Program for the Analysis of Non-linear Response Surfaces (Version III)

by J. K. Lindsey and A. M. Sandnes

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PROGRAM FOR THE ANALYSIS OF NON-LINEAR RESPONSE SURFACES

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Pacific Biological Station, Nanaimo, B. C.

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INTRODUCTION

These are extended versions of the programs previously reported in Technical Report No. 87 and 173 which are superseded by this report.

Response surface methodology involves the study of the effect of various combinations of a given number of factors on a response. Hill and Hunter (1966) give a good review of the available literature. As originally introduced by Box and Wilson (1951), the procedure was intended for use in determining the optimum response and not the form of the surface. The linear model provides only a limited amount of information about the shape of the surface in the region of the factor space under consideration. Power transformations were first introduced for the independent variables by Box and Tidwell (1962) and then for the dependent variables by Box and Cox (1964). These studies opened up the possibility of considering, in more detail, the surface as a whole.

Likelihood inference techniques (see Barnard et al. 1962) are applied here to the problem, when the transformations are considered as non-linear parameters in the model. The theory of these techniques is explained more fully in a paper by Lindsey, Alderdice and Pienaar (1970) which uses the appended programs.

THE PROGRAM

These programs were developed for a 16K core IBM 1130 single-disk computer using FORTRAN 1130 (a subset of FORTRAN IV). A large number of links were found to be necessary, so that only a small segment of the program is actually in core at any given time. The programs will execute under Version II, Level 9 of the Monitor system. An on-line IBM 1627 plotter is used for the graphical output on 12" paper.

If the dimensions are reduced to allow only twenty points in the factor space and four observed responses at each of these points, the program should compile and execute with an 8K core IBM 1130 computer.

Logical unit numbers of the principal peripheral devices have been assigned to integer variables (Q for card input = 8 for 2501; P for line printer = 5 for 1403). These are defined in each mainline program and subroutines. Other logical unit numbers are 1 for the typewriter, 6 for the keyboard and 7 for the plotter.

BØX2 is the mainline program for analysis of the two-factor response

surface. All of the plotting links are on option by use of data switches. The model used is:

$$y^c = b_o + b_1 x_1^{a1} + b_2 x_2^{a2} + b_3 x_1^{2a1} + b_4 x_2^{2a2} + b_5 x_1^{a1} x_2^{a2}$$

A complete analysis of the given data is done using the above non-linear model as well as the corresponding linear model:

$$y = b_o + b_1 x_1 + b_2 x_2 + b_3 x_1^2 + b_4 x_2^2 + b_5 x_1 x_2$$

After this complete analysis, various other values of the parameters may be tried, using the mainline program CRLF2, to determine their relative likelihoods and a complete analysis done on these, if desired.

The analysis of variance tables indicate whether or not various effects are plausible. However, they do not indicate whether the corresponding parameters can be eliminated, since orthogonal polynomials are used. A multiple regression program with elimination of variables may be used to determine whether a regression model with fewer turns is plausible. If so, the mainline program PRRE2 and PRRE3 may be used to plot the response surface with some b_i parameters eliminated.

A program, CØNPL, is available for the two-factor model, which prints out a grid of points on the likelihood surface of a_1, a_2 for a given fixed value of c. The point with the largest relative likelihood should give a good set of initial estimates for BØX2.

BØX3 is the corresponding mainline program for the calculations in a three-factor surface. The non-linear model is:

$$y^c = b_o + b_1 x_1^{a1} + b_2 x_2^{a2} + b_3 x_3^{a3} + b_4 x_1^{2a1} + b_5 x_2^{2a2} + b_6 x_3^{2a3} +$$

$$b_7 x_1^{a1} x_2^{a2} + b_8 x_1^{a1} x_3^{a3} + b_9 x_2^{a2} x_3^{a3}$$

The analysis is analogous to that in the two-factor case. Since this is a four-dimensional model, an additional mainline program, SRS3, has been added (to that of the two-factor analysis) which allows the experimenter to choose slices through the surface on various planes for contour plotting. The analyses using BØX3 and CRLF3 automatically choose slices through the centre of the surface parallel to the axes of the factor space.

The following options are also available on CRLF2 and CRLF3:

(a) estimation of the response y at a given locus in the factor space;
(b) calculation of canonical coordinates from the corresponding set of factor coordinates;
(c) calculation of factor coordinates from the corresponding set of canonical coordinates; and
(d) ability to investigate other contour levels and factor limits for the plot if imaginary points are found in the supporting calculations. In the

latter case BØX2 and BØX3 will not plot surface contours in which imaginary points have been found. Instead they will print out a message indicating the presence of an imaginary point, and proceed to the next contour. The operator then may examine the same data under CRLF2 or CRLF3 and explore the surface or surfaces where imaginary points occurred. With data switch 6 on, the operator has the option of trying other contour levels or factor limits for plotting.

Details of the function of each link, of the arrangement of data and control cards, and of the options are given in the listings on the comment cards preceding each mainline program. Output should be self-explanatory. All pages of output for the analysis of the linear model have only the title at the top, while all pages for the non-linear model have the power parameters listed as well. In the output of 40 loci for response contours plotted, the first, eleventh, twenty-first and thirty-first rows define loci on the principal axes of the surface.

Since an iterative technique is used in the calculation of the maximum likelihood estimates of the power parameters, there can be no assurance of convergence with a given number of iterations. Ten iterations have been sufficient in some cases but forty or more may be required. With large numbers of options available, and the large number of possible results from data, no guarantee can be given that all of the errors have been removed from the program.

A number of errors have been corrected in this version. Comments and suggestions would be appreciated.

HINTS FOR USERS

1. Only by plotting the maximized relative likelihood graphs can one determine if the true maximum likelihood estimates of the power parameters have been reached, and not a local maximum.

2. If the absolute value of the estimate of a power parameter becomes larger than six or eight, this might indicate that an exponential transformation should be used. More probably, however, the iteration procedure will have diverged. In this case, better initial estimates are required. Alternatively, the user can try iterating on some of the parameters only, using the option in the first column of the control card. In some cases, neither the exponential transformation nor the other initial estimates of the power parameters have provided a means of finding maximum likelihood estimates of the power parameters. In practice, this has been found to occur where the effect of one of the independent variables on the response is very small. In such instances a "minimum variance estimate" of the power parameters has been employed, as long as the non-linear case gives a superior fit to the data, in comparison with the linear case. The latter estimates often may be obtained by examination of the maximized relative likelihood graphs,

and a progressive search for sets of power parameters which reduce the variance.

3. If the response surface is saddle-shaped and the centre is remote from the experimental factor space, the factor limits for plotting the response must be enlarged to encompass the centre point.

4. In those cases in which an imaginary point is found when plotting the response surface, a graph of the associated contour will not be obtained. To obtain contours without imaginary points, the factor limits may be altered as follows. Either the first or second factor limit should be changed as shown below:

	Eigenvalues	
	- +	+ -
Imaginary point on a contour below the centre	Change first limit	Change second limit
Imaginary point on a contour above the centre	Change second limit	Change first limit

If the power transformation of the factor limit to be changed is positive, the limit should be expanded; if negative, it should be contracted. The change required may be so drastic that a reasonable plot cannot be produced by the plotter, but the points calculated on the contours will be available on the printout.

RESTRICTIONS

(a) The program, because of core size restrictions, is limited to a maximum of ninety-nine points in the factor space with a maximum of thirteen observed responses at each of these points for BØX2 and ten responses for BØX3. These responses are treated as within cell replicates in the analysis of variance.

(b) Without the use of any data switch options, execution time is less than twenty minutes. The options, especially options 8 and 9, increase the time drastically.

ACKNOWLEDGEMENTS

During the development of this program the availability of a program for linear response surface models by Dr. K. J. Turnbull, and the assistance of Dr. L. V. Pienaar, were most helpful and are gratefully acknowledged.

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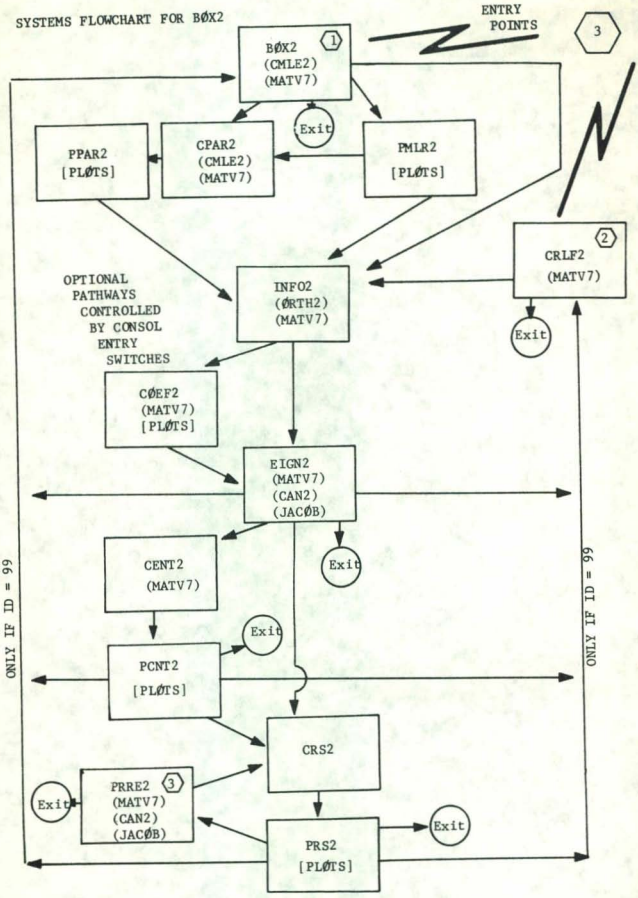
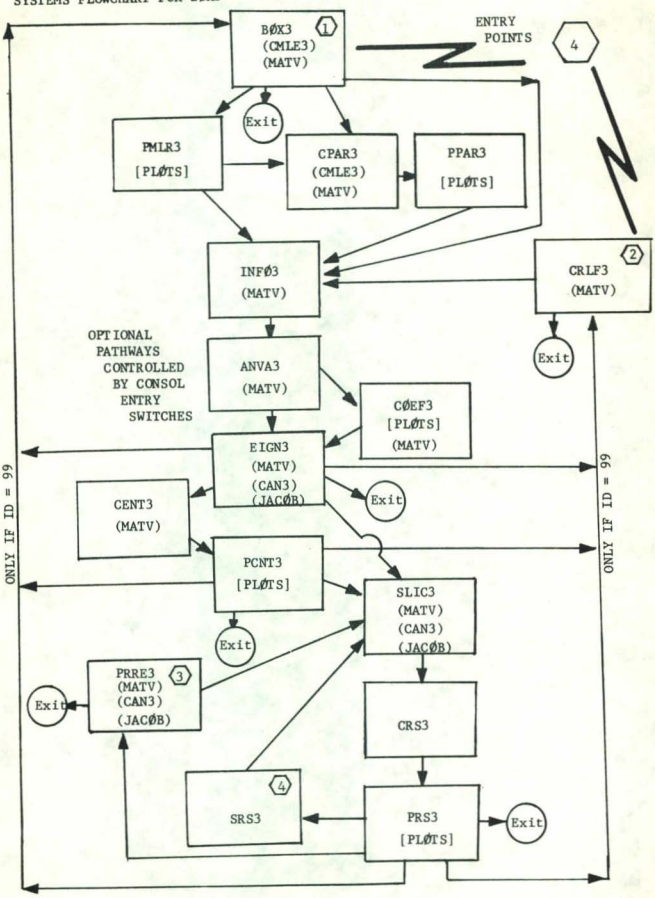

