR.            DSP12540
      PRINT 20,NFILE,(LABEL(I),I=1,NL)                                  DSP12550
      READ(IDTAPE)KTYPE,ICNT,(ISN(I),I=1,ICNT),MODSW,MODFAC             DSP12560
      PRINT 303,ICNT,MODSW,MODFAC,(ISN(I),I=1,ICNT)                     DSP12570
      READ(IDTAPE)KTYPE,ICNT,(ISN(I),I=1,ICNT),NUMMO,NUMYR              DSP12580
      PRINT 304,ICNT,NUMMO,NUMYR ,(ISN(I),I=1,ICNT)                     DSP12590
C                                                                       DSP12600
C                         PROCESS P ROW RECORDS.                        DSP12610
C                         INITIALIZE KSKIP SO THAT THE FIRST DATA RECORD DSP12620
C                         WILL BE READ.                                 DSP12630
      KSKIP=1                                                           DSP12640
C                         COMPUTE NUMBER OF PRINT LINES USED FOR HEADING. DSP12650
  310 LCUR=NL/30+4                                                      DSP12660
C                         PRINT P MATRIX NAME AND LABEL.                DSP12670
  312 PRINT 20,NFILE,(LABEL(I),I=1,NL)                                  DSP12680
C                         PRINT HEADING FOR P ELEMENTS.                 DSP12690
      PRINT 301                                                         DSP12700
C                         BRANCH ON KSKIP.                              DSP12710
      GO TO (320,324,330),KSKIP                                         DSP12720
C                         KSKIP = 1                                     DSP12730
C                         READ A RECORD                                 DSP12740
  320 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(P(I),I=1,ICNT)     DSP12750
C                         IS THIS AN END RECORD?                        DSP12760
      IF(KTYPE.GT.30) GO TO 400                                         DSP12770
C                         NO                                            DSP12780
C                         SET CONTINUE FIELD TO A BLANK CHARACTER.      DSP12790
      MPRINT=MBLANK                                                     DSP12800
C                         COMPUTE L, NUMBER OF LINES REQUIRED TO PRINT P DSP12810
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C                       ROW JUST READ.                                  DSP12820
      L=(ICNT-1)/5+1                                                    DSP12830
C                       WILL THIS ROW REQUIRE MORE LINES THAN ARE       DSP12840
C                       AVAILABLE ON THE CURRENT PAGE?                  DSP12850
  324 IF(LCUR+L+1.GT.60) GO TO 340                                      DSP12860
C                       NO                                              DSP12870
C                       SET INDEX VALUES FOR PRINT STATEMENT SO THAT ALLDSP12880
C                       ELEMENTS IN THE ROW WILL BE PRINTED.            DSP12890
  326 IFR=1                                                             DSP12900
      ITO=ICNT                                                          DSP12910
C                 UPDATE NUMBER OF PRINT LINES USED.                    DSP12920
      LCUR=LCUR+L+1                                                     DSP12930
C                                                                       DSP12940
C                       PRINT ROW NUMBER, CONTINUE FIELD AND IFR THRU   DSP12950
C                       ITO ELEMENTS OF ROW.                            DSP12960
  330 PRINT 302,IROW,MPRINT,(ISN(I),P(I),I=IFR,ITO)                     DSP12970
C                                                                       DSP12980
C                       IF THE NUMBER OF ELEMENTS FOR A ROW ON A PAGE ISDSP12990
C                       5, THE FORMAT FOR THE ROW PRINT WILL SPACE AFTERDSP13000
C                       THIS LINE IS PRINTED.                           DSP13010
C                       IF THE NUMBER OF ELEMENTS FOR A ROW ON A PAGE ISDSP13020
C                       NOT 5, THE FORMAT FOR THE ROW PRINT WILL NOT    DSP13030
C                       SPACE AFTER THE LINE IS PRINTED.                DSP13040
C                       ADJUST THE NUMBER OF PRINT LINES USED IF        DSP13050
C                       NECESSARY.                                      DSP13060
      IF(ICNT.EQ.5.OR.(ITO-IFR+1).EQ.5) LCUR=LCUR+1                     DSP13070
C                                                                       DSP13080
C                       ARE THERE ELEMENTS IN THIS ROW WHICH HAVE NOT   DSP13090
C                       YET BEEN PRINTED?                               DSP13100
      IF(ITO.NE.ICNT) GO TO 350                                         DSP13110
C                       NO                                              DSP13120
C                       GO TO READ A RECORD.                            DSP13130
      GO TO 320                                                         DSP13140
C                                                                       DSP13150
C                       SPACE ON CURRENT PAGE NOT ADEQUATE FOR ENTIRE   DSP13160
C                       ROW.                                            DSP13170
C                       ROW FORMAT SPACES BEFORE FIRST PRINT LINE.      DSP13180
C                       THEREFORE IF ONLY ONE PRINT LINE IS AVAILABLE,  DSP13190
C                       NO DATA ELEMENTS FOR THE CURRENT ROW WILL BE    DSP13200
C                       PRINTED ON THE CURRENT PAGE.                    DSP13210
C                       IS THERE SPACE ON THE CURRENT PAGE FOR ANY OF   DSP13220
C                       THE CURRENT ROW...                              DSP13230
  340 IF(LCUR.GE.59) GO TO 360                                          DSP13240
C                       YES                                             DSP13250
C                       SPLIT THE ROW.                                  DSP13260
C                       SET INDEX VALUES FOR PRINTING FIRST SEGMENT OF  DSP13270
C                       THE ROW SO THAT AS MANY ELEMENTS AS POSSIBLE    DSP13280
C                       WILL BE PRINTED ON THE CURRENT PAGE.            DSP13290
      IFR=1                                                             DSP13300
      ITO=(60-(LCUR+1))*5                                               DSP13310
C                       GO TO PRINT STATEMENT.                          DSP13320
      GO TO 330                                                         DSP13330
C                       SET INDEX VALUES FOR ADDITIONAL SEGMENT.        DSP13340
C                       SET CONTINUE FIELD TO THE CHARACTER C.          DSP13350
  350 MPRINT=MCONT                                                      DSP13360
C                       RESET LCUR TO NUMBER OF LINES HEADING REQUIRES. DSP13362
      LCUR=NL/30+4                                                      DSP13364
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C                         SET INDEX VALUES FOR PRINT STATEMENT SO THAT    DSP13370
C                         START WITH ELEMENT ITO + 1 AND CONTINUE THRU THEDSP13380
C                         ELEMENT WHOSE SUBSCRIPT IS (1) THE MAXIMUM TO   DSP13390
C                         VALUE FOR A FULL PAGE OR (2) THE MAXIMUM        DSP13400
C                         SUBSCRIPT FOR THIS ROW - WHICHEVER IS SMALLER.  DSP13410
      IFR=ITO+1                                                           DSP13420
      ITO=IFR+(60-(LCUR+1))*5-1                                           DSP13430
      IF(ITO.GT.ICNT) ITO=ICNT                                            DSP13440
C                         SET LCUR = LAST PRINT LINE THAT WILL BE PRINTED DSP13450
C                         WITH INDEX VALUES JUST SET.                     DSP13460
      LCUR=LCUR+(ITO-IFR)/5+2                                             DSP13470
C                         SET KSKIP TO INDICATE CONTINUATION OF SPLIT ROW DSP13480
C                         BEING PRINTED.                                  DSP13490
      KSKIP=3                                                             DSP13500
C                         GO TO PRINT HEADING.                            DSP13510
      GO TO 312                                                           DSP13520
C                         NO - THERE IS NO SPACE ON CURRENT PAGE FOR ANY  DSP13530
C                         OF CURRENT ROW.                                 DSP13540
C                         SET KSKIP TO INDICATE START NEW PAGE AND NEW ROWDSP13550
  360 KSKIP=2                                                             DSP13560
C                         GO TO SKIP TO A NEW PAGE AND PRINT.             DSP13570
      GO TO 310                                                           DSP13580
C                                                                        *DSP13590
C                                                                       ***DSP13600
C                                                                         DSP13610
C                         400                                             DSP13620
C                         END OF ARRAY                                    DSP13630
C                         DECREASE NUMBER OF ARRAYS TO BE PROCESSED BY    DSP13640
C                         ONE.                                            DSP13650
  400 NUMVC=NUMVC-1                                                       DSP13660
C                         HAVE ALL REQUESTED ARRAYS BEEN PROCESSED?       DSP13670
C                         YES. GO TO READ NEXT CONTROL CARD.              DSP13680
      IF(NUMVC.EQ.0) GO TO 10                                             DSP13690
C                         NO. READ NEXT LABEL.                            DSP13700
  410 READ(IDTAPE)KTYPE,NFILE,NL,(LABEL(I),I=1,NL)                        DSP13710
C                         IS THIS A BEGINNING OF ARRAY LABEL?             DSP13720
C                         YES. GO TO BRANCH ON ARRAY TYPE.                DSP13730
      IF(KTYPE.NE.40) GO TO 15                                            DSP13740
C                         NO                                              DSP13750
C                         REWIND TAPE.                                    DSP13760
  430 REWIND IDTAPE                                                       DSP13770
C                         GO TO READ NEXT CONTROL CARD.                   DSP13780
      GO TO 10                                                            DSP13790
C                                                                         DSP13800
C                         PRINT ALL LABELS.                               DSP13810
C                         SKIP TO A NEW PAGE.                             DSP13820
  500 PRINT 505,IDTAPE                                                    DSP13830
      DIMENSION MTYPE(4)                                                  DSP13840
      DATA MTYPE/16HD...S...P...END./                                     DSP13850
C                         INITIALIZE COUNT OF NUMBER OF LINES PRINTED.    DSP13860
      LCUR=0                                                              DSP13870
C                         READ A LABEL.                                   DSP13880
  510 READ(IDTAPE)KTYPE,NFILE,NL,(LABEL(I),I=1,NL)                        DSP13890
C                         INITIALIZE RECORD COUNT FOR THIS ARRAY.         DSP13900
      NR=1                                                                DSP13910
C                         SET K = KTYPE FOR SUBSCRIPT USE IN PRINT.       DSP13920
      K=KTYPE                                                             DSP13930
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C                       WAS THE LABEL JUST READ AN END OF FILE LABEL?   DSP13940
      IF(KTYPE.EQ.40) GO TO 550                                         DSP13950
C                       NO                                              DSP13960
C                       UPDATE NUMBER OF LINES COUNT.                   DSP13970
      LCUR=LCUR+NL/30+3                                                 DSP13980
C                       IS THERE SPACE ON CURRENT PAGE FOR LABEL AND    DSP13990
C                       RECORD COUNT...                                 DSP14000
      IF(LCUR.LE.60) GO TO 518                                          DSP14010
C                       NO - START NEW PAGE.                            DSP14020
      PRINT 505,IDTAPE                                                  DSP14030
C                       RESET NUMBER OF LINES COUNT.                    DSP14040
      LCUR=NL/30+3                                                      DSP14050
C                       YES.                                            DSP14060
C                       THERE IS SPACE ON CURRENT PAGE FOR LABEL AND    DSP14070
C                       RECORD COUNT.                                   DSP14080
C                       PRINT LABEL.                                    DSP14090
  518 PRINT 506,MTYPE(K),NFILE,(LABEL(I),I=1,NL)                        DSP14100
C                       READ TYPE FIELD ONLY FROM NEXT RECORD.          DSP14110
  530 READ(IDTAPE)KTYPE                                                 DSP14120
C                       COUNT THIS RECORD.                              DSP14130
      NR=NR+1                                                           DSP14140
C                       WAS THE RECORD JUST READ A DATA RECORD?         DSP14150
C                       YES. GO TO READ NEXT RECORD.                    DSP14160
      IF(KTYPE.LT.31) GO TO 530                                         DSP14170
C                       NO                                              DSP14180
C                       PRINT NR, NUMBER OF RECORDS FOR THIS ARRAY.     DSP14190
      PRINT 540,NR                                                      DSP14200
C                       GO TO READ NEXT LABEL.                          DSP14210
      GO TO 510                                                         DSP14220
C                       YES                                             DSP14230
C                       END RECORD                                      DSP14240
C                       SET K = 4 TO PRINT ARRAY TYPE 'END'.            DSP14250
  550 K=4                                                               DSP14260
C                       PRINT ARRAY TYPE AND FILE NUMBER OF THIS END    DSP14270
C                       RECORD.                                         DSP14280
      PRINT 560,MTYPE(K),LABEL(1)                                       DSP14290
C                       GO TO REWIND INPUT UNIT.                        DSP14300
      GO TO 430                                                         DSP14310
C                                                                       DSP14320
   11 FORMAT(I6,6A4,I6)                                                 DSP14330
   20 FORMAT(1H1,6A4/ (1X,30A4))                                        DSP14340
  101 FORMAT(/132H        FROM          TO        NUMBER          TO       NDSP14350
     1UMBER          TO        NUMBER          TO        NUMBER          TO  DSP14360
     2     NUMBER /                                                       DSP14370
     3        132H        STATE        STATE     OF CASES        STATE    OFDSP14380
     4 CASES        STATE     OF CASES        STATE     OF CASES        STATEDSP14390
     5    OF CASES)                                                       DSP14400
  102 FORMAT(/I12,A1,I11,9I12/ (12X,10I12))                             DSP14410
  210 FORMAT(/12X,  114H STATE      NUMBER         STATE      NUMBER     DSP14420
     1 STATE      NUMBER         STATE      NUMBER         STATE      NUMBER DSP14430
     2/22X,8HOF CASES,16X,8HOF CASES,16X,8HOF CASES,16X,8HOF CASES,16X, DSP14440
     38HOF CASES/)                                                      DSP14450
  230 FORMAT(6X,10I12)                                                  DSP14460
  250 FORMAT(//105X,9H TOTAL = ,I12)                                    DSP14470
  301 FORMAT(/132H        FROM          TO    PROBABILITY         TO   PROBADSP14480
     1BILITY         TO    PROBABILITY         TO    PROBABILITY         TO  DSP14490
     2 PROBABILITY/                                                     DSP14500
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     3        132H        STATE        STATE                    STATE       DSP14510
     4             STATE                    STATE                    STATEDSP14520
     5            )                                                        DSP14530
  302 FORMAT(/I12,A1,I11,F12.6,4(I12,F12.6)/ (12X,5(I12,F12.6)))           DSP14540
  303 FORMAT(/28H NUMBER OF ROW LIST ENTRIES ,I12                          DSP14550
     1      /14H MODIFY SWITCH,I12                                         DSP14560
     2      /14H MODIFY FACTOR,I12//12H ROW NUMBERS/                       DSP14570
     3      /(6X,10I12))                                                   DSP14580
  304 FORMAT(/30H NUMBER OF COLUMN LIST ENTRIES ,I12                       DSP14590
     1      /22H SXP INCREMENT MONTHS ,I12                                 DSP14600
     2      /22H SXP INCREMENT YEARS  ,I12//16H COLUMN NUMBERS /           DSP14610
     3      /(6X,10I12))                                                   DSP14620
  505 FORMAT(24H1LIST OF LABELS ON UNIT ,I6)                               DSP14630
  506 FORMAT(/1X,A4,6A4/ (1X,30A4))                                        DSP14640
  540 FORMAT(44H THE TOTAL NUMBER OF RECORDS IN THIS FILE = ,I12)          DSP14650
  560 FORMAT(/1X,A4,12HFILE NUMBER ,I6)                                    DSP14660
C                                                                          DSP14670
C                        REFERENCE LIST.                                   DSP14680
C                                                                          DSP14690
C                        SUBROUTINE ARGUMENTS.                             DSP14700
C                                                                          DSP14710
C     ISN    - ARRAY FOR COLUMN NUMBERS IN A D ROW, ELEMENT NUMBERS IN     DSP14720
C              AN S VECTOR, P MATRIX ROW LIST, P MATRIX COLUMN LIST AND    DSP14730
C              COLUMN NUMBERS IN A P ROW.                                  DSP14740
C     ISVEC  - ARRAY FOR COLUMN VALUES IN A D ROW - OR - ELEMENT VALUES    DSP14750
C              IN AN S VECTOR.                                             DSP14760
C     P      - ARRAY FOR COLUMN VALUES IN A P ROW.                         DSP14770
C     LABEL  - ARRAY FOR D, S, AND P LABELS.                               DSP14780
C                                                                          DSP14790
C                        OTHER VARIABLES.                                  DSP14800
C                                                                          DSP14810
C     LCUR   - NUMBER OF LINES PRINTED ON CURRENT PAGE.                    DSP14820
C     60     - MAXIMUM NUMBER OF LINES TO BE PRINTED. ON LINES 4-63.       DSP14830
C     KSKIP - 1...READ A RECORD.                                           DSP14840
C             2...DON'T READ.  PRINT ENTIRE ROW OF LAST READ.              DSP14850
C             3...DON'T READ.  CONTINUE PRINTING OF SPLIT ROW.             DSP14860
C                                                                          DSP14870
      END                                                                  DSP14880
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      SUBROUTINE DSPRN2                                                 DSP20010
     1       (ISN,ISVEC,P,LABEL,                                        DSP20020
     2        NAMEV,NAMEC,NCODE,LOC,ICODE,LIST)                         DSP20030
C                                                                       DSP20040
      IMPLICIT REAL*8(A-H,O-Z,$)                                        DSP20050
C                                                                       DSP20060
C     CALLS POSINP                                                      DSP20070
C                                                                       DSP20080
C                         D,S,P PRINT - FORMAT 2.                       DSP20090
C                                                                       DSP20100
C                         THIS IS A GENERAL PURPOSE PRINT FOR D AND P   DSP20110
C                         MATRICES AND S VECTORS. ONLY THE NON-ZERO     DSP20120
C                         ELEMENTS IN THE TAPE RECORDS WILL BE PRINTED. DSP20130
C                         FOR EACH D OR P MATRIX ELEMENT, THE ROW       DSP20140
C                         NUMBER, COLUMN NUMBER, AND VALUE WILL BE PRINTEDDSP20150
C                         THE MEANING OF THE CODES USED IN GENERATING EACHDSP20160
C                         ROW NUMBER AND EACH COLUMN NUMBER WITHIN EACH DSP20170
C                         ROW WILL ALSO BE PRINTED.                     DSP20180
C                         FOR EACH S VECTOR ELEMENT, THE STATE          DSP20190
C                         NUMBER, VALUE AND MEANING OF THE CODES USED IN DSP20200
C                         GENERATING THE STATE NUMBER WILL BE PRINTED.  DSP20210
C                                                                       DSP20220
C                                                                       DSP20230
C                         REQUIRES ONE TO 5 PRINT LINES PER ELEMENT.    DSP20240
C                                                                       DSP20250
C                                                                       DSP20260
C                         ONE CONTROL CARD IS REQUIRED FOR EACH SET OF  DSP20270
C                         CONSECUTIVE ARRAYS-ON AN INPUT UNIT-THAT ARE TO DSP20280
C                         BE PRINTED.                                   DSP20290
C                         A BLANK CONTROL CARD IS USED TO RETURN CONTROL DSP20300
C                         TO THE CALLING PROGRAM.                       DSP20310
C                         THE CONTROL CARD FIELDS ARE                   DSP20320
C                         IDTAPE - COL 1-6 (I6) FORTRAN INPUT UNIT NUMBER.DSP20330
C                         NFILE  - COL 7-30 (6A4) ARRAY NAME OF FIRST OF DSP20340
C                                  'NUMVC' FILES TO BE PRINTED UNDER    DSP20350
C                                  CONTROL OF THIS CARD.                DSP20360
C                         NUMVC  - COL 31-36 (I6)                       DSP20370
C                                  +N = THE NUMBER OF CONSECUTIVE ARRAYS DSP20380
C                                       TO BE PRINTED FROM 'IDTAPE'     DSP20390
C                                       STARTING WITH ARRAY 'NFILE'.    DSP20400
C                                   0 = PRINT OPERATION COMPLETED. RETURN.DSP20410
C                                  -1 = PRINT ALL ARRAYS ON THE TAPE.   DSP20420
C                                                                       DSP20430
C     DIMENSION NAMEV(3*NV),NAMEC(SUM OF NCODE(I)*3),NCODE(NV),LOC(NV+1)DSP20440
C               ICODE(NV),LIST(3*NV)                                    DSP20450
      DIMENSION NAMEV(1),NAMEC(1),NCODE(1),LOC(1),ICODE(1),LIST(1)      DSP20460
      DIMENSION ISN(1),ISVEC(1),P(1),LABEL(1),NFILE(6)                  DSP20470
      DIMENSION MULT(30)                                                DSP20480
      DATA NROW/4HROW /,NCOL/4HCOL /                                    DSP20490
C                                                                       DSP20500
C                                                                       DSP20510
C                         READ NUMBER OF VARIABLES.                     DSP20520
      READ 90,NV                                                        DSP20530
C                         INITIALIZE FOR LATER USE IN THE PROGRAM.      DSP20540
C                         NUMBER OF VARIABLES MINUS ONE.                DSP20550
      NVM1=NV-1                                                         DSP20560
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C                       NUMBER OF VARIABLES TIMES THREE.                DSP20570
      NV3=NV*3                                                          DSP20580
C                                                                    ***DSP20590
C                                                                     *DSP20600
C                       SET UP ARRAYS CONTAINING CODE DECRIPTIONS OF THEDSP20610
C                       VARIABLES USED TO DEFINE THE MODEL.             DSP20620
C                       SET CODE NAME ARRAY SUBSCRIPT FOR FIRST VARIABLEDSP20630
      LOC(1)=1                                                          DSP20640
C                       FOR EACH VARIABLE..                             DSP20650
      DO  2 I=1,NV                                                      DSP20660
C                       COMPUTE SUBSCRIPTS FOR I'TH VARIABLE IN NAME OF DSP20670
C                       VARIABLE VECTOR.                                DSP20680
      IFR=(I-1)*3+1                                                     DSP20690
      ITO=IFR+2                                                         DSP20700
C                       READ VARIABLE NUMBER, VARIABLE NAME AND NUMBER  DSP20710
C                       OF CODES DEFINED FOR THIS VARIABLE.             DSP20720
      READ 90,INV,(NAMEV(II),II=IFR,ITO),NCODE(I)                       DSP20730
C                       IS THE VARIABLE NUMBER READ EQUAL THE DO LOOP   DSP20740
C                       VARIABLE NUMBER?                                DSP20750
      IF(INV.EQ.I) GO TO 4                                              DSP20760
C                       NO                                              DSP20770
C                       PRINT ERROR MESSAGE.                            DSP20780
      PRINT 92,I,INV                                                    DSP20790
C                       EXIT.                                           DSP20800
      STOP                                                              DSP20810
C                                                                       DSP20820
C                       YES                                             DSP20830
    4 NCI=NCODE(I)                                                      DSP20840
C                       STORE IN ARRAY 'LOC' THE BEGINNING LOCATION IN  DSP20850
C                       NAME OF CODES ARRAY OF THE CODE NAMES FOR THE   DSP20860
C                       NEXT VARIABLE.                                  DSP20870
      LOC(I+1)=LOC(I)+NCI*3                                             DSP20880
C                       INITIALIZE SUBSCRIPT FOR READING I'TH VARIABLE  DSP20890
C                       CODE NAMES.                                     DSP20900
      JFR=LOC(I)-3                                                      DSP20910
C                                                                    **DSP20920
C                                                                     *DSP20930
C                       DO FOR EACH CODE FOR THIS VARIABLE.             DSP20940
      DO  1 J=1,NCI                                                     DSP20950
C                       COMPUTE SUBSCRIPTS FOR NAME OF CODE VECTOR.     DSP20960
      JFR=JFR+3                                                         DSP20970
      JTO=JFR+2                                                         DSP20980
C                       READ CODE NUMBER AND NAME.                      DSP20990
      READ 90,INC,(NAMEC(JJ),JJ=JFR,JTO)                                DSP21000
C                       IS THE CODE NUMBER READ EQUAL TO DO LOOP CODE   DSP21010
C                       NUMBER?                                         DSP21020
      IF(INC.EQ.J) GO TO 1                                              DSP21030
C                       NO                                              DSP21040
C                       PRINT ERROR MESSAGE.                            DSP21050
      PRINT 92,I,INV,J,INC                                              DSP21060
C                       EXIT.                                           DSP21070
      STOP                                                              DSP21080
C                                                                       DSP21090
C                       1                                               DSP21100
C                       YES                                             DSP21110
C                       CONTINUE                                        DSP21120
    1 CONTINUE                                                          DSP21130
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C                                                                       *DSP21140
C                                                                      **DSP21150
C                       2                                                DSP21160
C                       CONTINUE                                         DSP21170
    2 CONTINUE                                                           DSP21180
C                                                                       *DSP21190
C                                                                     ***DSP21200
C                                                                        DSP21210
C                       GENERATE THE MULTIPLY FACTORS USED IN DECODING ADSP21220
C                       STATE NUMBER INTO ITS ORIGINAL CODE VALUES.      DSP21230
      MULT(NV)=1                                                         DSP21240
      IF(NV.EQ.1) GO TO 5                                                DSP21245
      N=NV                                                               DSP21250
      DO  3 I=1,NVM1                                                     DSP21260
      MULT(N-1)=MULT(N)*NCODE(N)                                         DSP21270
    3 N=N-1                                                              DSP21280
C                                                                        DSP21290
C                       COMPUTE NUMBER OF PRINT LINES REQUIRED PER       DSP21300
C                       DESCRIPTION FOR THE CURRENT MODEL. THIS VALUE ISDSP21310
C                       A FUNCTION OF THE NUMBER OF VARIABLES USED TO    DSP21320
C                       DEFINE THE MODEL. THIS VALUE WILL BE USED FOR D,DSP21330
C                       S AND P ARRAYS.                                  DSP21340
    5 NLINES=(NV-1)/7+1                                                  DSP21350
C                       IF THE NUMBER OF VARIABLES IS EXACTLY SEVEN,     DSP21360
C                       THERE WILL BE AN EXTRA SPACE AFTER THE           DSP21370
C                       PRINT HEADING AND AFTER EACH STATE NUMBER        DSP21380
C                       DESCRIPTION.                                     DSP21390
C                       ADJUST THE NUMBER OF LINES PER DESCRIPTION IF    DSP21400
C                       NECESSARY.                                       DSP21410
      IF(NV.EQ.7) NLINES=NLINES+1                                        DSP21420
C                                                                        DSP21430
C                                                                   *****DSP21440
C                                                                       *DSP21450
C                       PRINT.                                           DSP21460
C                       READ FIRST PRINT CONTROL CARD.                   DSP21470
C                       READ INPUT UNIT NUMBER, ARRAY NAME, AND NUMBER   DSP21480
C                       OF ARRAYS TO BE PRINTED.                         DSP21490
      READ 91,IDTAPE,NFILE,NUMVC                                         DSP21500
C                       STORE INITIAL INPUT UNIT NUMBER IN IDTAPX.       DSP21510
      IDTAPX=IDTAPE                                                      DSP21520
C                       REWIND INPUT UNIT.                               DSP21530
      REWIND IDTAPE                                                      DSP21540
C                       GO TO TEST NUMVC.                                DSP21550
      GO TO 12                                                           DSP21560
C                       READ ADDITIONAL CONTROL CARD.                    DSP21570
C                       READ INPUT UNIT NUMBER, ARRAY NAME, AND NUMBER   DSP21580
C                       OF ARRAYS TO BE PRINTED.                         DSP21590
   10 READ 91,IDTAPE,NFILE,NUMVC                                         DSP21600
C                       IF CARD IS BLANK, PRINT OPERATION IS COMPLETE.   DSP21610
   12 IF(NUMVC.EQ.0) GO TO 500                                           DSP21620
C                       ADDITIONAL ARRAYS ARE TO BE PRINTED.             DSP21630
C                       WAS THERE A CHANGE IN THE INPUT UNIT NUMBER?     DSP21640
      IF(IDTAPX.NE.IDTAPE) GO TO 13                                      DSP21650
C                       NO                                               DSP21660
C                       ARE ALL ARRAYS ON THE TAPE TO BE PRINTED?        DSP21670
      IF(NUMVC.GT.0) GO TO 14                                            DSP21680
C                       YES                                              DSP21690
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C                       REWIND THE INPUT UNIT.                          DSP21700
      REWIND IDTAPE                                                     DSP21710
C                       GO TO READ THE FIRST LABEL RECORD.              DSP21720
      GO TO 410                                                         DSP21730
C                       YES                                             DSP21740
C                       THERE WAS A CHANGE IN THE INPUT UNIT NUMBER.    DSP21750
C                       REWIND PREVIOUS INPUT UNIT.                     DSP21760
   13 REWIND IDTAPX                                                     DSP21770
C                       STORE CURRENT INPUT UNIT NUMBER IN IDTAPX.      DSP21780
      IDTAPX=IDTAPE                                                     DSP21790
C                       REWIND CURRENT INPUT UNIT.                      DSP21800
      REWIND IDTAPE                                                     DSP21810
C                       IF NUMVC IS NEGATIVE, PRINT THE ENTIRE TAPE.    DSP21820
      IF(NUMVC.EQ.(-1)) GO TO 410                                       DSP21830
C                                                                       DSP21840
C                       THE FIRST ARRAY TO BE PRINTED UNDER CONTROL OF  DSP21850
C                       THIS CARD MUST BE LOCATED BY NAME.              DSP21860
C                       POSITION INPUT FILE TO ARRAY NAMED IN 'NFILE'.  DSP21870
C                       IDTAPE,NFILE ARE INPUT ARGUMENTS.               DSP21880
C                       NL,LABEL,KTYPE ARE RETURNED.                    DSP21890
   14 CALL POSINP(IDTAPE,KTYPE,NFILE,NL,LABEL)                          DSP21900
C                                                                       DSP21910
C                       USE KTYPE FROM FILE LABEL TO BRANCH TO D, S, OR DSP21920
C                       P PRINT.                                        DSP21930
   15 GO TO (1000,2000,3000),KTYPE                                      DSP21940
C                                                                     ***DSP21950
C                                                                       *DSP21960
C                       D                                               DSP21970
 1000 CONTINUE                                                          DSP21980
C                                                                       DSP21990
C                       THIS SEGMENT OF THE PROGRAM WILL                DSP22000
C                       (1) READ THE D MATRIX DATA RECORDS. PRINT THE   DSP22010
C                       ROW NUMBER AND THE VARIABLE DEFINITIONS DESCRIB-DSP22020
C                       ING THIS NUMBER.  FOR EACH NON-ZERO ELEMENT IN  DSP22030
C                       THE ROW, PRINT THE COLUMN NUMBER, FREQUENCY AND DSP22040
C                       VARIABLE DEFINITIONS DESCRIBING THIS NUMBER.    DSP22050
C                       (2) READ THE D MATRIX END LABEL.                DSP22060
C                                                                       DSP22070
C                                                                       DSP22080
C                       COMPUTE NUMBER OF PRINT LINES REQUIRED FOR HEAD-DSP22090
C                       ING.                                            DSP22100
      NLHEAD=NL/30+2+NLINES+1                                           DSP22110
C                       SET INITIAL VALUE OF NUMBER OF PRINT LINES USED DSP22120
C                       TO 60 SO THAT PRINT HEADING BRANCH WILL BE TAKENDSP22130
C                       PRECEDING THE PRINT OF THE FIRST STATE NUMBER.  DSP22140
      NLCUR=60                                                          DSP22150
C                                                                       DSP22160
C                                                                       DSP22170
C                       READ A D MATRIX RECORD.                         DSP22180
 1010 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT) DSP22190
C                       WAS THIS THE D MATRIX END LABEL.                DSP22200
C                       YES. GO TO END OF ARRAY PROCESSING.             DSP22210
      IF(KTYPE.GT.30) GO TO 400                                         DSP22220
C                       RECORD JUST READ WAS A DATA RECORD.             DSP22230
C                       PRINT DESCRIPTION FOR EACH NON-ZERO ENTRY IN THEDSP22240
C                       ROW.                                            DSP22250
C                       SET ISW TO 1 TO INDICATE THAT THE INITIAL PRINT DSP22260
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C                       OF THE DESCRIPTION OF THIS ROW HAS NOT YET      DSP22270
C                       OCCURRED.                                       DSP22280
      ISW=1                                                             DSP22290
C                                                                      **DSP22300
C                                                                       *DSP22310
C                       DO FOR EACH COLUMN ENTRY IN A ROW.              DSP22320
      DO 1210 IC=1,ICNT                                                 DSP22330
C                       IS THE COLUMN VALUE ZERO?                       DSP22340
C                       YES. GO TO INCREMENT COLUMN INDEX.              DSP22350
      IF(ISVEC(IC).EQ.0) GO TO 1210                                     DSP22360
C                       NO.                                             DSP22370
C                       HAS THE INITIAL PRINT OF THE DESCRIPTION OF THISDSP22380
C                       ROW BEEN EXECUTED?                              DSP22390
C                       YES. GO TO CHECK SPACE AVAILABLE FOR A COLUMN   DSP22400
C                       DESCRIPTION.                                    DSP22410
      IF(ISW.EQ.0) GO TO 1050                                           DSP22420
C                       INITIAL ROW DESCRIPTION HAS NOT BEEN PRINTED.   DSP22430
C                       RESET INITIAL PRINT DESCRIPTION SWITCH AND      DSP22440
C                       EXECUTE PRINT-ROW-DESCRIPTION PROCEDURE.        DSP22450
      ISW=0                                                             DSP22460
C                       IS THERE SPACE ON THE CURRENT PAGE FOR THE ROW  DSP22470
C                       DESCRIPTION AND AT LEAST ONE COLUMN DESCRIPTION DSP22480
C                       FOR THAT ROW?                                   DSP22490
C                       NO. GO TO SKIP TO A NEW PAGE.                   DSP22500
      IF(NLCUR+2*NLINES+1.GT.60) GO TO 1060                             DSP22510
C                       YES. SKIP A LINE BEFORE PRINTING THE ROW NUMBER.DSP22520
      PRINT 1002                                                        DSP22530
C                       ADD 1 TO NUMBER OF PRINT LINES CURRENTLY USED.  DSP22540
      NLCUR=NLCUR+1                                                     DSP22550
C                       GO TO DECODE ROW NUMBER.                        DSP22560
      GO TO 1080                                                        DSP22570
C                       IS SPACE AVAILABLE FOR A COLUMN DESCRIPTION?    DSP22580
C                       YES. GO TO DECODE COLUMN NUMBER.                DSP22590
 1050 IF(NLCUR+NLINES.LE.60) GO TO 1160                                 DSP22600
C                       NO.                                             DSP22610
C                       SKIP TO A NEW PAGE AND PRINT HEADING.           DSP22620
 1060 PRINT 97,NFILE,(LABEL(I),I=1,NL)                                  DSP22630
      PRINT 1001,(NAMEV(I),I=1,NV3)                                     DSP22640
      PRINT 1002                                                        DSP22650
C                       RESET NUMBER OF PRINT LINES USED ON CURRENT PAGEDSP22660
      NLCUR=NLHEAD                                                      DSP22670
C                       COMPUTE VARIABLE CODE VALUES FOR ROW NUMBER.    DSP22680
C                       IS THIS ROW ZERO?                               DSP22690
C                       YES. BYPASS DECODE PROCEDURE.                   DSP22700
 1080 IF(IROW.EQ.0) GO TO 1140                                          DSP22710
C                       THIS IS NOT ROW ZERO.                           DSP22720
C                       SET IRSW TO INDICATE A ROW NUMBER IS BEING DE-  DSP22730
C                       CODED.                                          DSP22740
      IRSW=1                                                            DSP22750
C                       SET I2 EQUAL THE ROW NUMBER TO BE DECODED.      DSP22760
      I2=IROW                                                           DSP22770
C                       TRANSFER HERE FOR DECODING OF BOTH ROW AND      DSP22780
C                       COLUMN NUMBERS.                                 DSP22790
 1090 IF(NV.EQ.1) GO TO 1102                                            DSP22795
      DO 1100 I3=1,NVM1                                                 DSP22800
      I1=(I2-1)/MULT(I3)                                                DSP22810
      I2=I2-I1*MULT(I3)                                                 DSP22820
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 1100 ICODE(I3)=I1+1                                                    DSP22830
 1102 ICODE(NV)=I2                                                      DSP22840
C                        TRANSFER CODE DESCRIPTIONS TO LIST ARRAY FOR   DSP22850
C                        PRINTING.                                      DSP22860
      L2=1                                                              DSP22870
      DO 1120 I=1,NV                                                    DSP22880
      L=LOC(I)+(ICODE(I)-1)*3                                           DSP22890
      LIST(L2)=NAMEC(L)                                                 DSP22900
      LIST(L2+1)=NAMEC(L+1)                                             DSP22910
      LIST(L2+2)=NAMEC(L+2)                                             DSP22920
      L2=L2+3                                                           DSP22930
 1120 CONTINUE                                                          DSP22940
C                        IF THE NUMBER JUST DECODED WAS A COLUMN, GO TO DSP22950
C                        COLUMN PRINT.                                  DSP22960
      IF(IRSW.EQ.2) GO TO 1180                                          DSP22970
C                        PRINT ROW NUMBER AND DESCRIPTION.              DSP22980
      PRINT 1002,NROW,IROW,(LIST(I),I=1,NV3)                            DSP22990
C                        INCREMENT NUMBER OF PRINT LINES USED.          DSP23000
      NLCUR=NLCUR+NLINES                                                DSP23010
C                        GO TO PROCESS COLUMN ENTRY.                    DSP23020
      GO TO 1160                                                        DSP23030
C                        PRINT ROW NUMBER FOR ROW ZERO.                 DSP23040
 1140 PRINT 1002,NROW,IROW                                              DSP23050
C                        INCREMENT NUMBER OF PRINT LINES USED.          DSP23060
      NLCUR=NLCUR+1                                                     DSP23070
C                        THERE IS SPACE FOR A COLUMN DESCRIPTION.       DSP23080
C                        IS THIS COLUMN ZERO?                           DSP23090
C                        YES. GO DIRECTLY TO PRINT STATEMENT.           DSP23100
 1160 IF(ISN(IC).EQ.0) GO TO 1190                                       DSP23110
C                        THIS IS NOT COLUMN ZERO.                       DSP23120
C                        SET IRSW TO INDICATE A COLUMN NUMBER IS BEING  DSP23130
C                        DECODED.                                       DSP23140
      IRSW=2                                                            DSP23150
C                        SET I2 EQUAL THE COLUMN NUMBER TO BE DECODED.  DSP23160
      I2=ISN(IC)                                                        DSP23170
C                        GO TO DECODE LOOP.                             DSP23180
      GO TO 1090                                                        DSP23190
C                        RETURN TO 1180 FROM DECODE LOOP.               DSP23200
C                        COLUMN PRINT.                                  DSP23210
 1180 PRINT 1003,NCOL,ISN(IC),ISVEC(IC),(LIST(I),I=1,NV3)               DSP23220
C                        INCREMENT NUMBER OF PRINT LINES USED.          DSP23230
      NLCUR=NLCUR+NLINES                                                DSP23240
C                        GO TO COLUMN DO LOOP CONTINUE STATEMENT.       DSP23250
      GO TO 1210                                                        DSP23260
C                        COLUMN PRINT FOR ZERO COLUMN.                  DSP23270
 1190 PRINT 1003,NCOL,ISN(IC),ISVEC(IC)                                 DSP23280
C                        INCREMENT NUMBER OF PRINT LINES USED.          DSP23290
      NLCUR=NLCUR+1                                                     DSP23300
C                        CONTINUE FOR DO FOR EACH COLUMN IN A ROW.      DSP23310
 1210 CONTINUE                                                          DSP23320
C                                                                      *DSP23330
C                                                                     **DSP23340
C                        GO TO READ NEXT D DATA RECORD.                 DSP23350
      GO TO 1010                                                        DSP23360
C                                                                       DSP23370
C                                                                      *DSP23380
C                                                                    ***DSP23390
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C                                                                       DSP23400
C                                                                     ***DSP23410
C                                                                      *DSP23420
C                         S                                             DSP23430
 2000 CONTINUE                                                          DSP23440
C                                                                       DSP23450
C                         THIS IS THE PRINT S SEGMENT OF THE PROGRAM. IT DSP23460
C                         WILL                                          DSP23470
C                         (1) READ THE S VECTOR DATA RECORD,            DSP23480
C                         (2) READ THE S VECTOR END LABEL, AND          DSP23490
C                         (3) FOR EACH ELEMENT IN THE S VECTOR, PRINT   DSP23500
C                             (A) THE STATE NUMBER,                     DSP23510
C                             (B) THE FREQUENCY, AND                    DSP23520
C                             (C) THE VARIABLE DEFINITIONS THAT DESCRIBE DSP23530
C                                 THE CASES IN THIS STATE.              DSP23540
C                                                                       DSP23550
C                                                                       DSP23560
C                         FOR CURRENT ARRAY COMPUTE NUMBER OF DESCRIPTIONSDSP23570
C                         THAT CAN BE PRINTED PER PAGE.                 DSP23580
      NDPAGE=(60-(NL/30+1)-1)/NLINES-1                                  DSP23590
C                         SET INITIAL VALUE OF NUMBER-OF-DESCRIPTIONS-  DSP23600
C                         CURRENTLY-PRINTED-ON-THE-PAGE TO THE MAXIMUM  DSP23610
C                         VALUE SO THAT THE PRINT HEADING BRANCH WILL BE DSP23620
C                         TAKEN IMMEDIATELY PRECEDING THE PRINT OF THE  DSP23630
C                         FIRST STATE NUMBER.                           DSP23640
      NDCUR=NDPAGE                                                      DSP23650
C                                                                       DSP23660
C                         READ S DATA RECORD                            DSP23670
      READ(IDTAPE)KTYPE,NFILL,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT)DSP23680
C                         READ S END LABEL                              DSP23690
      READ(IDTAPE)KTYPE,NFILL,NFILL,ISUM,NFILL                          DSP23700
C                                                                       DSP23710
C                                                                     **DSP23720
C                                                                      *DSP23730
C                         PROCESS EACH S VECTOR ENTRY.                  DSP23740
      DO 2090 IC=1,ICNT                                                 DSP23750
C                         IS THE VALUE OF THE ELEMENT EQUAL ZERO?       DSP23760
C                         YES. DO NOT PRINT.                            DSP23770
      IF(ISVEC(IC).EQ.0) GO TO 2090                                     DSP23780
C                         ELEMENT IS NON-ZERO.                          DSP23790
      I2=ISN(IC)                                                        DSP23800
C                         IS THERE SPACE ON THE CURRENT PAGE FOR THIS   DSP23810
C                         STATE NUMBER DESCRIPTION?                     DSP23820
 2025 IF(NDCUR.LT.NDPAGE) GO TO 2030                                    DSP23830
C                         NO                                            DSP23840
C                         RESET NUMBER OF DESCRIPTIONS ON CURRENT PAGE. DSP23850
      NDCUR=0                                                           DSP23860
C                         PRINT PAGE HEADING                            DSP23870
      PRINT 97,NFILE,(LABEL(I),I=1,NL)                                  DSP23880
      PRINT 2001,(NAMEV(II),II=1,NV3)                                   DSP23890
      PRINT 2002                                                        DSP23900
C                         INCREMENT COUNT OF NUMBER OF DESCRIPTIONS ON  DSP23910
C                         THIS PAGE.                                    DSP23920
 2030 NDCUR=NDCUR+1                                                     DSP23930
C                         IS STATE ZERO THE STATE BEING PRINTED?        DSP23940
C                         YES. BYPASS DECODE PROCEDURE.                 DSP23950
      IF(I2.EQ.0) GO TO 2080                                            DSP23960
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C                       NO.                                              DSP23970
C                       COMPUTE CODE NUMBER FOR EACH VARIABLE.           DSP23980
      IF(NV.EQ.1) GO TO 2042                                             DSP23985
      DO 2040 I3=1,NVM1                                                  DSP23990
      I1=(I2-1)/MULT(I3)                                                 DSP24000
      I2=I2-I1*MULT(I3)                                                  DSP24010
 2040 ICODE(I3)=I1+1                                                     DSP24020
 2042 ICODE(NV)=I2                                                       DSP24030
C                       TRANSFER CODE DESCRIPTIONS TO 'LIST' ARRAY FOR   DSP24040
C                       PRINTING.                                        DSP24050
      L2=1                                                               DSP24060
      DO 2050 I=1,NV                                                     DSP24070
      L=LOC(I)+(ICODE(I)-1)*3                                            DSP24080
      LIST(L2)=NAMEC(L)                                                  DSP24090
      LIST(L2+1)=NAMEC(L+1)                                              DSP24100
      LIST(L2+2)=NAMEC(L+2)                                              DSP24110
      L2=L2+3                                                            DSP24120
 2050 CONTINUE                                                           DSP24130
C                       PRINT STATE NUMBER AND DESCRIPTION               DSP24140
      PRINT 2002,ISN(IC),ISVEC(IC),(LIST(II),II=1,NV3)                   DSP24150
      GO TO 2090                                                         DSP24160
C                       PRINT STATEMENT FOR STATE ZERO. THE STATE NUMBERDSP24170
C                       AND FREQUENCY WILL BE PRINTED BUT NO DESCRIPTIONDSP24180
 2080 PRINT 2002,ISN(IC),ISVEC(IC)                                       DSP24190
C                       CONTINUE.                                        DSP24200
 2090 CONTINUE                                                           DSP24210
C                                                                       *DSP24220
C                                                                      **DSP24230
C                       ALL STATE NUMBERS IN S VECTOR HAVE BEEN PRINTED.DSP24240
C                       PRINT S VECTOR SUM.                              DSP24250
      PRINT 2003,ISUM                                                    DSP24260
C                       END OF PROCESSING FOR THIS ARRAY.                DSP24270
      GO TO 400                                                          DSP24280
C                                                                       *DSP24290
C                                                                    ***DSP24300
C                                                                       DSP24310
C                                                                    ***DSP24320
C                                                                      *DSP24330
C                       P                                                DSP24340
 3000 CONTINUE                                                           DSP24350
C                                                                       DSP24360
C                       THIS SEGMENT OF THE PROGRAM WILL                 DSP24370
C                       (1) PASS THE P MATRIX LIST OF ROWS AND LIST OF   DSP24380
C                       COLUMNS RECORDS.                                 DSP24390
C                       (2) READ THE P MATRIX DATA RECORDS. PRINT THE    DSP24400
C                       ROW NUMBER AND THE VARIABLE DEFINITIONS DESCRIB-DSP24410
C                       ING THIS NUMBER.  FOR EACH NON-ZERO ELEMENT IN   DSP24420
C                       THE ROW, PRINT THE COLUMN NUMBER, PROBABILITY    DSP24430
C                       AND VARIABLE DEFINITIONS DESCRIBING THIS NUMBER.DSP24440
C                       (3) READ THE P MATRIX END LABEL.                 DSP24450
C                                                                       DSP24460
C                       COMPUTE NUMBER OF PRINT LINES REQUIRED FOR HEAD-DSP24470
C                       ING.                                             DSP24480
      NLHEAD=NL/30+2+NLINES+1                                            DSP24490
C                       SET INITIAL VALUE OF NUMBER OF PRINT LINES USED DSP24500
C                       TO 60 SO THAT PRINT HEADING BRANCH WILL BE TAKENDSP24510
C                       PRECEDING THE PRINT OF THE FIRST STATE NUMBER.   DSP24520
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      NLCUR=60                                                          DSP24530
C                                                                       DSP24540
C                       PASS THE P MATRIX ROW LIST RECORD.              DSP24550
      READ(IDTAPE)                                                      DSP24560
C                       PASS THE P MATRIX COL LIST RECORD.              DSP24570
      READ(IDTAPE)                                                      DSP24580
C                                                                       DSP24590
C                       READ A P MATRIX RECORD.                         DSP24600
 3010 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(P(I),I=1,ICNT)     DSP24610
C                       WAS THIS THE P MATRIX END LABEL.                DSP24620
C                       YES. GO TO END OF ARRAY PROCESSING.             DSP24630
      IF(KTYPE.GT.30) GO TO 400                                         DSP24640
C                       RECORD JUST READ WAS A DATA RECORD.             DSP24650
C                       PRINT DESCRIPTION FOR EACH NON-ZERO ENTRY IN THEDSP24660
C                       ROW.                                            DSP24670
C                       SET ISW TO 1 TO INDICATE THAT THE INITIAL PRINT DSP24680
C                       OF THE DESCRIPTION OF THIS ROW HAS NOT YET      DSP24690
C                       OCCURRED.                                       DSP24700
      ISW=1                                                             DSP24710
C                                                                      **DSP24720
C                                                                       *DSP24730
C                       DO FOR EACH COLUMN ENTRY IN A ROW.              DSP24740
      DO 3210 IC=1,ICNT                                                 DSP24750
C                       IS THE COLUMN VALUE ZERO?                       DSP24760
C                       YES. GO TO INCREMENT COLUMN INDEX.              DSP24770
      IF(P(IC).EQ.0.0D0) GO TO 3210                                     DSP24780
C                       NO.                                             DSP24790
C                       HAS THE INITIAL PRINT OF THE DESCRIPTION OF THISDSP24800
C                       ROW BEEN EXECUTED?                              DSP24810
C                       YES. GO TO CHECK SPACE AVAILABLE FOR A COLUMN   DSP24820
C                       DESCRIPTION.                                    DSP24830
      IF(ISW.EQ.0) GO TO 3050                                           DSP24840
C                       INITIAL ROW DESCRIPTION HAS NOT BEEN PRINTED.   DSP24850
C                       RESET INITIAL PRINT DESCRIPTION SWITCH AND      DSP24860
C                       EXECUTE PRINT-ROW-DESCRIPTION PROCEDURE.        DSP24870
      ISW=0                                                             DSP24880
C                       IS THERE SPACE ON THE CURRENT PAGE FOR THE ROW  DSP24890
C                       DESCRIPTION AND AT LEAST ONE COLUMN DESCRIPTION DSP24900
C                       FOR THAT ROW?                                   DSP24910
C                       NO. GO TO SKIP TO A NEW PAGE.                   DSP24920
      IF(NLCUR+2*NLINES+1.GT.60) GO TO 3060                             DSP24930
C                       YES. SKIP A LINE BEFORE PRINTING THE ROW NUMBER.DSP24940
      PRINT 1002                                                        DSP24950
C                       ADD 1 TO NUMBER OF PRINT LINES CURRENTLY USED.  DSP24960
      NLCUR=NLCUR+1                                                     DSP24970
C                       GO TO DECODE ROW NUMBER.                        DSP24980
      GO TO 3080                                                        DSP24990
C                       IS SPACE AVAILABLE FOR A COLUMN DESCRIPTION?    DSP25000
C                       YES. GO TO DECODE COLUMN NUMBER.                DSP25010
 3050 IF(NLCUR+NLINES.LE.60) GO TO 3160                                 DSP25020
C                       NO.                                             DSP25030
C                       SKIP TO A NEW PAGE AND PRINT HEADING.           DSP25040
 3060 PRINT 97,NFILE,(LABEL(I),I=1,NL)                                  DSP25050
      PRINT 3001,(NAMEV(I),I=1,NV3)                                     DSP25060
      PRINT 1002                                                        DSP25070
C                       RESET NUMBER OF PRINT LINES USED ON CURRENT PAGEDSP25080
      NLCUR=NLHEAD                                                      DSP25090
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C                       COMPUTE VARIABLE CODE VALUES FOR ROW NUMBER.     DSP25100
C                       IS THIS ROW ZERO?                                DSP25110
C                       YES. BYPASS DECODE PROCEDURE.                    DSP25120
 3080 IF(IROW.EQ.0) GO TO 3140                                           DSP25130
C                       THIS IS NOT ROW ZERO.                            DSP25140
C                       SET IRSW TO INDICATE A ROW NUMBER IS BEING DE-   DSP25150
C                       CODED.                                           DSP25160
      IRSW=1                                                            DSP25170
C                       SET I2 EQUAL THE ROW NUMBER TO BE DECODED.       DSP25180
      I2=IROW                                                           DSP25190
C                       TRANSFER HERE FOR DECODING OF BOTH ROW AND       DSP25200
C                       COLUMN NUMBERS.                                  DSP25210
 3090 IF(NV.EQ.1) GO TO 3102                                            DSP25215
      DO 3100 I3=1,NVM1                                                 DSP25220
      I1=(I2-1)/MULT(I3)                                                DSP25230
      I2=I2-I1*MULT(I3)                                                 DSP25240
 3100 ICODE(I3)=I1+1                                                    DSP25250
 3102 ICODE(NV)=I2                                                      DSP25260
C                       TRANSFER CODE DESCRIPTIONS TO LIST ARRAY FOR     DSP25270
C                       PRINTING.                                        DSP25280
      L2=1                                                              DSP25290
      DO 3120 I=1,NV                                                    DSP25300
      L=LOC(I)+(ICODE(I)-1)*3                                           DSP25310
      LIST(L2)=NAMEC(L)                                                 DSP25320
      LIST(L2+1)=NAMEC(L+1)                                             DSP25330
      LIST(L2+2)=NAMEC(L+2)                                             DSP25340
      L2=L2+3                                                           DSP25350
 3120 CONTINUE                                                          DSP25360
C                       IF THE NUMBER JUST DECODED WAS A COLUMN, GO TO   DSP25370
C                       COLUMN PRINT.                                    DSP25380
      IF(IRSW.EQ.2) GO TO 3180                                          DSP25390
C                       PRINT ROW NUMBER AND DESCRIPTION.                DSP25400
      PRINT 1002,NROW,IROW,(LIST(I),I=1,NV3)                            DSP25410
C                       INCREMENT NUMBER OF PRINT LINES USED.            DSP25420
      NLCUR=NLCUR+NLINES                                                DSP25430
C                       GO TO PROCESS COLUMN ENTRY.                      DSP25440
      GO TO 3160                                                        DSP25450
C                       PRINT ROW NUMBER FOR ROW ZERO.                   DSP25460
 3140 PRINT 1002,NROW,IROW                                              DSP25470
C                       INCREMENT NUMBER OF PRINT LINES USED.            DSP25480
      NLCUR=NLCUR+1                                                     DSP25490
C                       THERE IS SPACE FOR A COLUMN DESCRIPTION.         DSP25500
C                       IS THIS COLUMN ZERO?                             DSP25510
C                       YES. GO DIRECTLY TO PRINT STATEMENT.             DSP25520
 3160 IF(ISN(IC).EQ.0) GO TO 3190                                       DSP25530
C                       THIS IS NOT COLUMN ZERO.                         DSP25540
C                       SET IRSW TO INDICATE A COLUMN NUMBER IS BEING    DSP25550
C                       DECODED.                                         DSP25560
      IRSW=2                                                            DSP25570
C                       SET I2 EQUAL THE COLUMN NUMBER TO BE DECODED.    DSP25580
      I2=ISN(IC)                                                        DSP25590
C                       GO TO DECODE LOOP.                               DSP25600
      GO TO 3090                                                        DSP25610
C                       RETURN TO 3180 FROM DECODE LOOP.                 DSP25620
C                       COLUMN PRINT.                                    DSP25630
 3180 PRINT 3003,NCOL,ISN(IC),P(IC)     ,(LIST(I),I=1,NV3)               DSP25640
C                       INCREMENT NUMBER OF PRINT LINES USED.            DSP25650
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      NLCUR=NLCUR+NLINES                                                DSP25660
C                         GO TO COLUMN DO LOOP CONTINUE STATEMENT.      DSP25670
      GO TO 3210                                                        DSP25680
C                         COLUMN PRINT FOR ZERO COLUMN.                 DSP25690
 3190 PRINT 3003,NCOL,ISN(IC),P(IC)                                     DSP25700
C                         INCREMENT NUMBER OF PRINT LINES USED.         DSP25710
      NLCUR=NLCUR+1                                                     DSP25720
C                         CONTINUE FOR DO FOR EACH COLUMN IN A ROW.     DSP25730
 3210 CONTINUE                                                          DSP25740
C                                                                      *DSP25750
C                                                                     **DSP25760
C                         GO TO READ NEXT P DATA RECORD.                DSP25770
      GO TO 3010                                                        DSP25780
C                                                                      *DSP25790
C                                                                    ***DSP25800
C                                                                       DSP25810
C                         END OF ARRAY LABEL WAS READ.                  DSP25820
C                         DECREASE NUMBER OF ARRAYS PROCESSED BY ONE.   DSP25830
  400 NUMVC=NUMVC-1                                                     DSP25840
C                         HAVE ALL SPECIFIED ARRAYS BEEN PRINTED?       DSP25850
C                         YES. READ NEXT CONTROL CARD.                  DSP25860
      IF(NUMVC.EQ.0) GO TO 10                                           DSP25870
C                         NO. READ NEXT LABEL.                          DSP25880
  410 READ(IDTAPE)KTYPE,NFILE,NL,(LABEL(I),I=1,NL)                      DSP25890
C                         IS THIS A BEGINNING OF ARRAY RECORD?          DSP25900
C                         YES - GO TO BRANCH ON ARRAY TYPE.             DSP25910
      IF(KTYPE.NE.40) GO TO 15                                          DSP25920
C                         NO                                            DSP25930
C                         THIS IS AN END OF FILE LABEL.                 DSP25940
C                         REWIND INPUT UNIT.                            DSP25950
  430 REWIND IDTAPE                                                     DSP25960
C                         GO TO READ NEXT CONTROL CARD.                 DSP25970
      GO TO 10                                                          DSP25980
C                                                                       DSP25990
C                                                                       DSP26000
C                         ALL PRINT CARDS PROCESSED.                    DSP26010
C                         REWIND LAST INPUT UNIT.                       DSP26020
  500 REWIND IDTAPX                                                     DSP26030
C                         SKIP TO A NEW PAGE.                           DSP26040
      PRINT 510                                                         DSP26050
C                         RETURN.                                       DSP26060
      RETURN                                                            DSP26070
C                                                                       DSP26080
C                                                                      *DSP26090
C                                                                  *****DSP26100
C                                                                       DSP26110
C                                                                       DSP26120
   90 FORMAT(I6,3A4,I6)                                                 DSP26130
   91 FORMAT(I6,6A4,2I6)                                                DSP26140
   92 FORMAT(48H DSPRN2 - ERROR IN STATE DESCRIPTION DATA CARDS.        DSP26150
     1       /1X,I6,30H = VARIABLE NUMBER IN DO LOOP.                   DSP26160
     2       /1X,I6,28H = VARIABLE NUMBER IN CARD.                      DSP26170
     3       /1X,I6,26H = CODE NUMBER IN DO LOOP.                       DSP26180
     4       /1X,I6,24H = CODE NUMBER IN CARD. )                        DSP26190
   97 FORMAT(1H1, 6A4/ (1X,30A4))                                       DSP26200
  510 FORMAT(1H1)                                                       DSP26210
 1001 FORMAT(27H0  STATE NUMBER   FREQUENCY,7(3X,3A4)/(27X,7(3X,3A4)))  DSP26220
```

```
 1002 FORMAT(1X,A3,I11,12X,7(3X,3A4)/(27X,7(3X,3A4)))                    DSP26230
 1003 FORMAT(1X,A3,I11,I12,7(3X,3A4)/(27X,7(3X,3A4)))                    DSP26240
 2001 FORMAT(25H0STATE NUMBER   FREQUENCY,7(3X,3A4)/(25X,7(3X,3A4)))     DSP26250
 2002 FORMAT(1X,2I12,7(3X,3A4)/(25X,7(3X,3A4)))                          DSP26260
 2003 FORMAT(//  4X,9H TOTAL = ,I12)                                     DSP26270
 3001 FORMAT(27H0  STATE NUMBER PROBABILITY,7(3X,3A4)/(27X,7(3X,3A4)))   DSP26280
 3003 FORMAT(1X,A3,I11,F12.6,7(3X,3A4)/(27X,7(3X,3A4)))                  DSP26290
C                                                                        DSP26300
C                        REFERENCE LIST.                                 DSP26310
C                                                                        DSP26320
C                        ARGUMENT LIST                                   DSP26330
C                                                                        DSP26340
C     ISN    - ARRAY FOR COLUMN NUMBERS IN A D ROW, ELEMENT NUMBERS IN   DSP26350
C              AN S VECTOR AND COLUMN NUMBERS IN A P ROW.                DSP26360
C     ISVEC  - ARRAY FOR COLUMN VALUES IN A D ROW - OR - ELEMENT VALUES  DSP26370
C              IN AN S VECTOR.                                           DSP26380
C     P      - ARRAY FOR COLUMN VALUES IN A P ROW.                       DSP26390
C     LABEL  - ARRAY FOR D, S, AND P LABELS.                             DSP26400
C     NAMEV(3*NV) - VARIABLE NAMES.                                      DSP26410
C     NAMEC(SUM OF NCODE(I)*3) - CODE NAMES.                             DSP26420
C     NCODE(NV) - NUMBER OF CODES FOR EACH VARIABLE.                     DSP26430
C     LOC(NV+1) - BEGINNING LOCATION IN NAMEC VECTOR OF CODE NAMES FOR   DSP26440
C                 EACH VARIABLE.                                         DSP26450
C     ICODE(NV) - CURRENT CODE VALUE BEING PRINTED FOR EACH VARIABLE.    DSP26460
C     LIST(3*NV) - PRINT LINE(S).                                        DSP26470
C                                                                        DSP26480
C                                                                        DSP26490
C                        OTHER VARIABLES.                                DSP26500
C                                                                        DSP26510
C     IDTAPE - THE UNIT ON WHICH THE CURRENT ARRAY IS LOCATED.           DSP26520
C     ISW    - 1 - THERE HAS NOT BEEN AN INITIAL ROW DESCRIPTION PRINT.  DSP26530
C              0 - THERE HAS BEEN AN INITIAL ROW DESCRIPTION PRINT.      DSP26540
C     IRSW   - 1 - A ROW NUMBER IS BEING DECODED.                        DSP26550
C              2 - A COL NUMBER IS BEING DECODED.                        DSP26560
C     MULT   - ARRAY FOR STATE NUMBER MULTIPLY FACTORS.                  DSP26570
C     NFILE  - THE NAME OF THE INITIAL ARRAY TO BE LOCATED.  OR, THE     DSP26580
C              NAME OF THE ARRAY CURRENTLY BEING PRINTED.                DSP26590
C     NL     - THE NUMBER OF INT*4 WORDS IN THE LABEL.                   DSP26600
C     NLINES - NUMBER PRINT LINES REQUIRED PER DESCRIPTION.              DSP26610
C     NDPAGE - NUMBER OF DESCRIPTIONS THAT CAN BE PRINTED PER PAGE.      DSP26620
C     NDCUR  - NUMBER OF DESCRIPTIONS CURRENTLY PRINTED ON THE PAGE.     DSP26630
C                                                                        DSP26640
      END                                                                DSP26650
```

```
      SUBROUTINE DXCOST                                                 DXC00010
     1      (ISN,ISVEC,JCOL,P,LABELD,LABELC)                            DXC00020
C                                                                       DXC00030
C                       ELEMENT BY ELEMENT MULTIPLICATION OF D MATRIX   DXC00040
C                       TIMES COST PER UNIT MATRIX.                     DXC00050
C                       DXC=X                                           DXC00060
C                       THERE WILL BE A ROW IN THE OUTPUT MATRIX ONLY   DXC00070
C                       WHEN THERE ARE CORRESPONDING ROWS IN THE INPUT  DXC00080
C                       ARRAYS.                                         DXC00090
C                                                                       DXC00100
      IMPLICIT REAL*8(A-H,O-Z,$)                                        DXC00110
      DIMENSION ISN(1),ISVEC(1),JCOL(1),P(1),LABELD(1),LABELC(1)        DXC00120
      DIMENSION NAMED(6),NAMEC(6)                                       DXC00130
C                                                                       DXC00140
C                       INITIALIZATION FOR THIS CALL.                   DXC00150
C                       P RECORD TYPE VARIABLES. THESE ARE USED FOR X   DXC00160
C                       MATRIX.                                         DXC00170
      KPBEG=3                                                           DXC00180
      KPLST=13                                                          DXC00190
      KPDAT=23                                                          DXC00200
      KPEND=33                                                          DXC00210
C                       FLOMOD END OF FILE RECORD.                      DXC00220
      KNEXT=40                                                          DXC00230
C                       OTHER CONSTANTS.                                DXC00240
      NFILL=1                                                           DXC00250
      DATA KBLANK/4H    /                                               DXC00260
C                       SKIP TO A NEW PAGE ON PRINTER.                  DXC00270
      PRINT 2                                                           DXC00280
C                       READ OUTPUT TAPE ID AND POSITION.               DXC00290
      READ 5,IOUT                                                       DXC00300
      REWIND IOUT                                                       DXC00310
C                       SET INITIAL COUNT OF FILES ON OUTPUT UNIT TO    DXC00320
C                       ZERO.                                           DXC00330
      NFILES=0                                                          DXC00340
C                       READ A CONTROL CARD.                            DXC00350
C                       D AND C MAY NOT BE ON THE SAME INPUT FILE.      DXC00360
   10 READ 11,NAMED,INP1,NAMEC,INP2                                     DXC00370
C                       HAVE ALL ARRAYS BEEN PROCESSED?                 DXC00380
      IF(INP1 .NE.0) GO TO 25                                           DXC00390
C                       YES. MULTIPLICATIONS COMPLETE FOR THIS CALL.    DXC00400
C                       ADD 1 TO COUNT OF OUTPUT FILES.                 DXC00410
   12 NFILES=NFILES+1                                                   DXC00420
C                       PLACE BLANKS IN FILE NAME.                      DXC00430
      DO 15 I=1,6                                                       DXC00440
   15 NAMED(I)=KBLANK                                                   DXC00450
C                       WRITE FLOMOD END OF FILE RECORD.                DXC00460
      WRITE(IOUT) KNEXT,NAMED,NFILL,NFILES                              DXC00470
C                       REWIND OUTPUT UNIT.                             DXC00480
      REWIND IOUT                                                       DXC00490
C                       DID AN ERROR IN THE UNITS SPECIFIED CAUSE THE   DXC00500
C                       TRANSFER TO THE END OF FILE PROCESSING?         DXC00510
C                       YES. CALL EXIT.                                 DXC00520
      IF(INP1.NE.0) STOP                                                DXC00530
C                       NO.                                             DXC00540
C                       RETURN.                                         DXC00550
      RETURN                                                            DXC00560
```

```
C                                                                       DXC00570
C                       THERE ARE STILL ARRAYS TO BE PROCESSED.         DXC00580
C                       ARE D AND C ON THE SAME UNIT?                   DXC00590
C                       NO. GO TO PROCESS THIS CARD.                    DXC00600
   25 IF(INP1.NE.INP2) GO TO 30                                         DXC00610
C                       YES. PRINT ERROR MESSAGE AND EXIT.              DXC00620
      PRINT 7,INP1                                                      DXC00630
    7 FORMAT(44H DXCOST ERROR. BOTH INPUT ARRAYS ARE ON UNIT,I6)        DXC00640
C                       GO TO CLOSE OUTPUT FILE.                        DXC00650
      GO TO 12                                                          DXC00660
C                       PROCESS THE CONTROL CARD JUST READ.             DXC00670
C                       LOCATE D MATRIX.                                DXC00680
   30 CALL POSINP(INP1,KTYPE,NAMED,NLD,LABELD)                          DXC00690
C                       LOCATE C MATRIX.                                DXC00700
      CALL POSINP(INP2,KTYPE,NAMEC,NLC,LABELC)                          DXC00710
C                       PASS C MATRIX ROW LIST RECORD.                  DXC00720
      READ(INP2)                                                        DXC00730
C                       PASS C MATRIX COL LIST RECORD.                  DXC00740
      READ(INP2)                                                        DXC00750
C                                                                       DXC00760
C                                                                       DXC00770
C                       READ NAME FOR OUTPUT ARRAY.                     DXC00780
      READ 11,NAMED                                                     DXC00790
C                       SET UP DXCOST ID LINE FOR OUTPUT LABEL.         DXC00800
      DATA LABELX/12OHTOTAL COST MATRIX RESULTING FROM ELEMENT BY ELEMENDXC00810
     1T MULTIPLICATION OF D MATRIX AND COST PER UNIT MATRIX             DXC00820
     2    /                                                             DXC00830
C                       COMPUTE OUTPUT LABEL LENGTH.                    DXC00840
      NLX=60+NLD                                                        DXC00850
C                                                                       DXC00860
C                       WRITE OUTPUT ARRAY BEGINNING LABEL.             DXC00870
      WRITE(IOUT)KPBEG,NAMED,NLX,LABELX,(LABELD(I),I=1,NLD),(LABELC(I), DXC00880
     1            I=1,30)                                               DXC00890
C                                                                       DXC00900
C                       WRITE DUMMY LIST RECORDS FOR X ARRAY TO MAINTAINDXC00910
C                       COMPATIBILITY WITH P ARRAY FORMAT.              DXC00920
      WRITE(IOUT) KPLST,NFILL,NFILL,NFILL,NFILL                         DXC00930
      WRITE(IOUT) KPLST,NFILL,NFILL,NFILL,NFILL                         DXC00940
C                       INITIAL VALUE OF NUMBER OF ROWS IN X IS ZERO.   DXC00950
      NDROWS=0                                                          DXC00960
C                       INITIAL VALUE OF NUMBER OF ELEMENTS IN X = ZERO.DXC00970
      NDLMTS=0                                                          DXC00980
C                       INITIAL VALUE OF ARRAY SUM IS ZERO.             DXC00990
      SUM=0                                                             DXC01000
C                                                                    ***DXC01010
C                                                                     *DXC01020
C                       D MATRIX - C MATRIX ELEMENT BY ELEMENT MULTIPLI-DXC01030
C                       CATION.                                         DXC01040
C                                                                       DXC01050
C                       I = SUBSCRIPT FOR ISN,ISVEC, LIST OF COLUMNS ANDDXC01060
C                           VALUES IN D MATRIX ROW.                     DXC01070
C                       J = SUBSCRIPT FOR JCOL,P, LIST OF COLUMNS AND   DXC01080
C                           VALUES IN C MATRIX ROW.                     DXC01090
C                       KPASS 1 - READ D AND C RECORDS.                 DXC01100
C                             2 - READ D RECORD ONLY.                   DXC01110
C                                                                       DXC01120
C                       INITIAL SETTING OF KPASS WILL BE 1.             DXC01130
```

```
C                                                                       DXC01140
      KPASS=1                                                           DXC01150
C                                                                       DXC01160
C                         READ A D RECORD.                              DXC01170
   85 READ(INP1)KTYPE,KROW1,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT)  DXC01180
C                         WAS RECORD JUST READ THE D END LABEL?         DXC01190
C                         YES. GO TO READ REMAINING C RECORDS.          DXC01200
      IF(KTYPE.EQ.31) GO TO 140                                         DXC01210
C                         RECORD JUST READ WAS A D DATA RECORD.         DXC01220
C                         IS A C RECORD TO BE READ?                     DXC01230
C                         NO. GO TO COMPARE ROW NUMBERS.                DXC01240
      IF(KPASS.EQ.2) GO TO 95                                           DXC01250
C                         READ A C RECORD.                              DXC01260
   90 READ(INP2)KTYPE,KROW2,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)     DXC01270
C                         WAS RECORD JUST READ THE C END LABEL?         DXC01280
C                         YES. GO TO READ REMAINING D RECORDS.          DXC01290
      IF(KTYPE.EQ.33) GO TO 145                                         DXC01300
C                         RECORD JUST READ WAS A C DATA RECORD.         DXC01310
C                                                                       DXC01320
C                         DOES CURRENT D ROW NUMBER EQUAL CURRENT C ROW DXC01330
C                         NUMBER?                                       DXC01340
C                                                                       DXC01350
C                         YES. GO TO MULTIPLY.                          DXC01360
   95 IF(KROW1.EQ.KROW2) GO TO 100                                      DXC01370
C                         NO.                                           DXC01380
C                         SET KPASS TO INDICATE A SINGLE READ IS REQUIRED DXC01390
C                         BECAUSE OF UNMATCHING ROWS.                   DXC01400
      KPASS=2                                                           DXC01410
C                         IF D ROW NUMBER IS LESS THAN C ROW NUMBER, GO TODXC01420
C                         READ D RECORD.                                DXC01430
      IF(KROW1.LT.KROW2) GO TO 85                                       DXC01440
C                         C ROW NUMBER IS LESS THAN D ROW NUMBER.       DXC01450
C                         GO TO READ NEXT C RECORD.                     DXC01460
      GO TO 90                                                          DXC01470
C                                                                       DXC01480
C                                                                      **DXC01490
C                                                                       *DXC01500
C                         D ROW AND C ROW MATCH.                        DXC01510
C                                                                       DXC01520
C                         SET KPASS TO INDICATE MATCHING ROWS.          DXC01530
  100 KPASS=1                                                           DXC01540
C                         INITIALIZE ROW D SUBSCRIPT.                   DXC01550
      I=1                                                               DXC01560
C                         INITIALIZE ROW C SUBSCRIPT.                   DXC01570
      J=1                                                               DXC01580
C                         INITIALIZE K, SUBSCRIPT FOR COLUMN LIST FOR   DXC01590
C                         OUTPUT ROW.                                   DXC01600
      K=0                                                               DXC01610
C                                                                       DXC01620
C                         NOW MULTIPLY THE CORRESPONDING COLUMN ELEMENTS DXC01630
C                         OF MATCHING ROW.                              DXC01640
C                                                                       DXC01650
C                         DO THE CURRENT COLUMN ELEMENTS WITHIN THE ROW DXC01660
C                         MATCH?                                        DXC01670
  105 IF(ISN(I)-JCOL(J)) 120,110,125                                    DXC01680
C                                                                       DXC01690
C                         COLUMN ELEMENTS MATCH.                        DXC01700
```

```
C                       INCREMENT K, SUBSCRIPT FOR OUTPUT ROW.          DXC01710
  110 K=K+1                                                             DXC01720
C                       MOVE COLUMN NUMBER TO K'TH LOCATION IN JCOL TO  DXC01730
C                       CREATE OUTPUT COLUMN LIST. K WILL ALWAYS BE LESSDXC01740
C                       THAN OR EQUAL J.                                DXC01750
      JCOL(K)=ISN(I)                                                    DXC01760
C                       COMPUTE K'TH ENTRY IN OUTPUT ROW. STORE IN P.   DXC01770
      P(K)=ISVEC(I)*P(J)                                                DXC01780
C                       ACCUMULATE ARRAY SUM.                           DXC01790
      SUM=SUM+P(K)                                                      DXC01800
C                       HAVE ALL ELEMENTS OF D ROW BEEN PROCESSED?      DXC01810
C                       YES. GO TO WRITE CURRENT ROW OF OUTPUT.         DXC01820
      IF(I.EQ.ICNT) GO TO 128                                           DXC01830
C                       NO.                                             DXC01840
C                       INCREMENT I, SUBSCRIPT FOR D ROW.               DXC01850
      I=I+1                                                             DXC01860
C                       HAVE ALL ELEMENTS OF C ROW BEEN PROCESSED?      DXC01870
C                       YES. GO TO WRITE CURRENT ROW OF OUTPUT.         DXC01880
      IF(J.EQ.JCNT) GO TO 128                                           DXC01890
C                       NO.                                             DXC01900
C                       INCREMENT J, SUBSCRIPT FOR C ROW.               DXC01910
      J=J+1                                                             DXC01920
C                       GO TO COMPARE COLUMN NUMBERS.                   DXC01930
      GO TO 105                                                         DXC01940
C                                                                       DXC01950
C                       D COLUMN NUMBER IS LESS THAN C COLUMN NUMBER.   DXC01960
C                       HAVE ALL ELEMENTS OF D ROW BEEN PROCESSED?      DXC01970
C                       YES. GO TO WRITE CURRENT OUTPUT ROW.            DXC01980
  120 IF(I.EQ.ICNT) GO TO 128                                           DXC01990
C                       NO                                              DXC02000
C                       ADDITIONAL ELEMENTS IN THIS ROW ARE TO BE       DXC02010
C                       PROCESSED.                                      DXC02020
C                       INCREMENT COLUMN LIST SUBSCRIPT FOR D ROW.      DXC02030
      I=I+1                                                             DXC02040
C                       GO TO COMPARE COLUMN NUMBERS.                   DXC02050
      GO TO 105                                                         DXC02060
C                                                                       DXC02070
C                       C COLUMN NUMBER IS LESS THAN D COLUMN NUMBER.   DXC02080
C                       HAVE ALL ELEMENTS IN THIS C ROW BEEN PROCESSED. DXC02090
C                       YES. GO TO WRITE CURRENT OUTPUT ROW.            DXC02100
  125 IF(J.EQ.JCNT) GO TO 128                                           DXC02110
C                       NO                                              DXC02120
C                       ADDITIONAL ELEMENTS IN THIS ROW ARE TO BE       DXC02130
C                       PROCESSED.                                      DXC02140
C                       INCREMENT J, SUBSCRIPT FOR C ROW.               DXC02150
      J=J+1                                                             DXC02160
C                       GO TO COMPARE COLUMN NUMBERS.                   DXC02170
      GO TO 105                                                         DXC02180
C                                                                       DXC02190
C                       ALL MATCHING COLUMN ELEMENTS, IF ANY, IN MATCH- DXC02200
C                       ING D AND C ROWS HAVE BEEN MULTIPLIED.          DXC02210
  128 CONTINUE                                                          DXC02220
C                       IF THERE ARE NO ENTRIES IN THE OUTPUT ROW, GO TODXC02230
C                       READ NEXT RECORDS.                              DXC02240
      IF(K.EQ.0) GO TO 85                                               DXC02250
C                       THERE ARE ENTRIES IN THE OUTPUT ROW.            DXC02260
C                       WRITE A ROW RECORD FOR THE OUTPUT MATRIX.       DXC02270
```

```
      WRITE(IOUT)KPDAT,KROW1,K,(JCOL(KK),KK=1,K),(P(KK),KK=1,K)          DXC02280
C                          INCREMENT COUNT OF ROWS IN X MATRIX.          DXC02290
      NDROWS=NDROWS+1                                                    DXC02300
C                          INCREMENT COUNT OF ELEMENTS IN X MATRIX.      DXC02310
      NDLMTS=NDLMTS+K                                                    DXC02320
C                          MATCHING ROWS JUST PROCESSED.                 DXC02330
C                                                                       *DXC02340
C                                                                      **DXC02350
C                          GO TO READ NEXT D RECORD.                     DXC02360
      GO TO 85                                                           DXC02370
C                                                                        DXC02380
C                          READ REMAINING D OR C RECORDS.                DXC02390
C                          THIS IS JUST SO TAPE WILL ALWAYS BE POSITIONED DXC02400
C                          AFTER AN END-OF-ARRAY RECORD AT THE COMPLETION DXC02410
C                          OF A MULTIPLY OPERATION.                      DXC02420
  140 READ(INP2)KTYPE                                                    DXC02430
      IF(KTYPE.EQ.33) GO TO 150                                          DXC02440
      GO TO 140                                                          DXC02450
  145 READ(INP1)KTYPE                                                    DXC02460
      IF(KTYPE.EQ.31) GO TO 150                                          DXC02470
      GO TO 145                                                          DXC02480
C                                                                        DXC02490
C                          INPUT TAPE IS POSITIONED FOR NEXT BEGINNING OF DXC02500
C                          ARRAY LABEL.                                  DXC02510
  150 CONTINUE                                                           DXC02520
C                          PRINT OUTPUT ARRAY NAME AND SUM.              DXC02530
      PRINT 6,NAMED,SUM                                                  DXC02540
C                          CHANGE NUMBER OF ELEMENTS TO A REAL VALUE.    DXC02550
      DLMTS=NDLMTS                                                       DXC02560
C                          WRITE X MATRIX END LABEL.                     DXC02570
      WRITE(IOUT)KPEND,NFILL,NFILL,NDROWS,DLMTS                          DXC02580
C                          ADD 1 TO COUNT OF FILES ON OUTPUT UNIT.       DXC02590
      NFILES=NFILES+1                                                    DXC02600
C                                                                       *DXC02610
C                                                                    ***DXC02620
C                          GO TO READ NEXT CONTROL CARD.                 DXC02630
      GO TO 10                                                           DXC02640
C                                                                        DXC02650
    2 FORMAT (1H1)                                                       DXC02660
    5 FORMAT(I6)                                                         DXC02670
    6 FORMAT(24H TOTAL C MATRIX - SUM....,6A4,F12.2)                     DXC02680
   11 FORMAT(6A4,I6,6A4,I6)                                              DXC02690
C                                                                        DXC02700
C                          REFERENCE LIST.                               DXC02710
C                                                                        DXC02720
C                          SUBROUTINE ARGUMENTS.                         DXC02730
C                                                                        DXC02740
C     ISN    - ELEMENT LIST  FOR D ROW.                                  DXC02750
C     ISVEC  - ELEMENT VALUE FOR D ROW.                                  DXC02760
C     JCOL   - ELEMENT LIST  FOR C ROW AND X ROW.                        DXC02770
C     P      - ELEMENT VALUE FOR C ROW AND X ROW.                        DXC02780
C     LABELD - ARRAY FOR INPUT D LABEL AND OUTPUT X LABEL.               DXC02790
C     LABELC - ARRAY FOR INPUT C LABEL.                                  DXC02800
C                                                                        DXC02810
C                                                                        DXC02820
C                          OTHER VARIABLES.                              DXC02830
C                                                                        DXC02840
```

```
C       IOUT    - OUTPUT UNIT.                                          DXC02850
C       INP1    - INPUT UNIT FOR D.                                     DXC02860
C       INP2    - INPUT UNIT FOR C. MAY NOT BE THE SAME AS INP1.        DXC02870
C       SUM     - SUM OF ENTRIES IN THE OUTPUT MATRIX.                  DXC02880
C       NFILES  - NUMBER OF FILES ON OUTPUT UNIT.                       DXC02890
C       NLD     - LENGTH OF D LABEL.                                    DXC02900
C       NLC     - LENGTH OF C LABEL.                                    DXC02910
C       NLX     - LENGTH OF X LABEL.                                    DXC02920
C                                                                       DXC02930
        END                                                             DXC02940
```

```
      SUBROUTINE FCHANG (NDIM,ISN,LSTCOL,JCOL,P,LABELP,NUROWS,/IT. )
C
C                        P MATRIX - FAMILY CHANGE AND SPECIFIC CHANGE.
C
      IMPLICIT REAL*8(A-H,O-Z,$)
C
      DIMENSION ISN(1),LSTCOL(1),JCOL(1),P(1),LABELP(1),NUROWS(1)
      DIMENSION NAMEP(6),NUNAME(6),NULABL(30)
      DIMENSION IRFR(30),IRTO(30),ICFR(30),ICTO(30),IRCR(30),ICCR(30),
     1      IFR(30),IVL(30),ICSW(30),IFSW(30),MULT(30),IACT(30)
C
C                *
C          *********
C           *********   THE DIRECT ACCESS DATA FILE MUST BE DEFINED FOR
C          *********    EACH MODEL. A DEFINE FILE STATEMENT MUST BE
C                *      INCLUDED IN THE CALLING PROGRAM.THE GENERAL FORM
C                       OF THE STATEMENT IN THE CALLING PROGRAM IS:
C                             DEFINE FILE KDISK(NO. RECORDS,RECORD SIZE,
C                                                FMT,ITRACK)
C                       REPLACE KDISK BY AN INTEGER CONSTANT THAT IS THE
C                                  DATA SET REFERENCE NUMBER.
C                       REPLACE NO. RECORDS BY AN INTEGER CONSTANT THAT
C                                  SPECIFIES THE NUMBER OF RECORDS IN
C                                  THE DATA SET.
C                       REPLACE RECORD SIZE BY AN INTEGER CONSTANT THAT
C                                  SPECIFIES THE MAXIMUM RECORD SIZE
C                                  (IN FOUR BYTE WORDS) OF EACH RECORD.
C
C                       INITIALIZATION FOR TOTAL RUN.
C                       SKIP TO NEW PAGE FOR PRINTED OUTPUT.
      PRINT 1
    1 FORMAT(1H1)
C                       SET ARRAY TYPE CONSTANTS.
C                       BEGINNING LABEL FOR P MATRIX.
      KPBEG=3
C                       ROW AND COLUMN LIST RECORD FOR P MATRIX.
      KPLST=13
C                       END LABEL FOR FLOMOD TAPE.
      KNEXT=40
C                       FILLER VARIABLE.
      NFILL=1
C                       NUMBER OF OUTPUT FILES.
      NFILES=0
C                       READ FORTRAN UNIT NUMBERS FOR INPUT UNIT, OUTPUT
C                       UNIT, DIRECT ACCESS DISK UNIT.
      READ 15,KINP,KOUTP,KDISK
   15 FORMAT(3I6)
C                       REWIND OUTPUT UNIT.
      REWIND KOUTP
C
C                       READ TYPE 1 OR TYPE 2 CONTROL CARD.
C                       TYPE 1 - CHANGE A P MATRIX.
C                       TYPE 2 - END OF CHANGES.
C                       READ: CARD TYPE - LTYPE, NAME OF P MATRIX,
C                       SWITCH FOR TYPE OF P POSITIONING, NAME FOR NEW
C                       P.
```