SYSTEMS FLOWCHART FOR BØX2
ENTRY POINTS
3
BØX2 (CMLE2) (MATV7)
1
Exit
PPAR2 [PLØTS]
CPAR2 (CMLE2) (MATV7)
PMLR2 [PLØTS]
CRLF2 (MATV7)
2
OPTIONAL PATHWAYS CONTROLLED BY CONSOL ENTRY SWITCHES
INFO2 (ØRTH2) (MATV7)
Exit
CØEF2 (MATV7) [PLØTS]
EIGN2 (MATV7) (CAN2) (JACØB)
CENT2 (MATV7)
Exit
Exit
PCNT2 [PLØTS]
CRS2
PRRE2 (MATV7) (CAN2) (JACØB)
3
Exit
Exit
PRS2 [PLØTS]
ONLY IF ID = 99
ONLY IF ID = 99

SYSTEMS FLOWCHART FOR BØX3



```
// JOB                                                                  BOX20000
// FOR                                                                  BOX20001
*LIST ALL                                                               BOX20002
*NAME BOX2                                                              BOX20003
*EXTENDED PRECISION                                                     BOX20004
*ONE WORD INTEGERS                                                      BOX20005
*IOCS(1403 PRINTER)                                                     BOX20006
*IOCS(2501 READER)                                                      BOX20007
C                                                                       BOX20008
C      THIS PROGRAM ANALYZES THE DATA FROM RESPONSE SURFACE EXPERIMENTS BOX20009
C WHEN TWO FACTORS ARE MEASURED. OPTIONS ALLOW CALCULATION OF MAXIMUM   BOX20010
C LIKELIHOOD ESTIMATES OF POWER TRANSFORMATIONS OF BOTH INDEPENDENT AND BOX20011
C DEPENDENT VARIABLES, AND THE PLOTTING OF THEIR MAXIMIZED RELATIVE     BOX20012
C LIKELIHOOD GRAPHS, AS A MEASURE OF THE PRECISION OF THE ESTIMATES.    BOX20013
C THE DATA IS THEN SUBJECTED TO ANALYSIS OF VARIANCE, USING ORTHOGONAL  BOX20014
C POLYNOMIALS, AND CANONICAL ANALYSIS, AND SPECIFIED CONTOURS           BOX20015
C OF THE DEPENDENT VARIABLE ARE PLOTTED, BOTH WITHOUT AND WITH          BOX20016
C TRANSFORMATION.                                                       BOX20017
C                                                                       BOX20018
C      OPTIONS ALLOW THE CALCULATION OF MAXIMUM RELATIVE LIKELIHOOD     BOX20019
C GRAPHS FOR THE B(J) COEFFICIENTS IN THE NON-LINEAR CASE, AND FOR THE  BOX20020
C X(I) COORDINATES OF THE CENTRE.                                       BOX20021
C                                                                       BOX20022
C      UP TO 99 POINTS IN THE FACTOR SPACE (TREATMENT COMBINATIONS) ARE BOX20023
C ALLOWED, WITH UP TO 13 OBSERVATIONS AT EACH POINT (OBSERVATION SETS). BOX20024
C                                                                       BOX20025
C     NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                BOX20026
C                                                                       BOX20027
C     TO TRY OTHER VALUES OF THE POWER TRANSFORMATIONS THAN THE ML      BOX20028
C ESTIMATES, USE CRLF2.                                                 BOX20029
C                                                                       BOX20030
C     TO TRY OTHER RESPONSE EQUATIONS WITH SOME B(J)=0, USE PRRE2       BOX20031
C                                                                       BOX20032
C    LINKS CALLED                                                       BOX20033
C                                                                       BOX20034
C   BOX2  - CALCULATES ML ESTIMATES AND POINTS FOR THE MLR GRAPHS       BOX20035
C   PMLR2 - PLOTS MLR GRAPHS OF THE POWER TRANSFORMATIONS               BOX20036
C   CPAR2 - CALCULATES POINTS FOR THE MLR GRAPHS OF B(J) IN THE         BOX20037
C NON-LINEAR CASE                                                       BOX20038
C   PPAR2 - PLOTS MLR GRAPHS OF THE B(J) COEFFICIENTS                   BOX20039
C   INFO2 - PERFORMS ANALYSIS OF VARIANCE                               BOX20040
C   COEF2 - CALCULATES AND PLOTS POINTS FOR MLR GRAPHS OF THE B(J)      BOX20041
C COEFFICIENTS                                                          BOX20042
C   EIGN2 - PERFORMS CANONICAL ANALYSIS                                 BOX20043
C   CENT2 - CALCULATES POINTS FOR THE MLR GRAPHS OF THE CENTRE          BOX20044
C           COORDINATES                                                 BOX20045
C   PCNT2 - PLOTS MLR GRAPHS OF THE COORDINATES OF THE RESPONSE CENTRE  BOX20046
C   CRS2  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS         BOX20047
C   PRS2  - PLOTS RESPONSE SURFACE CONTOURS                             BOX20048
C                                                                       BOX20049
C    SUBROUTINES CALLED                                                 BOX20050
```

```
C                                                                       BOX20051
C  CMLE2 - CALCULATES ML AND RML ESTIMATES                              BOX20052
C  MATV7 - INVERTS MATRICES                                             BOX20053
C  ORTH2 - CALCULATES ORTHOGONAL POLYNOMIALS FOR ANOVA                  BOX20054
C  CAN2  - DIAGONALIZES MATRICES                                        BOX20055
C  JACOB - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES      BOX20056
C                                                                       BOX20057
C   OPTIONS                                                             BOX20058
C                                                                       BOX20059
C SWITCH 10 UP - PLOT RESPONSE SURFACE CONTOURS                         BOX20060
C SWITCH  9 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF POWER TRANSFORMATIONSBOX20061
C SWITCH  8 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF B(J) COEFFICIENTS    BOX20062
C SWITCH  7 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF THE CENTRE           BOX20063
C                COORDINATES                                            BOX20064
C SWITCH  6 UP - ENTER ALTERNATE CONTOUR LEVELS IF IMAGINARY POINT FOUNDBOX20065
C                WHEN PLOTTING CONTOURS                                 BOX20066
C                                                                       BOX20067
C   MAKEUP OF DATA DECK                                                 BOX20068
C                                                                       BOX20069
C 1.TITLE CARD FIRST - (12A6)                                           BOX20070
C 2.CONTROL CARD - (I1,2I2,4F5.3,2I3,F5.3,I3)                           BOX20071
C     I1 - OPTION  -  0 - POWER TRANS. FOR IND. AND DEP. VARIABLES      BOX20072
C                     1 - POWER TRANS. FOR IND. VARIABLES ONLY          BOX20073
C                     2 - POWER TRANS. FOR DEP. VARIABLE ONLY           BOX20074
C     I2 - NUMBER OF TREATMENT COMBINATIONS                             BOX20075
C     I2 - NUMBER OF OBSERVATION SETS                                   BOX20076
C     F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                    BOX20077
C     3F5.3 - INITIAL ESTIMATES OF PARAMETERS - A1,A2,C                 BOX20078
C           0.0 YIELDS NATURAL LOG TRANSFORMATION                       BOX20079
C           +100. YIELDS POSITIVE EXPONENTIAL TRANSFORMATION            BOX20080
C           -100. YIELDS NEGATIVE EXPONENTIAL TRANSFORMATION            BOX20081
C     I3 - MAXIMUM NUMBER OF ITERATIONS ALLOWED FOR ML ESTIMATE         BOX20082
C    THE FOLLOWING REQUIRED ONLY WITH OPTION 9                          BOX20083
C     I3 - MAXIMUM NUMBER OF ITERATIONS ALLOWED FOR POINTS OF LIKELIHOODBOX20084
C          GRAPH                                                        BOX20085
C     F5.3 - HALF SIZE OF INTERVAL TO BE PLOTTED AROUND MAXIMUM -       BOX20086
C - SUGGEST 2.5                                                         BOX20087
C     I3 - NUMBER OF POINTS TO BE PLOTTED (MAX= 75) - SUGGEST 51        BOX20088
C 3.TREATMENT COMBINATIONS IN PAIRS - (16F5.3)                          BOX20089
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION          BOX20090
C     ONE SET PER CARD - (13F6.3)                                       BOX20091
C 5.99 IN COLS. 79-80 INDICATES END OF DATA, ANOTHER DECK TO FOLLOW     BOX20092
C   98 IN COLS. 79-80 INDICATES END OF JOB - CALL EXIT AFTER THIS DECK  BOX20093
C 6.IF OPTION 10 IS USED, CONTROL CARD - (12F6.2)                       BOX20094
C   10F6.2 - 10 CONTOUR LEVELS IN UNITS OF THE DEPENDENT VARIABLE       BOX20095
C   2F6.2 - 2 FACTOR LIMITS FOR PLOTTING IN UNITS OF THE INDEPENDENT    BOX20096
C VARIABLES                                                             BOX20097
C 7.REPEAT 1. TO 6. AS REQUIRED                                         BOX20098
C                                                                       BOX20099
C   STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWBOX20100
C PAPER                                                                 BOX20101
```

```
C                                                                       BOX20102
C                                                                       BOX20103
      INTEGER P,Q                                                       BOX20104
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),BOX20105
     1N4,N5,AN4,NNNN,D,R(75,3),AA(3)                                    BOX20106
   88 FORMAT(5CHOZERO Y OBSERVATION - PROCEEDING TO NEXT DATA DECK///)   BOX20107
   87 FORMAT(5OHOZERO X OBSERVATION - PROCEEDING TO NEXT DATA DECK///)   BOX20108
   86 FORMAT('OCONSTANT ADDED     Y + 'F5.3/'OINITIAL ESTIMATES'//7X'A1'1BOX20109
     13X'A2'13X'C'/3E15.7/)                                             BOX20110
   85 FORMAT(' INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DBOX20111
     1ATA DECK'///)                                                     BOX20112
   84 FORMAT(16F5.3)                                                    BOX20113
   83 FORMAT(I1,2I2,4F5.3,2I3,F5.3,I3)                                  BOX20114
   82 FORMAT('1'12A6)                                                   BOX20115
   81 FORMAT(13F6.3,I2)                                                 BOX20116
   80 FORMAT(12A6)                                                      BOX20117
   79 FORMAT(5E15.5,I6)                                                 BOX20118
   78 FORMAT('OMAXIMUM LIKELIHOOD ESTIMATES'//7X'A1'13X'A2'13X'C'14X'SSDBOX20119
     1'10X'ITER    ALLOWED'/4E15.7,2I8/)                                BOX20120
   77 FORMAT('0'6X'A1'13X'A2'13X'C'14X'SSD'13X'R'9X'ITER')              BOX20121
      P=5                                                               BOX20122
      Q=8                                                               BOX20123
      V2=0.0                                                            BOX20124
      J3=8                                                              BOX20125
    5 READ(Q,80)TITL                                                    BOX20126
      WRITE(P,82)TITL                                                   BOX20127
      READ(Q,83)N5,N1,IREP,CONST,AA,N10,N11,AN4,N4                      BOX20128
      IF(N4-75)24,24,25                                                 BOX20129
   25 N4=75                                                             BOX20130
   24 WRITE(P,86)CONST,AA                                               BOX20131
      N5=N5+1                                                           BOX20132
      READ(Q,84)((X(I,J),J=1,2),I=1,N1)                                 BOX20133
      I=0                                                               BOX20134
   22 I=I+1                                                             BOX20135
      READ(Q,81)(Y(I,J),J=1,13),ID                                      BOX20136
      IF(ID-98)9,23,23                                                  BOX20137
    9 DO 39 J=1,IREP                                                    BOX20138
   39 Y(I,J)=Y(I,J)+CONST                                               BOX20139
      GO TO 22                                                          BOX20140
   23 N2=I-1                                                            BOX20141
      IF(N1-N2)2,4,2                                                    BOX20142
    2 WRITE(P,85)                                                       BOX20143
   44 IF(ID-98)45,6,45                                                  BOX20144
   45 CALL DATSW(10,J10)                                                BOX20145
      GO TO (46,5),J10                                                  BOX20146
   46 READ(Q,81)B                                                       BOX20147
      GO TO 5                                                           BOX20148
    6 CALL EXIT                                                         BOX20149
    4 N=N1*IREP                                                         BOX20150
      DO 40 I=1,N1                                                      BOX20151
      DO 41 J=1,2                                                       BOX20152
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      IF(X(I,J))42,42,41                                        BOX20153
   41 CONTINUE                                                  BOX20154
      DO 40 J=1,IREP                                            BOX20155
      IF(Y(I,J))43,43,40                                        BOX20156
   40 CONTINUE                                                  BOX20157
      GO TO 47                                                  BOX20158
   42 WRITE(P,87)                                               BOX20159
      GO TO 44                                                  BOX20160
   43 WRITE(P,88)                                               BOX20161
      GO TO 44                                                  BOX20162
   47 DO 16 J=1,2                                               BOX20163
      IF(AA(J))26,17,26                                         BOX20164
   17 DO 18 I=1,N1                                              BOX20165
   18 X(I,J)=ALOG(X(I,J))                                       BOX20166
      GO TO 29                                                  BOX20167
   26 IF(ABS(AA(J))-100.0)16,27,16                              BOX20168
   27 DO 28 I=1,N1                                              BOX20169
   28 X(I,J)=EXP(AA(J)*X(I,J)/100.)                             BOX20170
   29 AA(J)=1.0                                                 BOX20171
   16 CONTINUE                                                  BOX20172
      IF(AA(3))19,20,19                                         BOX20173
   20 DO 21 I=1,N1                                              BOX20174
      DO 21 J=1,IREP                                            BOX20175
   21 Y(I,J)=ALOG(Y(I,J))                                       BOX20176
      GO TO 33                                                  BOX20177
   19 IF(ABS(AA(3))-100.)31,30,31                               BOX20178
   30 DO 32 I=1,N1                                              BOX20179
      DO 32 J=1,IREP                                            BOX20180
   32 Y(I,J)=EXP(AA(3)*Y(I,J)/100.)                             BOX20181
   33 AA(3)=1.0                                                 BOX20182
   31 D=0.0                                                     BOX20183
      DO 15 I=1,N1                                              BOX20184
      DO 15 J=1,IREP                                            BOX20185
   15 D=D+ALOG(Y(I,J))                                          BOX20186
      DO 7 J=1,3                                                BOX20187
    7 A4(J)=AA(J)                                               BOX20188
      NNNN=N10                                                  BOX20189
      CALL CMLE2(4,ITER,V2,J3)                                  BOX20190
      WRITE(P,78)A4,SSY,ITER,NNNN                               BOX20191
      DO 3 J=1,3                                                BOX20192
    3 A3(J)=A4(J)                                               BOX20193
      CALL DATSW(9,J9)                                          BOX20194
      GO TO (13,12),J9                                          BOX20195
   12 CALL DATSW(8,J8)                                          BOX20196
      GO TO (34,35),J8                                          BOX20197
   34 CALL LINK(CPAR2)                                          BOX20198
   35 N4=2                                                      BOX20199
      CALL LINK(INFO2)                                          BOX20200
   13 SSY1=SSY                                                  BOX20201
      AN5=N4-1                                                  BOX20202
      DO 1 J=1,3                                                BOX20203
```

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      GO TO (10,10,11),J                                          BOX20204
   10 GO TO (14,14,1),N5                                          BOX20205
   11 GO TO (14,1,14),N5                                          BOX20206
   14 WRITE(P,77)                                                 BOX20207
      X4=A3(J)-AN4                                                BOX20208
      A=2.0*(A3(J)-X4)                                            BOX20209
      DO 8 JJ=1,3                                                 BOX20210
    8 A4(JJ)=A3(JJ)                                               BOX20211
      DO 38 I=1,N4                                                BOX20212
      DO 36 K=1,3                                                 BOX20213
      IF(ABS(A4(K))-5.0)36,36,37                                  BOX20214
   37 A4(K)=A3(K)                                                 BOX20215
   36 CONTINUE                                                    BOX20216
      A4(J)=I*A/AN5+X4-A/AN5                                      BOX20217
      NNNN=N11                                                    BOX20218
      CALL CMLE2(J,ITER,V2,J3)                                    BOX20219
      R(I,J)=N*ALOG(SSY1/SSY)/2.0                                 BOX20220
      R(I,J)=EXP(R(I,J))                                          BOX20221
      WRITE(P,79)A4,SSY,R(I,J),ITER                               BOX20222
   38 CONTINUE                                                    BOX20223
    1 CONTINUE                                                    BOX20224
      CALL LINK(PMLR2)                                            BOX20225
      END                                                         BOX20226
// DUP                                                          BOX20227
*DELETE              BOX2                                       BOX20228
*STORE       WS  UA  BOX2                                       BOX20229
```

```
// JOB                                                                  CRLF2000
// FOR                                                                  CRLF2001
*LIST ALL                                                               CRLF2002
*NAME CRLF2                                                             CRLF2003
*EXTENDED PRECISION                                                     CRLF2004
*ONE WORD INTEGERS                                                      CRLF2005
*IOCS(KEYBOARD)                                                         CRLF2006
*IOCS(TYPEWRITER)                                                       CRLF2007
*IOCS(1403 PRINTER)                                                     CRLF2008
*IOCS(2501 READER)                                                      CRLF2009
C                                                                       CRLF2010
C      THIS PROGRAM IS DESIGNED FOR COMPLETE CONSOLE CONTROL.           CRLF2011
C                                                                       CRLF2012
C      THIS PROGRAM ANALYZES DATA IN THE SAME MANNER AS BOX2, BUT ONLY  CRLF2013
C FOR TEST VALUES OF THE POWER TRANSFORMATIONS WHICH ARE ENTERED ON THE CRLF2014
C CONSOLE TYPEWRITER.  THE RELATIVE LIKELIHOOD OF THESE TEST VALUES, AS CRLF2015
C COMPARED WITH THE MAXIMUM LIKELIHOOD ESTIMATES, IS CALCULATED.        CRLF2016
C VARIOUS TEST VALUES MAY BE ENTERED, AND THE COMPLETE ANALYSIS DONE ON CRLF2017
C ANY LIKELY VALUES SELECTED FROM THESE.  SEE BOX2 FOR DETAILS OF THE   CRLF2018
C ANALYSIS.                                                             CRLF2019
C                                                                       CRLF2020
C      PREDICTED VALUES OF THE RESPONSE VARIABLE MAY BY CALCULATED FOR  CRLF2021
C ANY SPECIFIED FACTOR VALUES. THE CANONICAL VARIABLES MAY BE CALCULATEDCRLF2022
C FROM GIVEN FACTOR VALUES AND VICE VERSA.  FORMAT(F15.5)               CRLF2023
C                                                                       CRLF2024
C    NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                 CRLF2025
C                                                                       CRLF2026
C   LINKS CALLED                                                        CRLF2027
C                                                                       CRLF2028
C  CRLF2 - CALCULATES RELATIVE LIKELIHOODS OF VARIOUS TEST VALUES OF    CRLF2029
C TRANSFORMS                                                            CRLF2030
C  INFO2 - PERFORMS ANALYSIS OF VARIANCE                                CRLF2031
C  COEF2 - CALCULATES AND PLOTS POINTS FOR MLR GRAPHS OF THE B(J)       CRLF2032
C COEFFICIENTS                                                          CRLF2033
C  EIGN2 - PERFORMS CANONICAL ANALYSIS                                  CRLF2034
C  CENT2 - CALCULATES POINTS FOR THE MLR GRAPHS OF THE CENTRE           CRLF2035
C          COORDINATES                                                  CRLF2036
C  PCNT2 - PLOTS MLR GRAPHS OF THE COORDINATES OF THE RESPONSE CENTRE   CRLF2037
C  CRS2  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS          CRLF2038
C  PRS2  - PLOTS RESPONSE SURFACE CONTOURS                              CRLF2039
C                                                                       CRLF2040
C   SUBROUTINES CALLED                                                  CRLF2041
C                                                                       CRLF2042
C  MATV7 - INVERTS MATRICES                                             CRLF2043
C  ORTH2 - CALCULATES ORTHOGONAL POLYNOMIALS FOR ANOVA                  CRLF2044
C  CAN2  - DIAGONALIZES MATRICES                                        CRLF2045
C  JACOB - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES      CRLF2046
C                                                                       CRLF2047
C   OPTIONS                                                             CRLF2048
C                                                                       CRLF2049
```