```
   20 READ 25,LTYPE,NAMEP,INPSW,NUNAME                                  FCH00570
   25 FORMAT(I6,6A4,I6,6A4)                                             FCH00580
C                        DID THE CARD JUST READ IDENTIFY A P MATRIX TO BEFCH00590
C                        CHANGED?                                       FCH00600
C                        NO. GO TO END OF CHANGE PROCESSING.            FCH00610
      IF(LTYPE.NE.1) GO TO 700                                          FCH00620
C                                                                       FCH00630
C                        YES                                            FCH00640
C                        LTYPE=1. CHANGE A P MATRIX.                    FCH00650
C                        READ TRANSITION MODIFY CHANGE SWITCH, CURRENT  FCH00660
C                        MODIFY SWITCH, AND CURRENT MODIFY FACTOR.      FCH00670
      READ 490,MODCHG,KURSW,KURFAC                                      FCH00680
C                        READ: NULABL - LABEL INFO FOR NEW P, NV - NUMBERFCH00690
C                        OF VARIABLES, IVL - NUMBER OF CODES DEFINED PER FCH00700
C                        VARIABLE.                                      FCH00710
      READ 30,NULABL,NV,(IVL(I),I=1,NV)                                 FCH00720
   30 FORMAT(20A4/10A4/I6/(6I12))                                       FCH00730
C                        COMPUTE NUMBER VARIABLES MINUS ONE FOR LATER DO FCH00740
C                        LOOP USE.                                      FCH00750
      NVM1=NV-1                                                         FCH00760
C                                                                       FCH00770
C                        BRANCH ON TYPE OF P POSITIONING.               FCH00780
      IF(INPSW.EQ.1) GO TO 40                                           FCH00790
C                        CALL POSITION INPUT TO LOCATE NAMED FILE.      FCH00800
      CALL POSINP(KINP,KTYPE,NAMEP,NL,LABELP)                           FCH00810
      GO TO 45                                                          FCH00820
C                        40                                             FCH00830
C                        SET KTYPE = 3. CALL POSITION FORWARD TO LOCATE FCH00840
C                        NEXT P MATRIX REGARDLESS OF NAME.              FCH00850
   40 KTYPE=3                                                           FCH00860
      CALL POSFWD(KINP,KTYPE,NAMEP,NL,LABELP)                           FCH00870
C                        READ P ROW LIST RECORD.                        FCH00880
   45 READ(KINP) KTYPE,ISCNT,(ISN(I),I=1,ISCNT),MODSW,MODFAC            FCH00890
C                        READ P COLUMN LIST RECORD.                     FCH00900
      READ(KINP) KTYPE,JCOUNT,(LSTCOL(I),I=1,JCOUNT),NUMMO,NUMYR        FCH00910
C                                                                       FCH00920
C                        PRINT INPUT VALUES OF MODIFY SWITCH SETTINGS ANDFCH00930
C                        ROW AND COLUMN COUNTS.                         FCH00940
      PRINT 46,MODSW,MODFAC,MODCHG,KURSW,KURFAC,ISCNT,JCOUNT            FCH00950
   46 FORMAT(18H INPUT VALUES FOR /                                     FCH00960
     18X,5HMODSW,6X,6HMODFAC,6X,6HMODCHG,7X,5HKURSW,6X,6HKURFAC,        FCH00970
     27X,14HNUMBER OF ROWS,6X,17HNUMBER OF COLUMNS/                     FCH00980
     31X,5I12,9X,I12,11X,I12)                                           FCH00990
C                        TRANSFER TAPE MODIFY INFO TO CURRENT MODIFY    FCH01000
C                        FIELDS IF NECESSARY.                           FCH01010
C                        DID THE MODIFY CHANGE CONTROL CARD CONTAIN     FCH01020
C                        CURRENT MODIFY SWITCH AND FACTOR VALUES?       FCH01030
      IF(MODCHG.EQ.2) GO TO 47                                          FCH01040
C                        NO                                             FCH01050
C                        TRANSFER MODIFY SWITCH AND FACTOR VALUES FROM P FCH01060
C                        ROW LIST RECORD TO CURRENT MODIFY SWITCH AND   FCH01070
C                        FACTOR VARIABLES.                              FCH01080
      KURSW=MODSW                                                       FCH01090
      KURFAC=MODFAC                                                     FCH01100
C                                                                       FCH01110
C                        INITIALIZE COUNTERS FOR THIS P MATRIX.         FCH01120
C                        NUMBER OF COLUMN ELEMENTS SEARCHED FOR.        FCH01130
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   47 NSERCH=0                                                          FCH01140
C                          NUMBER OF COLUMN ELEMENTS FOUND.             FCH01150
      NFOUND=0                                                          FCH01160
C                          NUMBER OF COLUMN ELEMENTS DECODED.           FCH01170
      NDCODE=0                                                          FCH01180
C                          NUMBER OF DECODED ELEMENTS THAT WERE IN CHANGE FCH01190
C                          RANGE.                                       FCH01200
      NINRNG=0                                                          FCH01210
C                          NUMBER OF CHANGES MADE.                      FCH01220
      NCHG=0                                                            FCH01230
C                          TRACK NUMBER OF DISK RECORD CURRENTLY IN CORE. FCH01240
      II=0                                                              FCH01250
C                          NUMBER OF ENTRIES IN NEW ROW LIST.           FCH01260
      NN=0                                                              FCH01270
C                          NUMBER OF CHANGES IN CURRENT ROW RECORD.     FCH01280
      KCHGSW=0                                                          FCH01290
C                          COMPUTE MULT ARRAY - FACTORS FOR USE IN GENERA- FCH01300
C                          TING STATE NUMBERS.                          FCH01310
      MULT(NV)=1                                                        FCH01320
      IF(NV.EQ.1) GO TO 52                                              FCH01325
      N=NV                                                              FCH01330
      DO 50 I=1,NVM1                                                    FCH01340
      MULT(N-1)=MULT(N)*IVL(N)                                          FCH01350
   50 N=N-1                                                             FCH01360
C                                                                       FCH01370
C                                                                      **FCH01380
C                                                                       *FCH01390
C                          TRANSFER P MATRIX TO DISK.                   FCH01400
C                          SET DIRECT ACCESS DATA FILE RECORD NUMBER TO 1. FCH01410
   52 ITK=1                                                             FCH01420
C                          READ A P RECORD FROM SEQUENTIAL INPUT FILE.  FCH01430
 2100        READ(KINP)                                                 FCH01440
     1             KTYPE,IROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)   FCH01450
C                          WRITE P RECORD IN NEXT DIRECT ACCESS DATA FILE FCH01460
C                          RECORD.                                      FCH01470
             WRITE(KDISK'ITK)                                           FCH01480
     1             KTYPE,IROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)   FCH01490
C                          WAS THIS A P END RECORD?                     FCH01500
C                          NO                                           FCH01510
C                          GO TO READ NEXT RECORD.                      FCH01520
             IF(KTYPE.NE.33) GO TO 2100                                 FCH01530
C                          YES                                          FCH01540
C                          SET DIRECT ACCESS DATA FILE RECORD NUMBER TO FCH01550
C                          LOCATION OF P END RECORD.                    FCH01560
             ITK=ITK-1                                                  FCH01570
C                                                                       FCH01580
C                          DOES THE NUMBER OF DISK RECORDS WRITTEN AGREE FCH01590
C                          WITH THE NUMBER OF ROWS COUNT IN THE ISN RECORD?FCH01600
      IF(ISCNT+1.EQ.ITK) GO TO 140                                      FCH01610
C                                                                       FCH01620
C                          NO                                           FCH01630
C                          PRINT ERROR MESSAGE.                         FCH01640
      PRINT 80,ISCNT,ITK                                                FCH01650
   80 FORMAT(42H ERROR IN DISK COPY RECORD COUNT. ISCNT = ,I12,6H ITK =,FCH01660
     1       I12)                                                       FCH01670
C                          EXIT                                         FCH01680
      STOP                                                              FCH01690
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C                                                                       *FCH01700
C                                                                      **FCH01710
C                                                                        FCH01720
C                       140                                              FCH01730
C                       THE INITIAL CHANGE SPECIFICATION WILL BE READ    FCH01740
C                       HERE. THE PROGRAM ALSO TRANSFERS HERE AT THE     FCH01750
C                       COMPLETION OF THE PROCESSING OF EACH TYPE 3 AND  FCH01760
C                       TYPE 4 CHANGE SPECIFICATION.                     FCH01770
C                       READ TYPE 3,4, OR 5 CHANGE DATA CARDS.           FCH01780
C                       READ A CARD:                                     FCH01790
C                       CARD TYPE, PERCENT CHANGE, ROW NUMBER, NON-FREE  FCH01800
C                       COLUMN NUMBER, FREE COLUMN NUMBER.               FCH01810
  140 READ 145,LTYPE,PCCHG,IDROW,IDCOL,IFRCOL                            FCH01820
  145 FORMAT(I6,F12.0,3I12)                                              FCH01830
C                       IS TYPE EQUAL 5?                                 FCH01840
C                       YES. END OF CHANGES FOR CURRENT P MATRIX.        FCH01850
      IF(LTYPE.EQ.5) GO TO 567                                           FCH01860
C                       NO                                               FCH01870
C                       DOES PCCHG SHOW A DECREASE GREATER THAN 100 PER-FCH01880
C                       CENT?                                            FCH01890
C                       YES. CONTROL CARD ERROR.                         FCH01900
      IF(PCCHG.LT.(-100.0D0)) GO TO 750                                  FCH01910
C                       NO                                               FCH01920
C                       EXPRESS PER CENT AS A DECIMAL VALUE.             FCH01922
      PCCHG=PCCHG/100.0D0                                                FCH01924
C                       IS TYPE EQUAL 3?                                 FCH01930
C                       YES. GO TO SPECIFIC CHANGE.                      FCH01940
      IF(LTYPE.EQ.3) GO TO 160                                           FCH01950
C                       NO                                               FCH01960
C                       IS TYPE EQUAL 4?                                 FCH01970
C                       YES. GO TO FAMILY CHANGE.                        FCH01980
      IF(LTYPE.EQ.4) GO TO 480                                           FCH01990
C                       NO                                               FCH02000
C                       IF THE TYPE IS NOT 3, 4 OR 5, THERE IS A CONTROLFCH02010
C                       CARD ERROR.                                      FCH02020
      GO TO 710                                                          FCH02030
C                                                                        FCH02040
C                       160                                              FCH02050
C                       YES                                              FCH02060
C                       LTYPE EQUAL 3.                                   FCH02070
C                             SPECIFIC CHANGE                            FCH02080
C                             PROCESS ONE FROM-TO PAIR                   FCH02090
C                             KPASS=1 FOR NON FREE ELEMENT               FCH02100
C                             KFRSW=FREE ELEMENT SWITCH                  FCH02110
C                                  0 = INITAL SETTING OR ELEMENT PRESENTFCH02120
C                                  1 = ELEMENT NOT PRESENT.              FCH02130
C                       II - ROW LIST SUBSCRIPT. ALSO DISK RECORD        FCH02140
C                            POSITION.                                   FCH02150
C                       IJ - COL LIST SUBSCRIPT.                         FCH02160
C                                                                        FCH02170
C                       KPASS = SPECIFIC CHANGE NON FREE ELEMENT.        FCH02180
  160 KPASS=1                                                            FCH02190
C                       KFRSW = INITIAL SETTING OR ELEMENT PRESENT.      FCH02200
      KFRSW=0                                                            FCH02210
C                                                                  **** FCH02220
C                                                                     * FCH02230
C                                                                     * FCH02240
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C                       LTYPE 3 (SPECIFIC CHANGE) AND                   FCH02250
C                       LTYPE 4 (FAMILY CHANGE) BOTH TRANSFER HERE.     FCH02260
C                                                                       FCH02270
C                       ROW SEARCH.                                     FCH02280
C                       IS THERE A ROW RECORD CURRENTLY IN CORE?        FCH02290
C                       NO. SEARCH FOR ROW.                             FCH02300
  170 IF(II.EQ.0) GO TO 172                                             FCH02310
C                       YES                                             FCH02320
C                       IS THE ROW CURRENTLY IN CORE THE SAME AS THE ROWFCH02330
C                       SPECIFIED FOR THE CHANGE BEING PROCESSED?       FCH02340
C                       YES. GO TO BRANCH ON TYPE OF CHANGE.            FCH02350
      IF(ISN(II).EQ.IDROW) GO TO 195                                    FCH02360
C                       NO                                              FCH02370
C                       IS THERE A CHANGED ROW THAT NEEDS TO BE WRITTEN.FCH02380
C                       NO. SEARCH FOR LATEST ROW SPECIFIED.            FCH02390
      IF(KCHGSW.EQ.0) GO TO 172                                         FCH02400
C                       YES.                                            FCH02410
C                       CHANGES HAVE BEEN MADE IN THE ROW RECORD IN     FCH02420
C                       CORE. WRITE THE CHANGED RECORD ON DISK.         FCH02430
C                       SET RANDOM ACCESS RECORD NUMBER EQUAL ROW NUMBERFCH02440
C                       SUBSCRIPT.                                      FCH02450
      ITK=II                                                            FCH02460
C                       WRITE ROW RECORD ON DISK.                       FCH02470
            WRITE(KDISK'ITK)                                            FCH02480
     1            KTYPE,ISN(II),JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT) FCH02490
C                                                                       FCH02500
C                       SET KCHGSW TO ZERO TO INDICATE NO CHANGES IN    FCH02510
C                       CORE RECORD THAT ARE NOT ON DISK.               FCH02520
      KCHGSW=0                                                          FCH02530
C                       CHECK ROW LIST FOR PRESENCE OF ROW FOR WHICH    FCH02540
C                       CHANGE IS SPECIFIED.                            FCH02550
  172 DO 175 II=1,ISCNT                                                 FCH02560
      IF(ISN(II).LT.IDROW) GO TO 175                                    FCH02570
      IF(ISN(II).EQ.IDROW) GO TO 190                                    FCH02580
      GO TO 176                                                         FCH02590
  175 CONTINUE                                                          FCH02600
C                                                                       FCH02610
C                       ROW DOES NOT EXIST.                             FCH02620
C                       II IS UNDEFINED FOLLOWING NORMAL EXIT FROM THE  FCH02630
C                       DO 175 LOOP.                                    FCH02640
C                       SET II TO ZERO TO INDICATE NO ROW RECORD IN COREFCH02650
  176 II=0                                                              FCH02660
C                       GO TO NEXT CHANGE.                              FCH02670
C                       IS THIS A SPECIFIC CHANGE?                      FCH02680
C                       YES. GO TO READ NEXT CARD.                      FCH02690
      IF(KPASS.EQ.1) GO TO 140                                          FCH02700
C                       NO                                              FCH02710
C                       FAMILY CHANGE.                                  FCH02720
C                       GO TO CODE NEXT ROW NUMBER.                     FCH02730
      GO TO 500                                                         FCH02740
C                                                                       FCH02750
C                       190                                             FCH02760
C                       YES                                             FCH02770
C                       ROW EXISTS.                                     FCH02780
C                       SET TRACK NUMBER EQUAL ISN SUBSCRIPT.           FCH02790
  190 ITK=II                                                            FCH02800
C                       READ DATA RECORD FOR IDROW FROM DISK.           FCH02810
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      READ(KDISK'ITK)                                                   FCH02820
    1          KTYPE,IROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)      FCH02830
C                       SET NUMBER OF CHANGES MADE IN THIS RECORD TO    FCH02840
C                       ZERO.                                           FCH02850
      KCHGSW=0                                                          FCH02860
C                       IS THIS A FAMILY CHANGE ROW?                    FCH02870
C                       YES. GO TO INITIALIZE NON-FREE COL CODES FOR ROWFCH02880
  195 IF(KPASS.EQ.3) GO TO 510                                          FCH02890
C                                                                     * FCH02900
C                                                                     * FCH02910
C                                                                 **** FCH02920
C                       NO                                              FCH02930
C                       THIS IS THE SPECIFIC CHANGE PATH. THE ELEMENT TOFCH02940
C                       BE LOCATED NEXT IS THE NONFREE COLUMN.          FCH02950
  200 ICOL=IDCOL                                                        FCH02960
C                                                                       FCH02970
C                                                                 **** FCH02980
C                                                                     * FCH02990
C                                                                     * FCH03000
C                       SEARCH THE ROW RECORD IN CORE FOR A SPECIFIC    FCH03010
C                       COLUMN NUMBER.                                  FCH03020
C                       THE VARIABLE 'ICOL' CONTAINS THE COLUMN NUMBER  FCH03030
C                       TO BE LOCATED.                                  FCH03040
C                                                                       FCH03050
C                       210                                             FCH03060
C                       PROGRAM PATHS FOR KPASS=1,2,3 AND 4 ALL TRANSFERFCH03070
C                       TO THIS POINT IN THE PROGRAM.                   FCH03080
C                       KPASS 1 - SPECIFIC CHANGE NON FREE COLUMN.      FCH03090
C                       KPASS 2 - SPECIFIC CHANGE FREE COLUMN.          FCH03100
C                       KPASS 3 - FAMILY CHANGE NON FREE COLUMN.        FCH03110
C                       KPASS 4 - FAMILY CHANGE FREE COLUMN.            FCH03120
C                                                                       FCH03130
C                       IS THE SPECIFIED COLUMN PRESENT?                FCH03140
  210 DO 220 IJ=1,JCNT                                                  FCH03150
      IF(JCOL(IJ).LT.ICOL) GO TO 220                                    FCH03160
C                       YES. GO TO BRANCH ON TYPE OF PASS.              FCH03170
      IF(JCOL(IJ).EQ.ICOL) GO TO 275                                    FCH03180
C                       NO                                              FCH03190
C                       ICOL NOT PRESENT. GT THAN CURRENT JCOL ENTRY.   FCH03200
C                       ICOL IS LESS THAN THE LARGEST COLUMN NUMBER IN  FCH03210
C                       THE ROW. THE PRESENT IJ SETTING IS THE POSITION FCH03220
C                       WHERE THIS COLUMN WOULD BE STORED IF IT WERE    FCH03230
C                       ADDED TO THE ROW.                               FCH03240
C                       GO TO BRANCH ON TYPE OF PASS.                   FCH03250
      GO TO 225                                                         FCH03260
C                       CONTINUE.                                       FCH03270
  220 CONTINUE                                                          FCH03280
C                       NO                                              FCH03290
C                       ICOL NOT PRESENT.                               FCH03300
C                       ICOL IS GREATER THAN LARGEST COLUMN NUMBER IN   FCH03310
C                       THE ROW.                                        FCH03320
C                       SET SUBSCRIPT TO POSITION WHERE ICOL ELEMENT    FCH03330
C                       WOULD BE STORED IF IT WERE ADDED TO THE ROW.    FCH03340
      IJ=JCNT+1                                                         FCH03350
C                       IF THE ELEMENT NOT PRESENT IS A NON-FREE ELEMENTFCH03360
C                       GO TO THE NEXT CHANGE.                          FCH03370
C                       IS THIS A NON-FREE ELEMENT (SPECIFIC CHANGE)?   FCH03380
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C                       YES. GO TO READ NEXT CARD.                      FCH03390
  225 IF(KPASS.EQ.1) GO TO 140                                          FCH03400
C                       NO                                              FCH03410
C                       IS THIS A NON-FREE ELEMENT (FAMILY CHANGE)?     FCH03420
C                       YES. GO TO CODE NEXT COLUMN NUMBER.             FCH03430
      IF(KPASS.EQ.3) GO TO 530                                          FCH03440
C                       NO                                              FCH03450
C                       THE ELEMENT NOT PRESENT IS A FREE ELEMENT.      FCH03460
C                       DO NOT ADD FREE ELEMENT TIL CHANGE OF A NON-FREEFCH03470
C                       ELEMENT REQUIRES IT.                            FCH03480
C                       SET SWITCH TO INDICATE FREE ELEMENT IS NOT      FCH03490
C                       PRESENT.                                        FCH03500
      KFRSW=1                                                           FCH03510
C                       FREE AMOUNT IS THEREFORE EQUAL 0.               FCH03520
      AMTFR=0.0                                                         FCH03530
      GO TO 300                                                         FCH03540
C                                                                       FCH03550
C                                                                       FCH03560
C                       YES - SPECIFIED COLUMN IS PRESENT.              FCH03570
C                       BRANCH ON ELEMENT TYPE AND TYPE OF CHANGE.      FCH03580
  275 GO TO(280,295,280,295),KPASS                                      FCH03590
C                       280                                             FCH03600
C                       KPASS=1,3                                       FCH03610
C                       NON FREE ELEMENT.                               FCH03620
C                       SET NON FREE AMOUNT AND SUBSCRIPT.              FCH03630
  280 AMTNF=P(IJ)                                                       FCH03640
      IJNF=IJ                                                           FCH03650
C                       IS THIS A SPECIFIC CHANGE?                      FCH03660
      IF(KPASS.NE.3) GO TO 285                                          FCH03670
C                       NO                                              FCH03680
C                       THIS IS A FAMILY CHANGE.                        FCH03690
C                       ADD 1 TO COUNT OF NUMBER OF ELEMENTS FOUND.     FCH03700
      NFOUND=NFOUND+1                                                   FCH03710
C                       GO TO MAKE CHANGE.                              FCH03720
      GO TO 317                                                         FCH03730
C                       285                                             FCH03740
C                       YES                                             FCH03750
C                       THIS IS A SPECIFIC CHANGE.                      FCH03760
C                       NOW SEARCH FOR SPECIFIC CHANGE FREE ELEMENT.    FCH03770
  285 ICOL=IFRCOL                                                       FCH03780
      KPASS=2                                                           FCH03790
      GO TO 210                                                         FCH03800
C                       295                                             FCH03810
C                       KPASS=2,4                                       FCH03820
C                             FREE ELEMENT IS PRESENT.                  FCH03830
C                       SET FREE AMOUNT.                                FCH03840
  295 AMTFR=P(IJ)                                                       FCH03850
C                                                                       FCH03860
C                       300                                             FCH03870
C                       FREE ELEMENT NOT PRESENT ALSO TRANSFERS HERE.   FCH03880
C                       SET FREE ELEMENT SUBSCRIPT.                     FCH03890
C                       WHEN KFRSW=0, IJFR IS THE LOCATION IN JCOL OF   FCH03900
C                       THE FREE ELEMENT.                               FCH03910
C                       WHEN KFRSW=1, IJFR IS THE LOCATION IN JCOL WHEREFCH03920
C                       THE FREE ELEMENT IS TO BE ADDED.                FCH03930
  300 IJFR=IJ                                                           FCH03940
C                       IS THIS A FAMILY CHANGE.                        FCH03950
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C                       YES. GO TO NON-FREE COLUMN PROCESSING.          FCH03960
      IF(KPASS.EQ.4) GO TO 524                                          FCH03970
C                       NO                                              FCH03980
C                                                                     * FCH03990
C                                                                     * FCH04000
C                                                                 **** FCH04010
C                                                                     FCH04020
C                                                                 **** FCH04030
C                                                                     * FCH04040
C                                                                     * FCH04050
C                       MAKE CHANGE FOR ELEMENT JUST LOCATED.           FCH04060
C                                                                       FCH04070
C                       AMTFR IS RESET AT THIS POINT BECAUSE FAMILY     FCH04080
C                       CHANGE CAN MAKE SEVERAL CHANGES IN THE SAME ROW.FCH04090
C                       RESET THE FREE ELEMENT WORKING VALUE IF THE     FCH04100
C                       ELEMENT IS PRESENT.                             FCH04110
  317 IF(KFRSW.EQ.0) AMTFR=P(IJFR)                                      FCH04120
C                       COMPUTE AMOUNT OF CHANGE REQUESTED.             FCH04130
      AMTC=PCCHG*AMTNF                                                  FCH04140
C                       IS THE TOTAL CHANGE REQUESTED POSSIBLE...       FCH04150
C                       ALL CHANGES DECREASING THE NON-FREE ELEMENT WILLFCH04160
C                       BE POSSIBLE.                                    FCH04170
C                       YES. GO TO PROCESS CHANGE.                      FCH04180
      IF(AMTFR-AMTC.GE.0.0D0) GO TO 330                                 FCH04190
C                       NO                                              FCH04200
C                       PRINT MESSAGE SAYING TOTAL CHANGE NOT POSSIBLE  FCH04210
C                       FOR CURRENT ROW AND COLUMN.                     FCH04220
  319 PRINT 320,IDROW,IDCOL,AMTNF,IFRCOL,AMTFR,AMTC                     FCH04230
  320 FORMAT(4H ROW,I12,4H COL,I12,6H VALUE,F9.5,9H FREE COL,I12,6H VALUFCH04240
     1E,F9.5/15H DESIRED CHANGE,F9.5,17H IS NOT POSSIBLE.)              FCH04250
C                                                                       FCH04260
C                       IS ANY CHANGE POSSIBLE?                         FCH04270
C                       YES. GO TO RESET AMOUNT OF CHANGE.              FCH04280
      IF(AMTFR.NE.0.0D0) GO TO 325                                      FCH04290
C                       NO. GO TO NEXT SPECIFIC CHANGE -- OR - NEXT ROW. FCH04300
      IF(KPASS.EQ.2) GO TO 140                                          FCH04310
      GO TO 500                                                         FCH04320
C                       325                                             FCH04330
C                       YES. SOME CHANGE IS POSSIBLE.                   FCH04340
C                       SET AMOUNT OF CHANGE TO BE MADE EQUAL AMOUNT OF FCH04350
C                       CHANGE POSSIBLE.                                FCH04360
  325 AMTC=AMTFR                                                        FCH04370
C                             PROCESS CHANGE - BOTH ALL OR PART.        FCH04380
C                             CHANGE NON-FREE ELEMENT.                  FCH04390
  330 AMTNF=AMTNF+AMTC                                                  FCH04400
      P(IJNF)=AMTNF                                                     FCH04410
C                       CHANGE WORKING VALUE OF FREE ELEMENT.           FCH04420
      AMTFR=AMTFR-AMTC                                                  FCH04430
C                       BRANCH ON FREE ELEMENT PRESENT SWITCH. IS FREE  FCH04440
C                       ELEMENT TO BE ADDED?                            FCH04450
C                       YES. GO TO ADD ELEMENT.                         FCH04460
      IF(KFRSW.NE.0) GO TO 340                                          FCH04470
C                       NO.                                             FCH04480
C                       CHANGE VALUE OF FREE ELEMENT.                   FCH04490
      P(IJFR)=AMTFR                                                     FCH04500
C                       GO TO UPDATE CHANGE COUNTS.                     FCH04510
      GO TO 380                                                         FCH04520
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C                                                                       ***FCH04530
C                                                                        *FCH04540
C                       340                                              FCH04550
C                       YES                                              FCH04560
C                       FREE ELEMENT MUST BE ADDED TO A ROW.             FCH04570
C                       IS FREE ELEMENT TO BE ADDED AT END OF ROW?       FCH04580
  340 IF(IJFR.GT.JCNT) GO TO 345                                         FCH04590
C                       NO                                               FCH04600
C                       CALL TMT2 TO PUSH DOWN COLUMN NUMBER ARRAY AND   FCH04610
C                       COLUMN VALUE ARRAY SO THAT THE FREE ELEMENT MAY  FCH04620
C                       BE ADDED IN THE MIDDLE OF THE ROW.               FCH04630
      CALL TMT2(JCOL(IJFR),JCOL(IJFR+1),JCNT-IJFR+1)                     FCH04640
      CALL TMT2(P(IJFR),P(IJFR+1),2*(JCNT-IJFR+1))                       FCH04650
C                       ADD 1 TO NUMBER OF ELEMENTS IN THE ROW.          FCH04660
  345 JCNT=JCNT+1                                                        FCH04670
C                       DOES NUMBER OF ELEMENTS PRESENT NOW EXCEED ARRAYFCH04680
C                       DIMENSION?                                       FCH04690
C                       YES. GO TO PRINT ERROR MESSAGE AND EXIT.         FCH04700
      IF(JCNT.GT.NDIM) GO TO 730                                         FCH04710
C                       NO                                               FCH04720
C                       PLACE FREE COLUMN NUMBER IN COLUMN LIST.         FCH04730
      JCOL(IJFR)=IFRCOL                                                  FCH04740
C                       PLACE FREE COLUMN VALUE IN VALUE LIST.           FCH04750
      P(IJFR)=AMTFR                                                      FCH04760
C                       CHANGE FREE ELEMENT PRESENT SWITCH TO SHOW       FCH04770
C                       ELEMENT IS PRESENT.                              FCH04780
      KFRSW=0                                                            FCH04790
C                       IS THIS A DECODE PROCEDURE FAMILY CHANGE?        FCH04800
      IF(KPASS.NE.5) GO TO 346                                           FCH04810
C                       YES                                              FCH04820
C                       SET DO LOOP CONTROLS TO MAINTAIN PROPER          FCH04830
C                       POSITION IN DECODE LOOP.                         FCH04840
      JFR=J+1                                                            FCH04850
      IF(IJFR.LE.J) JFR=JFR+1                                            FCH04860
      JTO=JCNT                                                           FCH04870
C                       346                                              FCH04880
C                       IS TRANS MODIFY BEING BYPASSED...                FCH04890
C                       YES. ADD FREE COLUMN TO MATRIX LIST OF COLUMNS,  FCH04900
C                       IF NECESSARY.                                    FCH04910
  346 IF(KURSW.LT.0) GO TO 358                                           FCH04920
C                       NO                                               FCH04930
C                                                                       **FCH04940
C                                                                        *FCH04950
C                       TRANSITION MODIFY OPERATION.                     FCH04960
C                       ADD THE COLUMN OF THE FREE ELEMENT TO THE NEW    FCH04970
C                       ROWS ARRAY IF NECESSARY.                         FCH04980
C                                                                        FCH04990
C                       IS THERE A ROW IN THE ISN LIST CORRESPONDING TO  FCH05000
C                       THE COLUMN OF THE FREE ELEMENT JUST ADDED.       FCH05010
C                       YES. GO TO CHECK THE COLUMN LIST.                FCH05020
      DO 348 I=1,ISCNT                                                   FCH05030
      IF(ISN(I).GE.IFRCOL) GO TO 354                                     FCH05040
  348 CONTINUE                                                           FCH05050
C                       349                                              FCH05060
C                       NO                                               FCH05070
C                       COL OF NEW ELEMENT NOT IN ISN.                   FCH05080
C                       NN IS NUMBER OF ENTRIES IN NUROWS.               FCH05090
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C                       IS THE ADDED ELEMENT IN THE NUROWS ARRAY?        FCH05100
  349 IF(NN.EQ.0) GO TO 356                                              FCH05110
      DO 350 N=1,NN                                                      FCH05120
      IF(NUROWS(N).GE.IFRCOL) GO TO 352                                  FCH05130
  350 CONTINUE                                                           FCH05140
C                       NO                                               FCH05150
C                       ADD ELEMENT AT END OF NEW ROWS ARRAY.            FCH05160
      NN=NN+1                                                            FCH05170
      NUROWS(NN)=IFRCOL                                                  FCH05180
      GO TO 358                                                          FCH05190
C                                                                        FCH05200
  352 IF(IFRCOL.EQ.NUROWS(N)) GO TO 358                                  FCH05210
C                       FILE ADDED ELEMENT IN NUROWS ARRAY AT POSITION NFCH05220
      CALL TMT2(NUROWS(N),NUROWS(N+1),NN-N+1)                            FCH05230
      NUROWS(N)=IFRCOL                                                   FCH05240
      NN=NN+1                                                            FCH05250
      GO TO 358                                                          FCH05260
C                                                                        FCH05270
  354 IF(IFRCOL.EQ.ISN(I)) GO TO 358                                     FCH05280
      GO TO 349                                                          FCH05290
C                                                                        FCH05300
C                       FIRST ENTRY IN NEW ROWS ARRAY.                   FCH05310
  356 NN=1                                                               FCH05320
      NUROWS(NN)=IFRCOL                                                  FCH05330
      GO TO 358                                                          FCH05340
C                                                                       *FCH05350
C                                                                      **FCH05360
C                       IS THERE A COLUMN IN LSTCOL CORRESPONDING TO THEFCH05370
C                       COLUMN OF THE FREE ELEMENT JUST ADDED...         FCH05380
C                       ADD ELEMENT TO LSTCOL IF NECESSARY.              FCH05390
  358 DO 360 I=1,JCOUNT                                                  FCH05400
      IF(LSTCOL(I).GE.IFRCOL) GO TO 364                                  FCH05410
  360 CONTINUE                                                           FCH05420
C                       FREE COL JUST ADDED NOT IN LSTCOL. ADD AT END.   FCH05430
      JCOUNT=JCOUNT+1                                                    FCH05440
      LSTCOL(JCOUNT)=IFRCOL                                              FCH05450
      GO TO 380                                                          FCH05460
C                                                                        FCH05470
  364 IF(IFRCOL.EQ.LSTCOL(I)) GO TO 380                                  FCH05480
C                       ADD COL AT POSITION I.                           FCH05490
      CALL TMT2(LSTCOL(I),LSTCOL(I+1),JCOUNT-I+1)                        FCH05500
      LSTCOL(I)=IFRCOL                                                   FCH05510
      JCOUNT=JCOUNT+1                                                    FCH05520
C                                                                       *FCH05530
C                                                                    ***FCH05540
C                       380                                              FCH05550
C                       TRANSFER HERE                                    FCH05560
C                       (1) WHEN CHANGE HAS BEEN MADE AND FREE ELEMENT   FCH05570
C                       WAS PRESENT, AND                                 FCH05580
C                       (2) WHEN CHANGE HAS BEEN MADE, FREE ELEMENT HAS  FCH05590
C                       BEEN ADDED, AND NECESSARY ROW LIST AND COLUMN    FCH05600
C                       LIST ADDITIONS HAVE BEEN PROCESSED.              FCH05610
C                                                                        FCH05620
C                       ADD 1 TO MATRIX CHANGE COUNT.                    FCH05630
  380 NCHG=NCHG+1                                                        FCH05640
C                       ADD 1 TO ROW CHANGE COUNT.                       FCH05650
      KCHGSW=KCHGSW+1                                                    FCH05660
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C                       GO TO NEXT CHANGE BY TYPE OF CHANGE JUST        FCH05670
C                       PROCESSED.                                      FCH05680
C                       WAS THIS A FAMILY CODE PROCEDURE CHANGE?        FCH05690
C                       YES. GO TO CODE NEXT COLUMN.                    FCH05700
      IF(KPASS.EQ.3) GO TO 530                                          FCH05710
C                       NO                                              FCH05720
C                       WAS THIS A FAMILY DECODE PROCEDURE CHANGE?      FCH05730
C                       YES. GO TO LOCATION IN DECODE SEGMENT OF PROGRAMFCH05740
C                       AS DETERMINED BY CURRENT VALUES OF J DO LOOP    FCH05750
C                       INDICES.                                        FCH05760
      IF(KPASS.EQ.5.AND.JFR.LE.J) GO TO 550                             FCH05770
      IF(KPASS.EQ.5.AND.JFR.GT.J) GO TO 541                             FCH05780
C                       NO                                              FCH05790
C                       THIS WAS A SPECIFIC CHANGE.                     FCH05800
C                       GO TO READ NEXT CHANGE CARD.                    FCH05810
      GO TO 140                                                         FCH05820
C                                                                       FCH05830
C                                                                     * FCH05840
C                                                                     * FCH05850
C                                                                  **** FCH05860
C                                                                       FCH05870
C                       CARD TYPE 4 - FAMILY CHANGE.                    FCH05880
C                       PICK UP PROCEDURE CODE FROM CARD FIELD IDROW.   FCH05890
  480 KPROC=IDROW                                                       FCH05900
C                       READ THE VARIABLE CODE RANGES FOR THE FAMILY    FCH05910
C                       CHANGE.                                         FCH05920
C                       FOR EACH VARIABLE, READ INDEX VALUES INTO THE   FCH05930
C                       FOLLOWING ARRAYS:                               FCH05940
C                       IRFR-ROW FROM VALUE.                            FCH05950
C                       IRTO-ROW TO VALUE.                              FCH05960
C                       ICFR-NON FREE COLUMN FROM VALUE.                FCH05970
C                       ICTO-NON FREE COLUMN TO VALUE.                  FCH05980
C                       IFR-FREE COLUMN VALUE.                          FCH05990
      READ 490,(IRFR(I),I=1,NV)                                         FCH06000
      READ 490,(IRTO(I),I=1,NV)                                         FCH06010
      READ 490,(ICFR(I),I=1,NV)                                         FCH06020
      READ 490,(ICTO(I),I=1,NV)                                         FCH06030
      READ 490,(IFR (I),I=1,NV)                                         FCH06040
  490 FORMAT(6I12)                                                      FCH06050
C                       SET NON-FREE COLUMN SWITCH AND FREE COLUMN      FCH06060
C                       SWITCH ARRAYS TO ZERO.                          FCH06070
      ICSW(1)=0                                                         FCH06080
      IF(NVM1.NE.0) CALL TMT(NVM1,ICSW(2),ICSW(1))                      FCH06090
      CALL  TMT (NV,IFSW(1),ICSW(1))                                    FCH06100
C                       SET A SWITCH FOR EACH -9 (INDICATING CURRENT    FCH06110
C                       VALUE OF ROW INDF. IS TO BE USED AS THE COLUMN  FCH06120
C                       INDEX) IN FREE COL AND NON-FREE COL RANGES.     FCH06130
      DO 495 I=1,NV                                                     FCH06140
      IF (ICFR(I).EQ.(-9)) ICSW(I)=1                                    FCH06150
      IF (IFR(I).EQ.(-9)) IFSW(I)=1                                     FCH06160
  495 CONTINUE                                                          FCH06170
C                       SET ROW CURRENT INDEX VALUES EQUAL ROW FROM     FCH06180
C                       INDEX VALUES.                                   FCH06190
      CALL  TMT (NV,IRCR(1),IRFR(1))                                    FCH06200
C                       SUBTRACT ONE FROM CURRENT ROW FROM-INDEX VALUE  FCH06210
C                       FOR LAST VARIABLE.                              FCH06220
      IRCR(NV)=IRFR(NV)-1                                               FCH06230
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C                       INITIAL SETTING FOR ROW VARIABLE CURRENTLY BEINGFCH06240
C                       INCREMENTED IS THE LAST VARIABLE.               FCH06250
      NCR=NV                                                            FCH06260
C                                                                      **FCH06270
C                                                                       *FCH06280
C                       500                                             FCH06290
C                       CODE A ROW NUMBER.                              FCH06300
  500 CONTINUE                                                          FCH06310
C                       1001                                            FCH06320
C                       IS CURRENT VALUE OF VARIABLE BEING INCREMENTED  FCH06330
C                       EQUAL TO-VALUE OF THAT VARIABLE?                FCH06340
C                       YES. GO TO STEP VARIABLE NUMBER.                FCH06350
 1001         IF(IRCR(NCR).EQ.IRTO(NCR)) GO TO 1019                     FCH06360
C                       NO                                              FCH06370
C                       ADD 1 TO CURRENT VALUE OF VARIABLE BEING INCRE- FCH06380
C                       MENTED.                                         FCH06390
              IRCR(NCR)=IRCR(NCR)+1                                     FCH06400
C                       IS THE VARIABLE BEING INCREMENTED THE LAST VARI-FCH06410
C                       ABLE?                                           FCH06420
C                       YES. GO TO COMPUTE ROW NUMBER.                  FCH06430
              IF(NCR.EQ.NV) GO TO 1008                                  FCH06440
C                       NO                                              FCH06450
C                       RESET ALL 'INNER DO'S' TO THEIR BEGINNING VALUE.FCH06460
              NC1=NCR+1                                                 FCH06470
              DO 1006 I=NC1,NV                                          FCH06480
 1006         IRCR(I)=IRFR(I)                                           FCH06490
C                       VARIABLE TO BE INCREMENTED NEXT WILL BE THE     FCH06500
C                       INNERMOST DO.                                   FCH06510
              NCR=NV                                                    FCH06520
C                       1008                                            FCH06530
C                       COMPUTE STATE NUMBER.                           FCH06540
C                       SET IDROW=0                                     FCH06550
 1008                IDROW=0                                            FCH06560
C                       IS CURRENT VALUE OF VARIABLE 1.EQ.0?            FCH06570
C                       YES. ROW WILL BE ROW ZERO.                      FCH06580
                     IF(IRCR(1).EQ.0) GO TO 1024                        FCH06590
C                       NO                                              FCH06600
                     IF(NV.EQ.1) GO TO 1012                             FCH06605
                     DO 1010 I=1,NVM1                                   FCH06610
 1010                IDROW=IDROW+(IRCR(I)-1)*MULT(I)                    FCH06620
 1012                IDROW=IDROW+IRCR(NV)                               FCH06630
C                       END OF CODE A ROW NUMBER.                       FCH06640
              GO TO 1024                                                FCH06650
C                       1019                                            FCH06660
C                       YES                                             FCH06670
C                       FOR VARIABLE BEING INCREMENTED, CURRENT VALUE ISFCH06680
C                       EQUAL TO-VALUE.                                 FCH06690
C                       IS THE VARIABLE BEING INCREMENTED THE FIRST ONE?FCH06700
 1019         IF(NCR.EQ.1) GO TO 1022                                   FCH06710
C                       NO                                              FCH06720
C                       DECREASE NUMBER OF VARIABLE BEING INCREMENTED BYFCH06730
C                       ONE.                                            FCH06740
              NCR=NCR-1                                                 FCH06750
              GO TO 1001                                                FCH06760
C                       YES                                             FCH06770
C                       ALL INDEX VALUES FOR ALL VARIABLES HAVE BEEN    FCH06780
C                       PROCESSED.                                      FCH06790
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C                         PLACE -1 IN ROW NUMBER VARIABLE.                FCH06800
 1022        IDROW=-1                                                     FCH06810
C                         1024                                            FCH06820
C                         CONTINUE                                        FCH06830
 1024        CONTINUE                                                     FCH06840
C                         END OF CODE A ROW NUMBER.                       FCH06850
C                                                                        *FCH06860
C                                                                       **FCH06870
C                         HAVE ALL ROW NUMBERS BEEN GENERATED?            FCH06880
C                         YES                                             FCH06890
C                         GO TO READ NEXT CONTROL CARD.                   FCH06900
      IF(IDROW.LT.0) GO TO 140                                            FCH06910
C                         NO                                              FCH06920
C                         SET KPASS=3. GO TO ROW SEARCH.                  FCH06930
C                         AT THE COMPLETION OF THE ROW SEARCH, THERE WILL FCH06940
C                         BE A TRANSFER TO (1) 510 IF THE ROW IS PRESENT  FCH06950
C                         AND (2) 500 IF THE ROW IS NOT PRESENT.          FCH06960
      KPASS=3                                                             FCH06970
      GO TO 170                                                           FCH06980
C                                                                         FCH06990
C                                                                         FCH07000
C                         510                                             FCH07010
C                         FAMILY CHANGE: ROW IS PRESENT AND HAS BEEN READ.FCH07020
  510 CONTINUE                                                            FCH07030
C                         1025                                            FCH07040
C                                                                       **FCH07050
C                                                                        *FCH07060
C                         INITIALIZE COLUMN CODE VALUES TO BE USED IN PRO-FCH07070
C                         CESSING THE ROW JUST READ.                      FCH07080
C                                                                         FCH07090
C                         SET ARRAY FOR CURRENT CODE VALUES FOR COLUMN    FCH07100
C                         (ICCR) EQUAL INITIAL CODE VALUES FOR COLUMN     FCH07110
C                         (ICFR).                                         FCH07120
 1025 CALL TMT(NV,ICCR(1),ICFR(1))                                        FCH07130
C                         SUBTRACT 1 FROM NVTH ENTRY IN ICCR.             FCH07140
      ICCR(NV)=ICFR(NV)-1                                                 FCH07150
C                         INITIAL SETTING FOR COLUMN VARIABLE CURRENTLY   FCH07160
C                         BEING INCREMENTED IS LAST VARIABLE.             FCH07170
      MCR=NV                                                              FCH07180
C                         1026                                            FCH07190
C                         SET CURRENT VALUE OF COLUMNS EQUAL CURRENT VALUEFCH07200
C                         OF ROW FOR VARIABLES SO SPECIFIED.              FCH07210
C                         DO FOR EACH VARIABLE.                           FCH07220
 1026        DO 1028 I=1,NV                                               FCH07230
C                         IS SWITCH SET INDICATING THAT CURRENT ROW CODES FCH07240
C                         ARE TO BE USED FOR NON FREE COLUMN CODES?       FCH07250
             IF(ICSW(I).EQ.0) GO TO 1027                                  FCH07260
C                         YES                                             FCH07270
C                         FOR THIS VARIABLE SET CURRENT INDEX, FROM INDEX FCH07280
C                         AND TO INDEX FOR THIS COLUMN EQUAL THE VALUE OF FCH07290
C                         THIS CODE FOR THE CURRENT ROW.                  FCH07300
             ICCR(I)=IRCR(I)                                              FCH07310
             ICFR(I)=IRCR(I)                                              FCH07320
             ICTO(I)=IRCR(I)                                              FCH07330
C                         1027                                            FCH07340
C                         IS SWITCH SET INDICATING THAT CURRENT ROW CODES FCH07350
C                         ARE TO BE USED FOR NON FREE COLUMN CODES?       FCH07360
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 1027       IF(IFSW(I).EQ.0) GO TO 1028                                  FCH07370
C                        YES                                             FCH07380
C                        SET FREE COLUMN CODE EQUAL CURRENT CODE FOR ROW.FCH07390
            IFR(I)=IRCR(I)                                               FCH07400
C                        1028                                            FCH07410
C                        CONTINUE                                        FCH07420
 1028       CONTINUE                                                     FCH07430
C                        1029                                            FCH07440
C                        IF THE CURRENT ROW VALUE IS TO BE USED FOR THE  FCH07450
C                        NVTH COLUMN VALUE, DECREASE THIS VALUF BY 1.    FCH07460
 1029       IF(ICSW(NV).EQ.1) ICCR(NV)=ICFR(NV)-1                        FCH07470
C                        END OF INITIALIZE COLUMN CODE VALUES.           FCH07480
C                                                                       *FCH07490
C                                                                      **FCH07500
C                        1030                                            FCH07510
C                        GENERATE FREE COLUMN NUMBER.                    FCH07520
C                        INITIALIZE IFRCOL TO ZERO.                      FCH07530
 1030              IFRCOL=0                                              FCH07540
C                        IS THE CURRENT VALUE OF VARIABLE 1 EQUAL 0?     FCH07550
C                        YES. FREE COLUMN WILL BE COLUMN ZERO.           FCH07560
                   IF(IFR(1).EQ.0) GO TO 1034                            FCH07570
C                        NO                                              FCH07580
C                        COMPUTE STATE NUMBER.                           FCH07590
                   IF(NV.EQ.1) GO TO 1033                                FCH07595
                   DO 1032 I=1,NVM1                                      FCH07600
 1032              IFRCOL=IFRCOL+(IFR(I)-1)*MULT(I)                      FCH07610
 1033              IFRCOL=IFRCOL+IFR(NV)                                 FCH07620
C                        1034                                            FCH07630
C                        CONTINUE                                        FCH07640
 1034       CONTINUE                                                     FCH07650
C                        END OF GENERATE FREE COLUMN NUMBER.             FCH07660
C                        SET KPASS, ICOL, AND KFRSW FOR USE IN FREE      FCH07670
C                        COLUMN SEARCH.                                  FCH07680
      KPASS=4                                                            FCH07690
      ICOL=IFRCOL                                                        FCH07700
      KFRSW=0                                                            FCH07710
C                        GO TO COLUMN SEARCH SEGMENT OF PROGRAM.         FCH07720
C                        AT THE COMPLETION OF THE COLUMN SEARCH, THE     FCH07730
C                        PROGRAM WILL TRANSFER TO 524.                   FCH07740
      GO TO 210                                                          FCH07750
C                        FREE ELEMENT SEARCH COMPLETE AND SWITCH SET.    FCH07760
C                                                                        FCH07770
C                        IF FREE ELEMENT IS NOT PRESENT AND PERCENT      FCH07780
C                        CHANGE IS POSITIVE, NO CHANGE IS POSSIBLE FOR   FCH07790
C                        THIS ROW. GO TO NEXT ROW.                       FCH07800
  524 IF(KFRSW.GT.0.AND.PCCHG.GT.0.0) GO TO 500                          FCH07810
C                        CONTINUE WITH CHANGES FOR THIS ROW.             FCH07820
C                        BRANCH ON PROCEDURE CODE.                       FCH07830
  525 GO TO (530,540),KPROC                                              FCH07840
C                                                                        FCH07850
C                                                                       **FCH07860
C                                                                        *FCH07870
C                        CODE                                            FCH07880
C                        PROCEDURE 1 - CODE NON FREE COLUMN NUMBERS.     FCH07890
  530 CONTINUE                                                           FCH07900
C                        1040                                            FCH07910
C                        CODE A NON FREE COLUMN NUMBER.                  FCH07920
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C                       IS CURRENT VALUE OF VARIABLE BEING INCREMENTED  FCH07930
C                       EQUAL TO-VALUE OF THAT VARIABLE?                FCH07940
C                       YES. GO TO STEP VARIABLE NUMBER.                FCH07950
 1040       IF(ICCR(MCR).EQ.ICTO(MCR)) GO TO 1056                       FCH07960
C                       NO                                              FCH07970
C                       ADD 1 TO CURRENT VALUE OF VARIABLE BEING INCRE- FCH07980
C                       MENTED.                                         FCH07990
            ICCR(MCR)=ICCR(MCR)+1                                       FCH08000
C                       IS THE VARIABLE BEING INCREMENTED THE LAST VARI-FCH08010
C                       ABLE?                                           FCH08020
C                       YES. GO TO COMPUTE COLUMN NUMBER.               FCH08030
            IF(MCR.EQ.NV) GO TO 1048                                    FCH08040
C                       NO                                              FCH08050
C                       RESET ALL 'INNER DO'S' TO THEIR BEGINNING VALUE.FCH08060
            MC1=MCR+1                                                   FCH08070
            DO 1046 I=MC1,NV                                            FCH08080
 1046       ICCR(I)=ICFR(I)                                             FCH08090
C                       VARIABLE TO BE INCREMENTED NEXT WILL BE THE     FCH08100
C                       INNERMOST DO.                                   FCH08110
            MCR=NV                                                      FCH08120
C                       1048                                            FCH08130
C                       COMPUTE STATE NUMBER.                           FCH08140
C                       INITIALIZE COLUMN NUMBER VARIABLE TO ZERO       FCH08150
 1048             IDCOL=0                                               FCH08160
C                       IS CURRENT VALUE OF VARIABLE 1.EQ.0?            FCH08170
C                       YES. COLUMN WILL BE COLUMN ZERO.                FCH08180
                  IF(ICCR(1).EQ.0) GO TO 1062                           FCH08190
C                       NO                                              FCH08200
                  IF(NV.EQ.1) GO TO 1053                                FCH08205
                  DO 1052 I=1,NVM1                                      FCH08210
 1052             IDCOL=IDCOL+(ICCR(I)-1)*MULT(I)                       FCH08220
 1053             IDCOL=IDCOL+ICCR(NV)                                  FCH08230
C                       CONTINUE                                        FCH08240
                  GO TO 1062                                            FCH08250
C                       1056                                            FCH08260
C                       IS THE VARIABLE BEING INCREMENTED THE FIRST ONE?FCH08270
 1056       IF(MCR.EQ.1) GO TO 1060                                     FCH08280
C                       NO                                              FCH08290
C                       DECREASE VARIABLE BEING INCREMENTED BY ONE.     FCH08300
            MCR=MCR-1                                                   FCH08310
            GO TO 1040                                                  FCH08320
C                       YES                                             FCH08330
C                       ALL INDEX VALUES FOR ALL VARIABLES HAVE BEEN    FCH08340
C                       PROCESSED.                                      FCH08350
C                       PLACE -1 IN COLUMN NUMBER VARIABLE.             FCH08360
 1060       IDCOL=-1                                                    FCH08370
C                       1062                                            FCH08380
C                       CONTINUE                                        FCH08390
 1062       CONTINUE                                                    FCH08400
C                       END OF CODE A COL NUMBER.                       FCH08410
C                                                                       FCH08420
C                       HAVE ALL COLUMNS IN CURRENT ROW BEEN PROCESSED? FCH08430
C                       YES - GO TO NEXT ROW.                           FCH08440
      IF(IDCOL.LT.0) GO TO 500                                          FCH08450
C                       NO - PROCESS NEXT COLUMN.                       FCH08460
C                       ADD 1 TO COUNT OF NUMBER OF SEARCHES MADE.      FCH08470
      NSERCH=NSERCH+1                                                   FCH08480
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C                       SET KPASS AND ICOL FOR USE IN COLUMN SEARCH.    FCH08490
      KPASS=3                                                           FCH08500
      ICOL=IDCOL                                                        FCH08510
C                                                                      *FCH08520
C                                                                     **FCH08530
C                       GO TO COLUMN SEARCH SEGMENT OF PROGRAM.         FCH08540
      GO TO 210                                                         FCH08550
C                       IF THE ELEMENT IS PRESENT, PROGRAM WILL TRANSFERFCH08560
C                       TO 317 TO MAKE A CHANGE.                        FCH08570
C                       IF THE ELEMENT IS NOT PRESENT, PROGRAM WILL     FCH08580
C                       TRANSFER TO 530 TO CODE NEXT COLUMN NUMBER.     FCH08590
C                                                                       FCH08600
C                                                                     **FCH08610
C                                                                      *FCH08620
C                       DECODE                                          FCH08630
C                       PROCEDURE 2 - DECODE EACH COLUMN PRESENT.       FCH08640
C                       SET INITIAL VALUES FOR THE DO LOOP FOR THE LIST FCH08650
C                       OF COLUMNS IN A ROW.                            FCH08660
  540 JFR=1                                                             FCH08670
      JTO=JCNT                                                          FCH08680
      GO TO 542                                                         FCH08690
C                                                                       FCH08700
C                       TRANSFER HERE FOLLOWING A CHANGE THAT CAUSED THEFCH08710
C                       FREE ELEMENT TO BE ADDED TO THE ROW.            FCH08720
C                       HAVE ALL COLUMN ELEMENTS BEEN PROCESSED?        FCH08730
C                       YES. GO TO CODE NEXT ROW NUMBER.                FCH08740
  541 IF(JFR.GT.JCNT) GO TO 500                                         FCH08750
C                       542                                             FCH08760
C                       NO                                              FCH08770
C                                                                       FCH08780
C                       DECODE A COLUMN NUMBER. COMPARE CODES WITH      FCH08790
C                       FAMILY CHANGE SPECIFICATIONS.                   FCH08800
C                                                                       FCH08810
C                       DO FOR EACH ELEMENT IN THE ROW.                 FCH08820
  542 DO 550 J=JFR,JTO                                                  FCH08830
C                       ADD 1 TO COUNT OF NUMBER OF ELEMENTS DECODED.   FCH08840
      NDCODE=NDCODE+1                                                   FCH08850
C                                                                       FCH08860
C                       DECODE JTH ELEMENT IN ROW AND COMPARE WITH      FCH08870
C                       FAMILY CHANGE SPECIFICATION.                    FCH08880
C                       1071                                            FCH08890
C                       IS COLUMN NUMBER ZERO...                        FCH08900
 1071         IF(JCOL(J).NE.0) GO TO 1074                               FCH08910
C                       YES.  SET ALL VARIABLE CODE VALUES TO ZERO.     FCH08920
              DO 1072 I=1,NV                                            FCH08930
 1072         IACT(I)=0                                                 FCH08940
              GO TO 1086                                                FCH08950
C                       1074                                            FCH08960
C                       NON-ZERO COLUMN NUMBER. DECODE TO OBTAIN        FCH08970
C                       ORIGINAL VARIABLE CODES.                        FCH08980
 1074         I2=JCOL(J)                                                FCH08990
              IF(NV.EQ.1) GO TO 1085                                    FCH08995
              DO 1084 I=1,NVM1                                          FCH09000
              I1=(I2-1)/MULT(I)                                         FCH09010
              I2=I2-I1*MULT(I)                                          FCH09020
 1084         IACT(I)=I1+1                                              FCH09030
 1085         IACT(NV)=I2                                               FCH090 0
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C                         1086                                          FCH09050
C                         ARE ALL CODES FOR THIS COLUMN NUMBER IN THE   FCH09060
C                         SPECIFIED RANGE?                              FCH09070
 1086         DO 1088 I=1,NV                                            FCH09080
              IF(IACT(I).LT.ICFR(I).OR.IACT(I).GT.ICTO(I)) GO TO 1092   FCH09090
 1088         CONTINUE                                                  FCH09100
C                         YES. THIS COLUMN NUMBER IS IN THE SPECIFIED   FCH09110
C                         CHANGE RANGE.                                 FCH09120
C                         SET IDCOL EQUAL THE COLUMN NUMBER JUST DECODED. FCH09130
              IDCOL=JCOL(J)                                             FCH09140
              GO TO 1094                                                FCH09150
C                         NO                                            FCH09160
C                         SET IDCOL=-1 TO INDICATE COLUMN NUMBER NOT IN FCH09170
C                         RANGE.                                        FCH09180
 1092         IDCOL=-1                                                  FCH09190
C                         1094                                          FCH09200
C                         CONTINUE                                      FCH09210
 1094         CONTINUE                                                  FCH09220
C                         END OF DECODE A COLUMN NUMBER.                FCH09230
C                                                                       FCH09240
C                         WAS COLUMN IN RANGE?                          FCH09250
C                         NO. GO TO DECODE NEXT COLUMN.                 FCH09260
      IF(IDCOL.LT.0) GO TO 550                                          FCH09270
C                         YES                                           FCH09280
C                         ADD 1 TO COUNT OF NUMBER OF COLUMNS IN RANGE. FCH09290
      NINRNG=NINRNG+1                                                   FCH09300
C                         SET NON-FREE AMOUNT, LOCATION OF NON-FREE     FCH09310
C                         ELEMENT AND TYPE OF PASS FOR USE OF PROGRAM SEG-FCH09320
C                         MENT THAT ACTUALLY CHANGES THE ELEMENT VALUES. FCH09330
      AMTNF=P(J)                                                        FCH09340
      IJNF=J                                                            FCH09350
      KPASS=5                                                           FCH09360
C                         GO TO PROGRAM SEGMENT THAT WILL MAKE THE CHANGE.FCH09370
C                         RETURN WILL BE TO 541 OR 550 TO DECODE NEXT COL.FCH09380
      GO TO 317                                                         FCH09390
C                         CONTINUE                                      FCH09400
  550 CONTINUE                                                          FCH09410
C                                                                      *FCH09420
C                                                                     **FCH09430
C                         ALL COLUMNS IN THIS ROW HAVE BEEN PROCESSED.  FCH09440
C                         GO TO NEXT ROW.                               FCH09450
      GO TO 500                                                         FCH09460
C                                                                       FCH09470
C                                                                    ***FCH09480
C                                                                      *FCH09490
C                         A TYPE 5 CARD - END OF CHANGES FOR CURRENT P  FCH09500
C                         MATRIX - WILL CAUSE A TRANSFER TO THIS SEGMENT FCH09510
C                         OF THE PROGRAM.                               FCH09520
C                         IS THERE A CHANGED ROW RECORD IN CORE THAT HAS FCH09530
C                         NOT BEEN WRITTEN.                             FCH09540
C                         NO. GO TO PRINT COUNTS.                       FCH09550
  567 IF(II.EQ.0.OR.KCHGSW.EQ.0) GO TO 568                              FCH09560
C                         YES                                           FCH09570
C                         SET RANDOM ACCESS RECORD NUMBER EQUAL ROW NUMBERFCH09580
C                         SUBSCRIPT.                                    FCH09590
      ITK=II                                                            FCH09600
C                         WRITE ROW RECORD ON DISK.                     FCH09610
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          WRITE(KDISK'ITK)                                              FCH09620
     1          KTYPE,ISN(II),JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT) FCH09630
C                                                                       FCH09640
C                     568                                               FCH09650
C                     PRINT COUNTS FOR THIS MATRIX: NUMBER OF ELEMENTSFCH09660
C                     SEARCHED FOR, NUMBER OF ELEMENTS FOUND, NUMBER  FCH09670
C                     OF COLUMNS DECODED, NUMBER OF COLUMNS IN RANGE, FCH09680
C                     NUMBER OF NON FREE COLUMNS CHANGED.             FCH09690
  568 PRINT 569,NSERCH,NFOUND,NDCODE,NINRNG                             FCH09700
  569 FORMAT(/21H FAMILY CHANGE COUNTS                                  FCH09710
     1       /35H NUMBER OF ELEMENTS SEARCHED FOR = ,I10               FCH09720
     2       /35H NUMBER OF ELEMENTS FOUND        = ,I10               FCH09730
     3       /35H NUMBER OF COLUMNS DECODED       = ,I10               FCH09740
     4       /35H NUMBER OF COLUMNS IN RANGE      = ,I10)              FCH09750
  577 PRINT 578,NCHG                                                    FCH09760
  578 FORMAT(/40H SPECIFIC CHANGE AND FAMILY CHANGE COUNT               FCH09770
     1       /38H NUMBER OF NON-FREE ELEMENTS CHANGED = ,I10)           FCH09780
C                                                                       FCH09790
C                     WERE ANY CHANGES ACTUALLY MADE IN THIS MATRIX?  FCH09800
C                     YES. GO TO WRITE OUTPUT MATRIX.                 FCH09810
      IF(NCHG.NE.0) GO TO 590                                           FCH09820
C                                                                       FCH09830
C                     NO.  SHOULD THE MATRIX BE COPIED ONTO THE OUTPUTFCH09840
C                     FILE ANYWAY...                                  FCH09850
C                     IF NOT, READ NEXT TYPE 1 CARD.                  FCH09860
C                     THE IDROW FIELD IN A TYPE 5 CARD IS THE WRITE P FCH09870
C                     SWITCH.                                         FCH09880
      IF(IDROW.EQ.0) GO TO 20                                           FCH09890
C                                                                       FCH09900
C                     590                                             FCH09910
C                     TRANSFER HERE (1) TO COPY CHANGED MATRIX AND    FCH09920
C                     (2) TO COPY MATRIX WITH NO CHANGES IF SWITCH SO FCH09930
C                     SPECIFIES.                                      FCH09940
C                     WRITE OUTPUT LABEL FOR CHANGED P.               FCH09950
  590 NLP=60                                                            FCH09960
      WRITE(KOUTP)KPBEG,NUNAME,NLP,(LABELP(I),I=1,30 ),NULABL           FCH09970
C                                                                     **FCH09980
C                                                                      *FCH09990
C                     UPDATE ISN LIST IF NEW ROWS HAS ANY ENTRIES     FCH10000
C                     ISN CANNOT BE UPDATED UNTIL THE CHANGE OPERATIONFCH10010
C                     FOR THE MATRIX IS COMPLETE SINCE IT IS USED TO  FCH10020
C                     DETERMINE ROW RECORD TRACK NUMBERS.             FCH10030
C                     IF NN.EQ.0, THERE ARE NO ROWS TO ADD TO ISN.    FCH10040
C                                                                     FCH10050
C                     IS THE NEW ROW LIST EMPTY?                      FCH10060
C                     YES. GO TO WRITE ROW LIST AND COLUMN LIST       FCH10070
C                     RECORDS.                                        FCH10080
      IF(NN.EQ.0) GO TO 610                                             FCH10090
C                     NO                                              FCH10100
C                     THERE ARE ENTRIES IN THE NEW ROW LIST. ARE ALL  FCH10110
C                     ELEMENTS BEING ADDED DIAGONAL ELEMENTS?         FCH10120
C                     YES. GO TO FILE NEW ROWS ENTRIES INTO TOTAL ROW FCH10130
C                     LIST.                                           FCH10140
      IF(KURSW.EQ.0) GO TO 591                                          FCH10150
C                                                                   ***FCH10160
C                                                                     *FCH10170
C                     NO                                              FCH10180
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C                         OFF DIAGONAL ELEMENTS MAY BE ADDED.                FCH10190
C                         GENERATE ADDITIONAL ROWS AND COLUMNS, IF ANY,      FCH10200
C                         FROM MODIFY SPECIFICATIONS.                        FCH10210
C                                                                            FCH10220
C                         EXECUTE THIS SEGMENT OF PROGRAM WHEN               FCH10230
C                         KURSW=+N AND NN.GT.0                               FCH10240
C                                                                            FCH10250
C                         COMPUTE COLUMN IN WHICH ENTRY WILL BE PLACED FORFCH10260
C                         EACH NEW ROW. ADD THE COLUMN TO LSTCOL AND/OR      FCH10270
C                         NUROWS AS REQUIRED.                                FCH10280
C                                                                            FCH10290
C                         INITIALIZE SUBSCRIPT FOR NEW ROW LIST.             FCH10300
 1500 N=1                                                                    FCH10310
C                         WILL THE COLUMN ELEMENT FOR THE NTH ENTRY IN THEFCH10320
C                         NEW ROW LIST BE A DIAGONAL ELEMENT?                FCH10330
C                         YES. GO TO CHECK NEXT ELEMENT.                     FCH10340
 1505 IF(MOD(NUROWS(N),KURFAC).EQ.0) GO TO 1570                              FCH10350
C                         NO                                                 FCH10360
C                         COMPUTE THE COLUMN NUMBER OF THE ELEMENT THAT      FCH10370
C                         WILL BE ADDED.                                     FCH10380
      ICOL=NUROWS(N)+KURSW                                                   FCH10390
C                         IS THE COLUMN NUMBER JUST COMPUTED IN LSTCOL?      FCH10400
      DO 1515 J=1,JCOUNT                                                     FCH10410
      IF(LSTCOL(J).GE.ICOL) GO TO 1525                                       FCH10420
 1515 CONTINUE                                                               FCH10430
C                         NO                                                 FCH10440
C                         ADD AT END OF LSTCOL.                              FCH10450
      JCOUNT=JCOUNT+1                                                        FCH10460
      LSTCOL(JCOUNT)=ICOL                                                    FCH10470
      GO TO 1540                                                             FCH10480
C                         WAS THIS AN EQUAL BRANCH...                        FCH10490
 1525 IF(ICOL.EQ.LSTCOL(J)) GO TO 1540                                       FCH10500
C                         NO. FILE NEW COL AT POSITION J.                    FCH10510
      CALL TMT2(LSTCOL(J),LSTCOL(J+1),JCOUNT-J+1)                            FCH10520
      LSTCOL(J)=ICOL                                                         FCH10530
      JCOUNT=JCOUNT+1                                                        FCH10540
C                         IS THE COLUMN NUMBER JUST COMPUTED IN ISN?         FCH10550
 1540 DO 1545 I=1,ISCNT                                                      FCH10560
      IF(ISN(I).LT.ICOL) GO TO 1545                                          FCH10570
      IF(ICOL.EQ.ISN(I)) GO TO 1570                                          FCH10580
      GO TO 1550                                                             FCH10590
 1545 CONTINUE                                                               FCH10600
C                         1550                                               FCH10610
C                         NO                                                 FCH10620
C                         IS THE COLUMN NUMBER JUST COMPUTED IN NUROWS?      FCH10630
 1550 DO 1555 I=N,NN                                                         FCH10640
      IF(NUROWS(I).GE.ICOL) GO TO 1560                                       FCH10650
 1555 CONTINUE                                                               FCH10660
C                         ADD COL AT END OF NUROWS.                          FCH10670
      NN=NN+1                                                                FCH10680
      NUROWS(NN)=ICOL                                                        FCH10690
      GO TO 1570                                                             FCH10700
C                         WAS THIS AN EQUAL BRANCH...                        FCH10710
 1560 IF(NUROWS(I).EQ.ICOL) GO TO 1570                                       FCH10720
C                         NO. FILE NEW COL AT POSITION I.                    FCH10730
      CALL TMT2(NUROWS(I),NUROWS(I+1),NN-I+1)                                FCH10740
      NUROWS(I)=ICOL                                                         FCH10750
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      NN=NN+1                                                           FCH10760
C                         CONTINUE.                                     FCH10770
C                         HAVE ALL ENTRIES IN THE NUROWS LIST BEEN PROCES-FCH10780
C                         SED?                                          FCH10790
C                         YES. GO TO FILE NEW ROWS ENTRIES INTO TOTAL ROW FCH10800
C                         LIST.                                         FCH10810
 1570 IF(N.EQ.NN) GO TO 591                                             FCH10820
C                         NO                                            FCH10830
C                         INCREMENT SUBSCRIPT FOR NEW ROW LIST.         FCH10840
      N=N+1                                                             FCH10850
C                         PROCESS NEXT ENTRY IN NUROWS LIST.            FCH10860
      GO TO 1505                                                        FCH10870
C                                                                      *FCH10880
C                                                                   ***FCH10890
C                                                                      FCH10900
C                                                                    **FCH10910
C                                                                     *FCH10920
C                         FILE NEW ROW ENTRIES INTO TOTAL ROW LIST AND UP-FCH10930
C                         DATE COUNT OF ELEMENTS IN ROW LIST.           FCH10940
C                         USE N FOR NUROWS SUBSCRIPT AND I FOR ISN SUB-  FCH10950
C                         SCRIPT. INITIALIZE.                           FCH10960
  591 N=1                                                               FCH10970
      I=1                                                               FCH10980
C                         592                                           FCH10990
C                         IS ISN ENTRY GREATER THAN NUROWS ENTRY?       FCH11000
  592 IF(ISN(I).GE.NUROWS(N)) GO TO 598                                 FCH11010
C                         NO                                            FCH11020
C                         UPDATE I.                                     FCH11030
      I=I+1                                                             FCH11040
C                         ARE THERE STILL ELEMENTS IN ISN TO BE PROCESSED?FCH11050
      IF(I.LE.ISCNT) GO TO 592                                          FCH11060
C                         594                                           FCH11070
C                         NO                                            FCH11080
C                         ADD REMAINING NEW ROW NUMBERS AT END OF ISN.  FCH11090
  594 ISN(I)=NUROWS(N)                                                  FCH11100
C                         UPDATE N.                                     FCH11110
      N=N+1                                                             FCH11120
C                         HAVE ALL NUROWS ENTRIES BEEN PROCESSED?       FCH11130
      IF(N.GT.NN) GO TO 602                                             FCH11140
C                         NO                                            FCH11150
C                         UPDATE I.                                     FCH11160
      I=I+1                                                             FCH11170
      GO TO 594                                                         FCH11180
C                         598                                           FCH11190
C                         YES                                           FCH11200
C                         NUROWS ENTRY IS GREATER THAN ISN ENTRY.       FCH11210
C                         FILE NUROWS ENTRY HERE.                       FCH11220
C                         PUSH DOWN ISN ARRAY, POSITION I THRU ISCNT.   FCH11230
  598 CALL TMT2(ISN(I),ISN(I+1),ISCNT-I+1)                              FCH11240
      ISN(I)=NUROWS(N)                                                  FCH11250
C                         ADD 1 TO COUNT OF ISN ENTRIES.                FCH11260
      ISCNT=ISCNT+1                                                     FCH11270
C                         UPDATE SUBSCRIPTS.                            FCH11280
      I=I+1                                                             FCH11290
      N=N+1                                                             FCH11300
C                         HAVE ALL NUROWS ENTRIES BEEN PROCESSED?       FCH11310
      IF(N.GT.NN) GO TO 602                                             FCH11320
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C                       NO                                                FCH11330
C                       ARE THERE STILL ISN ENTRIES TO BE PROCESSED?      FCH11340
      IF(I.GT.ISCNT) GO TO 594                                            FCH11350
C                       YES                                               FCH11360
      GO TO 592                                                           FCH11370
C                                                                         FCH11380
C                       602                                               FCH11390
C                       ALL NEW ROW ENTRIES HAVE BEEN PROCESSED.          FCH11400
C                       RESET COUNT OF NUMBER OF ENTRIES IN ROW LIST.     FCH11410
  602 ISCNT=I                                                             FCH11420
C                                                                        *FCH11430
C                                                                       **FCH11440
C                       WRITE P ROW LIST RECORD.                          FCH11450
  610 WRITE(KOUTP)KPLST,ISCNT,(ISN(I),I=1,ISCNT),MODSW,MODFAC             FCH11460
C                       WRITE P COLUMN LIST RECORD.                       FCH11470
      WRITE(KOUTP)KPLST,JCOUNT,(LSTCOL(I),I=1,JCOUNT),NUMMO,NUMYR         FCH11480
C                       PRINT OUTPUT MATRIX ROW AND COLUMN COUNTS.        FCH11490
      PRINT 612,ISCNT,JCOUNT                                              FCH11500
  612 FORMAT(/38H FOR OUTPUT P MATRIX, NUMBER OF ROWS = ,I12,5X,          FCH11510
     1       20HNUMBER OF COLUMNS = ,I12)                                 FCH11520
C                                                                         FCH11530
C                       COPY P MATRIX FROM DIRECT ACCESS FILE TO          FCH11540
C                       SEQUENTIAL ACCESS FILE. GENERATE A RECORD FOR     FCH11550
C                       EACH ENTRY IN NUROWS.                             FCH11560
C                       PLACE A -1 FOLLOWING THE LAST ENTRY IN NUROWS     FCH11570
C                       AND SET INITIAL DIRECT ACCESS RECORD NUMBER TO    FCH11580
C                       1.                                                FCH11590
      NUROWS(NN+1)=-1                                                     FCH11600
      ITK=1                                                               FCH11610
C                       SET RECORD TYPE AND ELEMENT VALUE FOR USE IN      FCH11620
C                       ADDED ROW ENTRIES.                                FCH11630
 2400       KPDAT=23                                                      FCH11640
            PVALUE=1.0                                                    FCH11650
C                       INITIALIZE SUBSCRIPT FOR PICKING UP ELEMENTS OF   FCH11660
C                       NUROWS.                                           FCH11670
            I=1                                                           FCH11680
C                       PICK UP NEXT NEW ROW NUMBER.                      FCH11690
            NADD=NUROWS(I)                                                FCH11700
C                       READ A RECORD FROM DISK.                          FCH11710
 2410       READ(KDISK'ITK)                                               FCH11720
     1            KTYPE,IROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)      FCH11730
C                       WAS THIS A P END LABEL?                           FCH11740
C                       YES. ALL DISK RECORDS READ.                       FCH11750
            IF(KTYPE.EQ.33) GO TO 2435                                    FCH11760
C                       NO                                                FCH11770
C                       HAVE ALL NEW ROWS BEEN ADDED?                     FCH11780
C                       YES. GO TO WRITE RECORD JUST READ.                FCH11790
 2420       IF(NADD.LE.0) GO TO 2430                                      FCH11800
C                       NO                                                FCH11810
C                       IS NEXT NEW ROW GREATER THAN ROW OF RECORD JUST   FCH11820
C                       READ?                                             FCH11830
C                       YES. GO TO WRITE RECORD JUST READ.                FCH11840
            IF(NADD.GT.IROW) GO TO 2430                                   FCH11850
C                       NO                                                FCH11860
C                       WRITE AN OUTPUT RECORD FOR THE NEXT NEW ROW.      FCH11870
C                       COMPUTE COLUMN NUMBER FROM ROW NUMBER AND         FCH11880
C                       CURRENT TRANSITION MODIFY SPECIFICATIONS.         FCH11890
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      ICOL=NADD                                                         FCH11900
      IF(KURSW.EQ.0) GO TO 2426                                         FCH11910
      IF(MOD(ICOL,KURFAC).NE.0) ICOL=ICOL+KURSW                         FCH11920
 2426 WRITE(KOUTP)KPDAT,NADD,NFILL,ICOL,PVALUE                          FCH11930
C                       UPDATE NUROWS SUBSCRIPT AND PICK UP NEXT NEW ROWFCH11940
C                       ELEMENT.                                        FCH11950
            I=I+1                                                       FCH11960
            NADD=NUROWS(I)                                              FCH11970
            GO TO 2420                                                  FCH11980
C                       2430                                            FCH11990
C                       WRITE THE RECORD READ FROM DISK ONTO THE OUTPUT FCH12000
C                       FILE.                                           FCH12010
 2430       WRITE(KOUTP)                                                FCH12020
     1            KTYPE,IROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)    FCH12030
C                       GO TO READ NEXT DISK RECORD.                    FCH12040
            GO TO 2410                                                  FCH12050
C                       2435                                            FCH12060
C                       ALL DISK RECORDS HAVE BEEN COPIED.              FCH12070
C                       HAVE ALL NEW ROWS BEEN ADDED?                   FCH12080
C                       YES. WRITE END LABEL.                           FCH12090
 2435       IF(NADD.LE.0) GO TO 2450                                    FCH12100
C                       2440                                            FCH12110
C                       NO                                              FCH12120
C                       WRITE AN OUTPUT RECORD FOR THE NEXT NEW ROW.    FCH12130
C                       COMPUTE COLUMN NUMBER FROM ROW NUMBER AND CUR-  FCH12140
C                       REN. TRANSITION MODIFY SPECIFICATIONS.          FCH12150
 2440 ICOL=NADD                                                         FCH12160
      IF(KURSW.EQ.0) GO TO 2446                                         FCH12170
      IF(MOD(ICOL,KURFAC).NE.0) ICOL=ICOL+KURSW                         FCH12180
 2446 WRITE(KOUTP)KPDAT,NADD,NFILL,ICOL,PVALUE                          FCH12190
C                       UPDATE NUROWS SUBSCRIPT AND PICK UP NEXT NEW ROWFCH12200
C                       ELEMENT.                                        FCH12210
            I=I+1                                                       FCH12220
            NADD=NUROWS(I)                                              FCH12230
      GO TO 2435                                                        FCH12240
C                       2450                                            FCH12250
C                       YES                                             FCH12260
C                       ALL DISK DATA RECORDS HAVE BEEN COPIED AND      FCH12270
C                       ALL NEW ROWS HAVE BEEN ADDED.                   FCH12280
C                       UPDATE P MATRIX ROW AND ELEMENT COUNT FOR END   FCH12290
C                       LABEL.                                          FCH12300
 2450       JCOL(1)=JCOL(1)+I-1                                         FCH12310
            P(1)=P(1)+DFLOAT(I-1)                                       FCH12320
C                       WRITE END LABEL ON OUTPUT FILE.                 FCH12330
            WRITE(KOUTP)                                                FCH12340
     1            KTYPE,IROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)    FCH12350
C                       UPDATE COUNT OF OUTPUT FILES.                   FCH12360
      NFILES=NFILES+1                                                   FCH12370
C                       GO TO READ NEXT CONTROL CARD.                   FCH12380
      GO TO 20                                                          FCH12390
C                                                                      *FCH12400
C                                                                   ***FCH12410
C                                                                       FCH12420
C                       LTYPE=2 FOR END OF CHANGES.                     FCH12430
C                       ADD 1 TO NUMBER OF FILES.                       FCH12440
  700 NFILES=NFILES+1                                                   FCH12450
C                       PLACE BLANKS IN NAME FIELD FOR END OF FILE      FCH12460
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C                         RECORD.                                          FCH12470
      DATA KBLANK/4H      /                                                FCH12480
      DO 701 I=1,6                                                         FCH12490
  701 NAMEP(I)=KBLANK                                                      FCH12500
C                         WRITE A TYPE 40 RECORD ON THE OUTPUT FILE.       FCH12510
      WRITE(KOUTP)KNEXT,NAMEP,NFILL,NFILES                                 FCH12520
C                         REWIND THE OUTPUT FILE.                          FCH12530
      REWIND KOUTP                                                         FCH12540
C                         WAS THE CARD WHICH CAUSED THE BRANCH TO THIS     FCH12550
C                         SEGMENT OF THE PROGRAM A TYPE 2 CARD?            FCH12560
      IF(LTYPE.NE.2) GO TO 710                                             FCH12570
C                         YES                                              FCH12580
C                         PRINT A MESSAGE: END OF F CHANGE DATA CARDS.     FCH12590
      PRINT 705                                                            FCH12600
  705 FORMAT(//30H END OF F CHANGE DATA CARDS.  )                          FCH12610
C                         RETURN                                           FCH12620
      RETURN                                                               FCH12630
C                                                                          FCH12640
C                         NO                                               FCH12650
C                         PRINT MESSAGE: F CHANGE CONTROL CARD ERROR AND   FCH12660
C                         CARD TYPE.                                       FCH12670
  710 PRINT 715,LTYPE                                                      FCH12680
  715 FORMAT(//36H F CHANGE CONTROL CARD ERROR. TYPE =,I6)                 FCH12690
C                         EXIT                                             FCH12700
      STOP                                                                 FCH12710
C                         YES                                              FCH12720
C                         NUMBER OF ELEMENTS PRESENT EXCEEDS ARRAY         FCH12730
C                         DIMENSION.                                       FCH12740
C                         PRINT ERROR MESSAGE.                             FCH12750
  730 PRINT 735,NDIM,JCNT                                                  FCH12760
  735 FORMAT(56H NUMBER OF ELEMENTS IN A ROW EXCEEDS VARIABLE DIMENSION.FCH12770
     1       /16H NDIM AND JCNT = ,2I12)                                   FCH12780
C                         EXIT                                             FCH12790
      STOP                                                                 FCH12800
C                         PRINT MESSAGE: DATA CARD ERROR IN PERCENT CHANGEFCH12810
C                         FIELD.                                           FCH12820
  750 PRINT 755                                                            FCH12830
  755 FORMAT(52H PCHANGE DATA CARD ERROR. NEGATIVE CHANGE CANNOT BE        FCH12840
     1      /28H GREATER THAN 100 PER CENT. )                              FCH12850
C                         PRINT CONTENTS OF DATA CARD.                     FCH12860
      PRINT 145,LTYPE,PCCHG,IDROW,IDCOL,IFRCOL                             FCH12870
C                         EXIT                                             FCH12880
      STOP                                                                 FCH12890
C                                                                          FCH12900
C                         REFERENCE LIST.                                  FCH12910
C                                                                          FCH12920
C                         SUBROUTINE ARGUMENTS.                            FCH12930
C                                                                          FCH12940
C     NDIM   - DIMENSION OF JCOL AND P IN THE CALLING PROGRAM.             FCH12950
C     ISN    - ARRAY FOR LIST OF ROWS IN P MATRIX.                         FCH12960
C     LSTCOL - ARRAY FOR LIST OF COLUMNS IN P MATRIX.                      FCH12970
C     JCOL   - ARRAY FOR LIST OF COLUMNS IN A SINGLE ROW OF THE P MATRIXFCH12980
C     P      - ARRAY FOR ELEMENT VALUES IN A SINGLE ROW OF THE P MATRIX.FCH12990
C     LABELP - ARRAY FOR LABEL OF INPUT P MATRIX.                          FCH13000
C     NUROWS - ARRAY FOR LIST OF ROWS NOT PRESENT IN INPUT P FOR WHICH     FCH13010
C              COLUMN ELEMENTS HAVE BEEN ADDED BY THE CHANGE OPERATION.    FCH13020
C     ITK    - DIRECT ACCESS DISK ASSOCIATED VARIABLE. AT THE CONCLUSIONFCH13030
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C              OF EACH READ OR WRITE OPERATION, ITK IS SET TO A VALUE   FCH13040
C              THAT POINTS TO THE RECORD THAT IMMEDIATELY FOLLOWS THE   FCH13050
C              LAST RECORD TRANSMITTED.                                 FCH13060
C                                                                       FCH13070
C                                                                       FCH13080
C                                                                       FCH13090
C                        OTHER VARIABLES.                               FCH13100
C                                                                       FCH13110
C     AMTC    - AMOUNT OF CHANGE POSSIBLE. THIS MAY ALSO BE THE AMOUNT OFFCH13120
C               CHANGE DESIRED.                                         FCH13130
C     AMTNF   - NON FREE ELEMENT PROBABILITY.                           FCH13140
C     AMTFR   - FREE ELEMENT PROBABILITY.                               FCH13150
C     IDROW   - ROW TO BE CHANGED.                                      FCH13160
C     IDCOL   - NON-FREE COLUMN ELEMENT TO BE CHANGED.                  FCH13170
C     IFRCOL  - FREE COLUMN ELEMENT.                                    FCH13180
C     ICOL    - COLUMN CURRENTLY SEARCHING FOR. THIS WILL EQUAL IDCOL OR FCH13190
C               IFRCOL.                                                 FCH13200
C     IROW    - ROW NUMBER IN P MATRIX RECORD READ FROM TAPE OR DISK.   FCH13210
C     INPSW   - 0 IF POSITION INPUT FOR P IS REQUIRED.                  FCH13220
C               1 IF POSITION FORWARD ONLY IS APPROPRIATE.              FCH13230
C                                                                       FCH13240
C     ISCNT   - NUMBER OF ENTRIES IN ISN.                               FCH13250
C     IVL     - VECTOR OF NUMBER OF CODES DEFINED FOR EACH VARIABLE.    FCH13260
C     IRFR    - VARIABLE CODES FOR ROW FROM VALUES.                     FCH13270
C     IRTO    - VARIABLE CODES FOR ROW TO.                              FCH13280
C     IFR     - VARIABLE CODES FOR FREE COLUMN.                         FCH13290
C     ICFR    - VARIABLE CODES FOR NON-FREE COLUMN FROM.                FCH13300
C     ICTO    - VARIABLE CODES FOR NON-FREE COLUMN TO.                  FCH13310
C     IACT    - ARRAY FOR VARIABLE VALUES OF THE COLUMN NUMBER BEING    FCH13320
C               DECODED.                                                FCH13330
C     IRCR    - CURRENT VARIABLE VALUE FOR ROW GENERATION.              FCH13340
C     ICCR    - CURRENT VARIABLE VALUE FOR COLUMN GENERATION.           FCH13350
C     ICSW    - SWITCH FOR NON-FREE COL VAR VALUE SAME AS ROW VAR VALUE. FCH13360
C     IFSW    - SWITCH FOR FREE COL VAR VAL SAME AS ROW VAR VALUE.      FCH13370
C                                                                       FCH13380
C     JCNT    - NUMBER OF COLUMNS IN CURRENT P MATRIX ROW.              FCH13390
C     JCOUNT  - NUMBER OF ENTRIES IN LSTCOL.                            FCH13400
C     KINP    - UNIT ON WHICH INPUT P IS LOCATED.                       FCH13410
C     KOUT    - UNIT ON WHICH CHANGED P IS TO BE WRITTEN.               FCH13420
C     KDISK   - DIRECT ACCESS SCRATCH DISK.                             FCH13430
C     KTYPE   - D,S,P ARRAY RECORD TYPE.                                FCH13440
C     KCHGSW  - 0 IF NO CHANGES HAVE BEEN MADE IN THE ROW RECORD IN CORE.FCH13450
C               NONZERO - NUMBER OF CHANGES MADE IN THE ROW RECORD.     FCH13460
C     KFRSW   - FREE ELEMENT SWITCH.                                    FCH13470
C               0.. FREE ELEMENT PRESENT.                               FCH13480
C               1.. FREE ELEMENT NOT PRESENT.                           FCH13490
C     KPASS   - 1.. NON-FREE ELEMENT PASS, SPECIFIC CHANGE.             FCH13500
C               2.. FREE ELEMENT PASS, SPECIFIC CHANGE.                 FCH13510
C               3.. NON-FREE ELEMENT PASS, FAMILY CHANGE.               FCH13520
C               3.. ALSO USED FOR ROW SEARCH, FAMILY CHANGE.            FCH13530
C               4.. FREE ELEMENT PASS, FAMILY CHANGE.                   FCH13540
C               5.. CHANGE PASS, FAMILY CHANGE DECODE PROCEDURE.        FCH13550
C     KPROC   - NON-FREE COLUMN PROCEDURE SWITCH.                       FCH13560
C               1.. CODE EACH ELEMENT IN CHANGE RANGE AND SEARCH THE ROW FCH13570
C                   FOR THESE ELEMENTS.                                 FCH13580
C               2.. DECODE EACH COLUMN PRESENT. SEE IF ELEMENT IS IN    FCH13590
C                   RANGE OF COLUMNS TO BE CHANGED.                     FCH13600
```

```
C     KURSW  - TRANSITION MODIFY SWITCH FOR THIS RUN.                    FCH13610
C     KURFAC - TRANSITION MODIFY FACTOR FOR THIS RUN.                    FCH13620
C                                                                        FCH13630
C     ' TYPE  - CONTROL CARD TYPE.                                       FCH13640
C               1.. CHANGE A P MATRIX.                                   FCH13650
C               2.. THE JOB IS FINISHED.                                 FCH13660
C               3.. SPECIFIC CHANGE.                                     FCH13670
C               4.. FAMILY CHANGE.                                       FCH13680
C               5.. END OF CHANGES FOR CURRENT P.                        FCH13690
C     MCR    - NUMBER OF COLUMN VARIABLE CURRENTLY BEING INCREMENTED.    FCH13700
C     MODSW  - ORIGINAL TRANSITION MODIFY SWITCH.                        FCH13710
C     MODFAC - ORIGINAL TRANSITION MODIFY FACTOR.                        FCH13720
C     MODCHG - SWITCH INDICATING (1) USE ORIGINAL MODIFY VALUES,         FCH13730
C              (2) USE VALUES IN FCHANG CONTROL CARD.                    FCH13740
C     MULT   - ARRAY FOR PRODUCTS USED IN GENERATING THE STATE NUMBERS.  FCH13750
C                                                                        FCH13760
C     NAMEP  - NAME OF INPUT P.                                          FCH13770
C     NUNAME - NAME OF OUTPUT P.                                         FCH13780
C     NULABL - LABEL INFORMATION FOR SECOND 120 CHARACTERS OF OUTPUT P   FCH13790
C              MATRIX.                                                   FCH13800
C     NFILES - NUMBER OF FILES ON OUTPUT UNIT.                           FCH13810
C     NCR    - NUMBER OF ROW VARIABLE CURRENTLY BEING INCREMENTED.       FCH13820
C     NCHG   - NUMBER OF CHANGES MADE IN THE MATRIX.                     FCH13830
C     NSERCH - NUMBER OF COLUMN ELEMENTS SEARCHED FOR IN CODE PROCEDURE  FCH13840
C              FAMILY CHANGE,                                            FCH13850
C     NFOUND - NUMBER OF COLUMN ELEMENTS FOUND IN FAMILY CHANGE SEARCH.  FCH13860
C     NDCODE - NUMBER OF COLUMN ELEMENTS DECODED IN FAMILY CHANGE DECODEFCH13870
C              PROCEDURE SEARCH.                                         FCH13880
C     NINRNG - NUMBER OF DECODED COLUMN ELEMENTS THAT WERE IN FAMILY     FCH13890
C              CHANGE RANGE.                                             FCH13900
C     NN     - NUMBER OF ELEMENTS IN LIST OF NEW ROWS.                   FCH13910
C     NV     - NUMBER OF VARIABLES IN STATE NUMBER DEFINITION.           FCH13920
C     NVM1   - NUMBER OF VARIABLES MINUS ONE.                            FCH13930
C     PCCHG  - PER CENT CHANGE TO BE MADE IN NON-FREE ELEMENT. MAY BE    FCH13940
C              POSITIVE OR NEGATIVE.                                     FCH13950
      END                                                                FCH13960
```

```
      SUBROUTINE FILE(LEMENT,LARRAY,LENGTH,LASTN)                       FILE 010
C                                                                       FILE 020
C                       FILE AN ELEMENT INTO AN ARRAY. THE ELEMENT      FILE 030
C                       PASSED IS GREATER THAN THE FIRST ELEMENT IN THE FILE 040
C                       INPUT ARRAY. THE ELEMENTS IN THE INPUT ARRAY AREFILE 050
C                       ASSUMED TO BE IN ASCENDING SEQUENCE.            FILE 060
C                                                                       FILE 070
      DIMENSION LARRAY(1)                                               FILE 080
C                       IS THERE JUST ONE ELEMENT IN THE INPUT ARRAY?   FILE 090
C                       YES.                                            FILE 100
C                       GO TO ADD ELEMENT AT END OF ARRAY.              FILE 110
      IF(LENGTH.EQ.1) GO TO 25                                          FILE 120
C                       NO.                                             FILE 130
C                       THERE IS MORE THAN ONE ELEMENT IN THE INPUT     FILE 140
C                       ARRAY.                                          FILE 150
C                       COMPARE THE ELEMENT TO BE FILED WITH THE        FILE 160
C                       ELEMENTS CURRENTLY IN THE ARRAY.                FILE 170
C                       START WITH THE SECOND ELEMENT IN THE ARRAY      FILE 180
C                       SINCE, BY DEFINITION OF THIS FILE OPERATION,    FILE 190
C                       'LEMENT' IS GREATER THAN THE FIRST ENTRY IN     FILE 200
C                       'LARRAY'.                                       FILE 210
      DO 20 L=2,LENGTH                                                  FILE 220
C                       IF THE ELEMENT IS ALREADY IN THE ARRAY, LEAVE   FILE 230
C                       ALL ARGUMENTS AS IS AND RETURN.                 FILE 240
      IF(LEMENT.EQ.LARRAY(L)) RETURN                                    FILE 250
      IF(LEMENT.GT.LARRAY(L)) GO TO 20                                  FILE 260
C                       ADD ELEMENT AT AN INTERMEDIATE POSITION IN THE  FILE 270
C                       ARRAY.                                          FILE 280
C                       PUSH DOWN ELEMENTS GREATER THAN THE ELEMENT     FILE 290
C                       BEING ADDED.                                    FILE 300
      CALL TMT2(LARRAY(L),LARRAY(L+1),LENGTH-L+1)                       FILE 310
C                       STORE ELEMENT IN ARRAY.                         FILE 320
      LARRAY(L)= LEMENT                                                 FILE 330
C                       ADD ONE TO COUNT OF ENTRIES IN THE TOTAL ARRAY. FILE 340
      LASTN=LASTN+1                                                     FILE 350
C                       RETURN.                                         FILE 360
      RETURN                                                            FILE 370
C                       CONTINUE.                                       FILE 380
C                       'LEMENT' IS GREATER THAN L'TH ENTRY IN 'LARRAY'.FILE 390
   20 CONTINUE                                                          FILE 400
C                       25                                              FILE 410
C                       ADD ELEMENT AT END OF ARRAY.                    FILE 420
C                       ADD ONE TO COUNT OF ENTRIES IN THE TOTAL ARRAY. FILE 430
   25 LASTN=LASTN+1                                                     FILE 440
C                       STORE ELEMENT IN ARRAY.                         FILE 450
      LARRAY(LENGTH+1)=LEMENT                                           FILE 460
C                       RETURN.                                         FILE 470
      RETURN                                                            FILE 480
C                                                                       FILE 490
C                       REFERENCE LIST.                                 FILE 500
C                       SUBROUTINE ARGUMENTS.                           FILE 510
C                                                                       FILE 520
C     LEMENT - ELEMENT TO BE FILED.                                     FILE 530
C     LARRAY - ARRAY INTO WHICH ELEMENT IS TO BE FILED.                 FILE 540
C     LENGTH - NUMBER OF ENTRIES IN LARRAY.                             FILE 550
C     LASTN  - THE NUMBER OF ENTRIES IN THE CALLING PROGRAM IN THE ARRAYFILE 560
```

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C               SHOWN IN THE 'LARRAY' ARGUMENT. IF THE CALL STATEMENT    FILE 570
C               SPECIFIES ARRAY NAME(1), THE INPUT ARGUMENTS 'LENGTH' ANDFILE 580
C               'LASTN' WILL BE EQUAL. IF THE CALL STATEMENT SPECIFIES   FILE 590
C               ARRAY NAME(N), 'LASTN' WILL BE GREATER THAN 'LENGTH'.    FILE 600
C               LASTN = LENGTH +N -1 ON INPUT. THE OUTPUT VALUE OF       FILE 610
C               'LASTN' WILL BE INCREASED BY ONE IF AN ELEMENT IS ADDED  FILE 620
C               TO 'LARRAY'.                                             FILE 630
      END                                                                FILE 640
```

```
      SUBROUTINE FREQ1(KS,KSNEW,KDISTF,KDISTN,NDIM)                     FRQ10010
C                                                                       FRQ10020
C                       FREQ1                                           FRQ10030
C                       THIS ROUTINE WILL COUNT THE NUMBER OF LIKE      FRQ10040
C                       PATTERNS ON A SORTED STATE NUMBER TAPE.         FRQ10050
C                       THERE MAY BE ONLY ONE MODEL ON ANY INPUT TAPE.  FRQ10060
C                       ALL STATE NUMBERS FOR A MODEL ARE ASSUMED TO BE FRQ10070
C                       ON ONE TAPE.                                    FRQ10080
C                       THE OUTPUT WILL BE A STATE PATTERN DISTRIBUTION FRQ10090
C                       TAPE PLUS A PRINT OF THE FREQUENCY DISTRIBUTION.FRQ10100
C                                                                       FRQ10110
      DIMENSION KS(1),KSNEW(1),KDISTF(1),KDISTN(1)                      FRQ10120
C                                                                       FRQ10130
C                       READ ID OF OUTPUT UNIT AND REWIND.              FRQ10140
      READ 10,KOUT                                                      FRQ10150
   10 FORMAT(4I12)                                                      FRQ10160
      REWIND KOUT                                                       FRQ10170
C                       READ ID OF INPUT UNIT, NUMBER OF TIMES PER      FRQ10180
C                       PATTERN, NUMBER CASES, MODEL NUMBER.            FRQ10190
   20 READ 10,KINP,NTIMES,KCASES,MODNUM                                 FRQ10200
C                       HAVE ALL INPUT FILES BEEN PROCESSED?            FRQ10210
C                       YES. GO TO REWIND OUTPUT UNIT.                  FRQ10220
      IF(KINP.EQ.0) GO TO 250                                           FRQ10230
C                       NO                                              FRQ10240
C                       REWIND INPUT UNIT.                              FRQ10250
      REWIND KINP                                                       FRQ10260
C                       READ FIRST STATE NUMBER RECORD FOR THIS MODEL.  FRQ10270
      READ(KINP)(KS(I),I=1,NTIMES)                                      FRQ10280
C                       INITIALIZATION FOR THIS MODEL:                  FRQ10290
C                       NUMBER OF RECORDS READ.                         FRQ10300
      NCASES=1                                                          FRQ10310
C                       NUMBER ENTRIES IN FREQ. DISTR.                  FRQ10320
      KD=0                                                              FRQ10330
C                       FREQ FOR CURRENT PATTERN.                       FRQ10340
      KOUNT=1                                                           FRQ10350
C                       NUMBER OF UNIQUE PATTERNS.                      FRQ10360
      KPAT=0                                                            FRQ10370
C                                                                     ***FRQ10380
C                                                                      *FRQ10390
C                       READ AND COMPARE PATTERNS.                      FRQ10400
C                       READ A DATA RECORD INTO KSNEW.                  FRQ10410
   52 READ(KINP,END=169)(KSNEW(I),I=1,NTIMES)                           FRQ10420
C                       NO EOF.                                         FRQ10430
C                       ADD 1 TO NUMBER OF CASES READ.                  FRQ10440
      NCASES=NCASES+1                                                   FRQ10450
C                       IS THIS PATTERN SAME AS PREVIOUS PATTERN...     FRQ10460
C                       COMPARE KS AND KSNEW.                           FRQ10470
      DO 60 I=1,NTIMES                                                  FRQ10480
      IF(KS(I).EQ.KSNEW(I)) GO TO 60                                    FRQ10490
      IF(KS(I).GT.KSNEW(I)) GO TO 300                                   FRQ10500
      GO TO 70                                                          FRQ10510
   60 CONTINUE                                                          FRQ10520
C                       KS EQUAL KSNEW.                                 FRQ10530
C                       ADD 1 TO FREQ FOR CURRENT PATTERN.              FRQ10540
      KOUNT=KOUNT+1                                                     FRQ10550
C                       GO TO READ NEXT RECORD.                         FRQ10560
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      GO TO 52                                                          FRQ10570
C                           70                                          FRQ10580
C                           KS LESS THAN KSNEW                          FRQ10590
C                           SET KSW TO INDICATE THERE WAS A PATTERN CHANGE. FRQ10600
   70 KSW=1                                                             FRQ10610
C                           GO TO UPDATE FREQ AND WRITE OUTPUT.         FRQ10620
C                           RETURN TO 140.                              FRQ10630
      GO TO 170                                                         FRQ10640
C                           140                                         FRQ10650
C                           RESET COMPARE FIELD AND COUNT.              FRQ10660
  140 DO 142 I=1,NTIMES                                                 FRQ10670
  142 KS(I)=KSNEW(I)                                                    FRQ10680
      KOUNT=1                                                           FRQ10690
C                           GO TO READ NEXT RECORD.                     FRQ10700
      GO TO 52                                                          FRQ10710
C                                                                      *FRQ10720
C                                                                   ***FRQ10730
C                                                                      FRQ10740
C                           169                                         FRQ10750
C                           EOF BRANCH                                  FRQ10760
C                           KSW SET TO INDICATE EOF ON INPUT UNIT.      FRQ10770
  169 KSW=2                                                             FRQ10780
C                           REWIND KINP.                                FRQ10790
      REWIND KINP                                                       FRQ10800
C                                                                   ***FRQ10810
C                                                                     *FRQ10820
C                           170                                         FRQ10830
C                           UPDATE FREQ DISTRIBUTION.                   FRQ10840
C                           FILE KOUNT INTO FREQ DISTRIBUTION.          FRQ10850
C                           ARE THERE ANY ENTRIES IN KDISTF AND KDISTN? FRQ10860
  170 IF(KD.GT.0) GO TO 80                                              FRQ10870
C                           NO                                          FRQ10880
C                           STORE CURRENT FREQUENCY IN THE FIRST LOCATION. FRQ10890
      KDISTF(1)=KOUNT                                                   FRQ10900
      KDISTN(1)=1                                                       FRQ10910
      KD=1                                                              FRQ10920
      GO TO 130                                                         FRQ10930
C                           80                                          FRQ10940
C                           YES - THERE ARE ENTRIES IN THE FREQ DISTRIBUTIONFRQ10950
C                           ARRAY.                                      FRQ10960
C                           IS CURRENT KOUNT VALUE IN KDISTF?           FRQ10970
   80 DO  90 II=1,KD                                                    FRQ10980
      IF(KDISTF(II).LT.KOUNT) GO TO 90                                  FRQ10990
      IF(KDISTF(II).GT.KOUNT) GO TO 110                                 FRQ11000
C                           YES                                         FRQ11010
C                           CURRENT KOUNT VALUE IS IN KDISTF. UPDATE    FRQ11020
C                           FREQUENCY COUNT AND GO TO WRITE OUTPUT RECORD. FRQ11030
      KDISTN(II)=KDISTN(II)+1                                           FRQ11040
      GO TO 130                                                         FRQ11050
   90 CONTINUE                                                          FRQ11060
C                           NO                                          FRQ11070
C                           CURRENT FREQUENCY GREATER THAN ANY IN LIST. ADD FRQ11080
C                           AT END.                                     FRQ11090
      KD=KD+1                                                           FRQ11100
      KDISTF(KD)=KOUNT                                                  FRQ11110
      KDISTN(KD)=1                                                      FRQ11120
C                           HAVE NDIM ENTRIES BEEN PLACED IN DISTR ARRAY? FRQ11130
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C                       THE DIMENSION OF THE DISTR ARRAY IS NDIM.        FRQ11140
      IF(KD.GE.NDIM) GO TO 175                                           FRQ11150
C                       NO                                               FRQ11160
      GO TO 130                                                          FRQ11170
C                       110                                              FRQ11180
C                       KOUNT GREATER THAN KDISTF(II).                   FRQ11190
C                       FILE FREQ IN HERE. PUSH DOWN KDISTF AND KDISTN   FRQ11200
C                       USING TMT2.                                      FRQ11210
  110 CALL TMT2(KDISTF(II),KDISTF(II+1),KD-II+1)                         FRQ11220
      CALL TMT2(KDISTN(II),KDISTN(II+1),KD-II+1)                         FRQ11230
      KDISTF(II)=KOUNT                                                   FRQ11240
      KDISTN(II)=1                                                       FRQ11250
      KD=KD+1                                                            FRQ11260
C                       HAVE NDIM ENTRIES BEEN PLACED IN DISTR ARRAY?    FRQ11270
C                       THE DIMENSION OF THE DISTR ARRAY IS NDIM.        FRQ11280
      IF(KD.GE.NDIM) GO TO 175                                           FRQ11290
C                       NO                                               FRQ11300
      GO TO 130                                                          FRQ11310
C                                                                        FRQ11320
C                       NDIM DISTR ARRAY ENTRIES HAVE BEEN PRINTED.      FRQ11330
C                       RESET NUMBER OF ENTRIES IN FREQ ARRAY.           FRQ11340
  128 KD=0                                                               FRQ11350
C                       RESET KSW TO SHOW NORMAL PATH                    FRQ11360
      KSW=1                                                              FRQ11370
C                       130                                              FRQ11380
C                       WRITE OUTPUT RECORD.                             FRQ11390
C                       WRITE THE MODEL NUMBER, PATTERN AND FREQUENCY    FRQ11400
C                       FOR THAT PATTERN.                                FRQ11410
  130 WRITE(KOUT)MODNUM,(KS(I),I=1,NTIMES),KOUNT                         FRQ11420
C                       UPDATE OUTPUT RECORD COUNT.                      FRQ11430
      KPAT=KPAT+1                                                        FRQ11440
C                       BRANCH ON KSW.                                   FRQ11450
      GO TO (140,180),KSW                                                FRQ11460
C                                                                       *FRQ11470
C                                                                      ***FRQ11480
C                       SET KSW TO INDICATE THAT BRANCH TO PRINT SEGMENTFRQ11490
C                       OF PROGRAM WAS DUE TO NDIM ENTRIES IN DISTRIBU- FRQ11500
C                       TION ARRAY.                                      FRQ11510
  175 KSW=3                                                              FRQ11520
C                       PRINT FREQUENCY DISTRIBUTION.                    FRQ11530
C                       PRINT NUMBER CASES READ AND EXPECTED, NUMBER     FRQ11540
C                       UNIQUE PATTERNS AND NUMBER UNIQUE FREQUENCIES.   FRQ11550
  180 PRINT 190,MODNUM,(KDISTF(I),KDISTN(I),I=1,KD)                      FRQ11560
      PRINT 195,NCASES,KCASES                                            FRQ11570
      PRINT 200,KPAT,KD                                                  FRQ11580
C                       BRANCH ON KSW.                                   FRQ11590
C                       GO TO NEXT CARD IF KSW =1 OR 2.                  FRQ11600
C                       (WILL NEVER EQUAL 1 ON THIS BRANCH.)             FRQ11610
      GO TO (20,20,128),KSW                                              FRQ11620
C                                                                        FRQ11630
C                       250                                              FRQ11640
C                       YES                                              FRQ11650
C                       END OF FREQ1 RUN.                                FRQ11660
C                       REWIND OUTPUT UNIT.                              FRQ11670
  250 REWIND KOUT                                                        FRQ11680
C                       RETURN                                           FRQ11690
      RETURN                                                             FRQ11700
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C                                                                       FRQ11710
C                         300                                           FRQ11720
C                         KS GREATER THAN KSNEW.                        FRQ11730
C                         ERROR IN INPUT DATA.                          FRQ11740
C                         PRINT SEQUENCE ERROR MESSAGE.                 FRQ11750
  300 PRINT 310,(KS(I),I=1,NTIMES)                                      FRQ11760
      PRINT 320,(KSNEW(I),I=1,NTIMES)                                   FRQ11770
      PRINT 330,MODNUM,NCASES                                           FRQ11780
C                         EXIT.                                         FRQ11790
      STOP                                                              FRQ11800
C                                                                       FRQ11810
C                                                                       FRQ11820
  190 FORMAT(34H1FREQUENCY DISTRIBUTION FOR MODEL ,I12//1X, 5(6X,4HFREQ,FRQ11830
     19X,1HN)/(1X,10I10))                                               FRQ11840
  195 FORMAT(/54H CURRENT NUMBER OF INPUT RECORDS FOR THIS MODEL      = ,FRQ11850
     1I12/54H EXPECTED NUMBER OF CASES FOR THIS MODEL (IF KNOWN) = ,I12)FRQ11860
  200 FORMAT(54H CURRENT NUMBER OF OUTPUT RECORDS FOR THIS MODEL     = , FRQ11870
     1I12/54H NUMBER OF ENTRIES IN FREQ DIST TABLE JUST PRINTED  = ,I12)FRQ11880
  310 FORMAT(35H INPUT TAPE NOT IN ASCENDING ORDER./                    FRQ11890
     1       10H KS      = ,10I12/(10X,10I12))                          FRQ11900
  320 FORMAT(10H KSNEW  = ,10I12/(10X,10I12))                           FRQ11910
  330 FORMAT(10H MODNUM = ,I12/10H CASE NO= ,I12)                       FRQ11920
C                                                                       FRQ11930
C                         REFERENCE LIST.                               FRQ11940
C                                                                       FRQ11950
C                         SUBROUTINE ARGUMENTS.                         FRQ11960
C     KS AND                                                            FRQ11970
C     KSNEW  - ARRAYS FOR STATE NUMBER PATTERNS.                        FRQ11980
C     KDISTF - ARRAY OF UNIQUE FREQUENCIES.                             FRQ11990
C     KDISTN - ARRAY OF NUMBER OF PATTERNS HAVING THAT FREQUENCY.       FRQ12000
C     NDIM   - DIMENSION OF KDISTF AND KDISTN.                          FRQ12002
C                                                                       FRQ12010
C                         OTHER VARIABLES                               FRQ12020
C                                                                       FRQ12030
C     KD     - NUMBER OF ENTRIES CURRENTLY IN KDISTF AND KDISTN.        FRQ12040
C     KPAT   - NUMBER OF UNIQUE PATTERNS.                               FRQ12050
C     KOUNT  - FREQ FOR CURRENT PATTERN.                                FRQ12060
C     KSH    - 1. BRANCH TO WRITE PATTERN BECAUSE OF A PATTERN CHANGE.  FRQ12070
C              2. BRANCH TO WRITE PATTERN BECAUSE OF END OF DATA.       FRQ12080
C              3. BRANCH TO PRINT FREQ BECAUSE KDISTF HAS NDIM ENTRIES. FRQ12090
      END                                                               FRQ12100
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      SUBROUTINE FREQ2(KS,KSNEW,KDISTF,KDISTN,NDIM)                     FRQ20010
C                                                                       FRQ20020
C                       FREQ2                                           FRQ20030
C                       INPUT - A STATE PATTERN TAPE PRODUCED BY SORTINGFRQ20040
C                               THE OUTPUT FROM A COLLAPSE RUN. THERE   FRQ20050
C                               MAY BE MORE THAN ONE RECORD PER UNIQUE  FRQ20060
C                               PATTERN. ANY GIVEN MODEL IS ASSUMED TO  FRQ20070
C                               BE ON ONLY ONE TAPE.                    FRQ20080
C                               THERE MAY BE MORE THAN ONE MODEL ON THE FRQ20090
C                               INPUT TAPE.                             FRQ20100
C                       OUTPUT - A STATE PATTERN TAPE WITH ONLY ONE     FRQ20110
C                               RECORD PER UNIQUE PATTERN.              FRQ20120
C                       OUTPUT - PRINTED - FREQUENCY DISTRIBUTION.      FRQ20130
C                                                                       FRQ20140
      DIMENSION KS(1),KSNEW(1),KDISTF(1),KDISTN(1)                      FRQ20150
C                       READ ID OF OUTPUT UNIT AND REWIND.              FRQ20160
      READ 10,KOUT                                                      FRQ20170
   10 FORMAT(4I12)                                                      FRQ20180
      REWIND KOUT                                                       FRQ20190
C                       READ ID OF INPUT UNIT, NUMBER OF TIMES PER PAT- FRQ20200
C                       TERN AND NUMBER CASES.                          FRQ20210
   20 READ 10,KINP,NTIMES,KCASES                                        FRQ20220
C                       HAVE ALL INPUT FILES BEEN PROCESSED?            FRQ20230
      IF(KINP.EQ.0) GO TO 250                                           FRQ20240
C                       NO                                              FRQ20250
C                       REWIND INPUT UNIT.                              FRQ20260
      REWIND KINP                                                       FRQ20270
C                       READ FIRST DATA RECORD INTO MODL, KS, KIN.      FRQ20280
      READ(KINP)MODL,(KS(I),I=1,NTIMES),KIN                             FRQ20290
C                       40                                              FRQ20300
C                       INITIALIZATION FOR THIS MODEL:                  FRQ20310
C                         NUMBER OF RECORDS READ.                       FRQ20320
   40 NCASES=1                                                          FRQ20330
C                         NUMBER ENTRIES IN FREQ. DIST.                 FRQ20340
      KD=0                                                              FRQ20350
C                         FREQ. FOR CURRENT PATTERN.                    FRQ20360
      KOUNT=KIN                                                         FRQ20370
C                         NUMBER OF UNIQUE PATTERNS.                    FRQ20380
      KPAT=0                                                            FRQ20390
C                                                                     ***FRQ20400
C                                                                       *FRQ20410
C                       READ A DATA RECORD INTO MODNU, KSNEW, KIN.      FRQ20420
   52 READ(KINP,END=169)MODNU,(KSNEW(I),I=1,NTIMES),KIN                 FRQ20430
C                       NO EOF                                          FRQ20440
C                       WAS THERE A MODEL CHANGE?                       FRQ20450
      IF(MODL.NE.MODNU) GO TO 160                                       FRQ20460
C                       NO                                              FRQ20470
C                       ADD 1 TO NUMBER OF CASES READ.                  FRQ20480
      NCASES=NCASES+1                                                   FRQ20490
C                       COMPARE KS AND KSNEW.                           FRQ20500
      DO 60 I=1,NTIMES                                                  FRQ20510
      IF(KS(I).EQ.KSNEW(I)) GO TO 60                                    FRQ20520
      IF(KS(I).GT.KSNEW(I)) GO TO 300                                   FRQ20530
      GO TO 70                                                          FRQ20540
   60 CONTINUE                                                          FRQ20550
C                       KS EQUAL KSNEW                                  FRQ20560
```

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C                       ADD FREQ FOR PATTERN JUST READ TO CUMULATIVE    FRQ20570
C                       FREQ FOR THAT PATTERN.                          FRQ20580
      KOUNT=KOUNT+KIN                                                   FRQ20590
      GO TO 52                                                          FRQ20600
C                       70                                              FRQ20610
C                       KS LESS THAN KSNEW                              FRQ20620
C                       KSW SETTING INDICATES A PATTERN CHANGE CONDITIONFRQ20630
C                       HAS OCCURED.                                    FRQ20640
   70 KSW=1                                                             FRQ20650
C                       GO TO UPDATE FREQ AND WRITE OUTPUT.             FRQ20660
C                       RETURN TO 140.                                  FRQ20670
      GO TO 170                                                         FRQ20680
C                       140                                             FRQ20690
C                       RESET COMPARE FIELD AND COUNT.                  FRQ20700
  140 DO 142 I=1,NTIMES                                                 FRQ20710
  142 KS(I)=KSNEW(I)                                                    FRQ20720
      KOUNT=KIN                                                         FRQ20730
C                       GO TO READ NEXT PATTERN RECORD.                 FRQ20740
      GO TO 52                                                          FRQ20750
C                                                                      *FRQ20760
C                                                                     **FRQ20770
C                       160                                             FRQ20780
C                       YES                                             FRQ20790
C                       THERE WAS A MODEL CHANGE.                       FRQ20800
C                       KSW SETTING INDICATES A MODEL CHANGE OCCURED.   FRQ20810
  160 KSW=4                                                             FRQ20820
      GO TO 170                                                         FRQ20830
C                                                                       FRQ20840
C                       169                                             FRQ20850
C                       EOF BRANCH                                      FRQ20860
C                       KSW SETTING INDICATES EOF ON INPUT.             FRQ20870
  169 KSW=2                                                             FRQ20880
C                       REWIND KINP                                     FRQ20890
      REWIND KINP                                                       FRQ20900
C                                                                    ***FRQ20910
C                                                                     *FRQ20920
C                       170                                             FRQ20930
C                       FILE KOUNT INTO FREQ DISTRIBUTION.              FRQ20940
C                       ARE THERE ANY ENTRIES IN KDISTF AND KDISTN?     FRQ20950
  170 IF(KD.GT.0) GO TO 80                                              FRQ20960
C                       NO                                              FRQ20970
C                       FIRST ENTRY IN LIST.                            FRQ20980
C                       STORE CURRENT FREQUENCY IN THE FIRST LOCATION.  FRQ20990
      KDISTF(1)=KOUNT                                                   FRQ21000
      KDISTN(1)=1                                                       FRQ21010
      KD=1                                                              FRQ21020
      GO TO 130                                                         FRQ21030
C                       80                                              FRQ21040
C                       YES                                             FRQ21050
C                       THERE ARE ENTRIES IN DISTRIBUTION ARRAYS.       FRQ21060
C                       IS CURRENT KOUNT VALUE IN KDISTF?               FRQ21070
   80 DO  90 II=1,KD                                                    FRQ21080
      IF(KDISTF(II).LT.KOUNT) GO TO 90                                  FRQ21090
      IF(KDISTF(II).GT.KOUNT) GO TO 110                                 FRQ21100
C                       YES                                             FRQ21110
C                       ADD 1 TO FREQUENCY OF THE FREQUENCY.            FRQ21120
      KDISTN(II)=KDISTN(II)+1                                           FRQ21130
```

```
      GO TO 130                                                         FRQ21140
   90 CONTINUE                                                          FRQ21150
C                        NO                                             FRQ21160
C                        CURRENT FREQUENCY IS GREATER THAN ANY IN LIST. FRQ21170
C                        ADD AT END.                                    FRQ21180
      KD=KD+1                                                           FRQ21190
      KDISTF(KD)=KOUNT                                                  FRQ21200
      KDISTN(KD)=1                                                      FRQ21210
C                        IS FREQUENCY ARRAY FULL?                       FRQ21220
      IF(KD.GE.NDIM) GO TO 175                                          FRQ21230
C                        NO                                             FRQ21240
      GO TO 130                                                         FRQ21250
C                        110                                            FRQ21260
C                        ADD FREQ IN MIDDLE OF LIST.                    FRQ21270
  110 CALL TMT2(KDISTF(II),KDISTF(II+1),KD-II+1)                        FRQ21280
      CALL TMT2(KDISTN(II),KDISTN(II+1),KD-II+1)                        FRQ21290
      KDISTF(II)=KOUNT                                                  FRQ21300
      KDISTN(II)=1                                                      FRQ21310
      KD=KD+1                                                           FRQ21320
C                        IS FREQUENCY ARRAY FULL?                       FRQ21330
      IF(KD.GE.NDIM) GO TO 175                                          FRQ21340
C                        NO                                             FRQ21350
      GO TO 130                                                         FRQ21360
C                        RESET NUMBER ENTRIES IN DISTRIBUTION ARRAY AFTERFRQ21370
C                        PRINTING NDIM ELEMENT SEGMENT.                 FRQ21380
  128 KD=0                                                              FRQ21390
      KSW=1                                                             FRQ21400
C                        130                                            FRQ21410
C                        WRITE OUTPUT RECORD.                           FRQ21420
C                        WRITE THE MODEL NUMBER, PATTERN AND FREQUENCY  FRQ21430
C                        FOR THAT PATTERN.                              FRQ21440
  130 WRITE(KOUT)MODL,(KS(I),I=1,NTIMES),KOUNT                          FRQ21450
C                        UPDATE OUTPUT RECORD COUNT.                    FRQ21460
      KPAT=KPAT+1                                                       FRQ21470
C                        BRANCH ON KSW                                  FRQ21480
      IF(KSW.EQ.1) GO TO 140                                            FRQ21490
C                        KSW=2,4                                        FRQ21500
      GO TO 180                                                         FRQ21510
C                                                                      *FRQ21520
C                                                                    ***FRQ21530
C                        KDISTF IS FULL. PRINT FIRST NDIM ENTRIES.      FRQ21540
  175 KSW=3                                                             FRQ21550
C                        180                                            FRQ21560
C                        PRINT FREQUENCY DISTRIBUTION.                  FRQ21570
  180 PRINT 190,MODL,(KDISTF(I),KDISTN(I),I=1,KD)                       FRQ21580
  190 FORMAT(34H1FREQUENCY DISTRIBUTION FOR MODEL ,I12//1X, 5(6X,4HFREQ,FRQ21590
     19X,1HN)/(1X,10I10))                                               FRQ21600
C                        PRINT NUMBER CASES READ AND EXPECTED, NUMBER   FRQ21610
C                        UNIQUE PATTERNS AND NUMBER UNIQUE FREQUENCIES. FRQ21620
      PRINT 195,NCASES,KCASES                                           FRQ21630
  195 FORMAT(/54H CURRENT NUMBER OF INPUT RECORDS FOR THIS MODEL     = ,FRQ21640
     1I12/54H EXPECTED NUMBER OF CASES FOR THIS MODEL (IF KNOWN) = ,I12)FRQ21650
      PRINT 200,KPAT,KD                                                 FRQ21660
  200 FORMAT(54H CURRENT NUMBER OF OUTPUT RECORDS FOR THIS MODEL    = , FRQ21670
     1I12/54H NUMBER OF ENTRIES IN FREQ DIST TABLE JUST PRINTED  = ,I12)FRQ21680
C                        BRANCH ON KSW. (WILL NEVER EQUAL 1 HERE.)      FRQ21690
      GO TO (20,20,128,205),KSW                                         FRQ21700
```

```
C                         MODEL CHANGE ON THE CURRENT INPUT UNIT.          FRQ21710
C                         RESET COMPARE FIELD AND MODEL NUMBER FIELD FOR   FRQ21720
C                         NEW MODEL.                                       FRQ21730
  205 DO 210 I=1,NTIMES                                                    FRQ21740
  210 KS(I)=KSNEW(I)                                                       FRQ21750
      MODL=MODNU                                                           FRQ21760
      GO TO 40                                                             FRQ21770
C                                                                          FRQ21780
C                         250                                              FRQ21790
C                         YES                                              FRQ21800
C                         ALL INPUT FILES HAVE BEEN PROCESSED.             FRQ21810
C                         REWIND OUTPUT UNIT.                              FRQ21820
  250 REWIND KOUT                                                          FRQ21830
C                         RETURN                                           FRQ21840
      RETURN                                                               FRQ21850
C                         300                                              FRQ21860
C                         ERROR IN INPUT DATA.                             FRQ21870
C                         PRINT SEQUENCE ERROR MESSAGE                     FRQ21880
  300 PRINT 310,(KS(I),I=1,NTIMES)                                         FRQ21890
      PRINT 320,(KSNEW(I),I=1,NTIMES)                                      FRQ21900
      PRINT 330,MODL,NCASES                                                FRQ21910
C                         EXIT                                             FRQ21920
      STOP                                                                 FRQ21930
C                                                                          FRQ21940
  310 FORMAT(35H INPUT TAPE NOT IN ASCENDING ORDER./                       FRQ21950
     1       10H KS      = ,10I12/(10X,10I12))                             FRQ21960
  320 FORMAT(10H KSNEW   = ,10I12/(10X,10I12))                             FRQ21970
  330 FORMAT(10H MODL    = ,I12/10H CASE NO= ,I12)                         FRQ21980
C                                                                          FRQ21990
C                         REFERENCE LIST.                                  FRQ22000
C                                                                          FRQ22010
C                         SUBROUTINE ARGUMENTS.                            FRQ22020
C                                                                          FRQ22030
C     KS      - ARRAY FOR A STATE NUMBER PATTERN.                          FRQ22040
C     KSNEW   - ARRAY FOR A STATE NUMBER PATTERN.                          FRQ22050
C     KDISTF  - ARRAY OF UNIQUE FREQUENCIES.                               FRQ22060
C     KDISTN  - ARRAY OF NUMBER OF PATTERNS HAVING THAT FREQUENCY.         FRQ22070
C     NDIM    - DIMENSION OF KDISTF AND KDISTN.                            FRQ22072
C                                                                          FRQ22080
C                         OTHER VARIABLES.                                 FRQ22090
C                                                                          FRQ22100
C     KD      - NUMBER OF ENTRIES CURRENTLY IN KDISTF AND KDISTN.          FRQ22110
C     KPAT    - NUMBER OF UNIQUE PATTERNS.                                 FRQ22120
C     KOUNT   - FREQ FOR CURRENT PATTERN.                                  FRQ22130
C     KIN     - FREQ FOR RECORD JUST READ.                                 FRQ22140
C     KSW     - 1. BRANCH TO WRITE PATTERN BECAUSE OF A PATTERN CHANGE.    FRQ22150
C               2. BRANCH TO WRITE PATTERN BECAUSE OF END OF DATA.         FRQ22160
C               3. BRANCH TO PRINT FREQ BECAUSE KDISTF HAS NDIM ENTRIES.   FRQ22170
C               4. BRANCH TO WRITE PATTERN AND PRINT FREQ ON MODEL CHANGE  FRQ22180
C     KOUT    - OUTPUT UNIT NUMBER.                                        FRQ22190
C     KINP    - INPUT UNIT NUMBER.                                         FRQ22200
C     KCASES  - EXPECTED CASE N.                                           FRQ22210
C     MODL    - MODEL NUMBER BEING PROCESSED.                              FRQ22220
C     MODNU   - MODEL NUMBER JUST READ.                                    FRQ22230
C     NTIMES  - NUMBER OF TIMES FOR WHICH STATE NUMBERS WERE GENERATED.    FRQ22240
      END                                                                  FRQ22250
```

```
      SUBROUTINE GENDSP(ISN,ISVEC,JCOL,JVAL,P,LSTCOL,LSVEC)
C
C                       GENERATE D MATRIX, FROM-S VECTOR, TO-S VECTOR
C                       AND P MATRIX.
C
      IMPLICIT REAL*8(A-H,O-Z,$)
      DIMENSION ISN(1),ISVEC(1),JCOL(1),JVAL(1),P(1),LSTCOL(1)
     1          ,LSVEC(1)
C                       FROM-S ARRAYS: ISN,ISVEC.
C                       D OR P ROW ARRAYS: JCOL,JVAL,P.
C                       TO-S ARRAYS: LSTCOL,LSVEC.
      DIMENSION NDFILE(6),LABELD(30),NSFILE(6),LABELS(30),NPFILE(6),
     1          LABELP(30),NAMES2(6),LABLS2(30),LSTCNT(10)
C                       THE CALLING PROGRAM MAY EQUIVALENCE JVAL AND P.
C                       EQUIVALENCE(JVAL(1),P((DIM D2/2)+1)
      EQUIVALENCE (NDFILE(1),NSFILE(1)),(LABELD(1),LABELS(1)),
     1            (NPFILE(1),NAMES2(1)),(LABELP(1),LABLS2(1))
      DATA KBLANK/4H    /
C                       INITIALIZE RECORD-TYPE VARIABLES.
C                       D MATRIX BEGINNING LABEL, DATA RECORD, END LABEL
      KDBEG=1
      KDDAT=21
      KDEND=31
C                       S VECTOR BEGINNING LABEL, DATA RECORD, END LABEL
      KSBEG=2
      KSDAT=22
      KSEND=32
C                       P MATRIX BEGINNING LABEL, LIST RECORD, DATA
C                       RECORD, END LABEL.
      KPBEG=3
      KPLST=13
      KPDAT=23
      KPEND=33
C                       FLOMOD END OF FILE RECORD.
      KNEXT=40
C
    1 FORMAT(5I6)
    2 FORMAT(3I12)
    5 FORMAT(1H1)
   25 FORMAT(6A4/20A4/10A4)
   30 FORMAT(//1X,30A4)
C
C                       INITIALIZE
C                       READ: I/O UNITS ID, NUMBER SETS OF DATA TO BE
C                       PROCESSED, PRINT SWITCH.
      READ 1,ITAPE1,ITAPE2,ITAPE3,NTIMES,KPRINT
C                       REWIND INPUT UNIT AND OUTPUT UNIT.
      REWIND ITAPE1
      REWIND ITAPE3
C                       SET INPSW TO INDICATE NO EOF CONDITION ON DATA
C                       RECORD READ.
      INPSW=0
C                       INITIALIZE NUMBER OF FILES ON OUTPUT UNIT TO
C                       ZERO.
      NFILES=0
C                       SKIP TO NEW PAGE ON PRINT UNIT.
```