```
C SWITCH 10 UP - PLOT RESPUNSE SURFACE CONTOURS                          CRLF2050
C SWITCH  8 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF B(J) COEFFICIENTS     CRLF2051
C SWITCH  7 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF THE CENTRE            CRLF2052
C                COORDINATES                                             CRLF2053
C SWITCH  6 UP - ENTER ALTERNATE CONTOUR LEVELS IF IMAGINARY POINT FOUNDCRLF2054
C                WHEN PLOTTING CONTOURS                                  CRLF2055
C                                                                        CRLF2056
C   MAKEUP OF DATA DECK                                                  CRLF2057
C                                                                        CRLF2058
C 1.TITLE CARD FIRST - (12A6)                                            CRLF2059
C 2.CONTROL CARD - (1X,2I2,F5.3)                                         CRLF2060
C     I2 - NUMBER OF TREATMENT COMBINATIONS                              CRLF2061
C     I2 - NUMBER OF OBSERVATION SETS                                    CRLF2062
C     F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                     CRLF2063
C 3.TREATMENT COMBINATIONS IN PAIRS - (16F5.3)                           CRLF2064
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION           CRLF2065
C     ONE SET PER CARD - (13F6.3)                                        CRLF2066
C 5.98 OR 99 IN COLS. 79-80 INDICATES END OF DATA                        CRLF2067
C 6.REPEAT 1. TO 5. AS REQUIRED                                          CRLF2068
C                                                                        CRLF2069
C   STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWCRLF2070
C PAPER                                                                  CRLF2071
C                                                                        CRLF2072
      INTEGER P,Q                                                        CRLF2073
      DIMENSION EVA(7),EVE(7,7),ZZ(2),X3(2),XS(2),X4(7)                  CRLF2074
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY1,N,IREP,TITL(12),ID,A3(3)CRLF2075
     1,N4,N5,X1(6),SSX(7,7),SSXY(6),YY1(100)                            CRLF2076
      COMMON Y2(100,13)                                                  CRLF2077
      EQUIVALENCE (X3(1),X4(1))                                          CRLF2078
   99 FORMAT('TYPE IN X1 AND X2 IN UNTRANSFORMED UNITS')                 CRLF2079
   98 FORMAT('0X VARIABLES CALCULATED FROM CANONICAL VARIABLES')         CRLF2080
   97 FORMAT('TYPE IN Z1 AND Z2')                                        CRLF2081
   96 FORMAT('TYPE IN EIGENVALUES AND -VECTORS BY ROWS AS IN PRINTOUT') CRLF2082
   95 FORMAT(3E15.5)                                                     CRLF2083
   94 FORMAT('0PREDICTED VALUE OF Y FOR GIVEN X1 AND X2'/'0'7X'Y'13X'X1'CRLF2084
     113X'X2')                                                           CRLF2085
   93 FORMAT('0VALUES OF B(J) COEFFICIENTS'/6E15.5)                      CRLF2086
   92 FORMAT('0TEST VALUES OF POWER TRANSFORMATIONS'/'0'6X'A1'13X'A2'13XCRLF2087
     1'C'/3E15.5)                                                        CRLF2088
   91 FORMAT('TYPE IN VALUES OF X1 AND X2')                              CRLF2089
   90 FORMAT(I2)                                                         CRLF2090
   89 FORMAT('TYPE IN NUMBER OF VALUES OF Y TO BE PREDICTED  I2 FORMAT')CRLF2091
   88 FORMAT('0CONSTANT ADDED    Y + 'F7.3)                              CRLF2092
   87 FORMAT('INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DACRLF2093
     1TA DECK')                                                          CRLF2094
   86 FORMAT(16F5.3)                                                     CRLF2095
   85 FORMAT('IF RELATIVE LIKELIHOOD IS SATISFACTORY, PRESS EOF'/ 'IF NOCRLF2096
     1T, TYPE 1 TO TRY NEW TEST VALUES, -1 TO READ MORE DATA OR CALL EXICRLF2097
     2T')                                                                CRLF2098
   84 FORMAT('0TEST VALUES OF POWER TRANSFORMATIONS'/'0'6X'A1'13X'A2'13XCRLF2099
     1'C'14X'SSD'13X'R'/5E15.5)                                          CRLF2100
```

```
83 FORMAT('OMAXIMUM LIKELIHOOD ESTIMATES'//7X'A1'13X'A2'13X'C'14X'SSDCRLF2101
  1'/4E15.5)                                                        CRLF2102
82 FORMAT('1'12A6)                                                  CRLF2103
81 FORMAT(13F6.3,I2)                                                CRLF2104
80 FORMAT(12A6)                                                     CRLF2105
79 FORMAT('TYPE IN TWO MAXIMUM LIKELIHOOD ESTIMATES OF POWER TRANSFORCRLF2106
  1MATIONS FOR INDEPENDENT VARIABLES'/'THEN, ONE ML ESTIMATE FOR DEPECRLF2107
  2NDENT VARIABLE')                                                 CRLF2108
78 FORMAT(1X,2I2,F5.3)                                              CRLF2109
77 FORMAT('TYPE 1 TO READ NEW DATA DECK, EOF TO READ NEW TEST VALUES CRLF2110
  1ON SAME DATA, -1 TO CALL EXIT')                                  CRLF2111
76 FORMAT(I3)                                                       CRLF2112
75 FORMAT(F15.5)                                                    CRLF2113
74 FORMAT('TYPE IN TWO TEST VALUES OF POWER TRANSFORMATIONS FOR INDEPCRLF2114
  1ENDENT VARIABLES'/'THEN, ONE FOR DEPENDENT VARIABLE'/'TYPE 0.0 FORCRLF2115
  2 LOG TRANSFORM, + OR - 100 FOR EXPONENTIAL TRANSFORM'/'DATA DECK MCRLF2116
  3UST BE REREAD TO REGAIN ORIGINAL VARIABLE VALUES WITH THESE 3')  CRLF2117
73 FORMAT('RELATIVE LIKELIHOOD IS'F8.5)                             CRLF2118
72 FORMAT('SWITCH 10 UP TO PLOT RESPONSE CONTOURS'/'SWITCH  8 UP TO PCRLF2119
  1LOT MLR GRAPHS OF B(J) COEFFICIENTS'/'SWITCH  7 UP TO PLOT MLR GRACRLF2120
  2PHS OF THE COORDINATES OF THE RESPONSE CENTRE'/'SWITCH 6 UP TO ENTCRLF2121
  3ER NEW CONTOUR LEVELS OR FACTOR LIMITS IF IMAGINARY POINTS ARE FOUCRLF2122
  4ND')                                                             CRLF2123
71 FORMAT(' PRESS EOF TO CONTINUE, -1 TO CALCULATE CANONICAL VARIABLECRLF2124
  1S FROM X''S,'/' OR 1 TO CALCULATE X''S FROM CANONICAL VARIABLES') CRLF2125
70 FORMAT('TYPE IN NUMBER OF SOLUTIONS  FORMAT I2')                 CRLF2126
69 FORMAT('TYPE IN COORDINATES OF CENTRE, X1S, X2S, AND YS IN UNTRANSCRLF2127
  1FORMED UNITS')                                                   CRLF2128
67 FORMAT('OCANONICAL VARIABLES CALCULATED FROM X VARIABLES')       CRLF2129
66 FORMAT('0'9X'Y EST'11X'X1'13X'X2'13X'Z1'13X'Z2')                 CRLF2130
65 FORMAT(5F15.3)                                                   CRLF2131
   P=5                                                              CRLF2132
   Q=8                                                              CRLF2133
   WRITE(1,72)                                                      CRLF2134
18 WRITE(1,77)                                                      CRLF2135
   READ(6,76)N5                                                     CRLF2136
   N6=1                                                             CRLF2137
   N4=1                                                             CRLF2138
   IF(N5)19,1,2                                                     CRLF2139
 2 READ(Q,80)TITL                                                   CRLF2140
   WRITE(1,80)TITL                                                  CRLF2141
   READ(Q,78)N1,IREP,CONST                                          CRLF2142
   N=N1*IREP                                                        CRLF2143
   READ(Q,66)((X(I,J),J=1,2),I=1,N1)                                CRLF2144
   I=0                                                              CRLF2145
10 I=I+1                                                            CRLF2146
   READ(Q,81)(Y(I,J),J=1,13),ID                                     CRLF2147
   IF(ID-98)21,11,11                                                CRLF2148
21 DO 61 J=1,IREP                                                   CRLF2149
61 Y(I,J)=Y(I,J)+CONST                                              CRLF2150
   GO TO 10                                                         CRLF2151
```