```
      PRINT 5                                                           GEND0570
C                         READ:                                         GEND0580
C                         NZERO - ZERO STATE N.                         GEND0590
C                         MODSW - TRANSITION MODIFY SWITCH.             GEND0600
C                         MODFAC - NUMBER CODES FOR LAST VARIABLE.      GEND0610
      READ 2,NZERO,MODSW,MODFAC                                         GEND0620
C                         READ FOR INITIAL DATA RECORD ONLY.            GEND0630
C                         MODEL NUMBER, FROM-STATE NUMBER, TO-STATE NUMBERGEND0640
C                         AND FREQUENCY FOR THIS STATE NUMBER PAIR ARE  GEND0650
C                         RETURNED.                                     GEND0660
      CALL READIN (ITAPE1,ID,IS1,IS2,KNT,INPSW)                         GEND0670
C                         WAS THERE AN END OF FILE ON THIS READ?        GEND0680
C                         YES. GO TO PRINT ERROR MESSAGE.               GEND0690
      IF(INPSW.NE.0) GO TO 400                                          GEND0700
C                                                                       GEND0710
C                         10                                            GEND0720
C                         NO                                            GEND0730
C                         INITIALIZATION FOR EACH MODEL.                GEND0740
C                         INITIALIZE LSTCOL BY INDICATING FIRST ELEMENT ISGEND0750
C                         COLUMN ZERO.                                  GEND0760
   10 LSTCOL(1)=0                                                       GEND0770
      LSVEC(1)=0                                                        GEND0780
C                         NUMBER OF ENTRIES IN LIST OF COLUMNS AND TO-S. GEND0790
      JCOUNT=1                                                          GEND0800
C                         NUMBER OF ELEMENTS IN THE MATRIX.             GEND0810
      NPELE=0                                                           GEND0820
C                         FILLER VARIABLE.                              GEND0830
      NFILL=1                                                           GEND0840
C                         S VECTOR SUM.                                 GEND0850
      ISUM=0                                                            GEND0860
C                         NUMBER OF WORDS IN EACH LABEL.                GEND0870
      NL=30                                                             GEND0880
C                         NUMBER OF ENTRIES IN LIST OF COUNTS OF ROW    GEND0890
C                         ELEMENTS - AN OPTIONAL PRINT ITEM.            GEND0900
      LST=1                                                             GEND0910
C                         READ D AND P NAMES AND LABELS.                GEND0920
      READ 25,NDFILE,LABELD,NPFILE,LABELP                               GEND0930
C                         PRINT D LABEL.                                GEND0940
      PRINT 30,LABELD                                                   GEND0950
C                         IF PRINT SWITCH SET, PRINT I COUNT HEADING.   GEND0960
      IF(KPRINT.NE.0) GO TO 34                                          GEND0970
      PRINT 32                                                          GEND0980
   32 FORMAT(44H LIST OF NUMBER OF NON-ZERO ENTRIES PER ROW.)           GEND0990
C                         REWIND TEMPORARY STORAGE UNIT.                GEND1000
   34 REWIND ITAPE2                                                     GEND1010
C                         WRITE D AND P LABELS ON TAPE.                 GEND1020
      WRITE(ITAPE3)KDBEG,NDFILE,NL,LABELD                               GEND1030
      WRITE(ITAPE2)KPBEG,NPFILE,NL,LABELP                               GEND1040
C                         READ FROM-S AND TO-S NAMES AND LABELS.        GEND1050
      READ 25,NSFILE,LABELS,NAMES2,LABLS2                               GEND1060
C                         READ P MATRIX INCREMENT FACTORS.              GEND1070
      READ 1,NUMMO,NUMYR                                                GEND1080
C                                                                       GEND1090
C                         SET NUMBER ENTRIES IN FROM-S EQUAL ZERO. THIS ISGEND1100
C                         ALSO THE NUMBER OF D MATRIX ROWS.             GEND1110
      ISCNT=0                                                           GEND1120
C                         FOR FIRST ROW OF DISTRIBUTION MATRIX, SET NUMBERGEND1130
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C                       OF ROW ENTRIES EQUAL ONE.                        GEND1140
      ICOUNT=1                                                           GEND1150
C                                                                        GEND1160
C                                                                      ***GEND1170
C                       GENERATE A ROW OF DISTRIBUTION MATRIX.           *GEND1180
C                       40                                               GEND1190
C                       STORE COL NUMBER AND INITIAL COL COUNT IN ROW.   GEND1200
   40 JCOL(ICOUNT)=IS2                                                   GEND1210
      JVAL(ICOUNT)=KNT                                                   GEND1220
C                       42                                               GEND1230
C                       READ FOR ALL EXCEPT FIRST DATA RECORD.           GEND1240
C                       MODEL NUMBER, FROM-STATE NUMBER, TO-STATE NUMBERGEND1250
C                       AND FREQUENCY FOR THIS STATE NUMBER PAIR ARE     GEND1260
C                       RETURNED.                                        GEND1270
   42 CALL READIN (ITAPE1,ID2,IS12,IS22,KNT,INPSW)                       GEND1280
C                       WAS THERE AN END OF FILE ON THIS READ?           GEND1290
C                       GO TO SUM ROW ON EOF.                            GEND1300
      IF(INPSW.NE.0) GO TO 60                                            GEND1310
C                       NO EOF.                                          GEND1320
C                       WAS MODEL NUMBER JUST READ SAME AS MODEL NUMBER GEND1330
C                       OF PREVIOUS READ?                                GEND1340
C                       GO TO SUM ROW ON ID CHANGE.                      GEND1350
      IF(ID2.NE.ID) GO TO 60                                             GEND1360
C                                                                        GEND1370
C                       YES. THIS IS THE SAME MODEL.                     GEND1380
C                       WAS ROW JUST READ SAME AS ROW OF PREVIOUS READ? GEND1390
C                       NO. GO TO SUM ROW.                               GEND1400
      IF (IS12.NE.IS1) GO TO 60                                          GEND1410
C                       YES. THIS IS THE SAME ROW AND MODEL.             GEND1420
C                       WAS COL JUST READ SAME AS COL OF PREVIOUS READ? GEND1430
C                       NO. GO TO INCREMENT COUNT OF COLUMN ELEMENTS IN GEND1440
C                       THE ROW.                                         GEND1450
      IF(IS22.NE.IS2) GO TO 45                                           GEND1460
C                       YES. THIS IS THE SAME COLUMN AND ROW AND MODEL. GEND1470
C                       ADD FREQUENCY FOR THIS DATA RECORD TO CUMULATIVEGEND1480
C                       FREQUENCY IN JVAL.                               GEND1490
      JVAL(ICOUNT)=JVAL(ICOUNT)+KNT                                      GEND1500
C                       GO TO READ NEXT PAIR RECORD.                     GEND1510
      GO TO 42                                                           GEND1520
C                       45                                               GEND1530
C                       THE RECORD JUST READ I D THE SAME ROW AS THE     GEND1540
C                       PREVIOUS READ BUT NOT THE SAME COLUMN.           GEND1550
C                       ADD 1 TO NUMBER OF COLUMN ELEMENTS.              GEND1560
   45 ICOUNT=ICOUNT+1                                                    GEND1570
C                       MOVE COL NUMBER JUST READ TO PREVIOUS COL VARI- GEND1580
C                       ABLE.                                            GEND1590
      IS2=IS22                                                           GEND1600
C                       GO TO STORE COLUMN NUMBER AND COUNT.             GEND1610
      GO TO 40                                                           GEND1620
C                                                                        GEND1630
C                       60                                               GEND1640
C                       TRANSFER HERE AT END OF A ROW.                   GEND1650
C                       CONDITIONS WHICH WILL SIGNAL THE END OF A ROW    GEND1660
C                       ARE (1) AN EOF ON THE READ OF A PAIR RECORD,     GEND1670
C                       (2) A MODEL CHANGE IN THE PAIR RECORDS, AND      GEND1680
C                       (3) A CHANGE IN THE ROW NUMBER IN A PAIR RECORD.GEND1690
C                       SUM ELEMENTS OF ROW OF D MATRIX TO OBTAIN FROM-SGEND1700
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```
C                       ENTRY.                                          GEND1710
   60 KSUM=0                                                            GEND1720
      DO 62 I=1,ICOUNT                                                  GEND1730
   62 KSUM=KSUM+JVAL(I)                                                 GEND1740
C                       UPDATE ROW COUNT.                               GEND1750
      ISCNT=ISCNT+1                                                     GEND1760
C                       STORE ROW NUMBER AND SUM IN FROM-S VECTOR.      GEND1770
      ISN(ISCNT)=IS1                                                    GEND1780
      ISVEC(ISCNT)=KSUM                                                 GEND1790
C                                                                       GEND1800
C                       IS THIS ROW ZERO?                               GEND1810
C                       NO. GO TO UPDATE COLUMN LIST.                   GEND1820
      IF(IS1.NE.0) GO TO 68                                             GEND1830
C                       YES                                             GEND1840
C                       IS COL ZERO PRESENT?                            GEND1850
      IF(JCOL(1).EQ.0) GO TO 66                                         GEND1860
C                       NO                                              GEND1870
C                       PUSH DOWN ENTRIES IN COL AND ELEMENT LIST.      GEND1880
      DO 64 I=1,ICOUNT                                                  GEND1890
      IFR=ICOUNT-I+2                                                    GEND1900
      JCOL(IFR)=JCOL(IFR-1)                                             GEND1910
   64 JVAL(IFR)=JVAL(IFR-1)                                             GEND1920
C                       ADD ZERO, ZERO WITH VALUE OF ZERO.              GEND1930
      ICOUNT=ICOUNT+1                                                   GEND1940
      JCOL(1)=0                                                         GEND1950
      JVAL(1)=0                                                         GEND1960
C                       66                                              GEND1970
C                       MAKE NZERO ADJUSTMENT TO FROM-S STATE ZERO ELE- GEND1980
C                       MENT.                                           GEND1990
   66 IF(NZERO.EQ.0) GO TO 68                                           GEND2000
      IF(NZERO.LT.KSUM) GO TO 67                                        GEND2010
C                       IF NZERO IS GREATER THAN KSUM,                  GEND2020
C                       ADJUST (ZERO,ZERO) ELEMENT.                     GEND2030
      JVAL(1)=NZERO-KSUM+JVAL(1)                                        GEND2040
C                       ADJUST ROW-ZERO SUM.                            GEND2050
      KSUM=NZERO                                                        GEND2060
      ISVEC(ISCNT)=KSUM                                                 GEND2070
      GO TO 68                                                          GEND2080
C                       PRINT MESSAGE IF NZERO ADJUSTMENT IS BYPASSED.  GEND2090
   67 PRINT 410,NZERO,KSUM                                              GEND2100
  410 FORMAT(55H NZERO VALUE IN CONTROL CARD IS LESS THAN ZERO ROW SUM./GEND2110
     136H NZERO ADJUSTMENT HAS BEEN BYPASSED./                          GEND2120
     2 9H NZERO = ,I12,5X,16H ZERO ROW SUM = ,I12)                      GEND2130
C                                                                      *GEND2140
C                                                                    ***GEND2150
C                                                                       GEND2160
C                                                                    ***GEND2170
C                                                                      *GEND2180
C                       68                                              GEND2190
C                                                                       GEND2200
C                       FOR D ROW JUST COMPLETED, FILE COL NUMBERS IN   GEND2210
C                       LSTCOL AND ACCUMULATE FREQUENCIES IN TO-S.      GEND2220
C                                                                       GEND2230
C                       INITIAL J FROM VALUE FOR LSTCOL INDEX USE.      GEND2240
   68 JFR=1                                                             GEND2250
C                       DO FOR EACH ENTRY IN ROW.                       GEND2260
      DO 76 I=1,ICOUNT                                                  GEND2270
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C                       COMPUTE ICOL TO AVOID GENERATING SUBSCRIPTED    GEND2280
C                       VALUE MANY TIMES IN INNER DO.                   GEND2290
      ICOL=JCOL(I)                                                      GEND2300
C                       DO FOR EACH ENTRY IN LSTCOL.                    GEND2310
      DO 70 J=JFR,JCOUNT                                                GEND2320
C                       COMPARE COLUMN IN ROW WITH COLUMN IN LIST OF    GEND2330
C                       COLUMNS.                                        GEND2340
      IF(ICOL.GT.LSTCOL(J)) GO TO 70                                    GEND2350
      IF(ICOL.LT.LSTCOL(J)) GO TO 72                                    GEND2360
C                       ICOL.EQ.LSTCOL(J)                               GEND2370
C                       ACCUMULATE FREQ FOR THIS ELEMENT IN TO-S.       GEND2380
      LSVEC(J)=LSVEC(J)+JVAL(I)                                         GEND2390
C                       GO TO INCREMENT LSTCOL FROM-INDEX.              GEND2400
      GO TO 74                                                          GEND2410
C                       70                                              GEND2420
C                       J CONTINUE                                      GEND2430
   70 CONTINUE                                                          GEND2440
C                       END OF J LOOP.                                  GEND2450
C                       IF FALL THRU LOOP, 'ICOL' AND ALL ADDITIONAL    GEND2460
C                       ENTRIES IN THE ROW LIST OF COLUMNS DO NOT MATCH GEND2470
C                       LSTCOL ENTRIES. THEY WILL BE ADDED TO THE END OFGEND2480
C                       THE COLUMN LIST FOR THE MATRIX.                 GEND2490
      GO TO 80                                                          GEND2500
C                                                                       GEND2510
C                       72                                              GEND2520
C                       ICOL IS LT LSTCOL(J) SO FILE IN ICOL HERE.      GEND2530
C                       PUSH DOWN LSTCOL AND LSVEC ENTRIES.             GEND2540
   72 CALL TMT2(LSTCOL(J),LSTCOL(J+1),JCOUNT-J+1)                       GEND2550
      CALL TMT2(LSVEC (J),LSVEC (J+1),JCOUNT-J+1)                       GEND2560
C                       UPDATE J COUNT.                                 GEND2570
      JCOUNT=JCOUNT+1                                                   GEND2580
C                       FILE COL NUMBER AND COL VALUE IN LSTCOL AND     GEND2590
C                       LSVEC.                                          GEND2600
      LSTCOL(J)=ICOL                                                    GEND2610
      LSVEC(J)=JVAL(I)                                                  GEND2620
C                       74                                              GEND2630
C                       INCREMENT INITIAL COLUMN LIST SUBSCRIPT VALUE   GEND2640
C                       FOR NEXT COMPARE.                               GEND2650
   74 JFR=J+1                                                           GEND2660
C                       HAVE ALL J'S BEEN PROCESSED?                    GEND2670
C                       NO. GO TO INCREMENT SUBSCRIPT FOR COLUMN ENTRY  GEND2680
C                       IN A ROW.                                       GEND2690
      IF(JFR.LE.JCOUNT) GO TO 76                                        GEND2700
C                       YES                                             GEND2710
C                       HAVE ALL I'S BEEN PROCESSED?                    GEND2720
C                       YES. COLUMN LIST UPDATE IS COMPLETE.            GEND2730
      IF(I.EQ.ICOUNT) GO TO 83                                          GEND2740
C                       NO                                              GEND2750
      GO TO 78                                                          GEND2760
C                       76                                              GEND2770
C                       CONTINUE - DO I FOR EACH ROW.                   GEND2780
   76 CONTINUE                                                          GEND2790
      GO TO 83                                                          GEND2800
C                                                                       GEND2810
C                       78                                              GEND2820
C                       UPDATE I INDEX                                  GEND2830
   78 I=I+1                                                             GEND2840
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C                       80                                                GEND2850
C                       ADD REMAINING I THRU ICOUNT ENTRIES IN ROW TO     GEND2860
C                       LSVEC AND LSTCOL. UPDATE ELEMENT COUNT (J COUNT)GEND2870
   80 DO 82 K=I,ICOUNT                                                    GEND2880
      JCOUNT=JCOUNT+1                                                     GEND2890
      LSVEC(JCOUNT)=JVAL(K)                                               GEND2900
   82 LSTCOL(JCOUNT)=JCOL(K)                                              GEND2910
C                       END OF UPDATE LSTCOL SEGMENT                     *GEND2920
C                                                                       ***GEND2930
C                       83                                                GEND2940
C                       ADD COUNT OF D ELEMENTS IN ROW JUST COMPLETED TOGEND2950
C                       COUNT OF D ELEMENTS IN THE MATRIX.                GEND2960
   83 NPELE=NPELE+ICOUNT                                                  GEND2970
C                       WRITE D ROW NUMBER AND DATA.                      GEND2980
      WRITE(ITAPE3)KDDAT,IS1,ICOUNT,(JCOL(I),I=1,ICOUNT),                GEND2990
     1             (JVAL(I),I=1,ICOUNT)                                   GEND3000
C                                                                         GEND3010
C                       IS PRINT SWITCH ON?                               GEND3020
      IF(KPRINT.NE.0) GO TO 88                                            GEND3030
C                       YES                                               GEND3040
C                       SAVE ICOUNT. PRINT ICOUNT PRINT LINE IF ONE LINEGEND3050
C                       ARRAY IS FULL.                                    GEND3060
      LSTCNT(LST)=ICOUNT                                                  GEND3070
      LST=LST+1                                                           GEND3080
      IF(LST.LT.11) GO TO 88                                              GEND3090
      PRINT 86,LSTCNT                                                     GEND3100
   86 FORMAT(1X,10I12)                                                    GEND3110
      LST=1                                                               GEND3120
C                       88                                                GEND3130
C                       DIVIDE EACH D ELEMENT BY ROW SUM TO GET P ROW.    GEND3140
   88 S=KSUM                                                              GEND3150
      DO 90 I=1,ICOUNT                                                    GEND3160
      D=JVAL(I)                                                           GEND3170
   90 P(I)=D/S                                                            GEND3180
C                       WRITE P ROW ON ITAPE 2.                           GEND3190
      WRITE(ITAPE2)KPDAT,IS1,ICOUNT,(JCOL(I),I=1,ICOUNT),                GEND3200
     1             (P(I),I=1,ICOUNT)                                      GEND3210
C                                                                         GEND3220
C                       END-OF-ROW HOUSEKEEPING.                          GEND3230
C                       ACCUMULATE ROW SUM INTO S SUM.                    GEND3240
      ISUM=ISUM+KSUM                                                      GEND3250
C                       SET 'PREVIOUS'ROW AND COL EQUAL ROW AND COL OF    GEND3260
C                       LAST RECORD READ.                                 GEND3270
      IS1=IS12                                                            GEND3280
      IS2=IS22                                                            GEND3290
C                       SET NUMBER OF ENTRIES IN ROW TO ONE.              GEND3300
      ICOUNT=1                                                            GEND3310
C                       ARE THERE ADDITIONAL DATA RECORDS TO BE PRO-      GEND3320
C                       CESSED FOR THE CURRENT MODEL?                     GEND3330
C                       YES. GO TO STORE LATEST PAIR COLUMN AND FREQ IN GEND3340
C                       A NEW ROW.                                        GEND3350
      IF(ID2.EQ.ID.AND.INPSW.EQ.0) GO TO 40                               GEND3360
C                       NO                                                GEND3370
C                       THERE WAS A MODEL CHANGE OR READ EOF.             GEND3380
C                       SET CURRENT MODEL ID TO ID OF RECORD LAST READ. GEND3390
      ID=ID2                                                              GEND3400
C                       IF PRINT SWITCH IS ON AND THERE ARE ANY ICOUNT    GEND3410
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C                       ELEMENTS LEFT IN PRINT LINE, PRINT.                GEND3420
      IF(KPRINT.NE.0) GO TO 93                                             GEND3430
      IF(LST.EQ.1) GO TO 93                                                GEND3440
      LST=LST-1                                                            GEND3450
      PRINT 86,(LSTCNT(I),I=1,LST)                                         GEND3460
C                                                                          GEND3470
C                       93                                                 GEND3480
C                       WRITE FILE END LABELS FOR D AND P.                 GEND3490
   93 WRITE(ITAPE3)KDEND,NFILL,NFILL,ISCNT,NPELE                           GEND3500
      PELE=NPELE                                                           GEND3510
      WRITE(ITAPE2)KPEND,NFILL,NFILL,ISCNT,PELE                            GEND3520
C                       FOR FROM-S, WRITE BEGINNING LABEL, DATA RECORD,    GEND3530
C                       END LABEL.                                         GEND3540
      WRITE(ITAPE3)KSBEG,NSFILE,NL,LABELS                                  GEND3550
      WRITE(ITAPE3)KSDAT,NFILL,ISCNT,(ISN(I),I=1,ISCNT),                   GEND3560
     1             (ISVEC(I),I=1,ISCNT)                                    GEND3570
      WRITE(ITAPE3)KSEND,NFILL,NFILL,ISUM,NFILL                            GEND3580
C                                                                          GEND3590
C                       FOR TO-S, WRITE BEGINNING LABEL, DATA RECORD,      GEND3600
C                       END LABEL.                                         GEND3610
      WRITE(ITAPE3)KSBEG,NAMES2,NL,LABLS2                                  GEND3620
      WRITE(ITAPE3)KSDAT,NFILL,JCOUNT,(LSTCOL(I),I=1,JCOUNT),              GEND3630
     1             (LSVEC(I),I=1,JCOUNT)                                   GEND3640
      WRITE(ITAPE3)KSEND,NFILL,NFILL,ISUM,NFILL                            GEND3650
C                                                                          GEND3660
C                       PRINT NUMBER OF NON-ZERO ELEMENTS AND NON-ZERO     GEND3670
C                       ROWS AND COLUMNS IN D MATRIX.                      GEND3680
      PRINT 95,NPELE                                                       GEND3690
      PRINT 96,ISCNT,JCOUNT                                                GEND3700
   95 FORMAT(42H THE NUMBER OF ELEMENTS IN THE D MATRIX IS ,I12)           GEND3710
   96 FORMAT(42H THE NUMBER OF ROWS IN THE D MATRIX IS    ,I12/            GEND3720
     1       42H THE NUMBER OF COLUMNS IN THE D MATRIX IS ,I12)            GEND3730
C                                                                          GEND3740
C                       IS TRANSITION MODIFY TO BE EXECUTED?               GEND3750
C                       NO, GO TO COPY P MATRIX.                           GEND3760
      IF(MODSW.LT.0) GO TO 340                                             GEND3770
C                                                                       ***GEND3780
C                                                                        *GEND3790
C                       YES.                                               GEND3800
C                       TRANSITION MODIFY IS TO BE EXECUTED.               GEND3810
C                       TRANSITION MODIFY WILL ADD A ROW TO THE P MATRIXGEND3820
C                       FOR EACH COLUMN WHICH DOES NOT HAVE A CORRE-       GEND3830
C                       SPONDING ROW PRESENT.                              GEND3840
C                                                                          GEND3850
C                       IN THIS SEGMENT OF THE PROGRAM, COMPARE THE P      GEND3860
C                       MATRIX LIST OF ROWS AND LIST OF COLUMNS. MAKE      GEND3870
C                       ADDITIONS TO THESE LISTS AS REQUIRED BY THE        GEND3880
C                       MODIFY OPERATION FOR THE CURRENT MODIFY SWITCH     GEND3890
C                       SETTINGS.                                          GEND3900
C                                                                          GEND3910
C                       DETERMINE ROWS TO BE ADDED BY TRANSITION MODIFY.GEND3920
C                       UPDATE ISN.                                        GEND3930
C                       THIS IS CONCEPTUALLY A PAIR OF PARALLEL DO LOOPSGEND3940
C                       DO LOOPS ARE NOT USED BECAUSE THE INDEX VALUES     GEND3950
C                       ARE CHANGING WITHIN THE RANGE OF THE LOOP.         GEND3960
C                                                                          GEND3970
C                       INITIALIZE INDICES.                                GEND3980
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C                       JADD - NUMBER OF ELEMENTS ADDED TO THE ROW LIST.GEND3990
      JADD=0                                                            GEND4000
C                       I IS SUBSCRIPT FOR LIST OF ROWS - ISN.          GEND4010
      I=1                                                               GEND4020
C                       J IS SUBSCRIPT FOR LIST OF COLUMNS - LSTCOL.    GEND4030
      J=1                                                               GEND4040
C                       100                                             GEND4050
C                       COMPARE COLUMN LIST ELEMENT AND ROW LIST ELEMENTGEND4060
  100 IF(LSTCOL(J).EQ.ISN(I)) GO TO 105                                 GEND4070
      GO TO 120                                                         GEND4080
C                       105                                             GEND4090
C                       THE COLUMN NUMBER EQUALS THE ROW NUMBER.        GEND4100
C                       ARE THERE ANYMORE ENTRIES IN THE ROW LIST?      GEND4110
C                       YES. GO TO INCREMENT ROW SUBSCRIPT.             GEND4120
  105 IF(I.LT.ISCNT) GO TO 135                                          GEND4130
C                       NO                                              GEND4140
C                       ARE THERE ANYMORE ENTRIES IN LSTCOL?            GEND4150
C                       NO. DETERMINATION OF ROWS TO BE ADDED COMPLETE. GEND4160
      IF(J.EQ.JCOUNT) GO TO 175                                         GEND4170
C                       YES                                             GEND4180
C                       ADD REMAINING ELEMENTS IN COLUMN LIST TO ROW    GEND4190
C                       LIST.                                           GEND4200
C                       SUBSCRIPT OF FIRST COLUMN LIST ELEMENT TO BE    GEND4210
C                       ADDED IS J+1.                                   GEND4220
      K=J+1                                                             GEND4230
C                                                                     **GEND4240
C                                                                      *GEND4250
C                       110                                             GEND4260
C                       PROGRAM SEGMENT TO ADD COLUMN LIST ENTRIES TO   GEND4270
C                       ROW LIST.                                       GEND4280
C                       UPDATE COUNT OF ROW ELEMENTS ADDED.             GEND4290
  110 JADD=JADD+1                                                       GEND4300
C                       UPDATE ROW LIST SUBSCRIPT.                      GEND4310
      ISCNT=ISCNT+1                                                     GEND4320
C                       MOVE COLUMN LIST ELEMENT TO ROW LIST.           GEND4330
      ISN(ISCNT)=LSTCOL(K)                                              GEND4340
C                       ARE ALL ELEMENTS TO BE ADDED BY THE MODIFY      GEND4350
C                       OPERATION DIAGONAL ELEMENTS?                    GEND4360
C                       YES. GO TO INCREMENT COLUMN LIST SUBSCRIPT.     GEND4370
      IF(MODSW.EQ.0) GO TO 114                                          GEND4380
C                       NO                                              GEND4390
C                       WAS THE STATE NUMBER JUST ADDED TO THE ROW LIST GEND4400
C                       GENERATED FROM THE LAST CODE OF THE LAST        GEND4410
C                       VARIABLE?                                       GEND4420
C                       YES. GO TO INCREMENT COLUMN LIST SUBSCRIPT.     GEND4430
      IF(MOD(LSTCOL(K),MODFAC).EQ.0) GO TO 114                          GEND4440
C                       NO                                              GEND4450
C                       THEREFORE AN OFF DIAGONAL ELEMENT WILL BE ADDED.GEND4460
C                       GENERATE THE COLUMN NUMBER OF THIS ELEMENT.     GEND4470
      ICOL=LSTCOL(K)+MODSW                                              GEND4480
C                                                                       GEND4490
C                       THIS OFF DIAGONAL ELEMENT WILL ALWAYS BE GREATERGEND4500
C                       THAN THE COLUMN NUMBER JUST PLACED IN THE ROW   GEND4510
C                       LIST.                                           GEND4520
C                       ADD THIS ELEMENT TO THE COLUMN LIST IF NECESSARYGEND4530
      CALL FILE(ICOL,LSTCOL(K),JCOUNT-K+1,JCOUNT)                       GEND4540
C                       THE FILE SUBROUTINE WILL UPDATE JCOUNT IF AN    GEND4550
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C                       ADDITION IS MADE TO THE COLUMN LIST.                GEND4560
C                       114                                                 GEND4570
C                       ARE THERE ANY MORE LSTCOL (JCOUNT) ELEMENTS?        GEND4580
C                       NO. LIST COMPARE COMPLETE.                          GEND4590
  114 IF(K.EQ.JCOUNT) GO TO 175                                             GEND4600
C                       YES                                                 GEND4610
C                       INCREMENT SUBSCRIPT FOR LSTCOL ELEMENT TO BE        GEND4620
C                       ADDED.                                              GEND4630
      K=K+1                                                                 GEND4640
      GO TO 110                                                             GEND4650
C                                                                          *GEND4660
C                                                                         **GEND4670
C                       120                                                 GEND4680
C                       THE CURRENT COLUMN AND ROW NUMBERS ARE NOT EQUALGEND4690
C                       IF THERE IS A ROW PRESENT FOR WHICH THERE IS NO GEND4700
C                       CORRESPONDING COLUMN, GO TO INCREMENT ROW SUB-  GEND4710
C                       SCRIPT.                                             GEND4720
  120 IF(LSTCOL(J).GT.ISN(I)) GO TO 125                                     GEND4730
C                       121                                                 GEND4740
C                       THE CURRENT COLUMN NUMBER IS LESS THAN THE ROW      GEND4750
C                       NUMBER. ADD THIS ONE ELEMENT TO THE ROW LIST.       GEND4760
C                       UPDATE COUNT OF ROW ELEMENTS ADDED.                 GEND4770
  121 JADD=JADD+1                                                           GEND4780
C                       CALL TMT2 TO PUSH DOWN ROW LIST.                    GEND4790
      CALL TMT2(ISN(I),ISN(I+1),ISCNT-I+1)                                  GEND4800
C                       PLACE COLUMN ELEMENT IN ROW LIST.                   GEND4810
      ISN(I)=LSTCOL(J)                                                      GEND4820
C                       ADD 1 TO NUMBER OF ENTRIES IN ROW LIST.             GEND4830
      ISCNT=ISCNT+1                                                         GEND4840
C                       ARE ALL ELEMENTS TO BE ADDED BY THE MODIFY          GEND4850
C                       OPERATION DIAGONAL ELEMENTS?                        GEND4860
C                       YES. GO TO INCREMENT BOTH ROW AND COLUMN LIST       GEND4870
C                       SUBSCRIPTS.                                         GEND4880
      IF(MODSW.EQ.0) GO TO 135                                              GEND4890
C                       NO                                                  GEND4900
C                       WAS THIS STATE NUMBER GENERATED FROM THE LAST       GEND4910
C                       CODE OF THE LAST VARIABLE?                          GEND4920
C                       YES. GO TO INCREMENT BOTH ROW AND COLUMN LIST       GEND4930
C                       SUBSCRIPTS.                                         GEND4940
      IF(MOD(LSTCOL(J),MODFAC).EQ.0) GO TO 135                              GEND4950
C                       NO                                                  GEND4960
C                       THEREFORE AN OFF DIAGONAL ELEMENT WILL BE ADDED.GEND4970
C                       GENERATE THE COLUMN NUMBER OF THIS ELEMENT.         GEND4980
      ICOL=LSTCOL(J)+MODSW                                                  GEND4990
C                       ADD THIS ELEMENT TO THE COLUMN LIST IF NECESSARYGEND5000
      CALL FILE(ICOL,LSTCOL(J),JCOUNT-J+1,JCOUNT)                           GEND5010
C                       THE FILE SUBROUTINE WILL UPDATE JCOUNT IF AN        GEND5020
C                       ADDITION IS MADE TO THE COLUMN LIST.                GEND5030
C                       GO TO INCREMENT SUBSCRIPTS.                         GEND5040
      GO TO 135                                                             GEND5050
C                       125                                                 GEND5060
C                       CURRENT COLUMN ELEMENT IS GT CURRENT ROW ELEMENTGEND5070
C                       ARE THERE ANYMORE ENTRIES IN ISN LIST?              GEND5080
C                       NO. ADD REMAINING COLUMN ENTRIES TO ROW LIST.       GEND5090
  125 IF(I.EQ.ISCNT) GO TO 130                                              GEND5100
C                       YES                                                 GEND5110
C                       INCREMENT I.                                        GEND5120
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      I=I+1                                                             GEND5130
C                          GO TO NEXT COMPARE.                          GEND5140
      GO TO 100                                                         GEND5150
C                          130                                          GEND5160
C                          THERE ARE NO MORE ENTRIES IN THE ROW LIST.   GEND5170
C                          THERE ARE ENTRIES IN THE COLUMN LIST. ADD    GEND5180
C                          REMAINING COLUMN LIST ENTRIES TO THE ROW LIST. GEND5190
C                          SUBSCRIPT OF FIRST LSTCOL ELEMENT TO BE ADDED GEND5200
C                          IS J.                                        GEND5210
  130 K=J                                                               GEND5220
C                          GO TO ADD COLUMN ENTRIES TO ROW LIST.        GEND5230
      GO TO 110                                                         GEND5240
C                                                                       GEND5250
C                          135                                          GEND5260
C                          YES                                          GEND5270
C                          THERE ARE ADDITIONAL ENTRIES IN THE ROW LIST. GEND5280
C                          INCREMENT ROW LIST SUBSCRIPT.                GEND5290
  135 I=I+1                                                             GEND5300
C                          ARE THERE ANYMORE ENTRIES IN LSTCOL?         GEND5310
C                          NO. LIST COMPARE COMPLETE.                   GEND5320
  140 IF(J.EQ.JCOUNT) GO TO 175                                         GEND5330
C                          YES                                          GEND5340
C                          INCREMENT J.                                 GEND5350
      J=J+1                                                             GEND5360
C                          GO TO COMPARE COLUMN LIST ELEMENT AND ROW LIST GEND5370
C                          ELEMENT.                                     GEND5380
      GO TO 100                                                         GEND5390
C                                                                      *GEND5400
C                                                                   ***GEND5410
C                          175                                          GEND5420
C                          WERE ANY ADDITIONS MADE TO THE ROW LIST BY THE GEND5430
C                          MODIFY OPERATION?                            GEND5440
  175 IF(JADD.GT.0) GO TO 185                                           GEND5450
C                          NO                                           GEND5460
C                          PRINT MESSAGE THAT NO ROWS ARE BEING ADDED.  GEND5470
      PRINT 180                                                         GEND5480
  180 FORMAT(68H NO ROWS OR COLUMNS WERE ADDED TO THE P MATRIX BY TRANSIGEND5490
     1TION MODIFY.)                                                     GEND5500
C                          GO TO COPY P MATRIX.                         GEND5510
      GO TO 350                                                         GEND5520
C                          185                                          GEND5530
C                          YES                                          GEND5540
C                          ADDITIONS WERE MADE TO THE ROW LIST BY TRANSI- GEND5550
C                          TION MODIFY.                                 GEND5560
C                          UPDATE COUNT OF NUMBER OF P ELEMENTS.        GEND5570
  185 NPELE=NPELE+JADD                                                  GEND5580
C                          PRINT NUMBER ELEMENTS AND NUMBER ROWS IN P   GEND5590
C                          MATRIX.                                      GEND5600
      PRINT 194                                                         GEND5610
      PRINT 195,NPELE                                                   GEND5620
      PRINT 196,ISCNT,JCOUNT                                            GEND5630
  194 FORMAT(56H CHANGES WERE MADE IN THE P MATRIX BY TRANSITION MODIFY.GEND5640
     1)                                                                 GEND5650
  195 FORMAT(42H THE NUMBER OF ELEMENTS IN THE P MATRIX IS ,I12)        GEND5660
  196 FORMAT(42H THE NUMBER OF ROWS IN THE P MATRIX IS     ,I12/        GEND5670
     1       42H THE NUMBER OF COLUMNS IN THE P MATRIX IS  ,I12)        GEND5680
C                                                                   ***GEND5690
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C                                                                       *GEND5700
C                       MODIFY LOOP                                      GEND5710
C                       TRANS MODIFY MAKES CHANGES TO P MATRIX ONLY.     GEND5720
C                       D AND S ARE NOT CHANGED.                         GEND5730
C                       ISW=0 FOR READ ANOTHER P RECORD.                 GEND5740
C                       ISW =1 FOR BY PASS READ P RECORD.                GEND5750
C                       COPY P MATRIX. ADD NEW ROWS AS REQUIRED.         GEND5760
C                                                                        GEND5770
C                       REWIND ITAPE 2 COPY P BEGINNING RECORD FROM      GEND5780
C                       ITAPE 2 TO ITAPE 3.                              GEND5790
      REWIND ITAPE2                                                      GEND5800
      READ (ITAPE2)KTYPE,NPFILE,N,LABELP                                 GEND5810
      WRITE(ITAPE3)KTYPE,NPFILE,N,LABELP                                 GEND5820
C                       WRITE P ISN RECORDS ON ITAPE 3.                  GEND5830
      WRITE(ITAPE3)KPLST,ISCNT,(ISN(I),I=1,ISCNT),MODSW,MODFAC           GEND5840
      WRITE(ITAPE3)KPLST,JCOUNT,(LSTCOL(I),I=1,JCOUNT),NUMMO,NUMYK       GEND5850
C                                                                        GEND5860
C                       200                                              GEND5870
C                       SET ISW TO INDICATE A P DATA RECORD IS TO BE     GEND5880
C                       READ.                                            GEND5890
  200 ISW=0                                                              GEND5900
C                       SET P VALUE=1.0                                  GEND5910
      PVALUE=1.0D0                                                       GEND5920
C                       DO FOR EACH ENTRY IN LIST OF ROWS.               GEND5930
      DO 260 I=1,ISCNT                                                   GEND5940
C                       BRANCH ON ISW.                                   GEND5950
      IF(ISW.NE.0) GO TO 210                                             GEND5960
C                       ISW=0                                            GEND5970
C                       READ A P DATA RECORD FOR ROW IROW.               GEND5980
      READ(ITAPE2)KPROW,IROW,ICOUNT,(JCOL(M),M=1,ICOUNT),                GEND5990
     1            (P(M),M=1,ICOUNT)                                      GEND6000
C                       WAS A P END RECORD READ?                         GEND6010
C                       YES. GO TO PROCESS REMAINING ENTRIES IN ROW LISTGEND6020
      IF(KPROW.EQ.KPEND) GO TO 280                                       GEND6030
C                       210                                              GEND6040
C                       NO                                               GEND6050
C                       IS P MATRIX ROW JUST READ EQUAL I'TH ENTRY IN    GEND6060
C                       LIST OF ROWS?                                    GEND6070
C                       YES. GO TO WRITE P RECORD.                       GEND6080
  210 IF(IROW.EQ.ISN(I)) GO TO 250                                       GEND6090
C                       225                                              GEND6100
C                       NO                                               GEND6110
C                       ROW NUMBER JUST READ IS GREATER THAN ROW LIST    GEND6120
C                       ENTRY.                                           GEND6130
C                       ADD A ROW RECORD TO P MATRIX.                    GEND6140
C                       DETERMINE COLUMN NUMBER FOR ROW BEING ADDED.     GEND6150
  225 ICOL=ISN(I)                                                        GEND6160
      IF(MODSW.EQ.0) GO TO 245                                           GEND6170
      IF(MOD(ICOL,MODFAC).NE.0) ICOL=ICOL+MODSW                          GEND6180
C                       245                                              GEND6190
C                       WRITE GENERATED P RECORD.                        GEND6200
  245 WRITE(ITAPE3)KPDAT,ISN(I),NFILL,ICOL,PVALUE                        GEND6210
C                       SET ISW TO INDICATE BYPASS READ P RECORD SINCE   GEND6220
C                       LAST RECORD READ HAS NOT BEEN WRITTEN.           GEND6230
      ISW=1                                                              GEND6240
      GO TO 260                                                          GEND6250
C                       250                                              GEND6260
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C                         WRITE AN ORIGINAL ROW.                          GEND6270
  250 WRITE(ITAPE3)KPROW,IROW,ICOUNT,(JCOL(M),M=1,ICOUNT),                GEND6280
     1              (P(M),M=1,ICOUNT)                                     GEND6290
C                         SET ISW=0                                       GEND6300
      ISW=0                                                               GEND6310
C                         260                                             GEND6320
C                         CONTINUE                                        GEND6330
  260 CONTINUE                                                            GEND6340
C                         270                                             GEND6350
C                         ALL ROW LIST ELEMENTS HAVE BEEN PROCESSED.      GEND6360
C                         WRITE UPDATED P END RECORD.                     GEND6370
  270 PELE=NPELE                                                          GEND6380
      WRITE(ITAPE3)KPEND,NFILL,NFILL,ISCNT,PELE                           GEND6390
      GO TO 320                                                           GEND6400
C                         280                                             GEND6410
C                         YES                                             GEND6420
C                         ALL ORIG P RECORDS COPIED BUT ITEMS REMAINING   GEND6430
C                         IN ISN TO BE PROCESSED.                         GEND6440
C                         FOR REMAINING ENTRIES IN ISN GENERATE AND WRITE GEND6450
C                         A P DATA RECORD.                                GEND6460
  280 DO 290 K=I,ISCNT                                                    GEND6470
      ICOL=ISN(K)                                                         GEND6480
      IF(MODSW.EQ.0) GO TO 290                                            GEND6490
      IF(MOD(ICOL,MODFAC).NE.0) ICOL=ICOL+MODSW                           GEND6500
  290 WRITE(ITAPE3)KPDAT,ISN(K),NFILL,ICOL,PVALUE                         GEND6510
      GO TO 270                                                           GEND6520
C                                                                        *GEND6530
C                                                                       ***GEND6540
C                                                                         GEND6550
C                         320                                             GEND6560
C                         TRANS MOD OF THIS MATRIX COMPLETE.              GEND6570
C                         UPDATE COUNT OF OUTPUT TAPE FILES.              GEND6580
  320 NFILES=NFILES+4                                                     GEND6590
C                         HAVE ALL INPUT DATA RECORDS BEEN READ?          GEND6600
C                         YES - RETURN.                                   GEND6610
      IF(INPSW.EQ.1) GO TO 330                                            GEND6620
C                         NO  - PROCESS NEXT MODEL.                       GEND6630
C                         IF THERE IS ONE.                                GEND6640
C                         HAVE THE NUMBER OF MODELS SPECIFIED BEEN PROCES-GEND6650
C                         SED?                                            GEND6660
      NTIMES=NTIMES-1                                                     GEND6670
      IF(NTIMES.EQ.0) GO TO 330                                           GEND6680
C                         NO                                              GEND6690
C                         READ NZERO, MODSW, MODFAC FOR NEXT MODEL.       GEND6700
      READ 2,NZERO,MODSW,MODFAC                                           GEND6710
C                         GO TO INITIALIZE FOR NEW MODEL.                 GEND6720
      GO TO 10                                                            GEND6730
C                         330                                             GEND6740
C                         YES                                             GEND6750
C                         SET FILE NAME TO BLANK. ADD 1 TO NUMBER OF      GEND6760
C                         FILES.                                          GEND6770
  330 DO 331 M=1,6                                                        GEND6780
  331 NSFILE(M)=KBLANK                                                    GEND6790
      NFILES=NFILES+1                                                     GEND6800
C                         WRITE END POSITIONING RECORD.                   GEND6810
      WRITE(ITAPE3)KNEXT,NSFILE,NFILL,NFILES                              GEND6820
C                         REWIND OUTPUT UNIT.                             GEND6830
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      REWIND ITAPE3                                                     GEND6840
C                           RETURN                                      GEND6850
      RETURN                                                            GEND6860
C                                                                       GEND6870
C                           NO.                                         GEND6880
C                           BY PASS TRANS MODIFY                        GEND6890
C                           BECAUSE MODSW SPECIFIES BYPASS.             GEND6900
  340 PRINT 345                                                         GEND6910
  345 FORMAT(28H TRANSITION MODIFY BYPASSED.)                           GEND6920
C                           BECAUSE NO ELEMENTS NEED TO BE ADDED.       GEND6930
C                           COPY ORIG P FROM TEMPORARY TO PERMANENT STORAGE.GEND6940
  350 REWIND ITAPE2                                                     GEND6950
C                           READ AND WRITE BEGINNING LABEL.             GEND6960
      READ(ITAPE2)KTYPE,NPFILE,N,LABELP                                 GEND6970
      WRITE(ITAPE3)KTYPE,NPFILE,N,LABELP                                GEND6980
C                           WRITE ROW AND COLUMN LIST RECORDS           GEND6990
      WRITE(ITAPE3)KPLST,ISCNT,(ISN(I),I=1,ISCNT),MODSW,MODFAC          GEND7000
      WRITE(ITAPE3)KPLST,JCOUNT,(LSTCOL(I),I=1,JCOUNT),NUMMO,NUMYR      GEND7010
C                           COPY DATA RECORDS.                          GEND7020
  357 ITO=ISCNT+1                                                       GEND7030
      DO 360 I=1,ITO                                                    GEND7040
      READ (ITAPE2)KTYPE,IROW,IC,(JCOL(M),M=1,IC),(P(M),M=1,IC)         GEND7050
  360 WRITE(ITAPE3)KTYPE,IROW,IC,(JCOL(M),M=1,IC),(P(M),M=1,IC)         GEND7060
C                           GO TO INCREMENT OUTPUT FILE COUNT.          GEND7070
      GO TO 320                                                         GEND7080
C                                                                       GEND7090
C                           400                                         GEND7100
C                           EOF                                         GEND7110
  400 PRINT 405                                                         GEND7120
C                           PRINT ERROR MESSAGE.                        GEND7130
  405 FORMAT(38H EOF ON FIRST READ OF INPUT DATA TAPE.)                 GEND7140
C                           EXIT                                        GEND7150
      STOP                                                              GEND7160
C                                                                       GEND7170
C                           REFERENCE LIST.                             GEND7180
C                                                                       GEND7190
C                           SUBROUTINE ARGUMENTS.                       GEND7200
C                                                                       GEND7210
C     ISN    - ROW NUMBER ARRAY.                                        GEND7220
C     ISVEC  - ROW SUM ARRAY.                                           GEND7230
C     JCOL   - COL NUMBER ARRAY FOR A ROW.                              GEND7240
C     JVAL   - COL ELEMENT ARRAY FOR A ROW.                             GEND7250
C     P      - ARRAY OF PROBABILITY ELEMENTS IN A ROW.                  GEND7260
C              JVAL AND P MAY SHARE THE SAME CORE LOCATIONS.            GEND7270
C     LSTCOL - ARRAY CONTAINING LIST OF COLUMNS PRESENT.                GEND7280
C     LSVEC  - ARRAY CONTAINING COLUMN SUMS - TO S.                     GEND7290
C                                                                       GEND7300
C                           OTHER VARIABLES.                            GEND7310
C                                                                       GEND7320
C     ICOUNT - NUMBER ENTRIES IN JCOL AND JVAL. AND P.                  GEND7330
C     ISCNT  - NUMBER ENTRIES IN ISN AND ISVEC.                         GEND7340
C     ISUM   - S VECTOR SUM.                                            GEND7350
C     ITAPE1 - INPUT. STATE NUMBER PAIRS PLUS FREQUENCY.                GEND7360
C     ITAPE2 - UNIT USED FOR TEMPORARY STORAGE OF UNMODIFIED P MATRIX.  GEND7370
C              THE BEGINNING LABEL, DATA RECORDS FOR ROWS EXISTING IN   GEND7380
C              THE D MATRIX AND END LABEL WILL BE WRITTEN ON THIS UNIT. GEND7390
C              ROW AND COLUMN LIST RECORDS AND DATA RECORDS FOR ROWS    GEND7400
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C               ADDED BY TRANSITION MODIFY WILL NOT BE WRITTEN ON THIS   GEND7410
C               UNIT.                                                    GEND7420
C     ITAPE3 - D MATRIX, FROM-S, TO-S, FINAL P MATRIX.                   GEND7430
C     INPSW  - 0 IF RECORD ON ITAPE1 READ.                               GEND7440
C              1 IF EOF ON ITAPE1 READ.                                  GEND7450
C                                                                        GEND7460
C     JADD   - NUMBER OF ELEMENTS ADDED TO THE ROW LIST BY TRANSITION    GEND7470
C              MODIFY.                                                   GEND7480
C     JCOUNT - NUMBER OF ENTRIES IN LSTCOL AND LSVEC.                    GEND7490
C     KPRINT - A SWITCH TO CONTROL THE LISTING OF THE NUMBER OF NON-ZEROGEND7500
C              ELEMENTS IN EACH NON-ZERO ROW OF THE D MATRIX.            GEND7510
C              0 - PRINT.                                                GEND7520
C              1 - DO NOT PRINT.                                         GEND7530
C     LSTCNT - ARRAY FOR 1 PRINT LINE OF ICOUNT VALUES.                  GEND7540
C     LST    - SUBSCRIPT FOR LSTCNT.                                     GEND7550
C     MODSW  - TRANSITION MODIFY SWITCH.                                 GEND7560
C              -1 BYPASS                                                 GEND7570
C               0 EXECUTE. ADD DIAG ELEMENT.                             GEND7580
C              +N EXECUTE. ADD ELEMENT TO DIAG POSITION + N.             GEND7590
C     MODFAC - ENTERED WHEN MODSW=+N. THE IS THE LAST CODE FOR THE LAST GEND7600
C              VARIABLE IN THE STATE DEFINITION.                         GEND7610
C                                                                        GEND7620
C     NFILL  - FILLER VARIABLE CONTAINING A ONE.                         GEND7630
C     NL     - LENGTH OF ALL LABEL ARRAYS.                               GEND7640
C     NTIMES - NUMBER OF TIME PERIODS FOR WHICH D S AND P ARE TO BE     GEND7650
C              GENERATED. MAY BE LESS THAN THE NUMBER OF TIME PERIODS ONGEND7660
C              THE INPUT TAPE, BUT NO POSITIONING IS PROVIDED FOR. THE   GEND7670
C              FIRST NTIMES DATA SETS WILL BE PROCESSED.                 GEND7680
C     NPELE  - NUMBER OF NON-ZERO ELEMENTS IN THE MATRIX.                GEND7690
C     NFILES - COUNT OF NUMBER OF FILES WRITTEN ON ITAPE3 - FINAL OUTPUTGEND7700
C              TAPE ON WHICH D, S, AND P ARRAYS ARE WRITTEN.             GEND7710
C     NZERO  - ADJUSTMENT FOR STATE ZERO SO THAT 'OUTSIDE WORLD' IS     GEND7720
C              LARGE.                                                    GEND7730
C                                                                        GEND7740
      END                                                                GEND7750
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      SUBROUTINE LSTPAT(IYRS,ISTATE)                                    LSTP0010
C                                                                       LSTP0020
C                        SUBROUTINE TO LIST STATE NUMBER PATTERNS.      LSTP0030
C                        THE MODEL NUMBER AND FREQUENCY RANGE SPECIFICA- LSTP0040
C                        TIONS FOR THE PATTERNS TO BE LISTED WILL BE READLSTP0050
C                        FROM CONTROL CARDS.                            LSTP0060
C                                                                       LSTP0070
      IMPLICIT REAL*8 (A-H,O-Z)                                         LSTP0080
      DIMENSION IDENT(30),IYRS(1),ISTATE(1)                             LSTP0090
C                        READ INPUT UNIT ID, NYRS - NUMBER OF TIME      LSTP0100
C                        PERIODS, NFREQ - TOTAL NUMBER OF CASES.        LSTP0110
      READ 20,ITAPE,NYRS,NFREQ                                          LSTP0120
   20 FORMAT(3I12)                                                      LSTP0130
C                        REWIND INPUT UNIT.                             LSTP0140
      REWIND ITAPE                                                      LSTP0150
C                        FLOAT NUMBER OF CASES VARIABLE.                LSTP0160
      FREQ=NFREQ                                                        LSTP0170
C                        READ ARRAY IYRS - A DATE FOR EACH TIME PERIOD. LSTP0180
      READ 30,(IYRS(I),I=1,NYRS)                                        LSTP0190
   30 FORMAT(20A4)                                                      LSTP0200
C                        SET SWITCH INDICATING NO UNPROCESSED DATA RECORDLSTP0210
C                        IN CORE.                                       LSTP0220
      KSKIP=0                                                           LSTP0230
C                        COMPUTE NUMBER OF PRINT LINES PER PATTERN AND  LSTP0240
C                        NUMBER OF PATTERNS PER PAGE. WHEN NYRS IS 9, AN LSTP0250
C                        EXTRA LINE WILL BE SPACED AFTER EACH PATTERN   LSTP0260
C                        PRINT. THE HEADING REQUIRES ONE SET OF LINES.  LSTP0265
      NLPAT=(NYRS-1)/9+1                                                LSTP0270
      IF(NYRS.EQ.9) NLPAT=NLPAT+1                                       LSTP0275
      NPPAGE=53/NLPAT-1                                                 LSTP0280
C                        READ FROM-FREQUENCY VALUE, TO-FREQUENCY VALUE  LSTP0290
C                        AND MODEL NUMBER.                              LSTP0300
   40 READ 20,NFROM,NTO,MODELN                                          LSTP0310
C                        IS THIS A RETURN CARD?                         LSTP0320
      IF(NFROM.GE.0) GO TO 45                                           LSTP0330
C                        YES                                            LSTP0340
C                        REWIND INPUT.                                  LSTP0350
      REWIND ITAPE                                                      LSTP0360
C                        SPACE PRINTED OUTPUT TO A NEW PAGE.            LSTP0370
      PRINT 50                                                          LSTP0380
   50 FORMAT(1H1)                                                       LSTP0390
C                        RETURN.                                        LSTP0400
      RETURN                                                            LSTP0410
C                                                                       LSTP0420
C                        NO - THE CARD JUST READ DID NOT SPECIFY A RETURNLSTP0430
C                        TO THE CALLING PROGRAM.                        LSTP0440
C                        READ HEADING FOR LIST INTO ARRAY IDENT.        LSTP0450
   45 READ 30,IDENT                                                     LSTP0460
C                        INITIALIZE TYPE OF FREQUENCY RANGE SPECIFICATIONLSTP0470
C                        SWITCH.                                        LSTP0480
   60 NSW=0                                                             LSTP0490
C                        IF ALL PATTERNS ARE TO BE PRINTED, SET NSW =1. LSTP0500
      IF(NFROM.EQ.0.AND.NTO.EQ.0) NSW=1                                 LSTP0510
C                        IF ALL PATTERNS WITH A FREQUENCY GREATER THAN  LSTP0520
C                        NFROM ARE TO BE PRINTED, SET NSW = 2.          LSTP0530
      IF(NFROM.GT.0.AND.NTO.EQ.0) NSW=2                                 LSTP0540
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C                       IF ALL PATTERNS WITH A FREQUENCY IN THE          LSTP0550
C                       SPECIFIED NFROM - NTO RANGE ARE TO BE PRINTED,   LSTP0560
C                       SET NSW = 3.                                     LSTP0570
      IF((NFROM.GT.0.AND.NTO.GT.0).AND.(NTO.GE.NFROM)) NSW=3             LSTP0580
C                       IS THE TYPE OF RANGE SWITCH STILL ZERO?          LSTP0590
C                       YES. GO TO PRINT ERROR MESSAGE.                  LSTP0600
      IF(NSW.EQ.0) GO TO 300                                             LSTP0610
C                                                                        LSTP0620
C                       NO - THE RANGE SPECIFICATION IS LEGAL.           LSTP0630
C                                                                        LSTP0640
C                       INITIALIZATION FOR THIS LIST.                    LSTP0650
C                       NUMBER OF PATTERNS LISTED.                       LSTP0660
      LISTN=0                                                            LSTP0670
C                       FREQ SUM OF PATTERNS LISTED.                     LSTP0680
      LSTSUM=0                                                           LSTP0690
C                       NUMBER OF PATTERNS READ.                         LSTP0700
      NPAT = 0                                                           LSTP0710
C                       NUMBER OF PATTERNS ON CURRENT PAGE.              LSTP0720
      NPCUR=0                                                            LSTP0730
C                       PRINT HEADING                                    LSTP0740
C                       SKIP TO A NEW PAGE AND PRINT HEADING FROM ARRAY  LSTP0750
C                       IDENT.                                           LSTP0760
   80 PRINT 90,IDENT                                                     LSTP0770
   90 FORMAT(1H1,30A4)                                                   LSTP0780
C                       BRANCH ON NSW AND PRINT TYPE OF FREQUENCY        LSTP0790
C                       SELECTION.                                       LSTP0800
      GO TO (100,110,120),NSW                                            LSTP0810
C                       NSW = 1 ALL PATTERNS.                            LSTP0820
  100 PRINT 105                                                          LSTP0830
  105 FORMAT(/36H LIST OF ALL STATE NUMBER PATTERNS  )                   LSTP0840
      GO TO 140                                                          LSTP0850
C                       NSW = 2 PATTERNS WITH FREQ GE NFROM.             LSTP0860
  110 PRINT 115,NFROM                                                    LSTP0870
  115 FORMAT(/68H LIST OF STATE NUMBER PATTERNS WITH FREQUENCY GREATER TLSTP0880
     1HAN OR EQUAL ,I8)                                                  LSTP0890
      GO TO 140                                                          LSTP0900
C                       NSW = 3 PATTERNS IN NFROM - NTO RANGE.           LSTP0910
  120 PRINT 125,NFROM,NTO                                                LSTP0920
  125 FORMAT(/55H LIST OF STATE NUMBER PATTERNS WITH FREQUENCY IN RANGE LSTP0930
     1,I8,6H THRU ,I8)                                                   LSTP0940
C                                                                        LSTP0950
C                       140                                              LSTP0960
C                       PRINT COLUMN HEADING INCLUDING THE DATE ARRAY    LSTP0970
C                       IYRS.                                            LSTP0980
  140 PRINT 145,(IYRS(I),I=1,NYRS)                                       LSTP0990
  145 FORMAT(/13X,8HPER CENT,3X,21H STATE NUMBER PATTERN/6X,18HFREQ   OFLSTP1000
     1 TOTAL    ,9(8X,A4)/ (24X,9(8X,A4)))                              LSTP1010
      PRINT 150                                                          LSTP1020
  150 FORMAT(/)                                                          LSTP1030
C                                                                        LSTP1040
C                       AT THIS POINT IN THE PROGRAM, NPCUR WILL BE ZEROLSTP1050
C                       WHEN THE HEADING JUST PRINTED IS FOR THE FIRST   LSTP1060
C                       PAGE OF OUTPUT FOR A MODEL. NPCUR WILL BE EQUAL LSTP1070
C                       NPPAGE WHEN THE HEADING JUST PRINTED IS FOR AN   LSTP1080
C                       ADDITIONAL PAGE FOR THE MODEL. THE SELECTED      LSTP1090
C                       PATTERN WHICH COULD NOT BE PRINTED ON THE PRE-   LSTP1100
C                       CEDING PAGE IS READY TO BE PRINTED.              LSTP1110
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C                                                                       LSTP1120
C                       IS THERE A PATTERN READY TO BE PRINTED?         LSTP1130
      IF(NPCUR.EQ.0) GO TO 160                                          LSTP1140
C                       YES                                             LSTP1150
C                       SET NUMBER OF PATTERNS ON THIS PAGE TO ZERO.    LSTP1160
      NPCUR=0                                                           LSTP1170
C                       GO TO PRINT A PATTERN.                          LSTP1180
      GO TO 215                                                         LSTP1190
C                                                                    ***LSTP1200
C                                                                     *LSTP1210
C                       READ PATTERNS AND PRINT IF IN RANGE.            LSTP1220
C                       IS A RECORD TO BE READ?                         LSTP1230
  160 IF(KSKIP.EQ.0) GO TO 170                                          LSTP1240
C                       NO.                                             LSTP1250
C                       SET KSKIP TO 0.                                 LSTP1260
      KSKIP=0                                                           LSTP1270
      GO TO 175                                                         LSTP1280
C                       170                                             LSTP1290
C                       YES.                                            LSTP1300
C                       READ A RECORD.                                  LSTP1310
  170 READ(ITAPE,END=254)MODL,(ISTATE(N),N=1,NYRS),IFREQ                LSTP1320
C                       NO EOF.                                         LSTP1330
C                       IS THE MODEL NUMBER READ FROM THE INPUT FILE    LSTP1340
C                       EQUAL THE MODEL NUMBER IN THE CONTROL CARD?     LSTP1350
C                       NO. GO TO END OF MODEL PROCESSING.              LSTP1360
  175 IF(MODL.NE.MODELN) GO TO 250                                      LSTP1370
C                       YES                                             LSTP1380
C                       COUNT RECORD READ.                              LSTP1390
      NPAT=NPAT+1                                                       LSTP1400
C                                                                       LSTP1410
C                       IS THE FREQUENCY OF THE CURRENT PATTERN RECORD  LSTP1420
C                       IN THE SPECIFIED FREQUENCY RANGE?               LSTP1430
C                                                                       LSTP1440
C                       BRANCH ON NSW (TYPE OF FREQUENCY SELECTION.)    LSTP1450
      GO TO (210,200,190),NSW                                           LSTP1460
C                       190                                             LSTP1470
C                       IS FREQUENCY GREATER THAN NTO?                  LSTP1480
  190 IF(IFREQ.GT.NTO) GO TO 240                                        LSTP1490
C                       200                                             LSTP1500
C                       NO                                              LSTP1510
C                       IS FREQUENCY LESS THAN NFROM?                   LSTP1520
  200 IF(IFREQ.LT.NFROM) GO TO 240                                      LSTP1530
C                       NO                                              LSTP1540
C                                                                       LSTP1550
C                       FREQUENCY IS IN SPECIFIED RANGE.                LSTP1560
C                                                                       LSTP1570
C                       IS THERE SPACE ON THE CURRENT PAGE TO PRINT THISLSTP1580
C                       PATTERN?                                        LSTP1590
C                       NO. GO TO SKIP TO A NEW PAGE. RETURN TO 215.    LSTP1600
  210 IF(NPCUR.EQ.NPPAGE) GO TO 80                                      LSTP1610
C                                                                       LSTP1620
C                       YES                                             LSTP1630
C                       ADD 1 TO PATTERNS LISTED.                       LSTP1640
  215 LISTN=LISTN+1                                                     LSTP1650
C                       ADD FREQUENCY OF THIS PATTERN TO FREQ-SUM FOR   LSTP1660
C                       THIS LIST.                                      LSTP1670
      LSTSUM=LSTSUM+IFREQ                                               LSTP1680
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C                       COMPUTE PERCENT FOR THE FREQUENCY OF THIS       LSTP1690
C                       PATTERN.                                        LSTP1700
      PERCNT=(DFLOAT(IFREQ)/FREQ)*100.0D0                               LSTP1710
C                       PRINT THIS PATTERN AND THE PERCENT VALUE JUST   LSTP1720
C                       COMPUTED.                                       LSTP1730
      PRINT 220,IFREQ,PERCNT,(ISTATE(N),N=1,NYRS)                       LSTP1740
  220 FORMAT(2X,I8,F11.4,3X,9I12/ (24X,9I12))                           LSTP1750
C                       ADD 1 TO THE NUMBER OF PATTERNS PRINTED ON THIS LSTP1760
C                       PAGE.                                           LSTP1770
      NPCUR=NPCUR+1                                                     LSTP1780
C                                                                       LSTP1790
C                       CONTINUE                                        LSTP1800
  240 CONTINUE                                                          LSTP1810
C                       GO TO READ A RECORD.                            LSTP1820
      GO TO 170                                                         LSTP1830
C                                                                      *LSTP1840
C                                                                    ***LSTP1850
C                                                                       LSTP1860
C                       THE MODEL NUMBER IN THE RECORD JUST READ FROM   LSTP1870
C                       THE INPUT FILE DOES NOT EQUAL THE MODEL NUMBER  LSTP1880
C                       IN THE CONTROL CARD.                            LSTP1890
C                       HAVE ANY PATTERNS FOR THE MODEL SPECIFIED IN THELSTP1900
C                       CONTROL CARD BEEN READ?                         LSTP1910
  250 IF(NPAT.EQ.0) GO TO 350                                           LSTP1920
C                       YES                                             LSTP1930
C                       SET UNPROCESSED RECORD IN CORE SWITCH.          LSTP1940
      KSKIP=1                                                           LSTP1950
      GO TO 255                                                         LSTP1960
C                       254                                             LSTP1970
C                       EOF ON READ                                     LSTP1980
C                       REWIND INPUT UNIT.                              LSTP1990
  254 REWIND ITAPE                                                      LSTP2000
C                       PRINT SUMMARY INFO.                             LSTP2010
C                       COMPUTE PERCENT FOR SUM FOR THIS LIST.          LSTP2020
  255 PERCNT=(DFLOAT(LSTSUM)/FREQ)*100.0D0                              LSTP2030
C                       PRINT SUMMARY DATA FOR THIS LIST.               LSTP2040
C                       SKIP TO A NEW PAGE IF NECESSARY.                LSTP2050
      IF((NPCUR*NLPAT+4).GT.(NPPAGE*NLPAT)) PRINT 90,IDENT              LSTP2060
      PRINT 260,LSTSUM,PERCNT,LISTN                                     LSTP2070
  260 FORMAT(//1X ,I9,F11.4,3X,I12,17H PATTERNS LISTED.)                LSTP2080
      PERCNT=100.0                                                      LSTP2090
      PRINT 270,NFREQ,PERCNT,NPAT                                       LSTP2100
  270 FORMAT(2X,I8,F11.4,3X,I12,16H PATTERNS TOTAL.)                    LSTP2110
C                       GO TO READ NEXT CONTROL CARD.                   LSTP2120
      GO TO 40                                                          LSTP2130
C                                                                       LSTP2140
C                       300                                             LSTP2150
C                       YES - THE RANGE SPECIFICATION IS ILLEGAL.       LSTP2160
C                       PRINT ERROR IN CONTROL CARDS MESSAGE.           LSTP2170
  300 PRINT 310,NFROM,NTO                                               LSTP2180
  310 FORMAT(37H1LSTPAT..CONTROL CARD ERROR. NFROM = ,I12,5X,7H NTO = , LSTP2190
     1I12)                                                              LSTP2200
C                       EXIT                                            LSTP2210
      STOP                                                              LSTP2220
C                       350                                             LSTP2230
C                       NO - MODEL NUMBER IN CONTROL CARD DOES NOT MATCHLSTP2240
C                       TAPE MODEL NUMBER.                              LSTP2250
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C                         PRINT ERROR MESSAGE.                                LSTP2260
  350 PRINT 360,MODELN,MODL                                                   LSTP2270
  360 FORMAT(22H1LSTPAT..CARD MODEL NO,I12,5X,14H TAPE MODEL NO,I12)          LSTP2280
C                         EXIT                                                LSTP2290
      STOP                                                                    LSTP2300
C                                                                             LSTP2310
C                         REFERENCE LIST.                                     LSTP2320
C                                                                             LSTP2330
C                         SUBROUTINE ARGUMENTS.                               LSTP2340
C                                                                             LSTP2350
C     IYRS   - ARRAY FOR LIST OF YEARS. EACH ELEMENT IS READ AND PRINTEDLSTP2360
C              AS AN A4 FIELD. THEREFORE THE DATE MAY BE YEAR ONLY- 1969LSTP2370
C              OR MONTH AND YEAR- 6-69.                                       LSTP2380
C     ISTATE - ARRAY FOR LIST OF STATE NUMBERS.                               LSTP2390
C                                                                             LSTP2400
C                         OTHER VARIABLES.                                    LSTP2410
C                                                                             LSTP2420
C     IDENT  - ARRAY FOR HEADING TO IDENTIFY MODEL. (30A4).                   LSTP2430
C     ITAPE  - INPUT UNIT.                                                    LSTP2440
C     KSKIP  - 0 NO UNPROCESSED DATA RECORD IN CORE.                          LSTP2450
C              1 AN UNPROCESSED DATA RECORD IS IN CORE- THIS WILL OCCUR LSTP2460
C                WHEN THERE IS A MODEL CHANGE IN THE INPUT RECORDS.           LSTP2470
C     LISTN  - NUMBER OF PATTERNS LISTED.                                     LSTP2480
C     LSTSUM - SUM OF FREQ FOR PATTERNS LISTED.                               LSTP2490
C     NYRS   - NUMBER OF TIME PERIODS AND STATE NUMBERS.                      LSTP2500
C     NPAT   - NUMBER OF UNIQUE PATTERNS READ FOR A MODEL.                    LSTP2510
C     NFREQ  - NUMBER OF CASES IN THE MODEL.                                  LSTP2520
C     NFROM  - FROM AND TO VALUES FOR FREQUENCY                               LSTP2530
C     NTO    -     RANGE TO BE PRINTED.                                       LSTP2540
C     NSW    - SET ON BASIS OF NFROM AND NTO VALUES.                          LSTP2550
C              1=PRINT ALL PATTERNS.                                          LSTP2560
C              2=PRINT ALL PATTERNS WHOSE FREQ.GE.NFROM.                      LSTP2570
C              3=PRINT ALL PATTERNS WHERE NFROM.LE.FREQ.LE.NTO.               LSTP2580
      END                                                                     LSTP2590
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      SUBROUTINE NUDATE(MONTH,MYEAR,NUMMO,NUMYR)                        NUDA0010
C                                                                       NUDA0020
C                       THE NEW DATE ROUTINE WILL INCREMENT THE DATE IN NUDA0030
C                       THE S VECTOR NAME BY THE MONTH AND YEAR FACTORS NUDA0040
C                       OF THE P MATRIX BEING USED IN THE SXP OPERATION.NUDA0050
C                                                                       NUDA0060
C                       DATA STATEMENT SETTING UP MLIST-AN ARRAY        NUDA0070
C                       CONTAINING 12 MONTH NAMES 3 CHARACTERS EACH.    NUDA0080
      DIMENSION MLIST(12)                                               NUDA0090
      DATA MLIST/48HJAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC /   NUDA0100
C                       DATA STATEMENT SETTING UP LITERAL ZERO WORD FOR NUDA0110
C                       USE IN BINARY-HEX CONVERSION.                   NUDA0120
      DATA NZERO/4H0000/                                                NUDA0130
C                                                                     ***NUDA0140
C                                                                      *NUDA0150
C                       INCREMENT MONTH                                 NUDA0160
C                       SET MONTH INCREMENT CARRY OVER VARIABLE TO ZERO.NUDA0170
      NADD=0                                                            NUDA0180
C                       IS THE MONTH INCREMENT VALUE EQUAL ZERO?        NUDA0190
C                       YES. MONTH WILL NOT CHANGE. GO TO INCREMENT YR. NUDA0200
      IF(NUMMO.EQ.0) GO TO 50                                           NUDA0210
C                       NO                                              NUDA0220
C                       IS THE ENTRY PASSED IN THE MONTH FIELD IN THE   NUDA0230
C                       MONTH LIST?                                     NUDA0240
      DO 20 I=1,12                                                      NUDA0250
      IF(MONTH.EQ.MLIST(I)) GO TO 30                                    NUDA0260
   20 CONTINUE                                                          NUDA0270
C                       NO                                              NUDA0280
C                       PRINT MESSAGE THAT MONTH DID NOT MATCH.         NUDA0290
      PRINT 25,MONTH                                                    NUDA0300
   25 FORMAT(50H NAME IN MONTH DOES NOT MATCH ANY NAME IN MLIST.  ,A4)  NUDA0310
C                       CONTINUE.                                       NUDA0320
      GO TO 50                                                          NUDA0330
C                       YES                                             NUDA0340
C                       MONTH MATCH.                                    NUDA0350
C                       NEW MONTH POSITION EQUALS OLD MONTH POSITION    NUDA0360
C                       PLUS MONTH INCREMENT.                           NUDA0370
   30 I=I+NUMMO                                                         NUDA0380
C                       IS THE SUBSCRIPT LESS THAN OR EQ 12?            NUDA0390
C                       YES. CURRENT SUBSCRIPT VALUE IS NEW MONTH NUMBERNUDA0400
      IF(I.LE.12) GO TO 40                                              NUDA0410
C                       NO                                              NUDA0420
C                       SET CARRY OVER VALUE FOR YEAR.                  NUDA0430
      NADD=1                                                            NUDA0440
C                       ADJUST MONTH LIST SUBSCRIPT.                    NUDA0450
      I=MOD(I,12)                                                       NUDA0460
C                       REPLACE INPUT MONTH ENTRY BY NEW MONTH.         NUDA0470
   40 MONTH=MLIST(I)                                                    NUDA0480
C                                                                      *NUDA0490
C                                                                     ***NUDA0500
C                                                                      *NUDA0510
C                       INCREMENT YEAR                                  NUDA0520
C                       TOTAL YEAR INCREMENT EQUALS MONTH CARRY OVER    NUDA0530
C                       PLUS INPUT YEAR INCREMENT.                      NUDA0540
   50 NADD=NADD+NUMYR                                                   NUDA0550
C                       IS THE TOTAL YEAR INCREMENT ZERO?               NUDA0560
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C                       YES                                              NUDA0570
C                       RETURN                                           NUDA0580
      IF(NADD.EQ.0) RETURN                                               NUDA0590
C                       NO                                               NUDA0600
C                       CONVERT EACH CHARACTER IN THE INPUT YEAR         NUDA0610
C                       ARGUMENT FROM A HEXADECIMAL TO A BINARY          NUDA0620
C                       CHARACTER.                                       NUDA0630
      NYR=MYEAR-NZERO                                                    NUDA0640
      N1=NYR/2**24                                                       NUDA0650
      NYR=NYR-N1*2**24                                                   NUDA0660
      N2=NYR/2**16                                                       NUDA0670
      NYR=NYR-N2*2**16                                                   NUDA0680
      N3=NYR/2**8                                                        NUDA0690
      N4=NYR-N3*2**8                                                     NUDA0700
C                                                                        NUDA0710
C                       COMBINE THESE BINARY CHARACTERS INTO A TOTAL     NUDA0720
C                       BINARY YEAR VALUE AND ADD THE TOTAL YEAR INCRE-  NUDA0730
C                       MENT.                                            NUDA0740
      NYR=N1*1000+N2*100+N3*10+N4+NADD                                   NUDA0750
C                       CONVERT THE INCREMENTED YEAR FROM A BINARY VALUENUDA0760
C                       TO BINARY CHARACTERS.                            NUDA0770
      N1=NYR/1000                                                        NUDA0780
      NYR=NYR-N1*1000                                                    NUDA0790
      N2=NYR/100                                                         NUDA0800
      NYR=NYR-N2*100                                                     NUDA0810
      N3=NYR/10                                                          NUDA0820
      N4=NYR-N3*10                                                       NUDA0830
C                       COMBINE THESE BINARY CHARACTERS AND THE WORD     NUDA0840
C                       CONTAINING ZERO CHARACTERS TO FORM THE HEXADECI-NUDA0850
C                       MAL VALUE OF THE NEW YEAR.                       NUDA0860
      MYEAR=N1*2**24+N2*2**16+N3*2**8+N4+NZERO                           NUDA0870
C                       RETURN                                           NUDA0880
      RETURN                                                             NUDA0890
C                                                                       *NUDA0900
C                                                                     ***NUDA0910
C                       NOTE:                                            NUDA0920
C                       THE HEXADECIMAL CHARACTER FOR A SINGLE DIGIT 0-9NUDA0930
C                       MINUS THE HEXADECIMAL CHARACTER FOR 0 GIVES THE NUDA0940
C                       BINARY VALUE OF THE DIGIT.                       NUDA0950
C                          HEXADECIMAL    BINARY                         NUDA0960
C                       0  11110000      00000000                        NUDA0970
C                       1  11110001      00000001                        NUDA0980
C                       2  11110010      00000010                        NUDA0990
C                       .      .             .                           NUDA1000
C                       .      .             .                           NUDA1010
C                       .      .             .                           NUDA1020
C                       9  11111001      00001001                        NUDA1030
C                                                                        NUDA1040
C                       REFERENCE LIST.                                  NUDA1050
C                       SUBROUTINE ARGUMENTS.                            NUDA1060
C                                                                        NUDA1070
C     MONTH  - THE S VECTOR NAME MONTH FIELD. THIS WILL BE THREE         NUDA1080
C              CHARACTERS, LEFT JUSTIFIED.                               NUDA1090
C     MYEAR  - THE S VECTOR NAME YEAR FIELD. THIS WILL BE 4 CHARACTERS.  NUDA1100
C     NUMMO  - P MATRIX MONTH INCREMENT.                                 NUDA1110
C     NUMYR  - P MATRIX YEAR INCREMENT.                                  NUDA1120
      END                                                                NUDA1130
```

```
      SUBROUTINE POSFWD(IDTAPE,KTYPE,NAMEX,NLX,LABELX)                  POSF 010
C                                                                       POSF 020
C                        THIS POSITION FORWARD SUBROUTINE WILL READ THE POSF 030
C                        LABEL OF THE SECOND S OR THE FIRST P DEPENDING POSF 040
C                        ON THE KTYPE INPUT VALUE. FOR AN S CALL THE    POSF 050
C                        INPUT IS EXPECTED TO BE GENDSP OUTPUT.         POSF 060
C                                                                       POSF 070
      DIMENSION NAMEX(6),LABELX(1)                                      POSF 080
C                        SET NUMBER OF S'S COUNTER.                     POSF 090
      NS=1                                                              POSF 100
C                        READ TYPE WORD ONLY FROM NEXT RECORD OF IDTAPE. POSF 110
   10 READ(IDTAPE)MTYPE                                                 POSF 120
C                        IS TYPE READ EQUAL TYPE REQUESTED?             POSF 130
      IF(MTYPE.NE.KTYPE) GO TO 10                                       POSF 140
C                        YES                                            POSF 150
C                        IS THIS A P MATRIX LABEL?                      POSF 160
      IF(MTYPE.EQ.3) GO TO 20                                           POSF 170
C                        NO                                             POSF 180
C                        IS S COUNTER EQUAL 2?                          POSF 190
      IF(NS.EQ.2)    GO TO 20                                           POSF 200
C                        NO                                             POSF 210
C                        ADD 1 TO S COUNTER.                            POSF 220
      NS=2                                                              POSF 230
      GO TO 10                                                          POSF 240
C                        YES                                            POSF 250
C                        FILE LOCATED.                                  POSF 260
C                        BACKSPACE IDTAPE.                              POSF 270
   20 BACKSPACE IDTAPE                                                  POSF 280
C                        READ ENTIRE LABEL RECORD.                      POSF 290
      READ(IDTAPE)MTYPE,NAMEX,NLX,(LABELX(I),I=1,NLX)                   POSF 300
C                        RETURN                                         POSF 310
      RETURN                                                            POSF 320
C                                                                       POSF 330
C                        REFERENCE LIST.                                POSF 340
C                        SUBROUTINE ARGUMENTS.                          POSF 350
C                                                                       POSF 360
C     IDTAPE - THE INPUT UNIT NUMBER.                  INPUT ARGUMENT.POSF 370
C     KTYPE  - THE ARRAY TYPE TO BE POSITIONED TO.     INPUT ARGUMENT.POSF 380
C     NAMEX  - THE NAME OF THE ARRAY.                  VALUE RETURNED.POSF 390
C     NLX    - THE NUMBER OF WORDS IN THE LABEL.       VALUE RETURNED.POSF 400
C     LABELX - THE LABEL OF THE ARRAY.                 VALUE RETURNED.POSF 410
      END                                                               POSF 420
```

```
      SUBROUTINE POSINP(IDTAPE,KTYPE,KFILE,NL,LABEL)                    POSI0010
C                                                                       POSI0020
C                         POSINP                                        POSI0030
C                         THIS ROUTINE WILL POSITION AN INPUT TAPE(WRITTENPOSI0040
C                         IN THE FLOW MODEL FORMAT) TO THE FILE NAMED   POSI0050
C                         KFILE. THE FILE TYPE AND LABEL INFORMATION WILL POSI0060
C                         BE RETURNED FOR POSSIBLE USE BY THE CALLING   POSI0070
C                         ROUTINE. THE TAPE WILL BE IN POSITION FOR A READPOSI0080
C                         OF THE FIRST DATA RECORD.                     POSI0090
C                                                                       POSI0100
C                         THIS ROUTINE WILL POSITION FROM THE RECORD READYPOSI0110
C                         TO BE READ AT THE TIME THE ROUTINE IS CALLED. POSI0120
C                         THERE WILL BE A TAPE REWIND ONLY WHEN A TYPE 40 POSI0130
C                         RECORD IS READ. THIS PROCEDURE WILL AVOID     POSI0140
C                         EXCESSIVE REWINDS WHEN SEQUENTIAL ARRAYS ARE  POSI0150
C                         BEING USED IN SUCH A WAY AS TO REQUIRE POSINP POSI0160
C                         CALLS TO LOCATE THEM BY NAME.                 POSI0170
C                                                                       POSI0180
      DIMENSION KFILE(6),NFILE(6),LABEL(1)                              POSI0190
C                         SET NUMBER OF FILES ON TAPE AND NUMBER OF FILES POSI0200
C                         READ TO ZERO.                                 POSI0210
      NFILES=0                                                          POSI0220
      KNT=0                                                             POSI0230
C                         HAS NFILES BEEN READ FROM TYPE 40 RECORD?     POSI0240
    5 IF(NFILES.EQ.0) GO TO 10                                          POSI0250
C                         YES                                           POSI0260
C                         HAVE ALL FILES BEEN READ IN THIS CALL OF THE  POSI0270
C                         POSITION INPUT OPERATION.                     POSI0280
    8 IF(KNT.GE.NFILES) GO TO 60                                        POSI0290
C                         NO                                            POSI0300
C                         ALL FILES HAVE NOT BEEN READ.                 POSI0310
C                         READ A LABEL RECORD.                          POSI0320
   10 READ(IDTAPE,END=40,ERR=50)KTYPE,NFILE,NL,(LABEL(I),I=1,NL)        POSI0330
C                         ADD 1 TO NUMBER OF FILES READ.                POSI0340
      KNT=KNT+1                                                         POSI0350
C                         IS THIS A TYPE 40 RECORD?                     POSI0360
      IF(KTYPE.EQ.40) GO TO 70                                          POSI0370
C                         NO                                            POSI0380
C                                                                       POSI0390
C                         IS THIS THE FILE REQUESTED...                 POSI0400
      DO 20 K=1,6                                                       POSI0410
      IF(NFILE(K).NE.KFILE(K)) GO TO 30                                 POSI0420
   20 CONTINUE                                                          POSI0430
C                         YES.                                          POSI0440
C                         RETURN                                        POSI0450
      RETURN                                                            POSI0460
C                                                                       POSI0470
C                         NO.                                           POSI0480
C                         THIS IS NOT THE FILE REQUESTED.               POSI0490
C                         PASS DATA RECORDS FOR THIS FILE.              POSI0500
C                         READ TYPE FIELD ONLY FROM A RECORD.           POSI0510
   30 READ(IDTAPE,END=40,ERR=50)KTYPE                                   POSI0520
C                         IS TYPE CODE AN ARRAY END CODE?               POSI0530
C                         YES. GO TO CHECK NUMBER OF FILES READ.        POSI0540
      IF(KTYPE.GT.23) GO TO 5                                           POSI0550
C                         NO                                            POSI0560
```

```
      GO TO 30                                                          POSI0570
C                         END BRANCH ON READ.                           POSI0580
C                         PRINT MESSAGE.                                POSI0590
   40 PRINT 41,IDTAPE,KFILE                                             POSI0600
   41 FORMAT(46H TAPE MARK READ BY POSINP FOR TAPE AND FILE = ,I4,4X,6A4POSI0610
     1)                                                                 POSI0620
C                         EXIT                                          POSI0630
      STOP                                                              POSI0640
C                         ERR BRANCH ON READ.                           POSI0650
C                         PRINT MESSAGE.                                POSI0660
   50 PRINT 51,IDTAPE,KFILE                                             POSI0670
   51 FORMAT(42H ERROR READ BY POSINP FOR TAPE AND FILE = ,I4,4X,6A4)   POSI0680
C                         EXIT                                          POSI0690
      STOP                                                              POSI0700
C                         YES                                           POSI0710
C                         ALL FILES ON THIS TAPE HAVE BEEN READ.        POSI0720
C                         PRINT MESSAGE: REQUESTED FILE IS NOT ON THIS  POSI0730
C                         TAPE.                                         POSI0740
   60 PRINT 61,KFILE,IDTAPE                                             POSI0750
   61 FORMAT( 6H FILE ,6A4,13H NOT ON TAPE ,I4)                         POSI0760
C                         EXIT                                          POSI0770
      STOP                                                              POSI0780
C                         TYPE 40 RECORD WAS JUST READ.                 POSI0790
C                         SAVE FILE COUNT FROM TYPE 40 RECORD.          POSI0800
   70 NFILES=LABEL(1)                                                   POSI0810
C                         REWIND IDTAPE.                                POSI0820
      REWIND IDTAPE                                                     POSI0830
      GO TO 8                                                           POSI0840
C                                                                       POSI0850
C                         REFERENCE LIST.                               POSI0860
C                         SUBROUTINE ARGUMENTS.                         POSI0870
C                                                                       POSI0880
C     IDTAPE - THE INPUT UNIT NUMBER.                   INPUT ARGUMENT.POSI0890
C     KTYPE  - THE TYPE OF ARRAY POSITIONED TO.         VALUE RETURNED.POSI0900
C     KFILE  - THE ARRAY NAME TO BE POSITIONED TO.      INPUT ARGUMENT.POSI0910
C     NL     - THE NUMBER OF WORDS IN THE LABEL.                       POSI0920
C     LABEL  - THE LABEL OF THE ARRAY.                  VALUE RETURNED.POSI0930
C                                                                       POSI0940
C                         OTHER VARIABLES.                              POSI0950
C                                                                       POSI0960
C     NFILES - NUMBER OF FILES ON TAPE. TO BE READ FROM TYPE 40 RECORD. POSI0970
C              VALUE WILL BE ZERO IF TYPE 40 RECORD HAS NOT BEEN READ.  POSI0980
C     KNT    - NUMBER OF FILES READ                                    POSI0990
C     NFILE  - NAME OF ARRAY JUST READ.                                POSI1000
      END                                                               POSI1010
```

```
      SUBROUTINE PRINTD (NFILE,NL,LABEL,ISN,ISVEC,IDTAPE,KSW)           PRNTD010
C                                                                       PRNTD020
C                        CALLED BY SUBROUTINE READSP.                   PRNTD030
C                                                                       PRNTD040
C                        THIS IS THE STANDARD 'PRINTD' SUBROUTINE WHICH PRNTD050
C                        WILL BE FOUND IN THE 'FLOMOD' LIBRARY. IT WILL PRNTD060
C                        (1) READ THE D MATRIX DATA RECORDS,            PRNTD070
C                        (2) READ THE D MATRIX END LABEL, AND           PRNTD080
C                        (3) RETURN TO THE READSP SUBROUTINE.           PRNTD090
C                                                                       PRNTD100
C                        IN ORDER TO PRINT THE D MATRICES FOR A GIVEN   PRNTD110
C                        MODEL IN ONE OR MORE SPECIFIC FORMATS, A'PRINTD'PRNTD120
C                        SUBROUTINE FOR THAT MODEL MUST BE WRITTEN. THIS PRNTD130
C                        NON-STANDARD 'PRINTD' SUBROUTINE MUST DUPLICATE PRNTD140
C                        ALL STATEMENTS IN THE STANDARD SUBROUTINE. THE PRNTD150
C                        'CONTINUE' STATEMENTS INDICATE THE POSITIONS IN PRNTD160
C                        THE PROGRAM WHERE THE STATEMENTS REQUIRED TO   PRNTD170
C                        PRODUCE THE DESIRED PRINTED OUTPUT MUST BE     PRNTD180
C                        INSERTED.                                      PRNTD190
C                                                                       PRNTD200
C                        DO NOT REPLACE THE STANDARD 'PRINTD' SUBROUTINE PRNTD210
C                        IN THE 'FLOMOD' LIBRARY. USE THE CARD DECK OR A PRNTD220
C                        PRIVATE LIBRARY FOR THE SPECIAL 'PRINTD'       PRNTD230
C                        SUBROUTINE.                                    PRNTD240
C                                                                       PRNTD250
      IMPLICIT REAL*8(A-H,O-Z,$)                                        PRNTD260
      DIMENSION ISN(1),ISVEC(1),LABEL(1),NFILE(6)                       PRNTD270
C                        PLACE HEADING PRINT INSTRUCTIONS HERE.        *PRNTD280
      CONTINUE                                                          PRNTD290
C                                                                      *PRNTD300
C                        READ A D MATRIX RECORD.                        PRNTD310
   10 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT) PRNTD320
C                        WAS THIS THE D MATRIX END LABEL.               PRNTD330
      IF(KTYPE.GT.30) GO TO 20                                          PRNTD340
C                        RECORD JUST READ WAS A DATA RECORD.            PRNTD350
C                        PLACE PRINT INSTRUCTIONS HERE FOR A ROW OF THE *PRNTD360
C                        MATRIX.                                       *PRNTD370
      CONTINUE                                                          PRNTD380
C                                                                      *PRNTD390
C                        GO TO READ THE NEXT RECORD.                    PRNTD400
      GO TO 10                                                          PRNTD410
C                        RECORD JUST READ WAS THE D MATRIX END LABEL.   PRNTD420
   20 CONTINUE                                                          PRNTD430
C                        PLACE ANY END OF ARRAY PRINT INSTRUCTIONS HERE.*PRNTD440
      CONTINUE                                                          PRNTD450
C                                                                      *PRNTD460
C                        RETURN                                         PRNTD470
      RETURN                                                            PRNTD480
C                                                                       PRNTD490
C                        REFERENCE LIST.                                PRNTD500
C                        SUBROUTINE ARGUMENTS.                          PRNTD510
C                                                                       PRNTD520
C     NFILE  - AN ARRAY FOR THE NAME OF THE D MATRIX.                   PRNTD530
C     NL     - THE NUMBER OF INT*4 WORDS IN THE LABEL.                  PRNTD540
C     LABEL  - AN ARRAY FOR THE LABEL OF THE D MATRIX.                  PRNTD550
C     ISN    - THE ARRAY FOR THE LIST OF NON-ZERO COLUMNS IN A D MATRIX PRNTD560
```

```
C               ROW.                                                    PRNTD570
C     ISVEC  - THE ARRAY FOR THE NON-ZERO ELEMENTS IN A D MATRIX ROW.   PRNTD580
C     IDTAPE - THE UNIT FROM WHICH THE D MATRIX IS TO BE READ.          PRNTD590
C     KSW    - A PRINT OPTION SWITCH INCLUDED IN THE READSP CONTROL CARDPRNTD600
C              IT IS USED TO SPECIFY A PRINT OPTION WITHIN A NON-       PRNTD610
C              STANDARD 'PRINTD' SUBROUTINE.                            PRNTD620
C                                                                       PRNTD630
      END                                                               PRNTD640
```

```
      SUBROUTINE PRINTP (NFILE,NL,LABEL,ISN,P,IDTAPE,KSW)                PRNTP010
C                                                                        PRNTP020
C                        CALLED BY SUBROUTINE READSP.                   PRNTP030
C                                                                        PRNTP040
C                        THIS IS THE STANDARD 'PRINTP' SUBROUTINE WHICH  PRNTP050
C                        WILL BE FOUND IN THE 'FLOMOD' LIBRARY. IT WILL  PRNTP060
C                        (1) READ THE P MATRIX LIST OF ROWS PRESENT,     PRNTP070
C                        (2) READ THE P MATRIX LIST OF COLUMNS PRESENT,  PRNTP080
C                        (3) READ THE P MATRIX DATA RECORDS,             PRNTP090
C                        (4) READ THE P MATRIX END LABEL, AND            PRNTP100
C                        (5) RETURN TO THE READSP SUBROUTINE.            PRNTP110
C                                                                        PRNTP120
C                        IN ORDER TO PRINT THE P MATRICES FOR A GIVEN    PRNTP130
C                        MODEL IN ONE OR MORE SPECIFIC FORMATS, A'PRINTP'PRNTP140
C                        SUBROUTINE FOR THAT MODEL MUST BE WRITTEN. THIS PRNTP150
C                        NON-STANDARD 'PRINTP' SUBROUTINE MUST DUPLICATE PRNTP160
C                        ALL STATEMENTS IN THE STANDARD SUBROUTINE. THE  PRNTP170
C                        'CONTINUE' STATEMENTS INDICATE THE POSITIONS IN PRNTP180
C                        THE PROGRAM WHERE THE STATEMENTS REQUIRED TO    PRNTP190
C                        PRODUCE THE DESIRED PRINTED OUTPUT MUST BE      PRNTP200
C                        INSERTED.                                       PRNTP210
C                                                                        PRNTP220
C                        DO NOT REPLACE THE STANDARD 'PRINTP' SUBROUTINE PRNTP230
C                        IN THE 'FLOMOD' LIBRARY. USE THE CARD DECK OR A PRNTP240
C                        PRIVATE LIBRARY FOR THE SPECIAL 'PRINTP'        PRNTP250
C                        SUBROUTINE.                                     PRNTP260
C                                                                        PRNTP270
      IMPLICIT REAL*8(A-H,O-Z,$)                                         PRNTP280
      DIMENSION ISN(1),P(1),LABEL(1),NFILE(6)                            PRNTP290
C                        READ THE P MATRIX LIST OF ROWS PRESENT RECORD.  PRNTP300
      READ(IDTAPE)KTYPE,ICNT,(ISN(I),I=1,ICNT),MODSW,MODFAC              PRNTP310
C                        PLACE HEADING / ROW LIST PRINT STATEMENTS HERE.*PRNTP320
      CONTINUE                                                           PRNTP330
C                                                                       *PRNTP340
C                        READ THE P MATRIX LIST OF COLUMNS PRESENT RECORDPRNTP350
      READ(IDTAPE)KTYPE,ICNT,(ISN(I),I=1,ICNT),NUMMO,NUMYR               PRNTP360
C                        PLACE COLUMN LIST PRINT STATEMENTS HERE.       *PRNTP370
      CONTINUE                                                           PRNTP380
C                                                                       *PRNTP390
C                        READ A P MATRIX RECORD.                        PRNTP400
   10 READ(IDTAPE)KTYPE,IROW,ICNT,(ISN(I),I=1,ICNT),(P(I),I=1,ICNT)      PRNTP410
C                        WAS THIS THE P MATRIX END LABEL.               PRNTP420
      IF(KTYPE.GT.30) GO TO 20                                           PRNTP430
C                        RECORD JUST READ WAS A DATA RECORD.            PRNTP440
C                        PLACE PRINT INSTRUCTIONS HERE FOR A ROW OF THE *PRNTP450
C                        MATRIX.                                        *PRNTP460
      CONTINUE                                                           PRNTP470
C                                                                       *PRNTP480
C                        GO TO READ THE NEXT RECORD.                    PRNTP490
      GO TO 10                                                           PRNTP500
C                        RECORD JUST READ WAS THE P MATRIX END LABEL.   PRNTP510
   20 CONTINUE                                                           PRNTP520
C                        PLACE ANY END OF ARRAY PRINT INSTRUCTIONS HERE.*PRNTP530
      CONTINUE                                                           PRNTP540
C                                                                       *PRNTP550
C                        RETURN                                         PRNTP560
```

```
      RETURN                                                            PRNTP570
C                                                                       PRNTP580
C                        SUBROUTINE ARGUMENTS.                          PRNTP590
C                        ARGUMENT LIST.                                 PRNTP600
C                                                                       PRNTP610
C     NFILE  - AN ARRAY FOR THE NAME OF THE P MATRIX.                   PRNTP620
C     NL     - THE NUMBER OF INT*4 WORDS IN THE LABEL.                  PRNTP630
C     LABEL  - AN ARRAY FOR THE LABEL OF THE P MATRIX.                  PRNTP640
C     ISN    - THE ARRAY FOR THE LIST OF NON-ZERO COLUMNS IN A P MATRIX PRNTP650
C              ROW.                                                     PRNTP660
C     P      - REAL*8 ARRAY FOR THE NON-ZERO ELEMENTS IN A P MATRIX ROW.PRNTP670
C     IDTAPE - THE UNIT FROM WHICH THE P MATRIX IS TO BE READ.          PRNTP680
C     KSW    - A PRINT OPTION SWITCH INCLUDED IN THE READSP CONTROL CARDPRNTP690
C              IT IS USED TO SPECIFY A PRINT OPTION WITHIN A NON-       PRNTP700
C              STANDARD 'PRINTP' SUBROUTINE.                            PRNTP710
C                                                                       PRNTP720
      END                                                               PRNTP730
```

```
      SUBROUTINE PRINTS (NFILE,NL,LABEL,ISN,ISVEC,IDTAPE,KSW)
C
C                        CALLED BY SUBROUTINE READSP.
C
C                        THIS IS THE STANDARD'PRINTS'SUBROUTINE WHICH
C                        WILL BE FOUND IN THE'FLOMOD'LIBRARY. IT WILL
C                        (1) READ THE S VECTOR DATA RECORD,
C                        (2) READ THE S VECTOR END LABEL, AND
C                        (3) RETURN TO THE READSP SUBROUTINE.
C
C                        IN ORDER TO PRINT THE S VECTORS FOR A GIVEN
C                        MODEL IN ONE OR MORE SPECIFIC FORMATS, A'PRINTS'
C                        SUBROUTINE FOR THAT MODEL MUST BE WRITTEN. THIS
C                        NON-STANDARD 'PRINTS' SUBROUTINE MUST DUPLICATE
C                        ALL STATEMENTS IN THE STANDARD SUBROUTINE. THE
C                        'CONTINUE' STATEMENT INDICATES THE POSITION IN
C                        THE PROGRAM WHERE THE STATEMENTS REQUIRED TO
C                        PRODUCE THE DESIRED PRINTED OUTPUT MUST BE
C                        INSERTED.
C
C                        DO NOT REPLACE THE STANDARD 'PRINTS' SUBROUTINE
C                        IN THE 'FLOMOD' LIBRARY. USE THE CARD DECK OR A
C                        PRIVATE LIBRARY FOR THE SPECIAL 'PRINTS'
C                        SUBROUTINE.
C
      IMPLICIT REAL*8(A-H,O-Z,$)
      DIMENSION ISN(1),ISVEC(1),LABEL(1),NFILE(6)
C                        READ S DATA RECORD
      READ(IDTAPE)KTYPE,NFILL,ICNT,(ISN(I),I=1,ICNT),(ISVEC(I),I=1,ICNT)
C                        READ S END LABEL
      READ(IDTAPE)KTYPE,NFILL,NFILL,ISUM,NFILL
C                        PLACE PRINT INSTRUCTIONS HERE.
      CONTINUE
C
C                        RETURN
      RETURN
C
C                        REFERENCE LIST.
C                        SUBROUTINE ARGUMENTS.
C
C     NFILE  - AN ARRAY FOR THE NAME OF THE S VECTOR.
C     NL     - THE NUMBER OF INT*4 WORDS IN THE LABEL.
C     LABEL  - AN ARRAY FOR THE LABEL OF THE S VECTOR.
C     ISN    - THE ARRAY FOR THE LIST OF STATES IN THE S VECTOR.
C     ISVEC  - THE ARRAY FOR THE ELEMENTS IN THE S VECTOR.
C     IDTAPE - THE UNIT FROM WHICH THE S VECTOR IS TO BE READ.
C     KSW    - THIS IS A PRINT OPTION SWITCH INCLUDED IN THE READSP
C              CONTROL CARD. IT IS USED TO SPECIFY A PRINT OPTION WITHIN
C              A NON-STANDARD 'PRINTS' SUBROUTINE.
C
      END
```

```
      SUBROUTINE READIN(IDTAPE,IDENT,IROW,ICOL,KOUNT,INPSW)              RDIN 010
C                                                                        RDIN 020
C                       THIS ROUTINE WILL READ STATE NUMBER PAIRS IN THERDIN 030
C                       STANDARD FORMAT.                                 RDIN 040
C                       IF THE SOURCE DATA EXISTS IN A DIFFERENT FORMAT,RDIN 050
C                       A SPECIAL READIN SUBROUTINE MAY BE WRITTEN. DO  RDIN 060
C                       NOT REPLACE THE STANDARD READIN SUBROUTINE IN   RDIN 070
C                       THE 'FLOMOD' LIBRARY. USE THE CARD DECK OR A    RDIN 080
C                       PRIVATE LIBRARY FOR THE SPECIAL READIN          RDIN 090
C                       SUBROUTINE.                                     RDIN 100
C                       INPSW HAS BEEN SET TO ZERO IN GENDSP.           RDIN 110
C                                                                       RDIN 120
      READ(IDTAPE,   END=20)IDENT,IROW,ICOL,KOUNT                        RDIN 130
      RETURN                                                             RDIN 140
C                       EOF READ ON INPUT TAPE.                         RDIN 150
   20 INPSW=1                                                            RDIN 160
      RETURN                                                             RDIN 170
C                                                                        RDIN 180
C                       REFERENCE LIST.                                 RDIN 190
C                       SUBROUTINE ARGUMENTS.                           RDIN 200
C                                                                       RDIN 210
C     IDTAPE - INPUT ARGUMENT. FORTRAN UNIT NUMBER WHERE STATE PAIR     RDIN 220
C              RECORDS ARE LOCATED.                                     RDIN 230
C     IDENT  - PAIR MODEL NUMBER. THIS VALUE IS RETURNED.               RDIN 240
C     IROW   - ROW NUMBER OF STATE NUMBER PAIR. THIS VALUE IS RETURNED. RDIN 250
C     ICOL   - COL NUMBER OF STATE NUMBER PAIR. THIS VALUE IS RETURNED. RDIN 260
C     KOUNT  - FREQUENCY FOR STATE NUMBER PAIR. THIS VALUE IS RETURNED. RDIN 270
C     INPSW  - INPUT VALUE WILL BE ZERO. IF A DATA RECORD IS READ, THE  RDIN 280
C              OUTPUT VALUE WILL BE ZERO. IF AN END OF FILE CONDITION   RDIN 290
C              OCCURS ON THE INPUT UNIT, THE VALUE RETURNED WILL BE ONE.RDIN 300
      END                                                                RDIN 310
```

```
      SUBROUTINE READSP(ISN,ISVEC,P,LABEL)                              RDSP0010
C                                                                       RDSP0020
C                       CALLS POSINP, PRINTD, PRINTS, PRINTP            RDSP0030
C                                                                       RDSP0040
C                       THIS IS A GENERAL PURPOSE D-S-P READ ROUTINE.   RDSP0050
C                       THIS ROUTINE WILL BE CALLED WHEN SPECIAL PURPOSERDSP0060
C                       PRINTS FOR A GIVEN MODEL ARE REQUIRED.          RDSP0070
C                                                                       RDSP0080
C                       ONE CONTROL CARD IS REQUIRED FOR EACH SET OF    RDSP0090
C                       CONSECUTIVE ARRAYS-ON AN INPUT UNIT-THAT ARE TO RDSP0100
C                       BE PRINTED.                                     RDSP0110
C                       A BLANK CONTROL CARD IS USED TO RETURN CONTROL  RDSP0120
C                       TO THE CALLING PROGRAM.                         RDSP0130
C                       THE CONTROL CARD FIELDS ARE                     RDSP0140
C                       IDTAPE - COL 1-6 (I6) FORTRAN INPUT UNIT NUMBER.RDSP0150
C                       NFILE  - COL 7-30 (6A4) ARRAY NAME OF FIRST OF  RDSP0160
C                                'NUMVC' FILES TO BE PRINTED UNDER      RDSP0170
C                                CONTROL OF THIS CARD.                  RDSP0180
C                       NUMVC  - COL 31-36 (I6)                         RDSP0190
C                                +N = THE NUMBER OF CONSECUTIVE ARRAYS  RDSP0200
C                                     TO BE PRINTED FROM 'IDTAPE'       RDSP0210
C                                     STARTING WITH ARRAY 'NFILE'.      RDSP0220
C                                 0 = PRINT OPERATION COMPLETED. RETURN.RDSP0230
C                                -1 = PRINT ALL ARRAYS ON THE TAPE.     RDSP0240
C                       KSW    - 1,2,...,N  USED IN PRINTD, PRINTS,     RDSP0250
C                                PRINTP IF MULTI-PRINT OPTIONS ARE      RDSP0260
C                                PROVIDED.                              RDSP0270
C                                                                       RDSP0280
      IMPLICIT REAL*8(A-H,O-Z,$)                                        RDSP0290
      DIMENSION ISN(1),ISVEC(1),P(1),LABEL(1),NFILE(6)                  RDSP0300
C                       READ FIRST PRINT CONTROL CARD.                  RDSP0310
      READ 11,IDTAPE,NFILE,NUMVC,KSW                                    RDSP0320
C                       SAVE INPUT UNIT NUMBER.                         RDSP0330
      IDTAPX=IDTAPE                                                     RDSP0340
C                       REWIND IDTAPE.                                  RDSP0350
      REWIND IDTAPE                                                     RDSP0360
      GO TO 12                                                          RDSP0370
C                       READ FOR ALL ADDITIONAL CONTROL CARDS.          RDSP0380
   10 READ 11,IDTAPE,NFILE,NUMVC,KSW                                    RDSP0390
   11 FORMAT(I6,6A4,2I6)                                                RDSP0400
C                       HAVE ALL PRINT CARDS BEEN PROCESSED?            RDSP0410
C                       IF CARD IS BLANK, PRINT OPERATION IS COMPLETE.  RDSP0420
   12 IF(NUMVC.EQ.0) GO TO 500                                          RDSP0430
C                       NO                                              RDSP0440
C                       IS TAPE FOR CURRENT CONTROL CARD A DIFFERENT    RDSP0450
C                       TAPE FROM ONE IN PREVIOUS CONTROL CARD?         RDSP0460
      IF(IDTAPX.NE.IDTAPE) GO TO 13                                     RDSP0470
C                       NO                                              RDSP0480
C                       IS POSITIONING TO A NAMED FILE ON IDTAPE RE-    RDSP0490
C                       QUIRED?                                         RDSP0500
      IF(NUMVC.NE.(-1)) GO TO 14                                        RDSP0510
C                       NO                                              RDSP0520
C                       ALL FILES ON THE INPUT TAPE WILL BE PROCESSED.  RDSP0530
C                       REWIND IDTAPE                                   RDSP0540
      REWIND IDTAPE                                                     RDSP0550
C                       GO TO READ FIRST LABEL.                         RDSP0560
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      GO TO 410                                                         RDSP0570
C                          13                                           RDSP0580
C                          YES - THERE WAS AN INPUT UNIT CHANGE.        RDSP0590
C                          REWIND PREVIOUS INPUT UNIT.                  RDSP0600
   13 REWIND IDTAPX                                                     RDSP0610
C                          SAVE CURRENT INPUT UNIT NUMBER.              RDSP0620
      IDTAPX=IDTAPE                                                     RDSP0630
C                          REWIND CURRENT INPUT UNIT.                   RDSP0640
      REWIND IDTAPE                                                     RDSP0650
C                          ARE ALL FILES ON THIS TAPE TO BE COPIED?     RDSP0660
C                          YES. GO TO READ FIRST LABEL.                 RDSP0670
      IF(NUMVC.EQ.(-1)) GO TO 410                                       RDSP0680
C                          NO                                           RDSP0690
C                          CALL POSINP TO LOCATE ARRAY NFILE ON UNIT    RDSP0700
C                          IDTAPE.                                      RDSP0710
C                          IDTAPE,NFILE ARE INPUT ARGUMENTS.            RDSP0720
C                          NL,LABEL,KTYPE ARE RETURNED.                 RDSP0730
   14 CALL POSINP(IDTAPE,KTYPE,NFILE,NL,LABEL)                          RDSP0740
C                          USE KTYPE FROM FILE LABEL TO BRANCH TO D, S, OR RDSP0750
C                          P PRINT.                                     RDSP0760
   15 GO TO (100,200,300),KTYPE                                         RDSP0770
C                          100                                          RDSP0780
C                          D                                            RDSP0790
  100 CONTINUE                                                          RDSP0800
C                          CALL PRINTD                                  RDSP0810
      CALL PRINTD(NFILE,NL,LABEL,ISN,ISVEC,IDTAPE,KSW)                  RDSP0820
      GO TO 400                                                         RDSP0830
C                                                                       RDSP0840
C                          200                                          RDSP0850
C                          S                                            RDSP0860
  200 CONTINUE                                                          RDSP0870
C                          CALL PRINTS                                  RDSP0880
      CALL PRINTS(NFILE,NL,LABEL,ISN,ISVEC,IDTAPE,KSW)                  RDSP0890
      GO TO 400                                                         RDSP0900
C                                                                       RDSP0910
C                          300                                          RDSP0920
C                          P                                            RDSP0930
  300 CONTINUE                                                          RDSP0940
C                          CALL PRINTP                                  RDSP0950
      CALL PRINTP(NFILE,NL,LABEL,ISN,P     ,IDTAPE,KSW)                 RDSP0960
      GO TO 400                                                         RDSP0970
C                          END OF ARRAY                                 RDSP0980
C                          DECREASE NUMBER OF ARRAYS TO BE PROCESSED BY RDSP0990
C                          ONE.                                         RDSP1000
  400 NUMVC=NUMVC-1                                                     RDSP1010
C                          HAVE ALL ARRAYS BEEN PRINTED?                RDSP1020
C                          YES. READ NEXT CONTROL CARD.                 RDSP1030
      IF(NUMVC.EQ.0) GO TO 10                                           RDSP1040
C                          NO                                           RDSP1050
C                          READ NEXT LABEL FROM IDTAPE.                 RDSP1060
  410 READ(IDTAPE)KTYPE,NFILE,NL,(LABEL(I),I=1,NL)                      RDSP1070
C                          IS THIS A D,S, OR P BEGINNING LABEL?         RDSP1080
C                          YES. GO TO BRANCH ON ARRAY TYPE.             RDSP1090
      IF(KTYPE.NE.40) GO TO 15                                          RDSP1100
C                          NO                                           RDSP1110
C                          THIS IS A TYPE 40 RECORD. THIS MEANS ALL FILES RDSP1120
C                          FOR THIS CARD HAVE BEEN PROCESSED. A TYPE 40 RDSP1130
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C                       RECORD IS A FLOMOD END OF FILE RECORD.          RDSP1140
C                       REWIND IDTAPE.                                  RDSP1150
  430 REWIND IDTAPF                                                     RDSP1160
C                       GO TO READ NEXT CONTROL CARD.                   RDSP1170
      GO TO 10                                                          RDSP1180
C                       500                                             RDSP1190
C                       YES                                             RDSP1200
C                       ALL PRINT CARDS PROCESSED.                      RDSP1210
C                       REWIND IDTAPE - LAST TAPE PRINTED FROM.         RDSP1220
  500 REWIND IDTAPX                                                     RDSP1230
C                       SKIP TO NEW PAGE ON PRINTER.                    RDSP1240
      PRINT 510                                                         RDSP1250
  510 FORMAT(1H1)                                                       RDSP1260
C                       RETURN                                          RDSP1270
      RETURN                                                            RDSP1280
C                                                                       RDSP1290
C                       REFERENCE LIST.                                 RDSP1300
C                       SUBROUTINE ARGUMENTS.                           RDSP1310
C                                                                       RDSP1320
C     ISN     - ARRAY FOR COLUMN NUMBERS IN A D ROW, ELEMENT NUMBERS IN RDSP1330
C               AN S VECTOR, P MATRIX ROW LIST, P MATRIX COLUMN LIST AND RDSP1340
C               COLUMN NUMBERS IN A P ROW.                              RDSP1350
C     ISVEC   - ARRAY FOR COLUMN VALUES IN A D ROW - OR - ELEMENT VALUES RDSP1360
C               IN AN S VECTOR.                                         RDSP1370
C     P       - ARRAY FOR COLUMN VALUES IN A P ROW.                     RDSP1380
C     LABEL   - ARRAY FOR D, S, AND P LABELS.                           RDSP1390
C                                                                       RDSP1400
      END                                                               RDSP1410
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      SUBROUTINE SELPAT                                                 SELP0010
     1           (IFROM,ITO,ICURR,MULT,NVCODE,                          SELP0020
     2            KSEL,KSELX,NI,NJ,                                     SELP0030
     3            KS)                                                   SELP0040
C                       SELPAT                                          SELP0050
C                       THIS SUBROUTINE WILL SELECT SPECIFIED PATTERNS  SELP0060
C                       FROM A STATE PATTERN DISTRIBUTION TAPE AND WRITESELP0070
C                       THE SELECTED PATTERNS ON AN OUTPUT TAPE.        SELP0080
C                       THE PATTERNS NOT SELECTED WILL BE WRITTEN ON A  SELP0090
C                       SEPARATE OUTPUT TAPE IF THIS OPTION IS SPECIFIEDSELP0100
C                                                                       SELP0110
      DIMENSION IFROM(1),ITO(1),ICURR(1),MULT(1),KSEL(1),KS(1)          SELP0120
     1          ,NVCODE(1)                                              SELP0130
      DIMENSION KSELX(NI,NJ)                                            SELP0140
C                       READ OUTPUT UNIT ID. KOUT1 FOR SELECTED PATTERNSSELP0150
C                       KOUT2 FOR PATTERNS NOT SELECTED.                SELP0160
      READ 10,KOUT1,KOUT2                                               SELP0170
C                       REWIND KOUT 1.                                  SELP0180
      REWIND KOUT1                                                      SELP0190
C                       IF PATTERNS NOT SELECTED ARE TO BE WRITTEN, RE- SELP0200
C                       WIND KOUT 2.                                    SELP0210
      IF(KOUT2.NE.0) REWIND KOUT2                                       SELP0220
C                       SET KRDSW2 TO INDICATE THERE IS NO PATTERN SEL- SELP0230
C                       ECTION DATA IN CORE.                            SELP0240
      KRDSW2=1                                                          SELP0250
C                       READ ID OF INPUT UNIT, INITIAL MODEL NO, MODEL  SELP0260
C                       NUMBER INCREMENTS FOR OUTPUT, NUMBER OF MODELS  SELP0270
C                       TO BE PROCESSED, LOCATION OF SELECTION DATA, ANDSELP0280
C                       NS-NUMBER OF STATE NUMBERS PER PATTERN.         SELP0290
  100 READ 10,KINP,MODL1,INC1,INC2,NMOD,KRDSW1,NS                       SELP0300
C                       HAVE ALL MODELS BEEN SPECIFIED...               SELP0310
C                       YES. GO TO REWIND OUTPUT UNITS.                 SELP0320
      IF(KINP.EQ.0) GO TO 600                                           SELP0330
C                       NO.                                             SELP0340
C                       REWIND INPUT UNIT.                              SELP0350
      REWIND KINP                                                       SELP0360
C                       SET OUTPUT MODEL NUMBERS.                       SELP0370
      MOUT1=MODL1+INC1                                                  SELP0380
      MOUT2=MODL1+INC2                                                  SELP0390
C                       IS PREVIOUS PATTERN INFO TO BE USED...          SELP0400
C                       NO. GO TO READ PATTERN SELECTION DATA.          SELP0410
      IF(KRDSW1.EQ.1) GO TO 150                                         SELP0420
C                       YES.                                            SELP0430
C                       HAS A SET OF PATTERN SELECTION DATA BEEN READ   SELP0440
C                       DURING THIS SELPAT CALL?                        SELP0450
C                       YES. GO TO PROCESS INPUT TAPE.                  SELP0460
      IF(KRDSW2.EQ.2) GO TO 200                                         SELP0470
C                       NO.                                             SELP0480
C                       PRINT ERROR MESSAGE.                            SELP0490
      PRINT 90,KINP,MODL1                                               SELP0500
C                       EXIT                                            SELP0510
      STOP                                                              SELP0520
C                                                                       SELP0530
C                                                                     ****SELP0540
C                                                                        *SELP0550
C                       150                                             SELP0560
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C                       READ PATTERN SELECTION DATA.                      SELP0570
C                                                                         SELP0580
C                       READ KOPT - OPTION TYPE.                          SELP0590
C                            NTFR - FROM TIME TO BE COMPARED.             SELP0600
C                            NTTO - TO TIME TO BE COMPARED.               SELP0610
  150 READ 10,KOPT,NTFR,NTTO                                              SELP0620
C                       BRANCH ON OPTION TYPE - KOPT.                     SELP0630
      GO TO (152,156,178), KOPT                                           SELP0640
C                       152                                               SELP0650
C                       OPTION 1.                                         SELP0660
C                       READ A LIST OF SINGLE TIME STATE NUMBERS.         SELP0670
C                       READ LISTN - LENGTH OF LIST AND KSEL(1) - KSEL    SELP0680
C                       (LISTN) - LIST OF STATE NUMBERS.                  SELP0690
  152 READ 20,LISTN,(KSEL(I),I=1,LISTN)                                   SELP0700
      GO TO 190                                                           SELP0710
C                       156                                               SELP0720
C                       OPTION 2.                                         SELP0730
C                       READ A FAMILY SPECIFICATION AND GENERATE A LIST   SELP0740
C                       OF SINGLE TIME STATE NUMBERS.                     SELP0750
C                       READ NV - NUMBER OF VARIABLES AND NVCODE(1) -     SELP0760
C                       NVCODE(NV) - NUMBER OF CODES DEFINED FOR EACH     SELP0770
C                       VARIABLE.                                         SELP0780
  156 READ 20,NV,(NVCODE(I),I=1,NV)                                       SELP0790
C                       LET NVM EQUAL NUMBER VARIABLES MINUS 1 FOR LATERSELP0800
C                       INDEX USE.                                        SELP0810
      NVM=NV-1                                                            SELP0820
C                                                                         SELP0830
C                       COMPUTE MULT ARRAY FOR USE IN STATE NUMBER GEN-   SELP0840
C                       ERATION.                                          SELP0850
C                       MULT(NV)=1                                        SELP0860
C                       MULT(NV-1)=NVCODE(NV)                             SELP0870
C                       MULT(NV-2)=NVCODE(NV-1)*NVCODE(NV)                SELP0880
C                          .                                              SELP0890
C                          .                                              SELP0900
C                          .                                              SELP0910
C                       MULT(1)=NVCODE(2)*NVCODE(3)*...*NVCODE(NV).       SELP0920
C                                                                         SELP0930
      MULT(NV)=1                                                          SELP0940
      IF(NV.EQ.1) GO TO 164                                               SELP0945
      II=NV                                                               SELP0950
      DO 162 I=1,NVM                                                      SELP0960
      MULT(II-1)=MULT(II)*NVCODE(II)                                      SELP0970
  162 II=II-1                                                             SELP0980
C                       READ CODE RANGE FOR SELECTION STATES.             SELP0990
C                       READ IFROM ARRAY - FAMILY FROM VALUES FOR EACH    SELP1000
C                       VARIABLE.                                         SELP1010
  164 READ  30,(IFROM(I),I=1,NV)                                          SELP1020
C                       READ ITO ARRAY - FAMILY TO VALUES FOR EACH VAR-   SELP1030
C                       ABLE.                                             SELP1040
      READ  30,(ITO(I),I=1,NV)                                            SELP1050
C                       SET ICURR(1) - ICURR(NV-1) EQUAL IFROM VALUES.    SELP1060
      IF(NV.EQ.1) GO TO 169                                               SELP1065
      DO 168 I=1,NVM                                                      SELP1070
  168 ICURR(I)=IFROM(I)                                                   SELP1080
C                       SET ICURR(NV)=IFROM(NV) -1.                       SELP1090
  169 ICURR(NV)=IFROM(NV)-1                                               SELP1100
C                       INUMBR=NV.'DO LOOP' CURRENTLY BEING INCREMENTED.SELP1110
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C                         (SEQUENCE IS INNER TO OUTER DO).                SELP1120
      INUMBR=NV                                                           SELP1130
C                         THIS IS THE COUNTER FOR THE NUMBER OF ENTRIES INSELP1140
C                         KSEL.                                           SELP1150
      LISTN=0                                                             SELP1160
C                                                                       ***SELP1170
C                                                                         *SELP1180
C                         THIS PROGRAM SEGMENT WILL CODE STATE NUMBERS    SELP1190
C                         FROM THE RANGE INFORMATION FOR A FAMILY OF      SELP1200
C                         NUMBERS.                                        SELP1210
C                                                                         SELP1220
C                         THE CONTROL PORTION OF THIS ROUTINE IS A NEST OFSELP1230
C                         DO LOOPS WHOSE DEPTH IS DETERMINED AT EXECUTION SELP1240
C                         TIME.  DO STATEMENTS ARE NOT USED.              SELP1250
C                                                                         SELP1260
  172 NUMDO=NV                                                            SELP1270
C                         OVERALL 'DO' LOOP.                              SELP1280
C                         COMPUTE VALUE FOR LATER USE IN DO STATEMENT.    SELP1290
 1100 NM1=NUMDO-1                                                         SELP1300
C                         IS THE CURRENT INDEX OF THE VARIABLE WHOSE DO   SELP1310
C                         LOOP IS BEING INCREMENTED EQUAL THE TO INDEX FORSELP1320
C                         THIS VARIABLE?                                  SELP1330
 1120 IF(ICURR(INUMBR).EQ.ITO(INUMBR)) GO TO1200                          SELP1340
C                                 NO.                                     SELP1350
C                         ADD 1 TO CURRENT INDEX OF THIS VARIABLE.        SELP1360
      ICURR(INUMBR)=ICURR(INUMBR)+1                                       SELP1370
C                                                                         SELP1380
C                         WAS THE INDEX JUST INCREMENTED FOR THE INNERMOSTSELP1390
C                         DO...                                           SELP1400
      IF(INUMBR.EQ.NUMDO) GO TO1170                                       SELP1410
C                                 NO.                                     SELP1420
C                         FOR ALL DO'S WITHIN THE DO JUST UPDATED, RESET  SELP1430
C                         THE CURRENT INDEX VALUES TO THE FROM INDEX      SELP1440
C                         VALUES.                                         SELP1450
      NFR=INUMBR+1                                                        SELP1460
      DO1150 N=NFR,NUMDO                                                  SELP1470
 1150 ICURR(N)=IFROM(N)                                                   SELP1480
C                         INNERMOST DO WILL BE INCREMENTED NEXT.          SELP1490
      INUMBR=NUMDO                                                        SELP1500
C                         COMPUTE THE STATE NUMBER FOR THIS SET OF CURRENTSELP1510
C                         VALUES.                                         SELP1520
C                            ISN = (ICURR(1)-1)*MULT(1)                   SELP1530
C                                  +(ICURR(2)-1)*MULT(2)                  SELP1540
C                                  + ...                                  SELP1550
C                                  +(ICURR(NUMDO-1)-1)*MULT(NUMDO-1)      SELP1560
C                                  + ICURR(NUMDO)                         SELP1570
 1170 ISN=0                                                               SELP1580
      IF(NV.EQ.1) GO TO 1192                                              SELP1585
      DO1190 N=1,NM1                                                      SELP1590
 1190 ISN=ISN+(ICURR(N)-1)*MULT(N)                                        SELP1600
 1192 ISN=ISN+ICURR(NUMDO)                                                SELP1610
C                         GO TO 'DO LOOP' CONTINUE STATEMENT.             SELP1620
      GO TO 1299                                                          SELP1630
C                                                                         SELP1640
C                         YES                                             SELP1650
C                         INUMBR'TH DO LOOP CURRENT INDEX HAS REACHED THE SELP1660
C                         TO INDEX VALUE.                                 SELP1670
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C                         IS THIS THE OUTERMOST DO?                          SELP1660
 1200 IF(INUMBR.EQ.1) GO TO1220                                              SELP1690
C                               NO.                                          SELP1700
C                         MOVE OUT ONE MORE DO LOOP.                         SELP1710
      INUMBR=INUMBR-1                                                        SELP1720
      GO TO1120                                                              SELP1730
C                               YES.                                         SELP1740
C                         EXECUTION OF DO LOOP NEST COMPLETE.                SELP1750
C                         RETURN A -1 TO INDICATE NO FURTHER STATE NUMBERSSELP1760
 1220 ISN=-1                                                                 SELP1770
C                         'DO LOOP' CONTINUE STATEMENT.                      SELP1780
 1299 CONTINUE                                                               SELP1790
C                         HAVE ALL STATE NUMBERS IN THIS SPECIFICATION       SELP1800
C                         BEEN GENERATED?                                    SELP1810
      IF(ISN.EQ.(-1)) GO TO 190                                              SELP1820
C                         NO                                                 SELP1830
C                         ADD 1 TO NUMBER OF ENTRIES IN LIST.                SELP1840
      LISTN=LISTN+1                                                          SELP1850
C                         STORE NUMBER JUST GENERATED IN LIST.               SELP1860
      KSEL(LISTN)=ISN                                                        SELP1870
      GO TO 1120                                                             SELP1880
C                                                                           *SELP1890
C                                                                        ***SELP1900
C                                                                           SELP1910
C                         OPTION 3.                                          SELP1920
C                         READ A LIST OF MULTI-TIME STATE NUMBERS.           SELP1930
C                         READ LISTN - LENGTH OF LIST.                       SELP1940
  178 READ 10,LISTN                                                          SELP1950
C                         FOR LENGTH-OF-LIST TIMES, READ A SELECTION         SELP1960
C                         PATTERN INTO THE TIME PERIODS SPECIFIED.           SELP1970
      DO 180 I=1,LISTN                                                       SELP1980
  180 READ 30,(KSELX(I,J),J=NTFR,NTTO)                                       SELP1990
C                                                                            SELP2000
C                         SET KRDSW2 TO INDICATE A SET OF DATA SELECTION     SELP2010
C                         INFO IS IN CORE.                                   SELP2020
  190 KRDSW2=2                                                               SELP2030
C                         END OF READ SELECTION DATA.                        SELP2040
C                                                                           *SELP2050
C                                                                       ****SELP2060
C                                                                            SELP2070
C                         PROCESS STATE PATTERN FREQUENCY TAPE.              SELP2080
C                         INITIALIZE COUNTERS                                SELP2090
C                         NUMBER OF PATTERNS READ.                           SELP2100
  200 NINP=0                                                                 SELP2110
C                         NUMBER PATTERNS SELECTED.                          SELP2120
      NOUT1=0                                                                SELP2130
C                         NUMBER PATTERNS NOT SELECTED.                      SELP2140
      NOUT2=0                                                                SELP2150
C                         READ A STATE PATTERN RECORD.                       SELP2160
  250 READ(KINP,END=550)MODRD,(KS(I),I=1,NS),IFREQ                           SELP2170
C                         NO EOF                                             SELP2180
C                         WAS THERE A MODEL CHANGE?                          SELP2190
C                         YES. GO TO END OF MODEL PROCESSING.                SELP2200
      IF(MODL1.NE.MODRD) GO TO 500                                           SELP2210
C                         NO                                                 SELP2220
C                         ADD 1 TO INPUT COUNT.                              SELP2230
  270 NINP=NINP+1                                                            SELP2240
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C                         BRANCH ON OPTION.                                SELP2250
      IF(KOPT.EQ.3) GO TO 320                                              SELP2260
C                         OPTIONS 1 AND 2.                                 SELP2270
C                         DOES A STATE NUMBER IN ANY OF THE SPECIFIED TIMESELP2280
C                         PERIODS IN THE RECORD JUST READ MATCH AN OPTION SELP2290
C                         1 OR 2 SELECTION STATE NUMBER?                   SELP2300
C                         GO TO 450 FOR MATCH.                             SELP2310
      DO 300 J=NTFR,NTTO                                                   SELP2320
      DO 290 I=1,LISTN                                                     SELP2330
      IF(KS(J)-KSEL(I)) 300,450,290                                        SELP2340
  290 CONTINUE                                                             SELP2350
  300 CONTINUE                                                             SELP2360
C                         IF FALLS THRU COMPARE, HAVE NON-MATCH.           SELP2370
      GO TO 400                                                            SELP2380
C                                                                          SELP2390
C                         OPTION 3.                                        SELP2400
C                         DO THE STATE NUMBERS IN THE SPECIFIED TIME       SELP2410
C                         PERIODS OF THE RECORD JUST READ MATCH ALL THE    SELP2420
C                         CORRESPONDING STATE NUMBERS IN AN OPTION 3       SELP2430
C                         SELECTION PATTERN?                               SELP2440
  320 DO 360 I=1,LISTN                                                     SELP2450
      DO 340 J=NTFR,NTTO                                                   SELP2460
      IF(KS(J)-KSELX(I,J)) 400,340,360                                     SELP2470
  340 CONTINUE                                                             SELP2480
C                         MATCH CONDITION IF FALL THRU THIS DO.            SELP2490
      GO TO 450                                                            SELP2500
C                                                                          SELP2510
  360 CONTINUE                                                             SELP2520
C                         UNMATCH IF FALL THRU THIS DO.                    SELP2530
C                                                                          SELP2540
C                         PROCESS NON-MATCH RECORD.                        SELP2550
C                         ADD 1 TO UNMATCHING COUNT.                       SELP2560
  400 NOUT2=NOUT2+1                                                        SELP2570
C                         IF UNMATCHING RECORDS ARE TO BE WRITTEN, WRITE   SELP2580
C                         PATTERN ON KOUT 2.                               SELP2590
      IF(KOUT2.NE.0) WRITE(KOUT2)MOUT2,(KS(I),I=1,NS),IFREQ                SELP2600
C                         GO TO READ NEXT RECORD.                          SELP2610
      GO TO 250                                                            SELP2620
C                                                                          SELP2630
C                         PROCESS MATCHING RECORD.                         SELP2640
C                         ADD 1 TO MATCHING COUNT.                         SELP2650
  450 NOUT1=NOUT1+1                                                        SELP2660
C                         WRITE MATCHING RECORD ON KOUT 1.                 SELP2670
      WRITE(KOUT1)MOUT1,(KS(I),I=1,NS),IFREQ                               SELP2680
C                         GO TO READ NEXT RECORD.                          SELP2690
      GO TO 250                                                            SELP2700
C                                                                          SELP2710
C                         CHANGE IN MODEL NUMBER.                          SELP2720
C                         DECREASE NUMBER OF MODELS PROCESSED BY 1.        SELP2730
  500 NMOD=NMOD-1                                                          SELP2740
C                         PRINT INPUT MODEL NUMBER AND OUTPUT COUNTS FOR   SELP2750
C                         THIS MODEL.                                      SELP2760
  510 PRINT 80,MODL1,NINP,NOUT1,NOUT2                                      SELP2770
C                         ARE ADDITIONAL MODELS TO BE PROCESSED FROM THIS  SELP2780
C                         TAPE?                                            SELP2790
C                         NO. GO TO REWIND INPUT UNIT.                     SELP2800
      IF(NMOD.LE.0) GO TO 570                                              SELP2810
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C                         YES                                           SELP2820
C                         PROCESS NEXT MODEL                            SELP2830
C                         RESET INPUT MODEL NUMBER; NUMBER OF PATTERNS  SELP2840
C                         READ AND SELECTED, OUTPUT MODEL NUMBERS.      SELP2850
      MODL1=MODRD                                                       SELP2860
      NINP=0                                                            SELP2870
      NOUT1=0                                                           SELP2880
      NOUT2=0                                                           SELP2890
      MOUT1=MODL1+INC1                                                  SELP2900
      MOUT2=MODL1+INC2                                                  SELP2910
C                         GO TO COUNT INPUT RECORD.                     SELP2920
      GO TO 270                                                         SELP2930
C                         550                                           SELP2940
C                         EOF ON READ.                                  SELP2950
C                         SET NUMBER OF MODELS PROCESSED TO -1.         SELP2960
  550 NMOD=-1                                                           SELP2970
      GO TO 510                                                         SELP2980
C                         570                                           SELP2990
C                         ALL MODELS COMPLETE ON THIS INPUT TAPE.       SELP3000
C                         REWIND INPUT UNIT.                            SELP3010
  570 REWIND KINP                                                       SELP3020
C                         GO TO READ NEXT CONTROL CARD.                 SELP3030
      GO TO 100                                                         SELP3040
C                         YES                                           SELP3050
C                         SELPAT RUN COMPLETE.                          SELP3060
C                         REWIND OUTPUT UNIT KOUT1.                     SELP3070
  600 REWIND KOUT1                                                      SELP3080
C                         IF AN OUTPUT UNIT FOR NON-SELECTED PATTERNS WAS SELP3090
C                         DESIGNATED, REWIND KOUT2.                     SELP3100
      IF(KOUT2.NE.0) REWIND KOUT2                                       SELP3110
C                         PRINT END OF RUN MESSAGE.                     SELP3120
      PRINT 70                                                          SELP3130
C                         RETURN                                        SELP3140
      RETURN                                                            SELP3150
C                                                                       SELP3160
   10 FORMAT(7I6)                                                       SELP3170
   20 FORMAT(I6/(6I12))                                                 SELP3180
   30 FORMAT(6I12)                                                      SELP3190
   70 FORMAT(22H SELPAT RUN COMPLETED.)                                 SELP3200
   80 FORMAT(14H END OF MODEL ,I6,35H INPUT N..SELECTED..NOT SELECTED.. SELP3210
     1,3I12)                                                            SELP3220
   90 FORMAT(74H PREVIOUS SELECTION INFO REQUESTED BUT NONE PRESENT. KINSELP3230
     1P AND MODEL NO. = ,2I6)                                           SELP3240
C                                                                       SELP3250
C                         REFERENCE LIST.                               SELP3260
C                                                                       SELP3270
C                         SUBROUTINE ARGUMENTS.                         SELP3280
C                                                                       SELP3290
C     IFROM  - ARRAY FOR FROM INDEX VALUES OF VARIABLE DEPTH NESTED DO'SSELP3300
C     ITO    - ARRAY FOR TO INDEX VALUES OF VARIABLE DEPTH NESTED DO'S. SELP3310
C     ICURR  - ARRAY FOR CURRENT INDEX VALUES OF VARIABLE DEPTH NESTED  SELP3320
C              DO'S.                                                    SELP3330
C     MULT   - ARRAY FOR THE VARIOUS PRODUCTS USED IN GENERATING A STATESELP3340
C              NUMBER.                                                  SELP3350
C     NVCODE - ARRAY FOR NUMBER OF CODES DEFINED FOR EACH VARIABLE.     SELP3360
C     KSEL   - ARRAY FOR SPECIFIC STATE NUMBER LIST.                    SELP3370
C     KSELX  - TWO DIMENSIONAL ARRAY FOR PATTERN LISTS. THE ARRAY SIZE  SELP3380
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C                IS VARIABLE.                                          SELP3390
C      NI      - ROW SIZE OF KSELX.                                    SELP3400
C      NJ      - COL SIZE OF KSELX.                                    SELP3410
C      KS      - ARRAY FOR STATE NUMBER PATTERN.                       SELP3420
C                                                                      SELP3430
C                          OTHER VARIABLES.                            SELP3440
C                                                                      SELP3450
C      IFREQ   - FREQUENCY OF LAST PATTERN READ.                      SELP3460
C      INUMBR  - NUMBER OF THE DO LOOP WHOSE INDEX IS CURRENTLY BEING SELP3470
C                INCREMENTED.                                          SELP3480
C      ISN     - STATE NUMBER GENERATED DURING EXECUTION OF CODE ROUTINE. SELP3490
C                A VALUE OF -1 IS'RETURNED'WHEN ALL NUMBERS HAVE BEEN  SELP3500
C                GENERATED.                                            SELP3510
C      INC1    - INCREMENT FOR MODEL NUMBER FOR SELECTED OUTPUT.       SELP3520
C      INC2    - INCREMENT FOR MODEL NUMBER FOR UNSELECTED OUTPUT.     SELP3530
C                                                                      SELP3540
C      KINP    - INPUT UNIT.                                           SELP3550
C      KOUT1   - OUTPUT UNIT FOR SELECTED CASES.                       SELP3560
C      KOUT2   - OUTPUT UNIT FOR CASES NOT SELECTED IF THEY ARE TO BE  SELP3570
C                WRITTEN ALSO.                                         SELP3580
C      KRDSW1  - 1..READ STATE NUMBER SELECTION INFO.                  SELP3590
C                2..USE STATE NUMBER SELECTION INFO FROM PREVIOUS READ, SELP3600
C      KRDSW2  - 1..NO STATE SELECTION INFO IN CORE AT PRESENT TIME.   SELP3610
C                2..THERE IS STATE SELECTION INFO IN CORE.             SELP3620
C      KOPT    - OPTION NUMBER.                                        SELP3630
C                1 - SELECT SPECIFIC STATE NUMBERS LISTED IN DATA CARDS. SELP3640
C                2 - SELECT SPECIFIC STATE NUMBERS GENERATED FROM A FAMILYSELP3650
C                    OF STATE NUMBERS SPECIFICATION.                   SELP3660
C                3 - SELECT SPECIFIC STATE NUMBER PATTERNS LISTED IN DATA SELP3670
C                    CARDS.                                            SELP3680
C      LISTN   - NUMBER OF ENTRIES IN SELECTION LIST - KSEL OR KSELX.  SELP3690
C      MODL1   - MODEL NUMBER OF FIRST MODEL NUMBER ON THIS INPUT TAPE. SELP3700
C      MODRD   - MODEL NUMBER OF LAST PATTERN READ.                    SELP3710
C      MOUT1   - MODEL NUMBER FOR OUTPUT OF SELECTED PATTERNS.         SELP3720
C      MOUT2   - MODEL NUMBER FOR OUTPUT OF PATTERNS NOT SELECTED.     SELP3730
C      NTFR    - FROM-TIME OF STATE NUMBERS TO BE CHECKED AGAINST LIST. SELP3740
C      NTTO    - TO-TIME   OF STATE NUMBERS TO BE CHECKED AGAINST LIST. SELP3750
C      NINP    - NUMBER OF PATTERNS READ.                              SELP3760
C      NOUT1   - NUMBER OF PATTERNS SELECTED.                          SELP3770
C      NOUT2   - NUMBER OF PATTERNS NOT SELECTED.                      SELP3780
C      NS      - NUMBER OF STATE NUMBERS IN PATTERN.                   SELP3790
C      NMOD    - NUMBER OF MODELS ON THIS TAPE TO BE PROCESSED. THE SAME SELP3800
C                SELECTION PATTERNS WILL APPLY TO ALL MODELS ON A GIVEN SELP3810
C                INPUT TAPE.                                           SELP3820
C      NV      - NUMBER OF VARIABLES IN STATE NUMBER DEFINITION.       SELP3830
C      NUMDO   - NUMBER OF DO LOOPS. THIS VARIABLE IS EQUAL NV.        SELP3840
       END                                                             SELP3850
```

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      SUBROUTINE SMATXP(NDIM,ISN,ISVEC,KSN,KSVEC,SVEC,JCOL,P,LABELS,    SMAT0010
     1      LABELP)                                                     SMAT0020
C                                                                       SMAT0030
C                       MULTIPLY DIAGONAL S MATRIX TIMES P MATRIX       SMAT0040
C                       TO OBTAIN D MATRIX.                             SMAT0050
C                       THE ELEMENTS OF THE D MATRIX ARE SUMMED BY ROW  SMAT0060
C                       TO OBTAIN AN S VECTOR                           SMAT0070
C                       SINCE S IS A DIAGONAL MATRIX, THERE WILL BE A   SMAT0080
C                       ROW IN THE D MATRIX ONLY WHEN THERE IS A CORRE- SMAT0090
C                       SPONDING ROW IN BOTH THE INPUT S MATRIX AND THE SMAT0100
C                       P MATRIX.                                       SMAT0110
C                                                                       SMAT0120
      IMPLICIT REAL*8(A-H,O-Z,$)                                        SMAT0130
      DIMENSION ISN(1),ISVEC(1),KSN(1),KSVEC(1),SVEC(1),JCOL(1),P(1)    SMAT0140
     1          ,LABELS(1),LABELP(1)                                    SMAT0150
C                       KSVEC(1),SVEC(1) MUST BE EQUIVALENT IN MAIN PGM.SMAT0160
      DIMENSION NAMES(6),NAMEP(6),NFILL6(6),L1(30),L2(30)               SMAT0170
C                                                                       SMAT0180
C                       INITIALIZATION FOR THIS CALL.                   SMAT0190
C                       S RECORD TYPE VARIABLES.                        SMAT0200
      KSBEG=2                                                           SMAT0210
      KSDAT=22                                                          SMAT0220
      KSEND=32                                                          SMAT0230
C                       D RECORD TYPE VARIABLES.                        SMAT0240
      KDBEG=1                                                           SMAT0250
      KDDAT=21                                                          SMAT0260
      KDEND=31                                                          SMAT0270
C                       FLOMOD END OF FILE RECORD.                      SMAT0280
      KNEXT=40                                                          SMAT0290
C                       OTHER CONSTANTS.                                SMAT0300
      NFILL=1                                                           SMAT0310
      DATA KBLANK/4H    /                                               SMAT0320
      DO 1 I=1,6                                                        SMAT0330
    1 NFILL6(I)=KBLANK                                                  SMAT0340
C                       SKIP TO A NEW PAGE ON PRINTER.                  SMAT0350
      PRINT 2                                                           SMAT0360
C                       READ OUTPUT TAPE ID AND POSITION.               SMAT0370
      READ 5,IOUT                                                       SMAT0380
      REWIND IOUT                                                       SMAT0390
C                       SET INITIAL COUNT OF FILES ON OUTPUT UNIT TO    SMAT0400
C                       ZERO.                                           SMAT0410
      NFILES=0                                                          SMAT0420
C                                                                      ***SMAT0430
C                                                                       *SMAT0440
C                       READ A CONTROL CARD.                            SMAT0450
   10 READ 20,NAMES,INPS,NAMEP,INPP,NITER,NPAIRS,NUMP,IODISK            SMAT0460
C                       HAVE ALL ARRAYS BEEN PROCESSED?                 SMAT0470
C                       NO. GO TO LOCATE S MATRIX.                      SMAT0480
      IF(NITER.NE.0) GO TO 30                                           SMAT0490
C                       YES. MULTIPLICATIONS COMPLETE FOR THIS CALL.    SMAT0500
C                       ADD 1 TO COUNT OF OUTPUT FILES.                 SMAT0510
      NFILES=NFILES+1                                                   SMAT0520
C                       WRITE FLOMOD END OF FILE RECORD.                SMAT0530
      WRITE(IOUT) KNEXT,NFILL6,NFILL,NFILES                             SMAT0540
C                       REWIND OUTPUT UNIT.                             SMAT0550
      REWIND IOUT                                                       SMAT0560
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C                         RETURN.                                          SMAT0570
      RETURN                                                               SMAT0580
C                                                                          SMAT0590
C                         THERE ARE STILL ARRAYS TO BE PROCESSED.          SMAT0600
C                         PROCESS THE CONTROL CARD JUST READ.              SMAT0610
C                         INITIAL S AND P POSITIONING FOR THIS CONTROL     SMAT0620
C                         CARD.                                            SMAT0630
C                         LOCATE S MATRIX.                                 SMAT0640
   30 CALL POSINP(INPS,KTYPE,NAMES,NLS,LABELS)                             SMAT0650
C                         READ DATA RECORD AND END LABEL.                  SMAT0660
   32 READ(INPS)KTYPE,                                                     SMAT0670
     1          NFILL,ISCNT,(ISN(I),I=1,ISCNT),(ISVEC(I),I=1,ISCNT)        SMAT0680
      READ(INPS)KTYPE,NFILL,NFILL,INSUM,NFILL                              SMAT0690
C                         PRINT INPUT S NAME AND SUM.                      SMAT0700
      PRINT 35,NAMES,INSUM                                                 SMAT0710
C                         TEST FOR TYPE POSITIONING REQUIRED FOR P.        SMAT0720
      IF(NPAIRS.GT.0) GO TO 50                                             SMAT0730
C                         POSITION TO NAMED P.                             SMAT0740
      CALL POSINP(INPP,KTYPE,NAMEP,NLP,LABELP)                             SMAT0750
      GO TO 52                                                             SMAT0760
C                         THE TAPE WILL BE IN POSITION FOR THE NEXT P.     SMAT0770
C                         READ LABEL RECORD.                               SMAT0780
   50 READ(INPP)KTYPE,NAMEP,NLP,(LABELP(I),I=1,NLP)                        SMAT0790
C                         PASS P MATRIX ROW LIST RECORD.                   SMAT0800
   52 READ(INPP)                                                           SMAT0810
C                         PASS P MATRIX COLUMN LIST RECORD.                SMAT0820
      READ(INPP)                                                           SMAT0830
C                                                                          SMAT0840
C                                                                          SMAT0850
C                         READ ARRAY NAMES FOR OUTPUT D AND S.             SMAT0860
   60 READ 70,NAMEP,NAMES                                                  SMAT0870
C                         SET UP SMATXP IDENT LINE FOR OUTPUT LABELS.      SMAT0880
      DATA L1/120HD MATRIX RESULTING FROM DIAGONAL S MATRIX TIMES P MATRSMAT0890
     1IX OPERATION                                                         SMAT0900
     2/,L2/120HVECTOR OF ROW SUMS OF D MATRIX RESULTING FROM DIAGONAL S SMAT0910
     3MATRIX TIMES P MATRIX OPERATION                                  /   SMAT0920
C                                                                          SMAT0930
C                         COMPUTE OUTPUT LABEL LENGTH.                     SMAT0940
      NLS2=30+NLS+NLP                                                      SMAT0950
C                                                                          SMAT0960
C                         WRITE D BEGINNING LABEL ON TAPE.                 SMAT0970
      WRITE(IOUT)KDBEG,NAMEP,NLS2,L1,(LABELS(I),I=1,NLS),(LABELP(I),I=1,SMAT0980
     1      NLP)                                                           SMAT0990
C                                                                          SMAT1000
C                         INITIAL VALUE OF NUMBER OF ROWS IN D IS ZERO.    SMAT1010
      NDROWS=0                                                             SMAT1020
C                         INITIAL VALUE OF NUMBER OF ELEMENTS IN D = ZERO.SMAT1030
      NDLMTS=0                                                             SMAT1040
C                         INITIAL VALUE OF S SUM IS ZERO.                  SMAT1050
      NSUM=0                                                               SMAT1060
C                                                                       ***SMAT1070
C                                                                        *SMAT1080
C                         S MATRIX - P MATRIX MULTIPLICATION.              SMAT1090
C                                                                          SMAT1100
C                         I = SUBSCRIPT FOR ISN, LIST OF INPUT S MATRIX    SMAT1110
C                             ROWS.                                        SMAT1120
C                         K = SUBSCRIPT FOR JCOL, P AND KSVEC, INPUT P     SMAT1130
```