```
11 N2=I-1                                                          CRLF2152
   IF(N1-N2)22,1,22                                                CRLF2153
22 WRITE(1,87)                                                     CRLF2154
   GO TO 18                                                        CRLF2155
 1 N1=N/IREP                                                       CRLF2156
   D=0.0                                                           CRLF2157
   DO 27 I=1,N1                                                    CRLF2158
   DO 27 J=1,IREP                                                  CRLF2159
27 D=D+ALOG(Y(I,J))                                                CRLF2160
   IF(N5)20,25,20                                                  CRLF2161
20 WRITE(1,79)                                                     CRLF2162
   READ(6,75)A3                                                    CRLF2163
36 DD=EXP(D*(A3(3)-1.)/FLOAT(N))                                   CRLF2164
   DO 41 I=1,N1                                                    CRLF2165
   DO 41 J=1,IREP                                                  CRLF2166
41 Y2(I,J)=(Y(I,J)**A3(3)-1.)/A3(3)/DD                             CRLF2167
 8 SSY2=0.0                                                        CRLF2168
   DO 24 K=1,N1                                                    CRLF2169
   DO 24 J=1,IREP                                                  CRLF2170
24 SSY2=SSY2+Y2(K,J)*Y2(K,J)                                       CRLF2171
   DO 26 I=1,N1                                                    CRLF2172
   YY1(I)=0.0                                                      CRLF2173
   DO 26 J=1,IREP                                                  CRLF2174
26 YY1(I)=YY1(I)+Y2(I,J)/IREP                                      CRLF2175
   DO 3 I=1,6                                                      CRLF2176
   B(I)=0.0                                                        CRLF2177
   DO 3 J=1,6                                                      CRLF2178
 3 SSX(I,J)=0.0                                                    CRLF2179
   X1(1)=1.0                                                       CRLF2180
   DO 4 K=1,N1                                                     CRLF2181
   DO 5 J=2,3                                                      CRLF2182
   X1(J)=X(K,J-1)**A3(J-1)                                         CRLF2183
 5 X1(J+2)=X1(J)*X1(J)                                             CRLF2184
   X1(6)=X1(2)*X1(3)                                               CRLF2185
   DO 4 I=1,6                                                      CRLF2186
   B(I)=B(I)+YY1(K)*X1(I)                                          CRLF2187
   DO 4 J=1,6                                                      CRLF2188
 4 SSX(I,J)=SSX(I,J)+X1(I)*X1(J)                                   CRLF2189
   DO 9 I=1,6                                                      CRLF2190
 9 SSXY(I)=B(I)                                                    CRLF2191
   CALL MATV7(SSX,6,B,1,DET)                                       CRLF2192
   IF(N6)14,13,14                                                  CRLF2193
13 SSY=SSY2                                                        CRLF2194
   DO 15 I=1,6                                                     CRLF2195
15 SSY=SSY-B(I)*SSXY(I)*IREP                                       CRLF2196
   GO TO 12                                                        CRLF2197
14 SSY1=SSY2                                                       CRLF2198
   DO 6 I=1,6                                                      CRLF2199
 6 SSY1=SSY1-B(I)*SSXY(I)*IREP                                     CRLF2200
   DO 7 I=1,3                                                      CRLF2201
 7 A4(I)=A3(I)                                                     CRLF2202
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```
25 WRITE(1,74)                                                          CRLF2203
   READ(6,75)A3                                                         CRLF2204
   N6=0                                                                 CRLF2205
   DO 28 J=1,2                                                          CRLF2206
   IF(A3(J))32,23,32                                                    CRLF2207
23 DO 29 I=1,N1                                                         CRLF2208
29 X(I,J)=ALOG(X(I,J))                                                  CRLF2209
   GO TO 33                                                             CRLF2210
32 IF(ABS(A3(J))-100.)28,34,28                                          CRLF2211
34 DO 35 I=1,N1                                                         CRLF2212
35 X(I,J)=EXP(A3(J)*X(I,J)/100.)                                        CRLF2213
33 A3(J)=1.0                                                            CRLF2214
28 CONTINUE                                                             CRLF2215
   IF(A3(3))30,31,30                                                    CRLF2216
31 DO 16 I=1,N1                                                         CRLF2217
   DO 16 J=1,IREP                                                       CRLF2218
   Y(I,J)=ALOG(Y(I,J))                                                  CRLF2219
16 Y2(I,J)=Y(I,J)+EXP(D/FLOAT(N))                                       CRLF2220
   GO TO 37                                                             CRLF2221
30 IF(ABS(A3(3))-100.)36,38,36                                          CRLF2222
38 DD=0.0                                                               CRLF2223
   DO 40 I=1,N1                                                         CRLF2224
   DO 40 J=1,IREP                                                       CRLF2225
40 DD=DD+Y(I,J)/N                                                       CRLF2226
   DD=EXP(-A3(3)*DD/100.)                                               CRLF2227
   DO 39 I=1,N1                                                         CRLF2228
   DO 39 J=1,IREP                                                       CRLF2229
   Y(I,J)=EXP(A3(3)*Y(I,J)/100.)                                        CRLF2230
39 Y2(I,J)=Y(I,J)*DD*A3(3)/100.                                         CRLF2231
37 A3(3)=1.0                                                            CRLF2232
   GO TO 8                                                              CRLF2233
12 R1=N*ALOG(SSY1/SSY)/2.0                                              CRLF2234
   R1=EXP(R1)                                                           CRLF2235
   WRITE(1,89)                                                          CRLF2236
   READ(6,90)N7                                                         CRLF2237
   IF(N7)43,43,44                                                       CRLF2238
44 WRITE(P,82)TITL                                                      CRLF2239
   WRITE(P,92)A3                                                        CRLF2240
   DO 45 I=1,6                                                          CRLF2241
45 B(I)=B(I)*A3(3)*DD                                                   CRLF2242
   B(1)=B(1)+1.0                                                        CRLF2243
   WRITE(P,93)(B(I),I=1,6)                                              CRLF2244
   WRITE(P,94)                                                          CRLF2245
   DO 42 J=1,N7                                                         CRLF2246
   WRITE(1,91)                                                          CRLF2247
   READ(6,75)XX1,XX2                                                    CRLF2248
   XX1=XX1**A3(1)                                                       CRLF2249
   XX2=XX2**A3(2)                                                       CRLF2250
   Z=B(1)+B(2)*XX1+B(3)*XX2+B(4)*XX1*XX1+B(5)*XX2*XX2+B(6)*XX1*XX2      CRLF2251
   Z=Z**(1.0/A3(3))                                                     CRLF2252
   XX1=XX1**(1.0/A3(1))                                                 CRLF2253
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      XX2=XX2**(1.0/A3(2))                                              CRLF2254
   42 WRITE(P,95)Z,XX1,XX2                                              CRLF2255
   43 WRITE(1,71)                                                       CRLF2256
      READ(6,76)N8                                                      CRLF2257
      IF(N8)47,46,47                                                    CRLF2258
   47 WRITE(P,82)TITL                                                   CRLF2259
      WRITE(P,92)A3                                                     CRLF2260
      IF(N8)56,46,57                                                    CRLF2261
   56 WRITE(P,67)                                                       CRLF2262
      GO TO 58                                                          CRLF2263
   57 WRITE(P,98)                                                       CRLF2264
   58 WRITE(P,66)                                                       CRLF2265
      WRITE(1,70)                                                       CRLF2266
      READ(6,90)N7                                                      CRLF2267
      WRITE(1,69)                                                       CRLF2268
      READ(6,75)XS,YS                                                   CRLF2269
      WRITE(1,96)                                                       CRLF2270
      READ(6,75)(EVA(I),(EVE(I,J),J=1,2),I=1,2)                         CRLF2271
      IF(N8)59,46,60                                                    CRLF2272
   60 CALL MATV7(EVE,2,X4,0,DET)                                        CRLF2273
   59 DO 53 II=1,N7                                                     CRLF2274
      IF(N8)48,46,49                                                    CRLF2275
   49 WRITE(1,97)                                                       CRLF2276
      READ(6,75)ZZ                                                      CRLF2277
      DO 50 I=1,2                                                       CRLF2278
      X3(I)=0.0                                                         CRLF2279
      DO 50 J=1,2                                                       CRLF2280
   50 X3(I)=X3(I)+ZZ(J)*EVE(I,J)                                        CRLF2281
      DO 54 I=1,2                                                       CRLF2282
   54 X3(I)=(X3(I)+XS(I)**A3(I))**(1.0/A3(I))                           CRLF2283
      GO TO 52                                                          CRLF2284
   48 WRITE(1,99)                                                       CRLF2285
      READ(6,75)X3                                                      CRLF2286
      DO 55 I=1,2                                                       CRLF2287
      ZZ(I)=0.0                                                         CRLF2288
      DO 55 J=1,2                                                       CRLF2289
   55 ZZ(I)=ZZ(I)+(X3(J)**A3(J)-XS(J)**A3(J))*EVE(I,J)                  CRLF2290
   52 Z=YS                                                              CRLF2291
      DO 51 I=1,2                                                       CRLF2292
   51 Z=Z+ZZ(I)**2*EVA(I)                                               CRLF2293
   53 WRITE(P,65)Z,X3,ZZ                                                CRLF2294
   46 WRITE(1,73)R1                                                     CRLF2295
      WRITE(P,82)TITL                                                   CRLF2296
      WRITE(P,88)CONST                                                  CRLF2297
      WRITE(P,83)A4,SSY1                                                CRLF2298
      WRITE(P,84)A3,SSY,R1                                              CRLF2299
      WRITE(1,85)                                                       CRLF2300
      READ(6,76)N5                                                      CRLF2301
      IF(N5)18,17,25                                                    CRLF2302
   17 CALL LINK(INFO2)                                                  CRLF2303
   19 CALL EXIT                                                         CRLF2304
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```
      END                                                    CRLF2305
// DUP                                                       CRLF2306
*DELETE                 CRLF2                               CRLF2307
*STORE        WS  UA    CRLF2                               CRLF2308
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// JOB                                                                  PRRE2000
// FOR                                                                  PRRE2001
*NAME PRRE2                                                             PRRE2002
*LIST ALL                                                               PRRE2003
*EXTENDED PRECISION                                                     PRRE2004
*ONE WORD INTEGERS                                                      PRRE2005
*IOCS(KEYBOARD)                                                         PRRE2006
*IOCS(TYPEWRITER)                                                       PRRE2007
*IOCS(1403 PRINTER)                                                     PRRE2008
*IOCS(2501 READER)                                                      PRRE2009
C                                                                       PRRE2010
C      THIS PROGRAM PLOTS THE RESPONSE SURFACE FOR A REDUCED EQUATION,  PRRE2011
C  WITH SOME B(J) COEFFICIENTS ZERO, FROM THE DATA OF BOX2. THE NEW     PRRE2012
C  COEFFICIENTS TO BE SUPPLIED MAY BE CALCULATED USING A MULTIPLE       PRRE2013
C  REGRESSION PROGRAM SUCH AS MREG1.                                    PRRE2014
C                                                                       PRRE2015
C     NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                PRRE2016
C                                                                       PRRE2017
C    LINKS CALLED                                                       PRRE2018
C                                                                       PRRE2019
C  CRS2  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS          PRRE2020
C  PRS2  - PLOTS RESPONSE SURFACE CONTOURS                              PRRE2021
C                                                                       PRRE2022
C    SUBROUTINES CALLED                                                 PRRE2023
C                                                                       PRRE2024
C  MATV7 - INVERTS MATRICES                                             PRRE2025
C  CAN2  - DIAGONALIZES MATRICES                                        PRRE2026
C  JACOB - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES      PRRE2027
C                                                                       PRRE2028
C    OPTIONS                                                            PRRE2029
C                                                                       PRRE2030
C SWITCH  6 UP - ENTER ALTERNATE CONTOUR LEVELS IF IMAGINARY POINT FOUNDPRRE2031
C                WHEN PLOTTING CONTOURS                                 PRRE2032
C                                                                       PRRE2033
C   MAKEUP OF DATA DECK                                                 PRRE2034
C                                                                       PRRE2035
C 1.TITLE CARD FIRST - (12A6)                                           PRRE2036
C 2.CONTROL CARD - (1X,2I2,F5.3)                                        PRRE2037
C      I2 - NUMBER OF TREATMENT COMBINATIONS                            PRRE2038
C      I2 - NUMBER OF OBSERVATION SETS                                  PRRE2039
C      F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                   PRRE2040
C 3.TREATMENT COMBINATIONS IN PAIRS - (16F5.3)                          PRRE2041
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION          PRRE2042
C      ONE SET PER CARD - (13F6.3)                                      PRRE2043
C 5.98 OR 99 IN COLS. 79-80 INDICATES END OF DATA                       PRRE2044
C 6.REPEAT 1. TO 5. AS REQUIRED                                         PRRE2045
C                                                                       PRRE2046
C   STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWPRRE2047
C PAPER                                                                 PRRE2048
C                                                                       PRRE2049
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```
      INTEGER P,Q                                                       PRRE2050
      DIMENSION ALAM1(2),ALAM2(2),PREP1(2,2),PREP2(2,2)                 PRRE2051
      COMMON Y(100,13),X(100,2),V(7),A4(3),SSY,NS,NREPS,TITL(12),ID,A3(3PRRE2052
     1),N4,I,YS(2),V1(2,2),ALAMD(2,2),PREP(2,2,2),COE(6),YDEV(100),BA(7,PRRE2053
     27),Z(2),XC(100,2),NNN(3)                                          PRRE2054
      EQUIVALENCE (ALAMD(1,1),ALAM1(1)),(ALAMD(1,2),ALAM2(1))           PRRE2055
      EQUIVALENCE (PREP1(1,1),PREP(1,1,1)),(PREP2(1,1),PREP(1,1,2))     PRRE2056
   99 FORMAT('INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DAPRRE2057
     1TA DECK')                                                         PRRE2058
   98 FORMAT('TYPE 1 TO READ NEW DATA DECK, EOF TO READ NEW TEST VALUES PRRE2059
     1ON SAME DATA, -1 TO CALL EXIT')                                   PRRE2060
   97 FORMAT(13F6.3,I2)                                                 PRRE2061
   96 FORMAT('TYPE IN 2 VALUES OF POWER TRANSFORMATIONS FOR INDEPENDENT PRRE2062
     1VARIABLES,'/'THEN, ONE FOR DEPENDENT VARIABLE'/'TYPE 0.0 FOR LOG TPRRE2063
     2RANSFORM, + OR - 100 FOR EXPONENTIAL TRANSFORM'/'DATA DECK MUST BEPRRE2064
     3 REREAD TO REGAIN ORIGINAL VARIABLE VALUES WITH THESE 3')          PRRE2065
   95 FORMAT(F15.5)                                                     PRRE2066
   94 FORMAT(51HTYPE IN 6 B(J) COEFFICIENTS - E13.6 - +0.000000E 00)    PRRE2067
   93 FORMAT('0VALUES OF B(J) COEFFICIENTS'/6E15.5)                     PRRE2068
   92 FURMAT(16F5.3)                                                    PRRE2069
   91 FORMAT(1X,212,F5.3)                                               PRRE2070
   90 FURMAT(12A6)                                                      PRRE2071
   89 FORMAT(1H0,8X,'EIGEN VALUES',10X,'EIGEN VECTORS AS ROWS',/,)      PRRE2072
   88 FORMAT('0'2(E11.4,'=YS'3X)'IN ORIGINAL UNITS'/)                   PRRE2073
   87 FURMAT(1H0,4(E11.4,'=X'I1'S'2X)' IN ORIGINAL UNITS')              PRRE2074
   86 FORMAT(I4,7E15.6)                                                 PRRE2075
   85 FORMAT(1H0,1X,'TABLE OF RESIDUALS')                               PRRE2076
   84 FURMAT(I3)                                                        PRRE2077
   83 FORMAT(E13.6)                                                     PRRE2078
   82 FORMAT('1'12A6)                                                   PRRE2079
   81 FURMAT(1H0,5X,3HY =,E15.6,3H + ,2(2H +,E15.6,2H Z,I1,3H SQ),/,)   PRRE2080
   80 FURMAT(1H0,9X,'Y EST',10X,'Y OBS',11X,'DEVN',15X,'VALUES OF Z',18XPRRE2081
     1,'FACTOR LEVELS'/)                                                PRRE2082
   79 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.PRRE2083
     14'  A2 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FPRRE2084
     28.4)                                                              PRRE2085
   78 FORMAT( 52H0 CANONICAL REGRESSION   (Z ARE CANONICAL VARIABLES),/)PRRE2086
   77 FORMAT(29H0  CENTRE OF RESPONSE SURFACE  ,/,)                     PRRE2087
      P=5                                                               PRRE2088
      Q=8                                                               PRRE2089
      N4=3                                                              PRRE2090
      LL=1                                                              PRRE2091
    9 WRITE(1,98)                                                       PRRE2092
      READ(6,84)N5                                                      PRRE2093
      IF(N5)41,1,2                                                      PRRE2094
   41 CALL EXIT                                                         PRRE2095
    2 READ(Q,90)TITL                                                    PRRE2096
      READ(Q,91)N1,NREPS,CONST                                          PRRE2097
      NS=N1*NREPS                                                       PRRE2098
      READ(Q,92)((X(I,J),J=1,2),I=1,N1)                                 PRRE2099
      I=0                                                               PRRE2100
```