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C                                MATRIX AND OUTPUT D MATRIX ELEMENT LIST AND SMAT1140
C                                VALUES IN A ROW.                            SMAT1150
C                            I2 = SUBSCRIPT FOR KSVEC, OUTPUT S ELEMENT      SMAT1160
C                                VALUES. INITIAL I2 VALUE WILL BE NDIM+1.    SMAT1170
C                            I3 = SUBSCRIPT FOR OUTPUT S ELEMENT LIST IN KSN.SMAT1180
      I=1                                                                    SMAT1190
      I2=NDIM                                                                SMAT1200
      I3=0                                                                   SMAT1210
C                            READ A P RECORD                                 SMAT1220
   90 READ(INPP)KTYPE,KROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)           SMAT1230
C                            WAS RECORD JUST READ THE P END LABEL?           SMAT1240
C                            YES. GO TO WRITE D END LABEL.                   SMAT1250
      IF(KTYPE.EQ.33) GO TO 150                                              SMAT1260
C                            RECORD JUST READ WAS A P DATA RECORD.           SMAT1270
C                            DOES CURRENT S ROW NUMBER EQUAL CURRENT P ROW   SMAT1280
C                            NUMBER?                                         SMAT1290
C                            YES. GO TO MULTIPLY.                            SMAT1300
   95 IF(ISN(I).EQ.KROW) GO TO 100                                           SMAT1310
C                            NO.                                             SMAT1320
C                            IF S ROW NUMBER IS LESS THAN P ROW NUMBER, GO TOSMAT1330
C                            INCREMENT S ROW NUMBER SUBSCRIPT.               SMAT1340
      IF(ISN(I).LT.KROW) GO TO 125                                           SMAT1350
C                            P ROW NUMBER IS LESS THAN S ROW NUMBER.         SMAT1360
C                            GO TO READ NEXT P RECORD.                       SMAT1370
      GO TO 90                                                               SMAT1380
C                                                                            SMAT1390
C                            S ROW AND P ROW MATCH.                          SMAT1400
C                            IS THE S VALUE ZERO?                            SMAT1410
C                            YES. GO TO INCREMENT S SUBSCRIPT.               SMAT1420
  100 IF(ISVEC(I).LE.0) GO TO 130                                            SMAT1430
C                            FLOAT INPUT S VALUE.                            SMAT1440
      S=ISVEC(I)                                                             SMAT1450
C                            INITIAL VALUE OF ROW SUM IS ZERO.               SMAT1460
      ISUM=0                                                                 SMAT1470
C                            MULTIPLY AN ELEMENT OF S TIMES EACH ELEMENT OF  SMAT1480
C                            THE CORRESPONDING ROW OF P TO GENERATE A ROW    SMAT1490
C                            OF D.                                           SMAT1500
      DO 110 K=1,JCNT                                                        SMAT1510
C                            COMPUTE K'TH ENTRY IN D MATRIX ROW.             SMAT1520
      KSVEC(K)=P(K)*S+.5D0                                                   SMAT1530
C                            ACCUMULATE ROW SUM.                             SMAT1540
  110 ISUM=ISUM+KSVEC(K)                                                     SMAT1550
C                            SET K EQUAL NUMBER ENTRIES IN D ROW.            SMAT1560
      K=JCNT                                                                 SMAT1570
C                            ALL ELEMENTS IN THIS ROW OF P HAVE BEEN         SMAT1580
C                            PROCESSED. GO TO WRITE THIS D MATRIX ROW.       SMAT1590
      GO TO 128                                                              SMAT1600
C                                                                            SMAT1610
C                            S ROW NUMBER IS LESS THAN P ROW NUMBER.         SMAT1620
C                            HAVE ALL S ELEMENTS BEEN PROCESSED?             SMAT1630
C                            YES. GO TO PASS P RECORDS.                      SMAT1640
  125 IF(I.EQ.ISCNT) GO TO 140                                               SMAT1650
C                            NO                                              SMAT1660
C                            INCREMENT S ROW NUMBER SUBSCRIPT.               SMAT1670
      I=I+1                                                                  SMAT1680
C                            GO TO COMPARE S AND P ROW NUMBERS.              SMAT1690
      GO TO 95                                                               SMAT1700
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C                                                                       SMAT1710
C                         ALL ELEMENTS IN P MATRIX ROW HAVE BEEN MULTI-  SMAT1720
C                         PLIED TIMES S MATRIX ELEMENT.                 SMAT1730
  128 CONTINUE                                                          SMAT1740
C                         WRITE D MATRIX ROW.                           SMAT1750
      WRITE(IOUT)KDDAT,KROW,K,(JCOL(KK),KK=1,K),(KSVEC(KK),KK=1,K)      SMAT1760
C                         INCREMENT COUNT OF ROWS IN D MATRIX.          SMAT1770
      NDROWS=NDROWS+1                                                   SMAT1780
C                         INCREMENT COUNT OF ELEMENTS IN D MATRIX.      SMAT1790
      NDLMTS=NDLMTS+K                                                   SMAT1800
C                         INCREMENT OUTPUT S VECTOR SUM.                SMAT1810
      NSUM=NSUM+ISUM                                                    SMAT1820
C                         INCREMENT OUTPUT S SUBSCRIPTS.                SMAT1830
      I2=I2+1                                                           SMAT1840
      I3=I3+1                                                           SMAT1850
C                         STORE CURRENT ROW NUMBER AND SUM IN OUTPUT S. SMAT1860
      KSVEC(I2)=ISUM                                                    SMAT1870
      KSN(I3)=KROW                                                      SMAT1880
C                         MATCHING ROWS JUST PROCESSED.                 SMAT1890
C                         HAVE ALL S MATRIX ENTRIES BEEN PROCESSED?     SMAT1900
C                         YES. GO TO POSITION TO END OF P ARRAY.        SMAT1910
  130 IF(I.EQ.ISCNT) GO TO 140                                          SMAT1920
C                         NO. INCREMENT S MATRIX INDEX.                 SMAT1930
      I=I+1                                                             SMAT1940
C                         GO TO READ NEXT P RECORD.                     SMAT1950
      GO TO 90                                                          SMAT1960
C                                                                       SMAT1970
C                         READ REMAINING P RECORDS IF ANY.              SMAT1980
C                         THIS IS JUST SO TAPE WILL ALWAYS BE POSITIONED SMAT1990
C                         AFTER A P END RECORD AT THE END OF A MULTIPLICA-SMAT2000
C                         TION.                                         SMAT2010
  140 READ(INPP)KTYPE                                                   SMAT2020
      IF(KTYPE.EQ.33) GO TO 150                                         SMAT2030
      GO TO 140                                                         SMAT2040
C                                                                       SMAT2050
C                         INPUT TAPE IS POSITIONED FOR NEXT BEGINNING OF SMAT2060
C                         ARRAY LABEL.                                  SMAT2070
  150 CONTINUE                                                          SMAT2080
C                         PRINT OUTPUT D SUM.                           SMAT2090
      PRINT 141,NAMEP,NSUM                                              SMAT2100
C                         WRITE D MATRIX END LABEL.                     SMAT2110
      WRITE(IOUT)KDEND,NFILL,NFILL,NDROWS,NDLMTS                        SMAT2120
C                         ADD 1 TO COUNT OF FILES ON OUTPUT UNIT.       SMAT2130
      NFILES=NFILES+1                                                   SMAT2140
C                                                                      *SMAT2150
C                                                                    ***SMAT2160
C                         WRITE S VECTOR ON OUTPUT UNIT.                SMAT2170
C                                                                       SMAT2180
C                         WRITE S BEGINNING LABEL.                      SMAT2190
      WRITE(IOUT)KSBEG,NAMES,NLS2,L2,(LABELS(I),I=1,NLS),(LABELP(I),I=1,SMAT2200
     1     NLP)                                                         SMAT2210
C                                                                       SMAT2220
C                         WRITE S DATA RECORD.                          SMAT2230
      IFR=NDIM+1                                                        SMAT2240
      WRITE(IOUT)KSDAT,NFILL,I3,(KSN(I),I=1,I3),(KSVEC(I),I=IFR,I2)     SMAT2250
C                         WRITE S END LABEL.                            SMAT2260
      WRITE(IOUT)KSEND,NFILL,NFILL,NSUM,NFILL                           SMAT2270
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C                         ADD 1 TO COUNT OF FILES ON OUTPUT UNIT.          SMAT2
      NFILES=NFILES+1                                                      SMAT2
C                         IS THIS A PAIR SPECIFICATION?                    SMAT2
C                         NO. GO TO CHECK NUMP SPECIFICATION.              SMAT2
  240 IF(NPAIRS.EQ.0) GO TO 260                                            SMAT2
C                         YES.                                             SMAT2
      NPAIRS=NPAIRS-1                                                      SMAT2
C                         HAVE ALL PAIRS BEEN PROCESSED?                   SMAT2
C                         YES. GO TO READ NEXT CONTROL CARD.               SMAT2
      IF(NPAIRS.EQ.0) GO TO 10                                             SMAT2
C                         NO. READ LABEL OF NEXT S MATRIX.                 SMAT2
      READ(INPS)KTYPE,NAMES,NLS,(LABELS(I),I=1,NLS)                        SMAT2
C                         GO TO READ S DATA RECORD.                        SMAT2
      GO TO 32                                                             SMAT2
C                         THIS IS NOT A PAIR SPECIFICATION. IS THIS A NUMPSMAT2
C                         SPECIFICATION?                                   SMAT2
C                         NO. GO TO READ NEXT CONTROL CARD.                SMAT2
  260 IF(NUMP.EQ.0) GO TO 10                                               SMAT2
C                         YES                                              SMAT2
      NUMP=NUMP-1                                                          SMAT2
C                         HAVE ALL NUMP P'S BEEN PROCESSED?                SMAT2
C                         YES. GO TO READ NEXT CONTROL CARD.               SMAT2
      IF(NUMP.EQ.0) GO TO 10                                               SMAT2
C                         NO.                                              SMAT2
C                         GO TO READ NEXT P LABEL.                         SMAT2
      GO TO 50                                                             SMAT2
C                                                                          SMAT2
    2 FORMAT (1H1)                                                         SMAT2
    5 FORMAT(I6)                                                           SMAT2
   20 FORMAT(6A4,I6,6A4,I6,4I3)                                            SMAT2
   35 FORMAT(24H INPUT S NAME AND SUM...,6A4,I12)                          SMAT2
   70 FORMAT(6A4,6A4)                                                      SMAT2
  141 FORMAT(24H D NAME AND SUM      ...,6A4,I12)                          SMAT2
C                                                                          SMAT2
C                         REFERENCE LIST.                                  SMAT2
C                                                                          SMAT2
C                         SUBROUTINE ARGUMENTS.                            SMAT2
C                                                                          SMAT2
C     NDIM   - DIMENSION OF KSN AND KSVEC. USED TO LOCATE POSITION IN      SMAT2
C              SVEC FOR STORING OUTPUT S.                                  SMAT2
C     ISN    - ELEMENT LIST  FOR INPUT S.                                  SMAT2
C     ISVEC  - ELEMENT VALUE FOR INPUT S.                                  SMAT2
C     KSN    - ELEMENT LIST  FOR OUTPUT S.                                 SMAT2
C     KSVEC,                                                               SMAT2
C      SVEC   - ELEMENT VALUE FOR D AND OUTPUT S.                          SMAT2
C     JCOL    - ELEMENT LIST FOR P ROW AND D ROW.                          SMAT2
C     P      - ELEMENT VALUE FOR P ROW.                                    SMAT2
C     LABELS - ARRAY FOR INPUT S LABEL AND OUTPUT D AND S LABELS.          SMAT2
C     LABELP - ARRAY FOR P MATRIX LABEL.                                   SMAT2
C                                                                          SMAT2
C                                                                          SMAT2
C                         OTHER VARIABLES.                                 SMAT2
C                                                                          SMAT2
C     INPS   - INPUT UNIT FOR S.                                           SMAT2
C     INPP   - INPUT UNIT FOR P. MAY BE THE SAME AS INPS.                  SMAT2
C     INSUM  - SUM OF INPUT S.                                             SMAT2
C     ISUM    - SUM OF VALUES FOR A D ROW.                                 SMAT2
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C     IODISK - THIS CONTROL CARD FIELD IS NOT USED BUT IS RETAINED TO   SMAT2850
C              MAINTAIN COMPATIBILITY WITH SUBROUTINE SXP CONTROL CARDS.SMAT2860
C     NFILES - NUMBER OF FILES ON OUTPUT UNIT.                          SMAT2870
C     NITER  - THIS CONTROL CARD FIELD IS RETAINED TO MAINTAIN COMPATI- SMAT2880
C              BILITY WITH SUBROUTINE SXP CONTROL CARDS.                SMAT2890
C              ENTER 1 IN ALL CONTROL CARDS WITH MULTIPLY SPECIFICATIONSSMAT2900
C              ENTER 0 TO INDICATE MULTIPLICATION OPERATION IS COMPLETE.SMAT2910
C     NLS    - LENGTH OF INPUT  S LABEL.                                SMAT2920
C     NLS2    - LENGTH OF D LABEL AND OUTPUT S LABEL.                   SMAT2930
C     NLP    - LENGTH OF P LABEL.                                       SMAT2940
C     NSUM    - SUM OF OUTPUT S.                                        SMAT2950
C     NPAIRS- NUMBER OF 'PAIRED (S,P)' ARRAYS. THESE ARRAYS MUST BE ON  SMAT2960
C             THE SAME INPUT TAPE AND IN A SPECIFIED ORDER.             SMAT2970
C     NUMP   - NUMBER OF P MATRICES TO BE PAIRED WITH A SINGLE INPUT S  SMAT2980
C                                                                       SMAT2990
      END                                                               SMAT3000
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      SUBROUTINE SMINUS(ISNI,ISVECI,LABELI,ISNJ,ISVECJ,LABELJ,          SMIN0010
     1                  ISNK,ISVECK)                                    SMIN0020
C                                                                       SMIN0030
C                       S VECTOR I MINUS S VECTOR J = S VECTOR K.       SMIN0040
C                                                                       SMIN0050
      DIMENSION ISNI(1),ISVECI(1),LABELI(1),ISNJ(1),ISVECJ(1),LABELJ(1),SMIN0060
     1          ISNK(1),ISVECK(1)                                       SMIN0070
      DIMENSION NAMEI(6),NAMEJ(6),NAMEK(6),NOLDI(6),NOLDJ(6),NULABL(30) SMIN0080
      DATA KBLANK/4H    /,M1/4HMINU/,M2/4HS   /                        SMIN0090
C                                                                       SMIN0100
C                       INITIALIZATION                                  SMIN0110
C                       PREVIOUS SI AND SJ NAMES.                       SMIN0120
      DO 5 N=1,6                                                        SMIN0130
      NOLDI(N)=KBLANK                                                   SMIN0140
    5 NOLDJ(N)=KBLANK                                                   SMIN0150
C                       SMINUS LABEL ADDITION.                          SMIN0160
      DO 6 N=1,30                                                       SMIN0170
    6 NULABL(N)=KBLANK                                                  SMIN0180
      NULABL(3)=M1                                                      SMIN0190
      NULABL(4)=M2                                                      SMIN0200
C                       S VECTOR RECORD TYPE CONSTANTS - BEGINNING LABELSMIN0210
C                       DATA RECORD AND END LABEL.                      SMIN0220
      KSBEG=2                                                           SMIN0230
      KSDAT=22                                                          SMIN0240
      KSEND=32                                                          SMIN0250
C                       SET NUMBER OF OUTPUT FILES EQUAL ZERO.          SMIN0260
      NFILES=0                                                          SMIN0270
C                       READ OUTPUT UNIT NUMBER.                        SMIN0280
      READ 10,KOUTS                                                     SMIN0290
C                       REWIND OUTPUT UNIT.                             SMIN0300
      REWIND KOUTS                                                      SMIN0310
C                                                                       SMIN0320
C                       30                                              SMIN0330
C                       READ INPUT UNIT NUMBER AND ARRAY NAME FOR       SMIN0340
C                       CURRENT SI AND SJ.                              SMIN0350
   30 READ 10,INPI,NAMEI,INPJ,NAMEJ                                     SMIN0360
C                       HAVE ALL INPUT FILES BEEN PROCESSED?            SMIN0370
C                       YES. GO TO WRITE OUTPUT END LABEL.              SMIN0380
      IF(INPI.EQ.0) GO TO 500                                           SMIN0390
C                       NO                                              SMIN0400
C                       IS PREVIOUS S(I) TO BE USED AGAIN...            SMIN0410
C                       IS PREVIOUS SI NAME = CURRENT SI NAME?          SMIN0420
      DO 50 N=1,6                                                       SMIN0430
      IF(NAMEI(N).NE.NOLDI(N)) GO TO 60                                 SMIN0440
   50 CONTINUE                                                          SMIN0450
C                       YES                                             SMIN0460
C                       GO TO LOCATE SJ.                                SMIN0470
      GO TO 140                                                         SMIN0480
C                       60                                              SMIN0490
C                       NO.                                             SMIN0500
C                       IS PREVIOUS S(J) TO BE USED AS S(I)...          SMIN0510
C                       IS PREVIOUS SJ NAME = CURRENT SI NAME?          SMIN0520
   60 DO 70 N=1,6                                                       SMIN0530
      IF(NAMEI(N).NE.NOLDJ(N)) GO TO 100                                SMIN0540
   70 CONTINUE                                                          SMIN0550
C                       YES                                             SMIN0560
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C                       USE PREVIOUS S(J) AS S(I).                          SMIN0570
C                       MOVE PREVIOUS SJ INFO TO CORRESPONDING LOCATIONSSMIN0580
C                       FOR CURRENT SI INFO.                                SMIN0590
      DO 80 N=1,ISCNTJ                                                      SMIN0600
      ISNI(N)=ISNJ(N)                                                       SMIN0610
   80 ISVECI(N)=ISVECJ(N)                                                   SMIN0620
      ISCNTI=ISCNTJ                                                         SMIN0630
      DO 85 N=1,NLJ                                                         SMIN0640
   85 LABELI(N)=LABELJ(N)                                                   SMIN0650
      NLI=NLJ                                                               SMIN0660
      ISUMI=ISUMJ                                                           SMIN0670
C                       GO TO LOCATE SJ.                                    SMIN0680
      GO TO 140                                                             SMIN0690
C                       100                                                 SMIN0700
C                       CURRENT SI MUST BE READ FROM AN INPUT UNIT.         SMIN0710
C                       LOCATE ARRAY NAMED.                                 SMIN0720
  100 CALL POSINP(INPI,KTYPE,NAMEI,NLI,LABELI)                              SMIN0730
C                       READ DATA RECORD AND END RECORD.                    SMIN0740
      READ(INPI)KTYPE,NFILL,ISCNTI,(ISNI(I),I=1,ISCNTI),                    SMIN0750
     1          (ISVECI(I),I=1,ISCNTI)                                      SMIN0760
      READ(INPI)KTYPE,NFILL,NFILL,ISUMI                                     SMIN0770
C                       120                                                 SMIN0780
C                       IS PREVIOUS S(J) TO BE USED AGAIN...                SMIN0790
C                       IS PREVIOUS SJ NAME = CURRENT SJ NAME?              SMIN0800
  120 DO 130 N=1,6                                                          SMIN0810
      IF(NAMEJ(N).NE.NOLDJ(N)) GO TO 140                                    SMIN0820
  130 CONTINUE                                                              SMIN0830
C                       YES                                                 SMIN0840
C                       GO TO SI MINUS SJ LOOP.                             SMIN0850
      GO TO 200                                                             SMIN0860
C                       140                                                 SMIN0870
C                       NO.                                                 SMIN0880
C                       PREVIOUS SJ IS NOT BEING USED AGAIN.                SMIN0890
C                       CURRENT SJ MUST BE READ FROM AN INPUT UNIT.         SMIN0900
C                       LOCATE ARRAY NAMED.                                 SMIN0910
  140 CALL POSINP(INPJ,KTYPE,NAMEJ,NLJ,LABELJ)                              SMIN0920
C                       READ DATA RECORD AND END RECORD.                    SMIN0930
      READ(INPJ)KTYPE,NFILL,ISCNTJ,(ISNJ(J),J=1,ISCNTJ),                    SMIN0940
     1          (ISVECJ(J),J=1,ISCNTJ)                                      SMIN0950
      READ(INPJ)KTYPE,NFILL,NFILL,ISUMJ                                     SMIN0960
C                                                                        ***SMIN0970
C                                                                         *SMIN0980
C                                                                          SMIN0990
C                       200                                                 SMIN1000
C                       COMPUTE SI MINUS SJ.                                SMIN1010
C                                                                           SMIN1020
C                       THE SI MINUS SJ SEGMENT OPERATES AS IF THREE DO SMIN1030
C                       LOOPS                                               SMIN1040
C                         DO I = 1, ISCNTI FOR SI.                          SMIN1050
C                         DO J = 1, ISCNTJ FOR SJ.                          SMIN1060
C                         DO K = 1, ISCNTK FOR SI-SJ.                       SMIN1070
C                       WERE BEING INCREMENTED SIMULTANEOUSLY.              SMIN1080
C                                                                           SMIN1090
C                       INITIALIZE 'DO LOOP' INDICES.                       SMIN1100
  200 I=1                                                                   SMIN1110
      J=1                                                                   SMIN1120
      K=0                                                                   SMIN1130
```

```
C                       210                                                 SMIN1140
C                       IS SI ROW = SJ ROW?                                 SMIN1150
  210 IF(ISNI(I).NE.ISNJ(J)) GO TO 300                                      SMIN1160
C                       YES.                                                SMIN1170
C                       COMPUTE ROW DIFFERENCE                              SMIN1180
      KDIF=ISVECI(I)-ISVECJ(J)                                              SMIN1190
C                       IS DIFFERENCE NON-ZERO?                             SMIN1200
C                       A DIFFERENCE VALUE OF ZERO WILL NOT BE STORED INSMIN1210
C                       THE OUTPUT S VECTOR.                                SMIN1220
      IF(KDIF.EQ.0) GO TO 230                                               SMIN1230
C                       YES                                                 SMIN1240
C                       DIFFERENCE IS NON-ZERO. STORE IN OUTPUT S.          SMIN1250
C                       UPDATE K                                            SMIN1260
      K=K+1                                                                 SMIN1270
C                       STORE ROW ID IN ISNK(K)                             SMIN1280
      ISNK(K)=ISNI(I)                                                       SMIN1290
C                       STORE DIF VALUE IN ISVECK(K)                        SMIN1300
      ISVECK(K)=KDIF                                                        SMIN1310
C                       230                                                 SMIN1320
C                       UPDATE I AND J.                                     SMIN1330
C                       IS I UPDATE POSSIBLE?                               SMIN1340
  230 IF(I.EQ.ISCNTI) GO TO 240                                             SMIN1350
C                       YES                                                 SMIN1360
C                       UPDATE I                                            SMIN1370
      I=I+1                                                                 SMIN1380
C                       IS J UPDATE POSSIBLE?                               SMIN1390
      IF(J.EQ.ISCNTJ) GO TO 270                                             SMIN1400
C                       YES                                                 SMIN1410
C                       UPDATE J                                            SMIN1420
      J=J+1                                                                 SMIN1430
C                       GO TO ROW NUMBER COMPARE.                           SMIN1440
      GO TO 210                                                             SMIN1450
C                                                                           SMIN1460
C                                                                           SMIN1470
C                       240                                                 SMIN1480
C                       NO                                                  SMIN1490
C                       I UPDATE IS NOT POSSIBLE.                           SMIN1500
C                       IS J UPDATE POSSIBLE?                               SMIN1510
  240 IF(J.EQ.ISCNTJ) GO TO 400                                             SMIN1520
C                       YES                                                 SMIN1530
C                       UPDATE J.                                           SMIN1540
      J=J+1                                                                 SMIN1550
C                       250                                                 SMIN1560
C                       ELEMENTS REMAIN IN J ONLY.                          SMIN1570
C                       PLACE REMAINING J ROWS AND NEG VALUE OF ELEMENTSSMIN1580
C                       IN OUTPUT S.                                        SMIN1590
  250 DO 260 N=J,ISCNTJ                                                     SMIN1600
      IF(ISVECJ(N).EQ.0) GO TO 260                                          SMIN1610
      K=K+1                                                                 SMIN1620
      ISNK(K)=ISNJ(N)                                                       SMIN1630
      ISVECK(K)=-ISVECJ(N)                                                  SMIN1640
  260 CONTINUE                                                              SMIN1650
C                       GO TO WRITE OUTPUT.                                 SMIN1660
      GO TO 400                                                             SMIN1670
C                       270                                                 SMIN1680
C                       ELEMENTS REMAIN IN I ONLY.                          SMIN1690
C                       PLACE REMAINING I ROWS AND VALUES IN OUTPUT S.      SMIN1700
```

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  270 DO 280 N=I,ISCNTI                                                 SMIN1710
      IF(ISVECI(N).EQ.0) GO TO 280                                      SMIN1720
      K=K+1                                                             SMIN1730
      ISNK(K)=ISNI(N)                                                   SMIN1740
      ISVECK(K)=ISVECI(N)                                               SMIN1750
  280 CONTINUE                                                          SMIN1760
C                         GO TO WRITE OUTPUT.                           SMIN1770
      GO TO 400                                                         SMIN1780
C                         300                                           SMIN1790
C                         UNMATCHING ROWS.                              SMIN1800
C                         IS SI ROW GT SJ ROW?                          SMIN1810
  300 IF(ISNI(I).GT.ISNJ(J)) GO TO 340                                  SMIN1820
C                         NO                                            SMIN1830
C                         SI ROW NUMBER IS LESS THAN SJ ROW NUMBER.     SMIN1840
C                         IS SI ROW VALUE EQUAL ZERO?                   SMIN1850
      IF(ISVECI(I).EQ.0) GO TO 320                                      SMIN1860
C                         NO                                            SMIN1870
C                         PLACE SI ROW AND VALUE IN OUTPUT S.           SMIN1880
      K=K+1                                                             SMIN1890
      ISNK(K)=ISNI(I)                                                   SMIN1900
      ISVECK(K)=ISVECI(I)                                               SMIN1910
C                         320                                           SMIN1920
C                         IS I UPDATE POSSIBLE?                         SMIN1930
C                         NO. GO TO PROCESS REMAINING SJ ELEMENTS.      SMIN1940
  320 IF(I.EQ.ISCNTI) GO TO 250                                         SMIN1950
C                         YES                                           SMIN1960
C                         UPDATE I.                                     SMIN1970
      I=I+1                                                             SMIN1980
C                         GO TO ROW NUMBER COMPARE.                     SMIN1990
      GO TO 210                                                         SMIN2000
C                                                                       SMIN2010
C                         340                                           SMIN2020
C                         SJ ROW NUMBER IS LESS THAN SI ROW NUMBER.     SMIN2030
C                         ADD J ELEMENT TO OUTPUT.                      SMIN2040
C                         IS SJ ROW VALUE EQUAL ZERO?                   SMIN2050
  340 IF(ISVECJ(J).EQ.0) GO TO 350                                      SMIN2060
C                         NO                                            SMIN2070
C                         PLACE SJ ROW AND NEG. VALUE IN OUTPUT S.      SMIN2080
      K=K+1                                                             SMIN2090
      ISNK(K)=ISNJ(J)                                                   SMIN2100
      ISVECK(K)=-ISVECJ(J)                                              SMIN2110
C                         350                                           SMIN2120
C                         IS J UPDATE POSSIBLE?                         SMIN2130
C                         NO. GO TO PROCESS REMAINING SI ELEMENTS.      SMIN2140
  350 IF(J.EQ.ISCNTJ) GO TO 270                                         SMIN2150
C                         YES                                           SMIN2160
C                         UPDATE J.                                     SMIN2170
      J=J+1                                                             SMIN2180
C                         GO TO ROW NUMBER COMPARE.                     SMIN2190
      GO TO 210                                                         SMIN2200
C                                                                      *SMIN2210
C                                                                   ***SMIN2220
C                                                                      SMIN2230
C                         400                                           SMIN2240
C                         WRITE OUTPUT.                                 SMIN2250
C                         READ NAME FOR OUTPUT S.                       SMIN2260
  400 READ 401,NAMEK                                                    SMIN2270
```

```
C                         DOES THE OUTPUT S CONTAIN ANY ENTRIES?          SMIN2280
      IF(K.EQ.0) GO TO 440                                                SMIN2290
C                         YES                                             SMIN2300
C                         CREATE NEW LABEL.                               SMIN2310
      NL=NLI+NLJ+30                                                       SMIN2320
C                         WRITE OUTPUT S FILE.                            SMIN2330
      WRITE(KOUTS)KSBEG,NAMEK,NL,(LABELI(N),N=1,NLI),NULABL,              SMIN2340
     1            (LABELJ(N),N=1,NLJ)                                     SMIN2350
      WRITE(KOUTS)KSDAT,NFILL,K,(ISNK(N),N=1,K),(ISVECK(N),N=1,K)         SMIN2360
      ISUMK=ISUMI-ISUMJ                                                   SMIN2370
C                         RESET FILLER VARIABLE. IT MUST EQUAL ONE IN END SMIN2380
C                         OF ARRAY LABEL.                                 SMIN2390
      NFILL=1                                                             SMIN2400
      WRITE(KOUTS)KSEND, NFILL, NFILL, ISUMK,NFILL                        SMIN2410
C                         UPDATE NUMBER OF OUTPUT FILES.                  SMIN2420
      NFILES=NFILES+1                                                     SMIN2430
      GO TO 450                                                           SMIN2440
C                                                                         SMIN2450
C                         440                                             SMIN2460
C                         PRINT MESSAGE THAT SI AND SJ ARE IDENTICAL AND  SMIN2470
C                         NO OUTPUT S BEING WRITTEN.                      SMIN2480
  440 PRINT 445,NAMEI,NAMEJ,NAMEK                                         SMIN2490
  445 FORMAT(1X,6A4,26H IS AN EXACT DUPLICATE OF ,6A4/35H  NO OUTPUT S ISMIN2500
     1S BEING WRITTEN FOR ,6A4)                                           SMIN2510
C                                                                         SMIN2520
C                         450                                             SMIN2530
C                         MOVE CURRENT SI AND SJ IDENTITY TO PREVIOUS SI  SMIN2540
C                         AND SJ IDENTITY.                                SMIN2550
  450 DO 455 N=1,6                                                        SMIN2560
      NOLDI(N)=NAMEI(N)                                                   SMIN2570
  455 NOLDJ(N)=NAMEJ(N)                                                   SMIN2580
C                         GO TO READ A CONTROL CARD.                      SMIN2590
      GO TO 30                                                            SMIN2600
C                         500                                             SMIN2610
C                         END OF S-S RUN.                                 SMIN2620
C                         UPDATE NUMBER OF OUTPUT FILES AND WRITE END     SMIN2630
C                         LABEL.                                          SMIN2640
  500 KNEXT=40                                                            SMIN2650
      NFILES=NFILES+1                                                     SMIN2660
C                         SET NAME FIELD BLANK FOR END OF FILE LABEL.     SMIN2670
      DO 505 I=1,6                                                        SMIN2680
  505 NAMEI(I)=KBLANK                                                     SMIN2690
      WRITE(KOUTS)KNEXT,NAMEI,NFILL,NFILES                                SMIN2700
C                         REWIND OUTPUT TAPE.                             SMIN2710
      REWIND KOUTS                                                        SMIN2720
C                         RETURN                                          SMIN2730
      RETURN                                                              SMIN2740
C                                                                         SMIN2750
   10 FORMAT(I6,6A4,I6,6A4)                                               SMIN2760
  401 FORMAT(6X,6A4)                                                      SMIN2770
C                                                                         SMIN2780
C                         REFERENCE LIST.                                 SMIN2790
C                                                                         SMIN2800
C                         SUBROUTINE ARGUMENTS.                           SMIN2810
C                                                                         SMIN2820
C     ISNI   - ARRAY FOR THE LIST OF STATE NUMBERS IN S VECTOR I.         SMIN2830
C     ISVECI - ARRAY FOR THE ELEMENTS IN S VECTOR I.                      SMIN2840
```

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C     LABELI - ARRAY FOR LABEL OF S VECTOR I.                          SMIN2850
C     ISNJ   - ARRAY FOR THE LIST OF STATE NUMBERS IN S VECTOR J.      SMIN2860
C     ISVECJ - ARRAY FOR THE ELEMENTS IN S VECTOR J.                   SMIN2870
C     LABELJ - ARRAY FOR LABEL OF S VECTOR J.                          SMIN2880
C     ISNK   - ARRAY FOR THE LIST OF NON-ZERO STATE NUMBERS IN S VECTOR SMIN2890
C              K.                                                      SMIN2900
C     ISVECK - ARRAY FOR THE NON-ZERO ELEMENTS IN S VECTOR K.          SMIN2910
C                                                                      SMIN2920
C                        OTHER VARIABLES.                              SMIN2930
C                                                                      SMIN2940
C     NAMEI  - ARRAY FOR THE NAME OF CURRENT S VECTOR I.               SMIN2950
C     NAMEJ  - ARRAY FOR THE NAME OF CURRENT S VECTOR J.               SMIN2960
C     NAMEK  - ARRAY FOR THE NAME OF CURRENT S VECTOR K.               SMIN2970
C     NOLDI  - ARRAY FOR THE NAME OF PREVIOUS S VECTOR I.              SMIN2980
C     NOLDJ  - ARRAY FOR THE NAME OF PREVIOUS S VECTOR J.              SMIN2990
C     NULABL - ARRAY FOR S MINUS ADDITION TO LABEL FOR S VECTOR K.     SMIN3000
      END                                                              SMIN3010
```

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      SUBROUTINE SPAIRS(KS)                                             SPAIR010
C                                                                       SPAIR020
C                         SPAIRS                                        SPAIR030
C                         THIS PROGRAM WILL WRITE A STATE-PAIR RECORD FOR SPAIR040
C                         EACH PAIR OF CONSECUTIVE TIME PERIODS IN EACH SPAIR050
C                         STATE PATTERN RECORD. THE OUTPUT-MODEL-NUMBER SPAIR060
C                         WILL BE THE INPUT-MODEL-NUMBER PLUS THE TIME  SPAIR070
C                         PERIOD PAIR NUMBER.                           SPAIR080
C                                                                       SPAIR090
      DIMENSION KS(1)                                                   SPAIR100
C                         READ INPUT UNIT ID, OUTPUT UNIT ID, AND NUMBER SPAIR110
C                         OF STATES PER RECORD.                         SPAIR120
      READ 10,KINP,KOUT,NS                                              SPAIR130
   10 FORMAT(3I6)                                                       SPAIR140
C                         REWIND INPUT AND OUTPUT UNITS.                SPAIR150
      REWIND KINP                                                       SPAIR160
      REWIND KOUT                                                       SPAIR170
C                         SET NUMBER OF PAIRS EQUAL NUMBER OF STATES PER SPAIR180
C                         RECORD MINUS 1.                               SPAIR190
      NPR=NS-1                                                          SPAIR200
C                                                                     ***SPAIR210
C                                                                      *SPAIR220
C                         READ A RECORD                                 SPAIR230
C                         READ MODEL NUMBER, STATE PATTERN AND FREQUENCY. SPAIR240
   30 READ(KINP,END=100) MOD,(KS(I),I=1,NS),KFREQ                       SPAIR250
C                                                                     **SPAIR260
C                                                                      *SPAIR270
C                         WRITE OUTPUT RECORDS                          SPAIR280
C                         DO K=1 THRU NUMBER OF PAIRS.                  SPAIR290
      DO 40  K=1,NPR                                                    SPAIR300
C                         SET NEW MODEL NUMBER EQUAL INPUT MODEL NUMBER SPAIR310
C                         PLUS PAIR NUMBER.                             SPAIR320
      NUMOD=MOD+K                                                       SPAIR330
C                         WRITE OUTPUT: NEW MODEL NUMBER, STATE NUMBER(K),SPAIR340
C                         STATE NUMBER(K+1), AND FREQUENCY.             SPAIR350
      WRITE(KOUT)NUMOD,KS(K),KS(K+1),KFREQ                              SPAIR360
C                         CONTINUE                                      SPAIR370
   40 CONTINUE                                                          SPAIR380
C                                                                      *SPAIR390
C                                                                     **SPAIR400
C                                                                       SPAIR410
C                         GO TO READ NEXT RECORD.                       SPAIR420
      GO TO 30                                                          SPAIR430
C                                                                      *SPAIR440
C                                                                     ***SPAIR450
C                         END OF FILE ON READ.                          SPAIR460
C                         REWIND INPUT AND OUTPUT UNITS.                SPAIR470
  100 REWIND KINP                                                       SPAIR480
      REWIND KOUT                                                       SPAIR490
C                         PRINT MESSAGE SPAIRS OPERATION COMPLETE.      SPAIR500
      PRINT 110,KINP,KOUT                                               SPAIR510
  110 FORMAT(/42H SPAIRS OPERATION COMPLETE FOR INPUT UNIT ,I6,5X,      SPAIR520
     1       13H OUTPUT UNIT ,I6)                                       SPAIR530
C                         RETURN                                        SPAIR540
      RETURN                                                            SPAIR550
C                                                                       SPAIR560
```

```
C                          REFERENCE LIST.                                SPAIR570
C                          SUBROUTINE ARGUMENTS.                          SPAIR580
C                                                                         SPAIR590
C     KS      - ARRAY FOR STATE NUMBER PATTERN.                           SPAIR600
C                                                                         SPAIR610
C                          OTHER VARIABLES.                               SPAIR620
C                                                                         SPAIR630
C     KINP    - INPUT UNIT ID.                                            SPAIR640
C     KOUT    - OUTPUT UNIT ID.                                           SPAIR650
C     NS      - NUMBER OF STATE NUMBERS PER INPUT RECORD.                 SPAIR660
      END                                                                 SPAIR670
```

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      SUBROUTINE STDES(NAMEV,NAMEC,NCODE,LOC,ICODE,LIST)                STDE0010
C                                                                       STDE0020
C                       STDES                                           STDE0030
C                       GENERAL PURPOSE PROGRAM TO LIST FOR EACH STATE  STDE0040
C                       NUMBER THE CODE MEANING FOR EACH VARIABLE.      STDE0050
C                                                                       STDE0060
C     DIMENSION NAMEV(3*NV),NAMEC(SUM OF NCODE(I)*3),NCODE(NV),LOC(NV+1)STDE0070
C               ICODE(NV),LIST(3*NV)                                    STDE0080
      DIMENSION NAMEV(1),NAMEC(1),NCODE(1),LOC(1),ICODE(1),LIST(1)      STDE0090
      DIMENSION IDMODL(30)                                              STDE0100
C                       READ PRINT HEADING.                             STDE0110
      READ 10,IDMODL                                                    STDE0120
C                       READ NUMBER OF VARIABLES AND NUMBER OF DESCRIP- STDE0130
C                       TION LISTS TO BE PRINTED.                       STDE0140
      READ 20,NV,NCOPYS                                                 STDE0150
C                       COMPUTE NV3 FOR LATER DO LOOP INDEX USE.        STDE0160
      NV3=NV*3                                                          STDE0170
C                       COMPUTE NUMBER OF LINES REQUIRED PER STATE NUM- STDE0180
C                       BER DESCRIPTION.                                STDE0190
      NLINES=(NV-1)/7+1                                                 STDE0200
C                       IF THE NUMBER OF VARIABLES IS EXACTLY 7, THERE  STDE0202
C                       WILL BE AN EXTRA SPACE AFTER EACH LINE.         STDE0204
      IF(NV.EQ.7) NLINES=NLINES+1                                       STDE0206
C                       COMPUTE NUMBER OF STATE NUMBER DESCRIPTIONS PER STDE0210
C                       PAGE.                                           STDE0220
      NDPAGE=(57/NLINES)-1                                              STDE0230
C                                                                     ***STDE0240
C                                                                      *STDE0250
C                       FOR EACH VARIABLE..                             STDE0260
C                       READ ALPHA ID OF VARIABLE AND NUMBER OF CODES.  STDE0270
C                                                                       STDE0280
C                       STORE IN ARRAY 'LOC' THE BEGINNING LOCATION IN  STDE0290
C                       NAME OF CODES ARRAY OF THE CODE NAMES FOR THE   STDE0300
C                       FIRST VARIABLE.                                 STDE0310
      LOC(1)=1                                                          STDE0320
C                       DO FOR EACH VARIABLE.                           STDE0330
      DO  90 I=1,NV                                                     STDE0340
C                       COMPUTE SUBSCRIPTS FOR ITH VARIABLE IN NAME OF  STDE0350
C                       VARIABLE VECTOR.                                STDE0360
      IFR=(I-1)*3+1                                                     STDE0370
      ITO=IFR+2                                                         STDE0380
C                       READ VARIABLE NUMBER, VARIABLE NAME AND NUMBER  STDE0390
C                       OF CODES DEFINED FOR THIS VARIABLE.             STDE0400
      READ 30,INV,(NAMEV(II),II=IFR,ITO),NCODE(I)                       STDE0410
C                       IS THE VARIABLE NUMBER READ EQUAL THE DO LOOP   STDE0420
C                       VARIABLE NUMBER?                                STDE0430
C                       NO, GO TO PRINT ERROR MESSAGE.                  STDE0440
      IF(INV.NE.I) GO TO 300                                            STDE0450
C                       YES                                             STDE0460
      NCI=NCODE(I)                                                      STDE0470
C                       STORE IN ARRAY 'LOC' THE BEGINNING LOCATION IN  STDE0480
C                       NAME OF CODES ARRAY OF THE CODE NAMES FOR THE   STDE0490
C                       NEXT VARIABLE.                                  STDE0500
      LOC(I+1)=LOC(I)+NCI*3                                             STDE0510
C                       INITIALIZE SUBSCRIPT FOR READING I'TH VARIABLE  STDE0520
C                       CODE NAMES.                                     STDE0530
```

```
      JFR=LOC(I)-3                                                      STDE0540
C                         DO FOR EACH CODE FOR THIS VARIABLE.           STDE0550
      DO  80 J=1,NCI                                                    STDE0560
C                         COMPUTE SUBSCRIPTS FOR NAME OF CODE VECTOR.   STDE0570
      JFR=JFR+3                                                         STDE0580
      JTO=JFR+2                                                         STDE0590
C                         READ CODE NUMBER AND NAME.                    STDE0600
      READ 30,INC,(NAMEC(JJ),JJ=JFR,JTO)                                STDE0610
C                         IS THE CODE NUMBER READ EQUAL TO DO LOOP CODE STDE0620
C                         NUMBER?                                       STDE0630
C                         NO. GO TO PRINT ERROR MESSAGE.                STDE0640
      IF(INC.NE.J) GO TO 310                                            STDE0650
C                         YES                                           STDE0660
C                         80                                            STDE0670
C                         CONTINUE                                      STDE0680
   80 CONTINUE                                                          STDE0690
C                         INITIALIZE THE PRINT ARRAY FOR THIS VARIABLE BY STDE0700
C                         STORING THE NAME FOR ITS FIRST CODE.          STDE0710
      L=LOC(I)                                                          STDE0720
      LIST(IFR)=NAMEC(L)                                                STDE0730
      LIST(IFR+1)=NAMEC(L+1)                                            STDE0740
      LIST(IFR+2)=NAMEC(L+2)                                            STDE0750
C                         90                                            STDE0760
C                         CONTINUE                                      STDE0770
   90 CONTINUE                                                          STDE0780
C                                                                      *STDE0790
C                                                                    ***STDE0800
C                         INITIALIZE ARRAY ICODE - NUMBER OF CODE VALUE STDE0810
C                         BEING PRINTED-TO 1 FOR EACH VARIABLE.         STDE0820
   93 DO 95 I=1,NV                                                      STDE0830
   95 ICODE(I)=1                                                        STDE0840
C                         INITIALIZE CURRENT STATE NUMBER.              STDE0850
      NS=0                                                              STDE0860
C                         THE NUMBER OF DESCRIPTIONS CURRENTLY ON THE PAGESTDE0870
C                         IS INITIALLY SET TO THE MAXIMUM VALUE SO THAT STDE0880
C                         THE INITIAL BRANCH WILL BE TO THE HEADING PRINT.STDE0890
      NDCUR=NDPAGE                                                      STDE0900
C                         IS THERE SPACE ON THE CURRENT PAGE FOR A STATE STDE0910
C                         NUMBER DESCRIPTION?                           STDE0920
  100 IF(NDCUR.LT.NDPAGE) GO TO 120                                     STDE0930
C                         NO                                            STDE0940
C                         RESET NUMBER OF DESCRIPTIONS ON CURRENT PAGE. STDE0950
      NDCUR=0                                                           STDE0960
C                         SKIP TO NEW PAGE. PRINT ONE LINE HEADING. PRINT STDE0970
C                         VARIABLE NAMES.                               STDE0980
      PRINT 97,IDMODL                                                   STDE0990
      PRINT 110,(NAMEV(II),II=1,NV3)                                    STDE1000
      PRINT 112                                                         STDE1010
C                         120                                           STDE1020
C                         INCREMENT CURRENT STATE NUMBER BY 1.          STDE1030
  120 NS=NS+1                                                           STDE1040
C                         ADD ONE TO NUMBER OF DESCRIPTIONS ON THE CURRENTSTDE1050
C                         PAGE.                                         STDE1060
      NDCUR=NDCUR+1                                                     STDE1070
C                         PRINT STATE NUMBER AND ITS DESCRIPTION.       STDE1080
      PRINT 130,NS,(LIST(II),II=1,NV3)                                  STDE1090
C                                                                       STDE1100
```

```
C                       UPDATE CODE LIST SUBSCRIPTS AND PRINT ARRAY.     STDE
C                       THIS PROGRAM SEGMENT IS CONCEPTUALLY A SET OF    STDE
C                       NESTED DO'S WHERE THE NUMBER OF DO'S IS VARI-    STDE
C                       ABLE.                                            STDE
C                       N WILL GO FROM NV TO 1. AT ANY GIVEN TIME N IS   STDE
C                       THE NUMBER OF THE DO LOOP WHOSE INDEX IS BEING   STDE
C                       TESTED AND STEPPED.                              STDE
C                                                                        STDE
C                       DO FOR EACH VARIABLE.                            STDE
      DO 160 I=1,NV                                                      STDE
C                       COMPUTE MISC SUBSCRIPTS (N WILL GO FROM NV TO 1)STDE
      N=NV-I+1                                                           STDE
C                       L2 IS THE LOCATION IN THE PRINT LINE ARRAY FOR   STDE
C                       THE NAME OF THE CODE OF THE N'TH VARIABLE.       STDE
      L2=(N-1)*3+1                                                       STDE
C                       CAN THE INDEX VALUE FOR THE NTH DO BE INCRE-     STDE
C                       MENTED FURTHER?                                  STDE
      IF(ICODE(N).EQ.NCODE(N)) GO TO 150                                 STDE
C                                                                        STDE
C                       YES                                              STDE
C                       INCREMENT NTH DO INDEX VALUE.                    STDE
      ICODE(N)=ICODE(N)+1                                                STDE
C                       L IS THE LOCATION IN THE CODE NAME ARRAY OF THE  STDE
C                       FIRST WORD OF THE CURRENT CODE OF THE N'TH       STDE
C                       VARIABLE.                                        STDE
      L=LOC(N)+(ICODE(N)-1)*3                                            STDE
C                       PLACE NAME FOR CODE NOW INDEXED IN PRINT ARRAY.  STDE
      LIST(L2)  =NAMEC(L)                                                STDE
      LIST(L2+1)=NAMEC(L+1)                                              STDE
      LIST(L2+2)=NAMEC(L+2)                                              STDE
C                       GO TO PRINT DESCRIPTION CURRENTLY IN 'LIST'.     STDE
      GO TO 100                                                          STDE
C                       NO                                               STDE
C                       INDEX VALUE FOR N'TH DO CANNOT BE INCREMENTED    STDE
C                       FURTHER.                                         STDE
C                       RESET THE NTH DO INDEX TO 1.                     STDE
  150 ICODE(N)=1                                                         STDE
C                       L IS THE LOCATION IN THE CODE NAME ARRAY OF THE  STDE
C                       FIRST WORD OF THE FIRST CODE OF THE N'TH         STDE
C                       VARIABLE.                                        STDE
      L=LOC(N)                                                           STDE
C                       PLACE NAME FOR FIRST CODE FOR NTH VARIABLE IN    STDE
C                       PRINT ARRAY.                                     STDE
      LIST(L2)  =NAMEC(L)                                                STDE
      LIST(L2+1)=NAMEC(L+1)                                              STDE
      LIST(L2+2)=NAMEC(L+2)                                              STDE
C                       160                                              STDE
C                       CONTINUE                                         STDE
  160 CONTINUE                                                           STDE
C                       ALL DO LOOPS ARE COMPLETE.                       STDE
C                       ALL STATES LISTED.                               STDE
C                       HAVE ALL COPIES BEEN PRINTED?                    STDE
      IF(NCOPYS.LE.1) GO TO 169                                          STDE
C                       NO                                               STDE
C                       DECREASE NUMBER OF COPIES TO BE PRINTED BY 1.    STDE
      NCOPYS=NCOPYS-1                                                    STDE
      GO TO 93                                                           STDE
```