```
10 I=I+1                                                          PRRE2101
   READ(Q,97)(Y(I,J),J=1,13),ID                                   PRRE2102
   IF(ID-98)21,11,11                                              PRRE2103
21 DO 61 J=1,NREPS                                                PRRE2104
61 Y(I,J)=Y(I,J)+CONST                                            PRRE2105
   GO TO 10                                                       PRRE2106
11 N2=I-1                                                         PRRE2107
   IF(N1-N2)43,1,43                                               PRRE2108
43 WRITE(1,99)                                                    PRRE2109
   GO TO 9                                                        PRRE2110
 1 N1=NS/NREPS                                                    PRRE2111
   WRITE(P,82)TITL                                                PRRE2112
   WRITE(1,90)TITL                                                PRRE2113
   WRITE(1,94)                                                    PRRE2114
   READ(6,83)(V(I),I=1,6)                                         PRRE2115
   WRITE(1,96)                                                    PRRE2116
   READ(6,95)A3                                                   PRRE2117
   WRITE(P,79)A3                                                  PRRE2118
   WRITE(P,93)(V(I),I=1,6)                                        PRRE2119
   DO 42 J=1,2                                                    PRRE2120
   IF(A3(J))5,12,5                                                PRRE2121
12 DO 13 I=1,N1                                                   PRRE2122
13 X(I,J)=ALOG(X(I,J))                                            PRRE2123
   GO TO 14                                                       PRRE2124
 5 IF(ABS(A3(J))-100.)42,15,42                                    PRRE2125
15 DO 19 I=1,N1                                                   PRRE2126
19 X(I,J)=EXP(A3(J)*X(I,J)/100.)                                  PRRE2127
14 A3(J)=1.0                                                      PRRE2128
42 CONTINUE                                                       PRRE2129
   IF(A3(3))20,25,20                                              PRRE2130
25 DO 26 I=1,N1                                                   PRRE2131
   DO 26 J=1,NREPS                                                PRRE2132
26 Y(I,J)=ALOG(Y(I,J))                                            PRRE2133
   GO TO 27                                                       PRRE2134
20 IF(ABS(A3(3))-100.)28,38,28                                    PRRE2135
38 DO 39 I=1,N1                                                   PRRE2136
   DO 39 J=1,NREPS                                                PRRE2137
39 Y(I,J)=EXP(A3(3)*Y(I,J)/100.)                                  PRRE2138
27 A3(3)=1.0                                                      PRRE2139
28 DO 45 I=1,N1                                                   PRRE2140
   DO 45 J=1,2                                                    PRRE2141
45 XC(I,J)=X(I,J)**A3(J)                                          PRRE2142
   TEMP=V(6)                                                      PRRE2143
   V(6)=V(5)                                                      PRRE2144
   V(5)=TEMP                                                      PRRE2145
   DO 29 J=1,6                                                    PRRE2146
29 COE(J)=V(J)                                                    PRRE2147
   NFAK=2                                                         PRRE2148
   KP=NFAK+2                                                      PRRE2149
   DO 32 I=1,NFAK                                                 PRRE2150
   DO 32 J=1,I                                                    PRRE2151
```

```
      IF(I-J)31,30,31                                                    PRRE2152
   30 PREP(I,J,LL)=V(KP)                                                 PRRE2153
      GO TO 32                                                           PRRE2154
   31 PREP(I,J,LL)=V(KP)*0.5                                             PRRE2155
      PREP(J,I,LL)=PREP(I,J,LL)                                          PRRE2156
   32 KP=KP+1                                                            PRRE2157
      DO 33 I=1,NFAK                                                     PRRE2158
   33 V(I)=-V(I+1)*0.500                                                 PRRE2159
      DO 34 I=1,NFAK                                                     PRRE2160
      DO 34 J=1,NFAK                                                     PRRE2161
   34 BA(I,J)=PREP(I,J,LL)                                               PRRE2162
      WRITE(P,77)                                                        PRRE2163
      CALL MATV7(BA,NFAK,V,1,DET)                                        PRRE2164
      YS(LL)=COE(1)                                                      PRRE2165
      DO 44 I=1,NFAK                                                     PRRE2166
   44 YS(LL)=YS(LL)+0.5*V(I)*COE(I+1)                                    PRRE2167
      I1=1                                                               PRRE2168
      I2=2                                                               PRRE2169
      DO 40 I=1,2                                                        PRRE2170
   40 NNN(I)=V(I)/ABS(V(I))                                              PRRE2171
      V3=ABS(V(1))**(1./A3(1))*NNN(1)                                    PRRE2172
      V4=ABS(V(2))**(1./A3(2))*NNN(2)                                    PRRE2173
      NNN(3)=YS(LL)/ABS(YS(LL))                                          PRRE2174
      YS1=ABS(YS(LL))**(1./A3(3))*NNN(3)                                 PRRE2175
      WRITE(P,87)(V(I),I,I=1,NFAK),V3,I1,V4,I2                           PRRE2176
      WRITE(P,88)YS(LL),YS1                                              PRRE2177
      WRITE(P,89)                                                        PRRE2178
      CALL CAN2(PREP1,ALAM1,NFAK)                                        PRRE2179
      WRITE(P,78)                                                        PRRE2180
      WRITE(P,81)YS(LL),(ALAMD(J,LL),J,J=1,NFAK)                         PRRE2181
      WRITE(P,85)                                                        PRRE2182
      WRITE(P,80)                                                        PRRE2183
      DO 18 J=1,N1                                                       PRRE2184
      YPRED=0.0                                                          PRRE2185
      DO 16 I=1,NFAK                                                     PRRE2186
      Z(I)=0.0                                                           PRRE2187
      DO 16 L=1,NFAK                                                     PRRE2188
   16 Z(I)=Z(I)+(XC(J,L)-V(L))*PREP(I,L,LL)                              PRRE2189
      DO 17 L1=1,NFAK                                                    PRRE2190
   17 YPRED=YPRED+(Z(L1)**2)*ALAMD(L1,LL)                                PRRE2191
      YPRED=YPRED+YS(LL)                                                 PRRE2192
      MM1=YPRED/ABS(YPRED)                                               PRRE2193
      YPRED=MM1*ABS(YPRED)**(1.0/A3(3))                                  PRRE2194
      YDEV(J)=0.0                                                        PRRE2195
      DO 51 I=1,NREPS                                                    PRRE2196
   51 YDEV(J)=YDEV(J)+Y(J,I)/NREPS                                       PRRE2197
      YDEV1=YDEV(J)-YPRED                                                PRRE2198
   18 WRITE(P,86)J,YPRED,YDEV(J),YDEV1,(Z(I),I=1,NFAK),(X(J,II),II=1,NFAPRRE2199
     1K)                                                                 PRRE2200
      DO 46 I=1,2                                                        PRRE2201
   46 V1(I,LL)=V(I)                                                      PRRE2202
```

```
      DO 3 I=1,4                                                    PRRE2203
    3 V(I)=COE(I)                                                   PRRE2204
      V(5)=COE(6)                                                   PRRE2205
      V(6)=COE(5)                                                   PRRE2206
      CALL LINK(CRS2)                                               PRRE2207
      END                                                           PRRE2208
// DUP                                                              PRRE2209
*DELETE              PRRE2                                        PRRE2210
*STORE       WS  UA  PRRE2                                        PRRE2211
```

```
// JOB                                                                    PMLR2000
// FOR                                                                    PMLR2001
*LIST ALL                                                                 PMLR2002
*NAME PMLR2                                                               PMLR2003
*EXTENDED PRECISION                                                       PMLR2004
*ONE WORD INTEGERS                                                        PMLR2005
*IOCS(PLOTTER)                                                           PMLR2006
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),PMLR2007
     1N4,N5,AN4,NNNN,D,R(75,3)                                           PMLR2008
   78 FORMAT(12A6)                                                        PMLR2009
   77 FORMAT('VALUE OF C    MAXIMUM AT C ='F8.4)                         PMLR2010
   76 FORMAT(F3.1)                                                        PMLR2011
   75 FORMAT('VALUE OF A'I1'    MAXIMUM AT A'I1' ='F8.4)                  PMLR2012
   74 FORMAT(F6.3)                                                        PMLR2013
   73 FORMAT('MAXIMUM LIKELIHOOD RATIO')                                  PMLR2014
      AN5=N4-1                                                            PMLR2015
      DO 4 J=1,3                                                          PMLR2016
      GO TO (8,8,9),J                                                     PMLR2017
    8 GO TO (10,10,4),N5                                                  PMLR2018
    9 GO TO (10,4,10),N5                                                  PMLR2019
   10 X1=A3(J)                                                            PMLR2020
      X4=A3(J)-AN4                                                        PMLR2021
      A=2.0*AN4                                                           PMLR2022
      B1=A/20.                                                            PMLR2023
      C=X4-A/50.                                                          PMLR2024
      D=A/10.                                                             PMLR2025
      E=10./A                                                             PMLR2026
      F=X4-B1                                                             PMLR2027
      G=X4+D                                                              PMLR2028
      H=X4+A*1.3                                                          PMLR2029
      W=X4-A/15.                                                          PMLR2030
      Z=X4-D                                                              PMLR2031
      CALL SCALE(E,10.0,X4,0.0)                                           PMLR2032
      CALL EGRID(0,X4,0.0,B1,20)                                          PMLR2033
      CALL EGRID(1,X4,0.0,0.05,20)                                        PMLR2034
      DO 2 I=1,11                                                         PMLR2035
      X1=G-D/10.0+D*FLOAT(I-2)                                            PMLR2036
      XO=G+D*FLOAT(I-2)                                                   PMLR2037
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                    PMLR2038
    2 WRITE(7,74)XO                                                       PMLR2039
      DO 3 I=1,11                                                         PMLR2040
      X1=-0.1+0.1*FLOAT(I)                                                PMLR2041
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                        PMLR2042
    3 WRITE(7,76)X1                                                       PMLR2043
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                     PMLR2044
      GO TO (5,5,6),J                                                     PMLR2045
    5 WRITE(7,75)J,J,A3(J)                                                PMLR2046
      GO TO 7                                                             PMLR2047
    6 WRITE(7,77)A3(J)                                                    PMLR2048
    7 CALL ECHAR(W,0.1,0.1,0.1,1.5709)                                    PMLR2049
```

```
      WRITE(7,73)                                                    PMLR2050
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                               PMLR2051
      WRITE(7,78)TITL                                                PMLR2052
      CALL EPLOT(-2,X4,0.0)                                          PMLR2053
      DO 1 I=1,N4                                                    PMLR2054
      A4(J)=I*A/AN5+X4-A/AN5                                         PMLR2055
      IF(R(I,J)-1.0)1,1,11                                           PMLR2056
   11 R(I,J)=1.0                                                     PMLR2057
    1 CALL EPLOT(0,A4(J),R(I,J))                                     PMLR2058
      CALL EPLOT(1,H,0.0)                                            PMLR2059
    4 CONTINUE                                                       PMLR2060
      CALL DATSW(8,J8)                                               PMLR2061
      GO TO (12,13),J8                                               PMLR2062
   13 N4=2                                                           PMLR2063
      CALL LINK(INFO2)                                               PMLR2064
   12 CALL LINK(CPAR2)                                               PMLR2065
      END                                                            PMLR2066
// DUP                                                               PMLR2067
*DELETE              PMLR2                                          PMLR2068
*STORE      WS  UA   PMLR2                                          PMLR2069
```

```
// JOB                                                                  CPAR2000
// FOR                                                                  CPAR2001
*LIST ALL                                                               CPAR2002
*NAME CPAR2                                                             CPAR2003
*EXTENDED PRECISION                                                     CPAR2004
*ONE WORD INTEGERS                                                      CPAR2005
*IOCS(1403 PRINTER)                                                     CPAR2006
      INTEGER P,Q                                                       CPAR2007
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),CPAR2008
     1N4,N5,AN4,NNNN,D,R(35,5),BB(5),RR(52)                             CPAR2009
   80 FORMAT('1'12A6)                                                   CPAR2010
   79 FORMAT(10E11.3,I6)                                                CPAR2011
   78 FORMAT('0POINTS PLOTTED FOR MLR GRAPH OF B('I1')'//5(5X'B('I1')'2XCPAR2012
     1)5X'A1'10X'A2'10X'C'9X'SSD'8X'R'7X'ITER')                         CPAR2013
      P=5                                                               CPAR2014
      Q=6                                                               CPAR2015
      N1=N/IREP                                                         CPAR2016
      DO 14 I=1,3                                                       CPAR2017
   14 A4(I)=A3(I)                                                       CPAR2018
      V2=0.0                                                            CPAR2019
      J3=8                                                              CPAR2020
      D=0.0                                                             CPAR2021
      DO 11 I=1,N1                                                      CPAR2022
      DO 11 J=1,IREP                                                    CPAR2023
   11 D=D+ALOG(Y(I,J))                                                  CPAR2024
      DD=EXP(D/FLOAT(N))                                                CPAR2025
      CALL CMLE2(4,ITER,V2,J3)                                          CPAR2026
      SS=SSY                                                            CPAR2027
      DO 5 I=1,5                                                        CPAR2028
    5 BB(I)=B(I)                                                        CPAR2029
      IF(N4-35)8,8,9                                                    CPAR2030
    8 AN5=N4-1                                                          CPAR2031
      GO TO 10                                                          CPAR2032
    9 N4=35                                                             CPAR2033
      AN5=34                                                            CPAR2034
   10 DO 1 J3=1,5                                                       CPAR2035
      IF(BB(J3))2,2,3                                                   CPAR2036
    2 X4=2.0*BB(J3)                                                     CPAR2037
      GO TO 13                                                          CPAR2038
    3 X4=0.0                                                            CPAR2039
   13 A=2.0*ABS(BB(J3))                                                 CPAR2040
      WRITE(P,80)TITL                                                   CPAR2041
      WRITE(P,78)J3,(I,I=1,5)                                           CPAR2042
      DO 4 I=1,3                                                        CPAR2043
    4 A4(I)=A3(I)                                                       CPAR2044
      DO 1 KK=1,N4                                                      CPAR2045
      DO 15 I=1,3                                                       CPAR2046
      IF(ABS(A4(I))-5.0)15,15,16                                        CPAR2047
   16 A4(I)=A3(I)                                                       CPAR2048
   15 CONTINUE                                                          CPAR2049
```

```
      V2=(KK-1)*A/AN5+X4                                              CPAR2050
      CALL CMLE2(4,ITER,V2,J3)                                        CPAR2051
      R(KK,J3)=N*ALOG(SS/SSY)/2.0                                     CPAR2052
      R(KK,J3)=EXP(R(KK,J3))                                          CPAR2053
      DO 6 J=1,5                                                      CPAR2054
    6 B(J)=A4(3)*DD**(A4(3)-1.0)*B(J)                                 CPAR2055
      WRITE(P,79)(B(J),J=1,5),A4,SSY,R(KK,J3),ITER                    CPAR2056
    1 CONTINUE                                                        CPAR2057
      DO 12 I=1,3                                                     CPAR2058
   12 A4(I)=A3(I)                                                     CPAR2059
      V2=0.0                                                          CPAR2060
      J3=8                                                            CPAR2061
      CALL CMLE2(4,ITER,V2,J3)                                        CPAR2062
      DO 7 J=1,5                                                      CPAR2063
    7 B(J)=A4(3)*DD**(A4(3)-1.0)*R(J)                                 CPAR2064
      CALL LINK(PPAR2)                                                CPAR2065
      END                                                             CPAR2066
// DUP                                                                CPAR2067
*DELETE              CPAR2                                           CPAR2068
*STORE      WS  UA   CPAR2                                           CPAR2069
```