```
C                         169
C                         YES
C                                   ALL COPYS LISTED
C                         SKIP TO NEW PAGE.
  169 PRINT 170
C                         RETURN
      RETURN
C
C                         300
C                         ERROR IN CARD ENTRY FOR VARIABLE NUMBER.
C                         PRINT ERROR MESSAGE.
  300 PRINT 305,I,INV
C                         EXIT
      STOP
C                         310
C                         ERROR IN CARD ENTRY FOR CODE NUMBER.
C                         PRINT ERROR MESSAGE.
  310 PRINT 305,I,INV,J,INC
C                         EXIT
      STOP
C
   10 FORMAT(20A4/10A4)
   20 FORMAT(2I6)
   30 FORMAT(I6,3A4,I6)
   97 FORMAT(1H1,30A4/)
  110 FORMAT(13H STATE NUMBER,7(4X,3A4)/ (13X,7(4X,3A4)))
  112 FORMAT(1H )
  130 FORMAT(1X,I12,7(4X,3A4)/ (13X,7(4X,3A4)))
  170 FORMAT(1H1)
  305 FORMAT(38H ERROR IN STATE DESCRIPTION DATA CARDS,4I6)
C
C                         REFERENCE LIST.
C
C                         SUBROUTINE ARGUMENTS.
C
C     NAMEV(3*NV) - ARRAY OF VARIABLE NAMES. EACH NAME WILL BE READ AND
C              PRINTED WITH A 3A4 FORMAT.
C     NAMEC(3*SUM OF NCODE(I)) - ARRAY OF CODE NAMES. EACH NAME WILL BE
C              READ AND PRINTED WITH A 3A4 FORMAT.
C     NCODE(NV) - ARRAY CONTAINING NUMBER OF CODES DEFINED FOR EACH
C              VARIABLE.
C     LOC(NV+1) - BEGINNING LOCATION IN NAMEC VECTOR OF CODE NAMES FOR
C                 EACH VARIABLE.
C     ICODE(NV) - CURRENT CODE VALUE BEING PRINTED FOR EACH VARIABLE.
C     LIST(3*NV) - THE ARRAY IN WHICH EACH STATE NUMBER DESCRIPTION IS
C              PLACED FOR PRINTING.
C
C                         OTHER VARIABLES.
C
C     NV     - NUMBER OF VARIABLES IN STATE NUMBER DEFINITION.
C     NS     - NUMBER OF STATE WHOSE DESCRIPTION IS CURRENTLY BEING
C              PRINTED.
C     NLINES - NUMBER PRINT LINES REQUIRED PER DESCRIPTION.
C     NDPAGE - NUMBER OF DESCRIPTIONS THAT CAN BE PRINTED PER PAGE.
C     NDCUR  - NUMBER OF DESCRIPTIONS CURRENTLY PRINTED ON THE PAGE.
C
      END
```

```
      SUBROUTINE STSORT(KSORT,KI,KJ,KS)                                 STS00010
C                                                                       STS00020
C                         THIS IS A CORE SORT TO BE USED FOR            STS00030
C                         (1) ORIGINAL STATE PATTERN SORT               STS00040
C                         (2) CLLAPS OUTPUT SORT                        STS00050
C                         WHEN THE NUMBER OF UNIQUE OUTPUT PATTERNS PLUS STS00060
C                         THEIR FREQUENCIES WILL FIT IN CORE.           STS00070
C                         THIS OPERATION MAY BE USED WHEN THE SORT OUTPUT STS00080
C                         WILL FIT IN CORE REGARDLESS OF THE NUMBER OF  STS00090
C                         INPUT RECORDS.  BUT  THE NUMBER OF INPUT RECORDSSTS00100
C                         IS A CRITICAL FACTOR IN DETERMINING CPU TIME  STS00110
C                         SINCE THIS SORT IS NOT SOPHISTICATED.         STS00120
C                         EACH UNIQUE PATTERN IS STORED AS A COLUMN SINCE STS00130
C                         FORTRAN STORES ARRAYS BY COLUMN. THEREFORE THE STS00140
C                         'PUSHDOWN' OPERATION WILL OPERATE ON CONSECUTIVESTS00150
C                         LOCATIONS.                                    STS00160
C                                                                       STS00170
      DIMENSION KSORT(KI,KJ),KS(1)                                      STS00180
C                         READ OUTPUT UNIT ID                           STS00190
      READ 10,KOUT                                                      STS00200
   10 FORMAT(4I6)                                                       STS00210
C                         REWIND OUTPUT UNIT.                           STS00220
      REWIND KOUT                                                       STS00230
C                         READ INPUT UNIT ID, MODEL NUMBER, NUMBER OF   STS00240
C                         WORDS IN INPUT RECORD, TYPE OF INPUT SWITCH.  STS00250
   20 READ 10,KINP,MODL,NS,NSW                                          STS00260
C                         HAVE ALL INPUT FILES BEEN PROCESSED?          STS00270
      IF(KINP.NE.0) GO TO 30                                            STS00280
C                         YES                                           STS00290
C                         REWIND OUTPUT UNIT.                           STS00300
      REWIND KOUT                                                       STS00310
C                         RETURN                                        STS00320
      RETURN                                                            STS00330
C                         30                                            STS00340
C                         NO                                            STS00350
C                         REWIND THE INPUT UNIT.                        STS00360
   30 REWIND KINP                                                       STS00370
C                         READ THE FIRST DATA RECORD FROM KINP.         STS00380
      READ(KINP,END=300)(KS(I),I=1,NS)                                  STS00390
C                         NO EOF                                        STS00400
C                         STORE KS AS FIRST COLUMN RECORD IN KSORT.     STS00410
      DO 40 I=1,NS                                                      STS00420
   40 KSORT(I,1)=KS(I)                                                  STS00430
C                                                                       STS00440
C                         INITIALIZE COUNTERS AND CONTROL VARIABLES.    STS00450
C                                                                       STS00460
C                         INITIALIZE NUMBER OF ENTRIES IN SORT ARRAY, AND STS00470
C                         NUMBER OF RECORDS READ.                       STS00480
      LAST=1                                                            STS00490
      NCASES=1                                                          STS00500
C                         IF THE FILE BEING SORTED DOES NOT HAVE A FREQ- STS00510
C                         UENCY WORD, STORE A 1 IN THE NSWTH WORD.      STS00520
      IF(NSW.NE.0) KSORT(NSW,1)=1                                       STS00530
C                         SET NSTO EQUAL THE NUMBER OF WORDS IN THE SORT STS00540
C                         FIELD. THIS WILL BE THE TOTAL INPUT RECORD IF STS00550
C                         THE INPUT RECORD CONTAINS STATE NUMBERS ONLY. STS00560
```

```
      NSTO=NS                                                           STS00570
C                          THE SORT FIELD WILL BE THE MODEL NUMBER AND THE STS00580
C                          STATE PATTERN BUT NOT THE FREQUENCY IF COLLAPSEDSTS00590
C                          OUTPUT IS BEING SORTED.                      STS00600
      IF(NSW.EQ.0) NSTO=NSTO-1                                          STS00610
C                                                                       STS00620
C                          READ FOR DATA RECORD 2 PLUS ALL OTHER RECORDS. STS00630
C                          READ A DATA RECORD FROM KINP INTO KS.        STS00640
   50 READ(KINP,END=250)(KS(I),I=1,NS)                                  STS00650
C                          NO EOF                                       STS00660
C                          ADD 1 TO NUMBER OF RECORDS READ.             STS00670
      NCASES=NCASES+1                                                   STS00680
C                                                                     ***STS00690
C                                                                      *STS00700
C                          FILE KS INTO KSORT.                          STS00710
C                          DO FOR EACH PATTERN IN THE SORT ARRAY.       STS00720
      DO 150 I=1,LAST                                                   STS00730
C                          DO FOR EACH WORD IN THE SORT FIELD.          STS00740
      DO 100 J=1,NSTO                                                   STS00750
C                          IS PATTERN ALREADY STORED IN CORE.           STS00760
      IF(KS(J).LT.KSORT(J,I)) GO TO 190                                 STS00770
      IF(KS(J).GT.KSORT(J,I)) GO TO 150                                 STS00780
C                          100                                          STS00790
C                          CONTINUE                                     STS00800
  100 CONTINUE                                                          STS00810
C                          YES                                          STS00820
C                          MATCH IF FALLS THRU THIS CONTINUE.           STS00830
C                          UPDATE FREQUENCY WORD.                       STS00840
      IF(NSW.EQ.0) KSORT(NS,I)=KSORT(NS,I)+KS(NS)                       STS00850
      IF(NSW.NE.0) KSORT(NSW,I)=KSORT(NSW,I)+1                          STS00860
C                          GO TO READ NEXT RECORD.                      STS00870
      GO TO 50                                                          STS00880
C                          150                                          STS00890
C                          CONTINUE FOR DO EACH PATTERN LOOP.           STS00900
  150 CONTINUE                                                          STS00910
C                                                                       STS00920
C                          NO MATCH AND PATTERN HAS GREATER VALUE THAN ANY STS00930
C                          IN ARRAY. ADD TO ARRAY.                      STS00940
C                          ADD 1 TO COUNT OF UNIQUE PATTERNS.           STS00950
      LAST=LAST+1                                                       STS00960
C                          DOES NUMBER OF PATTERNS EXCEED SORT ARRAY DIM- STS00970
C                          ENSION.                                      STS00980
C                          YES. GO TO PRINT ERROR MESSAGE.              STS00990
      IF(LAST.GT.KJ) GO TO 350                                          STS01000
C                          NO                                           STS01010
C                          MOVE KS TO COLUMN LAST OF KSORT.             STS01020
      DO 170 J=1,NS                                                     STS01030
  170 KSORT(J,LAST)=KS(J)                                               STS01040
C                          IF THIS IS AN ORIG PATTERN TAPE ADD A FREQ WORD STS01050
C                          WITH THE VALUE OF 1.                         STS01060
      IF(NSW.NE.0) KSORT(NSW,LAST)=1                                    STS01070
C                          GO TO READ NEXT RECORD.                      STS01080
      GO TO 50                                                          STS01090
C                                                                       STS01100
C                          190                                          STS01110
C                          NO MATCH. ADD PATTERN AT ITH POSITION IN SORT STS01120
C                          ARRAY.                                       STS01130
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C                       WITH ADDITION OF THIS ELEMENT, WILL NUMBER OF   STSO1140
C                       PATTERNS EXCEED SORT ARRAY DIMENSION?           STSO1150
C                       YES, GO TO PRINT ERROR MESSAGE.                 STSO1160
  190 IF(LAST+1.GT.KJ) GO TO 350                                        STSO1170
C                       NO                                              STSO1180
C                       PUSH DOWN ENTRIES IN SORT ARRAY.                STSO1190
      CALL TMT2(KSORT(1,I),KSORT(1,I+1),(LAST-I+1)*KI)                  STSO1200
C                       MOVE KS TO COLUMN I OF KSORT.                   STSO1210
      DO 200 J=1,NS                                                     STSO1220
  200 KSORT(J,I)=KS(J)                                                  STSO1230
C                       IF THIS IS AN ORIG PATTERN TAPE ADD A FREQ WORD STSO1240
C                       WITH THE VALUE OF 1.                            STSO1250
      IF(NSW.NE.0) KSORT(NSW,I)=1                                       STSO1260
C                       ADD 1 TO COUNT OF UNIQUE PATTERNS.              STSO1270
      LAST=LAST+1                                                       STSO1280
C                       GO TO READ NEXT RECORD.                         STSO1290
      GO TO 50                                                          STSO1300
C                                                                      *STSO1310
C                                                                   ***STSO1320
C                       250                                             STSO1330
C                       END OF FILE ON READ.                            STSO1340
C                       REWIND INPUT UNIT.                              STSO1350
  250 REWIND KINP                                                       STSO1360
C                       PRINT NUMBER OF INPUT RECORDS AND NUMBER OF     STSO1370
C                       PATTERNS FOR THIS MODEL.                        STSO1380
      PRINT 260,MODL,NCASES,LAST                                        STSO1390
  260 FORMAT(23H STSORT - MODEL NUMBER ,I6,24H NUMBER OF INPUT RECORDS ,STSO1400
     1I12/9X,                                                           STSO1410
     2    53H NUMBER OF OUTPUT RECORDS (UNIQUE PATTERNS OR PAIRS) ,I12) STSO1420
C                                                                       STSO1430
C                       BRANCH ON INPUT DATA TYPE.                      STSO1440
      IF(NSW.NE.0) GO TO 400                                            STSO1450
C                       COLLAPSE INPUT: FOR EACH OF LAST UNIQUE PAT-    STSO1460
C                       TERN, WRITE NS WORDS.                           STSO1470
      DO 280 I=1,LAST                                                   STSO1480
  280 WRITE(KOUT)(KSORT(J,I),J=1,NS)                                    STSO1490
C                       GO TO READ NEXT CONTROL CARD.                   STSO1500
      GO TO 20                                                          STSO1510
C                       400                                             STSO1520
C                       GENERATE STATE NUMBER INPUT: FOR EACH OF 'LAST' STSO1530
C                       UNIQUE PATTERNS, WRITE MODEL NUMBER AND NSW     STSO1540
C                       WORDS.                                          STSO1550
  400 DO 410 I=1,LAST                                                   STSO1560
  410 WRITE(KOUT)MODL,(KSORT(J,I),J=1,NSW)                              STSO1570
C                       GO TO READ NEXT CONTROL CARD.                   STSO1580
      GO TO 20                                                          STSO1590
C                       300                                             STSO1600
C                       EOF ON FIRST READ.                              STSO1610
C                       PRINT ERROR MESSAGE - EOF ON FIRST READ         STSO1620
  300 PRINT 310,KINP,MODL                                               STSO1630
  310 FORMAT(40H STSORT - EOF ON FIRST READ. INPUT UNIT ,I6,11H MODEL NOSTSO1640
     1. ,I6)                                                            STSO1650
C                       EXIT                                            STSO1660
      STOP                                                              STSO1670
C                       350                                             STSO1680
C                       DIMENSION PROBLEM.                              STSO1690
C                       PRINT MESSAGE IN RE NUMBER OF PATTERNS EXCEEDINGSTSO1700
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C                         DIMENSION.                                    STS01710
  350 PRINT 360,KINP,MODL,NCASES                                        STS01720
  360 FORMAT(68H STSORT - NUMBER OF PATTERNS EXCEEDS KJ (COL) DIMENSION.STS01730
     1 INPUT UNIT ,I6,11H MODEL NO. ,I6                                 STS01740
     2/30H NUMBER OF INPUT RECORDS READ ,I6)                            STS01750
C                                                                       STS01760
C                         REWIND INPUT UNIT.                            STS01770
      REWIND KINP                                                       STS01780
C                         EXIT                                          STS01790
      STOP                                                              STS01800
C                                                                       STS01810
C                         REFERENCE LIST.                               STS01820
C                                                                       STS01830
C                         SUBROUTINE ARGUMENTS.                         STS01840
C                                                                       STS01850
C     KSORT  - ARRAY CONTAINING PATTERNS AND FREQUENCIES.               STS01860
C     KI     - KSORT ROW DIMENSION. ALLOW FOR MAX STATES+MOD NO+FREQ.   STS01670
C     KJ     - KSORT COL DIMENSION. ALLOW FOR MAX NUMBER PATTERNS.      STS01880
C     KS     - ARRAY FOR READING INPUT.                                 STS01890
C                                                                       STS01900
C                         OTHER VARIABLES.                              STS01910
C                                                                       STS01920
C     LAST   - NUMBER OF ENTRIES IN KSORT ARRAY.  NUMBER OF OUTPUT RECDSSTS01930
C     MODL   - MODEL NUMBER FOR OUTPUT IF ORIGINAL STATE NUMBERS ARE    STS01940
C              BEING SORTED. THIS IS ALSO THE MODEL NUMBER THAT WILL BE STS01950
C              PRINTED WITH THE I/O COUNTS.                             STS01960
C     NCASES - NUMBER OF INPUT RECORDS READ.                            STS01970
C     NS     - NUMBER WORDS IN INPUT RECORD. THIS WILL BE NUMBER OF     STS01980
C              STATE NUMBERS IF NSW IS NON-ZERO, AND NUMBER OF STATE    STS01990
C              NUMBERS -PER PATTERN- PLUS TWO IF NSW IS ZERO.           STS02000
C     NSTO   - THE NUMBER OF WORDS IN THE SORT FIELD.                   STS02010
C     NSW    - SWITCH INDICATING TYPE OF INPUT.                         STS02020
C              NS+1 - UNSORTED ORIGINAL STATE NUMBER RECORDS.           STS02030
C              0    - MOD NUMB, STATE PATTERN, FREQ FROM COLLAPSE RUN.  STS02040
      END                                                               STS02050
```

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      SUBROUTINE SXP(NDIM,ISN,ISVEC,KSN,KSVEC,SVEC,JCOL,P,LABELS,LABELP)SXP 0010
C                                                                       SXP 0020
C                       MULTIPLY S VECTOR TIMES P MATRIX TO OBTAIN      SXP 0030
C                       PROJECTED S VECTOR.                             SXP 0040
C                                                                       SXP 0050
      IMPLICIT REAL*8(A-H,O-Z,$)                                        SXP 0060
      DIMENSION ISN(1),ISVEC(1),KSN(1),KSVEC(1),SVEC(1),JCOL(1),P(1)    SXP 0070
     1          ,LABELS(1),LABELP(1)                                    SXP 0080
C                       KSVEC(1) AND SVEC(1) MAY HAVE BEEN EQUIVALENCED SXP 0090
C                       IN THE MAIN PROGRAM. NO OTHER EQUIVALENCE RELA- SXP 0100
C                       TION OF THE ARRAYS IN THE ARGUMENT LIST IS PER- SXP 0110
C                       MITTED.                                         SXP 0120
      DIMENSION NAMES(6),NAMEP(6),NFILL6(6)                             SXP 0130
C                                                                       SXP 0140
C                       INITIALIZATION FOR THIS CALL.                   SXP 0150
C                       SET RECORD TYPE CONSTANTS.                      SXP 0160
C                       S VECTOR BEGINNING LABEL.                       SXP 0170
      KSBEG=2                                                           SXP 0180
C                       S VECTOR DATA RECORD.                           SXP 0190
      KSDAT=22                                                          SXP 0200
C                       S VECTOR END LABEL.                             SXP 0210
      KSEND=32                                                          SXP 0220
C                       FLOW MODEL END OF FILE RECORD.                  SXP 0230
      KNEXT=40                                                          SXP 0240
      NFILL=1                                                           SXP 0250
C                       ARRAY NFILL6 = BLANK.                           SXP 0260
      DATA KBLANK/4H    /                                               SXP 0270
      DO 1 I=1,6                                                        SXP 0280
    1 NFILL6(I)=KBLANK                                                  SXP 0290
C                       SKIP TO NEW PAGE ON PRINTER.                    SXP 0300
      PRINT 2                                                           SXP 0310
C                       READ OUTPUT UNIT ID AND REWIND.                 SXP 0320
      READ 5,IOUT                                                       SXP 0330
      REWIND IOUT                                                       SXP 0340
C                       SET NUMBER OF OUTPUT FILES EQUAL ZERO.          SXP 0350
      NFILES=0                                                          SXP 0360
C                                                                     ***SXP 0370
C                                                                      *SXP 0380
C                       10                                              SXP 0390
C                       READ AN INPUT SPECIFICATION CONTROL CARD.       SXP 0400
C                       READ:                                           SXP 0410
C                       NAMES - NAME OF S VECTOR.                       SXP 0420
C                       INPS - UNIT WHERE S IS LOCATED.                 SXP 0430
C                       NAMEP - NAME OF P MATRIX.                       SXP 0440
C                       INPP - UNIT WHERE P IS LOCATED.                 SXP 0450
C                       NITER - NUMBER ITERATIONS PER S, P PAIR.        SXP 0460
C                       NPAIRS - NUMBER 'PAIRED' (S,P) ARRAYS.          SXP 0470
C                       NUMP - NUMBER P'S PER S.                        SXP 0480
C                       IODISK - INTERMEDIATE STORAGE DISK.             SXP 0490
   10 READ 20,NAMES,INPS,NAMEP,INPP,NITER,NPAIRS,NUMP,IODISK            SXP 0500
C                       HAS ALL INPUT BEEN PROCESSED?                   SXP 0510
C                       YES. GO TO CLOSE OUTPUT FILE.                   SXP 0520
      IF(NITER.EQ.0) GO TO 300                                          SXP 0530
C                                                                       SXP 0540
C                       30                                              SXP 0550
C                       NO                                              SXP 0560
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C                       PROCESS THE CONTROL CARD JUST READ.                SXP 0570
C                       INITIALIZE ITERATIONS COMPLETED TO ZERO.           SXP 0580
   30 ITER=0                                                               SXP 0590
C                       LOCATE NAMED S VECTOR. S LABEL IS RETURNED.        SXP 0600
      CALL POSINP(INPS,KTYPE,NAMES,NLS,LABELS)                             SXP 0610
C                       READ S VECTOR DATA RECORD INTO ISN AND ISVEC.      SXP 0620
   32 READ(INPS)KTYPE,                                                     SXP 0630
     1          NFILL,ISCNT,(ISN(I),I=1,ISCNT),(ISVEC(I),I=1,ISCNT)       SXP 0640
C                       READ INPUT S SUM FROM S END RECORD.                SXP 0650
      READ(INPS)KTYPE,NFILL,NFILL,INSUM,NFILL                              SXP 0660
C                       PRINT INPUT S NAME AND SUM.                        SXP 0670
      PRINT 35,NAMES,INSUM                                                 SXP 0680
C                       TEST FOR TYPE POSITIONING REQUIRED FOR P.          SXP 0690
C                       IS THIS AN (S,P) PAIRS SPECIFICATION?              SXP 0700
      IF(NPAIRS.GT.0) GO TO 50                                             SXP 0710
C                       NO                                                 SXP 0720
C                       LOCATE NAMED P AND RETURN P LABEL.                 SXP 0730
      CALL POSINP(INPP,KTYPE,NAMEP,NLP,LABELP)                             SXP 0740
      GO TO 52                                                             SXP 0750
C                       50                                                 SXP 0760
C                       YES                                                SXP 0770
C                       THIS IS AN (S,P) PAIR SPECIFICATION.               SXP 0780
C                       THE NEXT RECORD WILL BE THE P TO BE PAIRED WITH SXP 0790
C                       THE S JUST READ. READ THIS P LABEL RECORD.         SXP 0800
   50 READ(INPP)KTYPE,NAMEP,NLP,(LABELP(I),I=1,NLP)                        SXP 0810
C                                                                          SXP 0820
C                       52                                                 SXP 0830
C                       SKIP P MATRIX ROW LIST RECORD.                     SXP 0840
   52 READ(INPP)                                                           SXP 0850
C                       READ P MATRIX LIST OF COLUMNS PRESENT AND INCRE-SXP 0860
C                       MENT DATA.                                         SXP 0870
      READ(INPP)KTYPE,KSCNT,(KSN(K),K=1,KSCNT),NUMMO,NUMYR                 SXP 0880
C                                                                          SXP 0890
C                       IS NUMBER OF ITERATIONS FOR THIS P EQUAL ONE?      SXP 0900
      IF(NITER.EQ.1) GO TO 58                                              SXP 0910
C                       NO                                                 SXP 0920
C                       SET WORKING P UNIT EQUAL SEQUENTIAL DISK UNIT.     SXP 0930
      INPX=IODISK                                                          SXP 0940
C                       REWIND DISK UNIT.                                  SXP 0950
      REWIND INPX                                                          SXP 0960
C                       COPY P MATRIX ONTO DISK.                           SXP 0970
C                       READ A P DATA RECORD FROM TAPE.                    SXP 0980
   56 READ(INPP) KTYPE,KROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)        SXP 0990
C                       WRITE RECORD JUST READ ON DISK.                    SXP 1000
      WRITE(INPX)KTYPE,KROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)        SXP 1010
C                       WAS THIS A P END RECORD?                           SXP 1020
C                       NO. GO TO READ NEXT RECORD.                        SXP 1030
      IF(KTYPE.NE.33) GO TO 56                                             SXP 1040
C                       YES                                                SXP 1050
C                       REWIND DISK.                                       SXP 1060
      REWIND INPX                                                          SXP 1070
      GO TO 60                                                             SXP 1080
C                       58                                                 SXP 1090
C                       YES                                                SXP 1100
C                       THE NUMBER OF ITERATIONS IS ONE.                   SXP 1110
C                       THE P MATRIX IS NOT TRANSFERRED TO THE WORK UNITSXP 1120
C                       SET WORKING P UNIT EQUAL ORIGINAL INPUT UNIT FORSXP 1130
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C                       P.                                                SXP 1140
   58 INPX=INPP                                                          SXP 1150
C                                                                        SXP 1160
C                       60                                                SXP 1170
C                       SET UP OUTPUT S LABEL AND NAME.                   SXP 1180
C                       FIRST. COPY INFO FROM INPUT S AND P MATRIX.       SXP 1190
   60 NLS2=90                                                            SXP 1200
      IF(NLP.GT.30) NLS2=120                                             SXP 1210
      CALL TMT(NLS2-60,LABELS(61),LABELP(1))                             SXP 1220
      CALL TMT(13,LABELS(31),52H   PROJECTED TO MON YEAR BY TRANSITION MSXP 1230
     1ATRIX       )                                                      SXP 1240
      CALL TMT(17,LABELS(44),LABELS(43))                                 SXP 1250
C                       SECOND. INCREMENT MONTH AND YEAR. PLACE IN        SXP 1260
C                       OUTPUT S NAME AND OUTPUT S LABEL.                 SXP 1270
C                       MONTH WILL BE IN LABELS(35).                      SXP 1280
C                       YEAR  WILL BE IN LABELS(36).                      SXP 1290
  65  CALL NUDATE(NAMES(5),NAMES(6),NUMMO,NUMYR)                          SXP 1300
      LABELS(35)=NAMES(5)                                                SXP 1310
      LABELS(36)=NAMES(6)                                                SXP 1320
C                       OUTPUT S LABEL COMPLETE.                          SXP 1330
C                                                                       ***SXP 1340
C                                                                        *SXP 1350
C                       S VECTOR - P MATRIX MULTIPLICATION.               SXP 1360
C                       PLACE ZEROS IN OUTPUT S AREA.                     SXP 1370
      DO 80 I=1,NDIM                                                     SXP 1380
   80 SVEC(I)=0.0                                                        SXP 1390
C                                                                        SXP 1400
C                       I = SUBSCRIPT FOR INPUT S, ISN.                   SXP 1410
C                       J = SUBSCRIPT FOR P MATRIX ROW, JCOL.             SXP 1420
C                       K = SUBSCRIPT FOR OUTPUT S, KSN.                  SXP 1430
C                                                                        SXP 1440
C                       SET I TO 1(SUBSCRIPT FOR INPUT S).                SXP 1450
      I=1                                                                SXP 1460
C                       90                                                SXP 1470
C                       READ A P RECORD: TYPE, ROW NUMBER, NUMBER OF      SXP 1480
C                       ELEMENTS, COLUMN NUMBERS, COLUMN VALUES.          SXP 1490
   90 READ(1..PX)KTYPE,KROW,JCNT,(JCOL(J),J=1,JCNT),(P(J),J=1,JCNT)      SXP 1500
C                       WAS THIS A P END LABEL?                           SXP 1510
C                       YES. GO TO END OF MULTIPLY SEGMENT.               SXP 1520
      IF(KTYPE.EQ.33) GO TO 150                                          SXP 1530
C                       NO                                                SXP 1540
C                       DOES I'TH STATE NUMBER OF INPUT S EQUAL ROW       SXP 1550
C                       NUMBER OF P RECORD JUST READ?                     SXP 1560
   95 IF(ISN(I).EQ.KROW) GO TO 100                                       SXP 1570
C                       NO                                                SXP 1580
C                       IS I'TH STATE NUMBER OF INPUT S LESS THAN         SXP 1590
C                       CURRENT ROW NUMBER OF P?                          SXP 1600
C                       YES. GO TO INCREMENT INDEX FOR INPUT S ELEMENT.   SXP 1610
      IF(ISN(I).LT.KROW) GO TO 125                                       SXP 1620
C                       NO                                                SXP 1630
C                       S STATE NUMBER NOT PRESENT FOR CURRENT P ROW.     SXP 1640
C                       GO TO READ NEXT P RECORD.                         SXP 1650
      GO TO 90                                                           SXP 1660
C                                                                        SXP 1670
C                       100                                               SXP 1680
C                       S STATE NUMBER AND P ROW NUMBER MATCH.            SXP 1690
C                       MULTIPLY                                          SXP 1700
```

```
C                                                                       SXP 1710
C                         IS S(I) STATE VALUE .LE.ZERO?                 SXP 1720
C                         YES. GO TO INCREMENT INPUT S SUBSCRIPT.       SXP 1730
  100 IF(ISVEC(I).LE.0) GO TO 130                                       SXP 1740
C                         NO                                            SXP 1750
C                                                                       SXP 1760
C                         MULTIPLY S(I) VALUE TIMES ELEMENTS OF CURRENT P SXP 1770
C                         ROW.                                          SXP 1780
C                                                                       SXP 1790
C                         FLOAT S(I) STATE VALUE.                       SXP 1800
      S=ISVEC(I)                                                        SXP 1810
C                         SET J=1 (SUBSCRIPT FOR P ROW).                SXP 1820
      J=1                                                               SXP 1830
C                         SET K=1 (SUBSCRIPT FOR OUTPUT S).             SXP 1840
      K=1                                                               SXP 1850
C                                                                       SXP 1860
C                         110                                           SXP 1870
C                         IS J'TH COLUMN NUMBER IN CURRENT P ROW EQUAL  SXP 1880
C                         K'TH ELEMENT NUMBER IN OUTPUT S?              SXP 1890
  110 IF(JCOL(J).NE.KSN(K)) GO TO 120                                   SXP 1900
C                         YES                                           SXP 1910
C                         OUTPUT S VALUE(K) = OUTPUT S VALUE(K) + P VALUE SXP 1920
C                         (J) * INPUT S VALUE(I).                       SXP 1930
      SVEC(K)=SVEC(K)+P(J)*S                                            SXP 1940
C                         HAVE ALL COLUMN ELEMENTS IN THIS ROW OF P MATRIXSXP 1950
C                         BEEN PROCESSED?                               SXP 1960
      IF(J.EQ.JCNT) GO TO 130                                           SXP 1970
C                         NO                                            SXP 1980
C                         INCREMENT P AND OUTPUT S SUBSCRIPTS.          SXP 1990
      J=J+1                                                             SXP 2000
      K=K+1                                                             SXP 2010
C                         KSCNT WILL ALWAYS BE GE JCNT.                 SXP 2020
C                         GO TO COMPARE P COL AND OUTPUT S ELEMENT NUMBERSSXP 2030
      GO TO 110                                                         SXP 2040
C                                                                       SXP 2050
C                         120                                           SXP 2060
C                         J'TH COL NUMB IN P ROW IS NOT EQUAL K'TH ELEMENTSXP 2070
C                         NUMB IN OUTPUT S. SINCE THE OUTPUT S ELEMENT  SXP 2080
C                         LIST IS THE P MATRIX COL LIST, ALL COL NUMB'S INSXP 2090
C                         ANY P ROW ARE IN THE OUTPUT S ELEMENT LIST.   SXP 2100
C                         THEREFORE INCREMENT S ELEMENT SUBSCRIPT.      SXP 2110
  120 K=K+1                                                             SXP 2120
C                         GO TO COMPARE P COL AND OUTPUT S ELEMENT NUMBERSSXP 2130
      GO TO 110                                                         SXP 2140
C                         125                                           SXP 2150
C                         P ROW NOT PRESENT FOR CURRENT S STATE NUMBER. SXP 2160
C                         HAVE ALL S(I) ELEMENTS BEEN PROCESSED?        SXP 2170
C                         YES. GO TO END OF ITERATION POSITIONING OF P. SXP 2180
  125 IF(I.EQ.ISCNT) GO TO 140                                          SXP 2190
C                         NO                                            SXP 2200
C                         ADD 1 TO SUBSCRIPT I.                         SXP 2210
      I=I+1                                                             SXP 2220
C                         GO TO COMPARE CURRENT INPUT S STATE NUMBER AND SXP 2230
C                         P ROW NUMBER.                                 SXP 2240
      GO TO 95                                                          SXP 2250
C                                                                       SXP 2260
C                         130                                           SXP 2270
```

```
C                         PROCESSING COMPLETED FOR A MATCHING S(I) STATE  SXP 2280
C                         NUMBER AND P ROW.                               SXP 2290
C                         HAVE ALL S(I) ELEMENTS BEEN PROCESSED?          SXP 2300
  130 IF(I.EQ.ISCNT) GO TO 140                                            SXP 2310
C                         NO                                              SXP 2320
C                         ADD 1 TO INPUT S SUBSCRIPT.                     SXP 2330
      I=I+1                                                               SXP 2340
C                         GO TO READ NEXT P ROW RECORD.                   SXP 2350
      GO TO 90                                                            SXP 2360
C                                                                         SXP 2370
C                         140                                             SXP 2380
C                         YES                                             SXP 2390
C                         ALL INPUT S ELEMENTS HAVE BEEN PROCESSED.       SXP 2400
C                                                                         SXP 2410
C                         IS WORKING P MATRIX ON DISK?                    SXP 2420
  140 IF(NITER.GT.1) GO TO 150                                            SXP 2430
C                         NO                                              SXP 2440
C                         READ REMAINING RECORDS FOR THIS P MATRIX.       SXP 2450
C                         THIS IS JUST SO TAPE WILL ALWAYS BE POSITIONED  SXP 2460
C                         AFTER A P END RECORD AT THE END OF AN ITERATION.SXP 2470
C                         DISK WILL BE POSITIONED PROPERLY BY A REWIND.   SXP 2480
C                         READ NEXT P RECORD.                             SXP 2490
  142 READ(INPP)KTYPE                                                     SXP 2500
C                         IS THIS THE END RECORD?                         SXP 2510
      IF(KTYPE.EQ.33) GO TO 150                                           SXP 2520
C                         NO                                              SXP 2530
      GO TO 142                                                           SXP 2540
C                                                                         SXP 2550
C                         150                                             SXP 2560
C                         MULTIPLICATION OF THIS S AND P COMPLETE.        SXP 2570
C                         ADD 1 TO ITERATIONS COMPLETED COUNT.            SXP 2580
  150 ITER=ITER+1                                                         SXP 2590
C                         END OF MULTIPLY SEGMENT OF PROGRAM.             SXP 2600
C                                                                        *SXP 2610
C                                                                       ***SXP 2620
C                         INITIALIZE OUTPUT S SUM.                        SXP 2630
      ISUM=0                                                              SXP 2640
C                         DO FOR EACH ENTRY IN OUTPUT S.                  SXP 2650
      DO 200 M=1,KSCNT                                                    SXP 2660
C                         CONVERT NEW S VALUES FROM REAL TO INTEGER.      SXP 2670
      KSVEC(M)=SVEC(M)+.5D0                                               SXP 2680
C                         ACCUMULATE OUTPUT S SUM.                        SXP 2690
  200 ISUM=ISUM+KSVEC(M)                                                  SXP 2700
C                         IF THE NEW SUM IS NOT EQUAL THE OLD SUM, ADJUST SXP 2710
C                         THE STATE ZERO VALUE SO THAT IT WILL BE.        SXP 2720
      KSVEC(1)=KSVEC(1)+INSUM-ISUM                                        SXP 2730
C                         PRINT OUTPUT S NAME AND SUM BEFORE STATE ZERO   SXP 2740
C                         ADJUSTMENT.                                     SXP 2750
      PRINT 220,NAMES,ISUM                                                SXP 2760
C                                                                         SXP 2770
C                         WRITE NEW S ON OUTPUT UNIT: BEGINNING RECORD,   SXP 2780
C                         DATA RECORD. END RECORD.                        SXP 2790
      WRITE(IOUT)KSBEG,NAMES,NLS2,(LABELS(I),I=1,NLS2)                    SXP 2800
      WRITE(IOUT)KSDAT,NFILL,KSCNT,(KSN(K),K=1,KSCNT),(KSVEC(K),K=1,      SXP 2810
     1           KSCNT)                                                   SXP 2820
      WRITE(IOUT)KSEND,NFILL,NFILL,INSUM,NFILL                            SXP 2830
C                         UPDATE NUMBER OF OUTPUT FILES.                  SXP 2840
```

```
      NFILES=NFILES+1                                                   SXP 2850
C                          IS WORKING P ON DISK?                        SXP 2860
C                          NO. ITERATIONS FOR THIS S AND P COMPLETE.    SXP 2870
      IF(NITER .LE.1) GO TO 240                                         SXP 2880
C                          YES                                          SXP 2890
C                          REWIND DISK.                                 SXP 2900
      REWIND INPX                                                       SXP 2910
C                          ARE MORE ITERATIONS TO BE PERFORMED FOR THIS SXP 2920
C                          S AND P?                                     SXP 2930
      IF(ITER.GE.NITER) GO TO 240                                       SXP 2940
C                          YES                                          SXP 2950
C                          THE NEW S FROM THE ITERATION JUST COMPLETED WILLSXP 2960
C                          BE THE INPUT S FOR THE NEXT ITERATION.       SXP 2970
C                          MOVE KSCNT TO ISCNT.                         SXP 2980
      ISCNT=KSCNT                                                       SXP 2990
C                               KSN TO ISN                              SXP 3000
      CALL TMT(KSCNT,ISN(1),KSN(1))                                     SXP 3010
C                               KSVEC TO ISVEC.                         SXP 3020
      CALL TMT(KSCNT,ISVEC(1),KSVEC(1))                                 SXP 3030
C                          GO TO INCREMENT MON AND YEAR AND CONTINUE.   SXP 3040
      GO TO 65                                                          SXP 3050
C                                                                       SXP 3060
C                          240                                          SXP 3070
C                          ALL ITERATIONS FOR THIS S AND P ARE COMPLETED. SXP 3080
C                          IS THIS A PAIR OPERATION?                    SXP 3090
  240 IF(NPAIRS.EQ.0) GO TO 260                                         SXP 3100
C                          YES                                          SXP 3110
C                          DECREASE NPAIRS BY 1.                        SXP 3120
      NPAIRS=NPAIRS-1                                                   SXP 3130
C                          HAVE ALL PAIRS BEEN PROCESSED?               SXP 3140
C                          YES. GO TO READ A CONTROL CARD.              SXP 3150
      IF(NPAIRS.EQ.0) GO TO 10                                          SXP 3160
C                          NO                                           SXP 3170
C                          RESET ITERATION TO 0, KTYPE TO 2.            SXP 3180
      ITER=0                                                            SXP 3190
      KTYPE=2                                                           SXP 3200
C                          CALL POSFWD FOR S OF NEXT PAIR.              SXP 3210
      CALL POSFWD(INPS,KTYPE,NAMES,NLS,LABELS)                          SXP 3220
C                          GO TO READ S DATA RECORD.                    SXP 3230
      GO TO 32                                                          SXP 3240
C                                                                       SXP 3250
C                          IS THIS A NUMP SET?                          SXP 3260
C                          NO, GO TO READ A CONTROL CARD.               SXP 3270
  260 IF(NUMP.EQ.0) GO TO 10                                            SXP 3280
C                          YES                                          SXP 3290
C                          DECREASE NUMP BY 1.                          SXP 3300
      NUMP=NUMP-1                                                       SXP 3310
C                          HAVE ALL P'S BEEN PROCESSED?                 SXP 3320
C                          YES. GO TO READ A CONTROL CARD.              SXP 3330
      IF(NUMP.EQ.0) GO TO 10                                            SXP 3340
C                          NO                                           SXP 3350
C                          RESET ITER TO 0, KTYPE TO 3.                 SXP 3360
      ITER=0                                                            SXP 3370
      KTYPE=3                                                           SXP 3380
C                          CALL POSFWD FOR NEXT P.                      SXP 3390
      CALL POSFWD(INPP,KTYPE,NAMEP,NLP,LABELP)                          SXP 3400
C                          FINAL NEW S FROM LAST ITERATION OF PREVIOUS P SXP 3410
```

```
C                       WILL BE THE INPUT S FOR THE FIRST ITERATION OF  SXP
C                       THIS P.                                         SXP
C                       MOVE KSCNT TO ISCNT, KSN TO ISN, KSVEC TO ISVEC.SXP
      ISCNT=KSCNT                                                       SXP
      CALL TMT(KSCNT,ISN(1),KSN(1))                                     SXP
      CALL TMT(KSCNT,ISVEC(1),KSVEC(1))                                 SXP
C                       GO TO READ P DATA RECORDS.                      SXP
      GO TO 52                                                          SXP
C                                                                       SXP
C                       YES                                             SXP
C                       MULTIPLICATIONS COMPLETE FOR THIS CALL.         SXP
C                       ADD 1 TO NUMBER OF OUTPUT FILES.                SXP
  300 NFILES=NFILES+1                                                   SXP
C                       WRITE END LABEL ON OUTPUT.                      SXP
      WRITE(IOUT) KNEXT,NFILL6,NFILL,NFILES                             SXP
C                       REWIND OUTPUT UNIT.                             SXP
      REWIND IOUT                                                       SXP
C                       RETURN                                          SXP
      RETURN                                                            SXP
C                                                                       SXP
    2 FORMAT (1H1)                                                      SXP
    5 FORMAT(I6)                                                        SXP
   20 FORMAT(6A4,I6,6A4,I6,4I3)                                         SXP
   35 FORMAT(/24H INPUT S NAME AND SUM...,6A4,I12)                      SXP
  220 FORMAT(24H OUTPUT S NAME AND SUM..,6A4,I12)                       SXP
C                                                                       SXP
C                       REFERENCE LIST.                                 SXP
C                                                                       SXP
C                       SUBROUTINE ARGUMENTS.                           SXP
C                                                                       SXP
C     NDIM   - DIMENSION OF KSN AND KSVEC.                              SXP
C     ISN    - ELEMENT LIST  FOR INPUT S.                               SXP
C     ISVEC  - ELEMENT VALUE FOR INPUT S.                               SXP
C     KSN    - ELEMENT LIST  FOR OUTPUT S.                              SXP
C     KSVEC,                                                            SXP
C      SVEC  - ELEMENT VALUE FOR OUTPUT S.                              SXP
C     JCOL   - ELEMENT LIST  FOR P ROW.                                 SXP
C     P      - ELEMENT VALUE FOR P ROW.                                 SXP
C     LABELS - ARRAY FOR INPUT AND OUTPUT S VECTOR LABELS.              SXP
C     LABELP - ARRAY FOR P MATRIX LABELS.                               SXP
C                                                                       SXP
C                                                                       SXP
C                       OTHER VARIABLES.                                SXP
C                                                                       SXP
C     INPS   - INPUT UNIT FOR S.                                        SXP
C     INPP   - INPUT UNIT FOR P. MAY BE THE SAME AS INPS.               SXP
C     INSUM  - SUM OF INPUT S.                                          SXP
C     ISUM   - SUM OF PROJ S BEFORE SUM FORCED TO INSUM IF NECESSARY.   SXP
C     IODISK - A SEQUENTIAL ACCESS DISK OR TAPE USED TO STORE P DATA    SXP
C              RECORDS WHEN 'NITER' IS GT 1. USING THIS TEMPORARY STOR- SXP
C              AGE UNIT AVOIDS EXCESSIVE TAPE PASSING TO RELOCATE THE   SXP
C              ORIGINAL COPY OF P 'NITER' TIMES.                        SXP
C     ISCNT  - NUMBER OF ENTRIES IN INPUT S VECTOR.                     SXP
C     JCNT   - NUMBER OF ENTRIES IN P MATRIX ROW.                       SXP
C     KSCNT  - NUMBER OF ENTRIES IN P MATRIX COLUMN LIST AND OUTPUT S.  SXP
C     NLS    - LENGTH OF INPUT  S LABEL.                                SXP
C     NLS2   - LENGTH OF OUTPUT S LABEL.                                SXP
```

```
C     NLP   - LENGTH OF P LABEL.                                        SXP 3990
C     NITER - NUMBER OF ITERATIONS FOR EACH S,P PAIR IN THE CONTROL CARDSXP 4000
C             ALSO USED TO DETERMINE IF P MATRIX IS TO BE PLACED ON AND SXP 4010
C             USED FROM DISK.                                           SXP 4020
C     NPAIRS- NUMBER OF 'PAIRED (S,P)' ARRAYS. THESE ARRAYS MUST BE ON  SXP 4030
C             THE SAME INPUT TAPE AND IN A SPECIFIED ORDER.             SXP 4040
C     NUMP  - NUMBER OF P MATRICES TO BE PAIRED WITH A SINGLE INPUT S   SXP 4050
C             AND ITS PROJECTIONS.                                      SXP 4060
C     NFILES - NUMBER OF FILES ON OUTPUT UNIT.                          SXP 4070
C                                                                       SXP 4080
      END                                                               SXP 4090
```

```
      SUBROUTINE TMT(NWORDS,LTO,LFROM)                                  TMT  010
C                                                                       TMT  020
C                        TRANSMIT DATA IN CORE IN INCREASING LOCATION   TMT  030
C                        ORDER.                                         TMT  040
      DIMENSION LTO(1),LFROM(1)                                         TMT  050
C                                                                       TMT  060
C                        MOVE 'NWORDS' INTEGER*4 WORDS FROM 'LFROM' ARRAYTMT  070
C                        TO 'LTO' ARRAY.                                TMT  080
      DO 5 I=1,NWORDS                                                   TMT  090
    5 LTO(I)=LFROM(I)                                                   TMT  100
      RETURN                                                            TMT  110
C                                                                       TMT  120
C                        REFERENCE LIST.                                TMT  130
C                        SUBROUTINE ARGUMENTS.                          TMT  140
C                                                                       TMT  150
C     NWORDS - IF THE TO AND FROM ARRAYS IN THE CALL STATEMENT ARE      TMT  160
C              INTEGER*4 ARRAYS, THIS IS THE NUMBER OF WORDS TO BE MOVEDTMT  170
C              IF THE TO AND FROM ARRAYS IN THE CALL STATEMENT ARE REAL*TMT  180
C              8 ARRAYS, THIS IS THE NUMBER OF WORDS TO BE MOVED TIMES 2TMT  190
C     LTO    - ARRAY TO WHICH ELEMENTS ARE TO BE MOVED. THIS MUST BE THETMT  200
C              SAME TYPE AS THE LFROM ARRAY.                            TMT  210
C     LFROM  - ARRAY FROM WHICH ELEMENTS ARE BEING COPIED. THIS ARRAY   TMT  220
C              MUST BE THE SAME TYPE AS THE LTO ARRAY.                  TMT  230
      END                                                               TMT  240
```

```
      SUBROUTINE TMT2(LFROM,LTO,NWORDS)                                 TMT2 010
C                                                                       TMT2 020
C                       TRANSMIT DATA IN CORE IN DECREASING LOCATION    TMT2 030
C                       ORDER. THIS IS A PUSH DOWN OPERATION.           TMT2 040
C                       LTO(1) AND LFROM(1) ARE THE PAIR OF WORDS TO BE TMT2 050
C                       USED IN THE NWORD'TH MOVE.                      TMT2 060
C                                                                       TMT2 070
C                                                                       TMT2 080
      DIMENSION LTO(1),LFROM(1)                                         TMT2 090
C                       MOVE 'NWORDS' INTEGER*4 WORDS FROM 'LFROM' ARRAYTMT2 100
C                       TO 'LTO' ARRAY.                                 TMT2 110
      II=NWORDS+1                                                       TMT2 120
      DO 10 I=1,NWORDS                                                  TMT2 130
      II=II-1                                                           TMT2 140
   10 LTO(II)=LFROM(II)                                                 TMT2 150
      RETURN                                                            TMT2 160
C                                                                       TMT2 170
C                       REFERENCE LIST.                                 TMT2 180
C                       SUBROUTINE ARGUMENTS.                           TMT2 190
C                                                                       TMT2 200
C     LFROM  - ARRAY FROM WHICH ELEMENTS ARE BEING COPIED. THIS ARRAY   TMT2 210
C              MUST BE THE SAME TYPE AS THE LTO ARRAY.                  TMT2 220
C     LTO    - ARRAY TO WHICH ELEMENTS ARE TO BE MOVED. THIS MUST BE THETMT2 230
C              SAME TYPE AS THE LFROM ARRAY.                            TMT2 240
C     NWORDS - IF THE TO AND FROM ARRAYS IN THE CALL STATEMENT ARE      TMT2 250
C              INTEGER*4 ARRAYS, THIS IS THE NUMBER OF WORDS TO BE MOVEDTMT2 260
C              IF THE TO AND FROM ARRAYS IN THE CALL STATEMENT ARE REAL*TMT2 270
C              8 ARRAYS, THIS IS THE NUMBER OF WORDS TO BE MOVED TIMES 2TMT2 280
      END                                                               TMT2 290
```

VI. SAMPLE PROGRAM

Table 1, the program listed on p. 160[†], can be used to test a FLOMOD library implemented on a Non-Rand system. This deck contains all the required input data; the program output, Table 2[††] (pp. 161-162), is a printed report. No tape input or output is required. The system being used may require changes in the JCL cards.

[†]This is the same as Fig. 1 in Ref. 2.

[††]This is the same as Table 2 in Ref. 1.

Table 1

PRINT STATE-NUMBER DESCRIPTIONS

```
//HC795#34 JOB (312A,50,110),'STATE DES',CLASS=A
// EXEC FORTCLG,LIB1='SYS1.FLOMOD'
//FORT.SYSIN DD *
      IMPLICIT REAL*8(A-H,O-Z,$)
      DIMENSION NAMEV(9),NAMEC(120),NCODE(3),LOC(4),ICODE(3),LIST(9)
      CALL STDES(NAMEV,NAMEC,NCODE,LOC,ICODE,LIST)
      CALL EXIT
      END
/*
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1330)
//GO.SYSIN DD *
STATE DESCRIPTION:    AIR FORCE LINE OFFICER MODEL    AFRO RATING X CAREER FIELD
 X YEARS OF SERVICE
     3      1
     1 AFRO RATING      2
     1        RATED
     2     NONRATED
     2CAREER FIELD      2
     1  OPERATIONS
     2  ALL OTHERS
     3 YRS SERVICE     26
     1         LT 1
     2            1
     3            2
     4            3
     5            4
     6            5
     7            6
     8            7
     9            8
    10            9
    11           10
    12           11
    13           12
    14           13
    15           14
    16           15
    17           16
    18           17
    19           18
    20           19
    21           20
    22           21
    23           22
    24           23
    25           24
    26          25+
/*
//
```

Table 2

STATE-NUMBER DESCRIPTIONS AS PRINTED BY THE STDES (STATE DESCRIPTION) PROGRAM

STATE DESCRIPTION: AIR FORCE LINE OFFICER MODEL AERO RATING X CAREER FIELD X YEARS OF SERVICE

STATE NUMBER	AERO RATING	CAREER FIELD	YRS SERVICE
1	RATED	OPERATIONS	LT 1
2	RATED	OPERATIONS	1
3	RATED	OPERATIONS	2
4	RATED	OPERATIONS	3
5	RATED	OPERATIONS	4
6	RATED	OPERATIONS	5
7	RATED	OPERATIONS	6
8	RATED	OPERATIONS	7
9	RATED	OPERATIONS	8
10	RATED	OPERATIONS	9
11	RATED	OPERATIONS	10
12	RATED	OPERATIONS	11
13	RATED	OPERATIONS	12
14	RATED	OPERATIONS	13
15	RATED	OPERATIONS	14
16	RATED	OPERATIONS	15
17	RATED	OPERATIONS	16
18	RATED	OPERATIONS	17
19	RATED	OPERATIONS	18
20	RATED	OPERATIONS	19
21	RATED	OPERATIONS	20
22	RATED	OPERATIONS	21
23	RATED	OPERATIONS	22
24	RATED	OPERATIONS	23
25	RATED	OPERATIONS	24
26	RATED	OPERATIONS	25+
27	RATED	ALL OTHERS	LT 1
28	RATED	ALL OTHERS	1
29	RATED	ALL OTHERS	2
30	RATED	ALL OTHERS	3
31	RATED	ALL OTHERS	4
32	RATED	ALL OTHERS	5
33	RATED	ALL OTHERS	6
34	RATED	ALL OTHERS	7
35	RATED	ALL OTHERS	8
36	RATED	ALL OTHERS	9
37	RATED	ALL OTHERS	10
38	RATED	ALL OTHERS	11
39	RATED	ALL OTHERS	12
40	RATED	ALL OTHERS	13
41	RATED	ALL OTHERS	14
42	RATED	ALL OTHERS	15
43	RATED	ALL OTHERS	16
44	RATED	ALL OTHERS	17
45	RATED	ALL OTHERS	18
46	RATED	ALL OTHERS	19
47	RATED	ALL OTHERS	20
48	RATED	ALL OTHERS	21
49	RATED	ALL OTHERS	22
50	RATED	ALL OTHERS	23
51	RATED	ALL OTHERS	24
52	RATED	ALL OTHERS	25+
53	NONRATED	OPERATIONS	LT 1
54	NONRATED	OPERATIONS	1
55	NONRATED	OPERATIONS	2
56	NONRATED	OPERATIONS	3

Table 2 (con't)

STATE-NUMBER DESCRIPTIONS AS PRINTED BY THE STDES (STATE DESCRIPTION) PROGRAM

STATE DESCRIPTION: AIR FORCE LINE OFFICER MODEL AERO RATING X CAREER FIELD X YEARS OF SERVICE

STATE NUMBER	AERO RATING	CAREER FIELD	YRS SERVICE
57	NONRATED	OPERATIONS	4
58	NONRATED	OPERATIONS	5
59	NONRATED	OPERATIONS	6
60	NONRATED	OPERATIONS	7
61	NONRATED	OPERATIONS	8
62	NONRATED	OPERATIONS	9
63	NONRATED	OPERATIONS	10
64	NONRATED	OPERATIONS	11
65	NONRATED	OPERATIONS	12
66	NONRATED	OPERATIONS	13
67	NONRATED	OPERATIONS	14
68	NONRATED	OPERATIONS	15
69	NONRATED	OPERATIONS	16
70	NONRATED	OPERATIONS	17
71	NONRATED	OPERATIONS	18
72	NONRATED	OPERATIONS	19
73	NONRATED	OPERATIONS	20
74	NONRATED	OPERATIONS	21
75	NONRATED	OPERATIONS	22
76	NONRATED	OPERATIONS	23
77	NONRATED	OPERATIONS	24
78	NONRATED	OPERATIONS	25+
79	NONRATED	ALL OTHERS	LT 1
80	NONRATED	ALL OTHERS	1
81	NONRATED	ALL OTHERS	2
82	NONRATED	ALL OTHERS	3
83	NONRATED	ALL OTHERS	4
84	NONRATED	ALL OTHERS	5
85	NONRATED	ALL OTHERS	6
86	NONRATED	ALL OTHERS	7
87	NONRATED	ALL OTHERS	8
88	NONRATED	ALL OTHERS	9
89	NONRATED	ALL OTHERS	10
90	NONRATED	ALL OTHERS	11
91	NONRATED	ALL OTHERS	12
92	NONRATED	ALL OTHERS	13
93	NONRATED	ALL OTHERS	14
94	NONRATED	ALL OTHERS	15
95	NONRATED	ALL OTHERS	16
96	NONRATED	ALL OTHERS	17
97	NONRATED	ALL OTHERS	18
98	NONRATED	ALL OTHERS	19
99	NONRATED	ALL OTHERS	20
100	NONRATED	ALL OTHERS	21
101	NONRATED	ALL OTHERS	22
102	NONRATED	ALL OTHERS	23
103	NONRATED	ALL OTHERS	24
104	NONRATED	ALL OTHERS	25+

REFERENCES

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10. ABSTRACT

The third in a series of reports describing a model of social mobility, the study of which will provide researchers with information concerning patterns of movement, projections of existing population trends, and the impact produced by changes in rates of movement. Intended to be used by the programmer/analyst in creating a program library, this report lists the 29 FORTRAN subroutines that perform the operations described in the program package. The storage required on an IBM 360/65 is given for each subroutine. Comment cards contain a step-by-step, natural-language description of source-language statements. These listings will be useful when the programs are to be executed on another computer system, or when a subroutine implementing a new operation is to be written. A sample program is included.

11. KEY WORDS

Computer Programming
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