```
// JOB                                                                  PPAR2000
// FOR                                                                  PPAR2001
*LIST ALL                                                               PPAR2002
*NAME PPAR2                                                             PPAR2003
*EXTENDED PRECISION                                                     PPAR2004
*ONE WORD INTEGERS                                                      PPAR2005
*IOCS(PLOTTER)                                                         PPAR2006
      COMMON Y(100,13),X(100,2),BB(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3)PPAR2007
     1,N4,N5,AN4,NNNN,D,R(35,5)                                         PPAR2008
   78 FORMAT(12A6)                                                      PPAR2009
   77 FORMAT('MAXIMUM LIKELIHOOD RATIO')                                PPAR2010
   76 FORMAT(F3.1)                                                      PPAR2011
   75 FORMAT('VALUE OF B('I1') - MLE OF B('I1') ='E10.3)                PPAR2012
   74 FORMAT(E10.3)                                                     PPAR2013
      IF(N4-35)8,8,9                                                    PPAR2014
    8 AN5=N4-1                                                          PPAR2015
      GO TO 10                                                          PPAR2016
    9 N4=35                                                             PPAR2017
      AN5=34                                                            PPAR2018
   10 DO 4 J3=1,5                                                       PPAR2019
      IF(BB(J3))5,5,6                                                   PPAR2020
    5 X4=2.0*BB(J3)                                                     PPAR2021
      GO TO 7                                                           PPAR2022
    6 X4=0.0                                                            PPAR2023
    7 A=2.0*ABS(BB(J3))                                                 PPAR2024
      B1=A/20.                                                          PPAR2025
      C=X4-A/50.                                                        PPAR2026
      D=A/10.                                                           PPAR2027
      E=10./A                                                           PPAR2028
      F=X4-B1                                                           PPAR2029
      G=X4+D                                                            PPAR2030
      H=X4+A*1.3                                                        PPAR2031
      W=X4-A/15.                                                        PPAR2032
      Z=X4-D                                                            PPAR2033
      CALL SCALE(E,10.0,X4,0.0)                                         PPAR2034
      CALL EGRID(0,X4,0.0,B1,20)                                        PPAR2035
      CALL EGRID(1,X4,0.0,0.05,20)                                      PPAR2036
      DO 2 I=1,11                                                       PPAR2037
      X1=G+D*FLOAT(I-3)+D/2.5                                           PPAR2038
      XO=G+D*FLOAT(I-2)                                                 PPAR2039
      CALL ECHAR(X1,-0.02,C.1,0.1,0.0)                                  PPAR2040
    2 WRITE(7,74)XO                                                     PPAR2041
      DO 3 I=1,11                                                       PPAR2042
      X1=-0.1+0.1*FLOAT(I)                                              PPAR2043
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                      PPAR2044
    3 WRITE(7,76)X1                                                     PPAR2045
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                   PPAR2046
      WRITE(7,75)J3,J3,BB(J3)                                           PPAR2047
      CALL ECHAR(W,0.1,0.1,0.1,1.5709)                                  PPAR2048
      WRITE(7,77)                                                       PPAR2049
```

```
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                          PPAR2050
      WRITE(7,78)TITL                                           PPAR2051
      CALL EPLOT(-2,X4,0.0)                                     PPAR2052
      DO 1 KK=1,N4                                              PPAR2053
      V2=(KK-1)*A/AN5+X4                                        PPAR2054
      IF(R(KK,J3)-1.0)1,1,11                                    PPAR2055
   11 R(KK,J3)=1.0                                              PPAR2056
    1 CALL EPLOT(0,V2,R(KK,J3))                                 PPAR2057
      CALL EPLOT(1,H,0.0)                                       PPAR2058
    4 CONTINUE                                                  PPAR2059
      N4=2                                                      PPAR2060
      CALL LINK(INFO2)                                          PPAR2061
      END                                                       PPAR2062
// DUP                                                          PPAR2063
*DELETE              PPAR2                                      PPAR2064
*STORE       WS  UA  PPAR2                                      PPAR2065
```

```
// JOB                                                                  INF02000
// FOR                                                                  INF02001
*LIST ALL                                                               INF02002
*NAME INFO2                                                             INF02003
*EXTENDED PRECISION                                                     INF02004
*ONE WORD INTEGERS                                                      INF02005
*IOCS(1403 PRINTER)                                                     INF02006
      INTEGER P,Q                                                       INF02007
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),INF02008
     1N4,K,SSX2(7,7),XX(7),YY2(100),A5(3),SSXY(7),X4(2),YY,X1(7),SSX1(7,INF02009
     27),SS(5),YY1(13),SSY1(13),SSY5(5)                                 INF02010
  100 FORMAT(' PURE ERROR   'F14.4,I4,F12.2)                            INF02011
   99 FORMAT(' REGRESSION   'F14.4,I4,2F12.2,E16.6)                     INF02012
   98 FORMAT('   X2 QUAD.   'F14.4,I4,2F12.2,E16.6)                     INF02013
   97 FORMAT('  X1 * X2     'F14.4,I4,2F12.2,E16.6)                     INF02014
   96 FORMAT('  LACK OF FIT'F14.4,I4,2F12.2,E16.6)                      INF02015
   95 FORMAT(1X2F7.3,15F7.2)                                            INF02016
   94 FORMAT(' RESIDUAL     'F14.4,I4, F12.2)                          INF02017
   93 FORMAT(' TOTAL        'F14.4,I4)                                 INF02018
   92 FORMAT('ORELATIVE LIKELIHOOD OF NO TRANSFORMATION VS. ML ESTIMATESINF02019
     1 ='E14.5)                                                         INF02020
   91 FORMAT('  TRANSFORM   'F14.4,I4,2F12.2,E16.6)                     INF02021
   90 FORMAT('O*** VARIABLES FITTED'//52X16HOBSERVATION SETS/4X2HX15X2HXINF02022
     122X13(3X12,2X)13H  MEAN    VAR.)                                  INF02023
   89 FORMAT(' STANDARD DEVIATIONS WITHIN OBSERVATION SETS'/15X13F7.2)   INF02024
   88 FORMAT(' VARIANCES WITHIN OBSERVATION SETS'/15X13F7.2)            INF02025
   87 FORMAT(' MEANS WITHIN OBSERVATION SETS'/15X13F7.2)                INF02026
   86 FORMAT('OVARIANCE-COVARIANCE MATRIX')                             INF02027
   85 FORMAT('OPOWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.INF02028
     14'  A2 ='F8.4/'OPOWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FINF02029
     28.4)                                                              INF02030
   84 FORMAT('OB(J) COEFFICIENTS'/'O'6E15.6)                            INF02031
   83 FORMAT('OINFORMATION MATRIX FOR PARAMETERS OF UNTRANSFORMED DATA')INF02032
   82 FORMAT('OINFORMATION MATRIX FOR PARAMETERS OF TRANSFORMED DATA')  INF02033
   81 FORMAT('OANALYSIS OF VARIANCE TABLE - TRANSFORMED DATA'/'0   SOURCINF02034
     1E'11X'SS'6X'D.F.'5X'MSS'7X'APPROX. F'6X'MLR')                     INF02035
   80 FORMAT('1'12A6)                                                   INF02036
   79 FORMAT(' '5E15.6)                                                 INF02037
   78 FORMAT('OANALYSIS OF VARIANCE TABLE - UNTRANSFORMED DATA'/'0   SOUINF02038
     1RCE'11X'SS'6X'D.F.'5X'MSS'11X'F'9X'MLR')                          INF02039
   77 FORMAT(' TREATMENTS   'F14.4,I4,2F12.2,E16.6)                     INF02040
   76 FORMAT('  LINEAR      'F14.4,I4,2F12.2,E16.6)                     INF02041
   75 FORMAT('   X1 LINEAR 'F14.4,I4,2F12.2,E16.6)                      INF02042
   74 FORMAT('   X2 LINEAR 'F14.4,I4,2F12.2,E16.6)                      INF02043
   73 FORMAT('  QUADRATIC   'F14.4,I4,2F12.2,E16.6)                     INF02044
   72 FORMAT('   X1 QUAD.  'F14.4,I4,2F12.2,E16.6)                      INF02045
      P=5                                                               INF02046
      Q=8                                                               INF02047
      N1=N/IREP                                                         INF02048
      D=0.0                                                             INF02049
```

```
      DO 66 I=1,N1                                                      INF02050
      DO 66 J=1,IREP                                                    INF02051
   66 D=D+ALOG(Y(I,J))                                                  INF02052
      D=EXP(D/FLOAT(N))                                                 INF02053
      DO 57 I=1,3                                                       INF02054
   57 A5(I)=A4(I)                                                       INF02055
      WRITE(P,80)TITL                                                   INF02056
      IF(IREP-13)103,104,104                                            INF02057
  103 N2=IREP+1                                                         INF02058
      DO 55 I=1,N1                                                      INF02059
      DO 55 J=N2,13                                                     INF02060
   55 Y(I,J)=0.0                                                        INF02061
  104 WRITE(P,90)(I,I=1,13)                                             INF02062
      DO 54 I=1,N1                                                      INF02063
      YYY=0.0                                                           INF02064
      DO 8 J=1,IREP                                                     INF02065
    8 YYY=YYY+Y(I,J)/IREP                                               INF02066
      SYY=0.0                                                           INF02067
      IF(IREP-1)54,54,105                                               INF02068
  105 DO 9 J=1,IREP                                                     INF02069
    9 SYY=SYY+(Y(I,J)-YYY)*(Y(I,J)-YYY)/FLOAT(IREP-1)                   INF02070
   54 WRITE(P,95)X(I,1),X(I,2),(Y(I,J),J=1,13),YYY,SYY                  INF02071
      DO 41 I=1,IREP                                                    INF02072
      YY1(I)=0.0                                                        INF02073
      DO 41 J=1,N1                                                      INF02074
   41 YY1(I)=YY1(I)+Y(J,I)/N1                                           INF02075
      DO 44 I=1,IREP                                                    INF02076
      SSY1(I)=0.0                                                       INF02077
      DO 44 J=1,N1                                                      INF02078
   44 SSY1(I)=SSY1(I)+(Y(J,I)-YY1(I))*(Y(J,I)-YY1(I))/FLOAT(N1-1)       INF02079
      WRITE(P,87)(YY1(I),I=1,IREP)                                      INF02080
      WRITE(P,88)(SSY1(I),I=1,IREP)                                     INF02081
      DO 43 I=1,IREP                                                    INF02082
   43 SSY1(I)=SQRT(SSY1(I))                                             INF02083
      WRITE(P,89)(SSY1(I),I=1,IREP)                                     INF02084
      DO 58 I=1,3                                                       INF02085
   58 A4(I)=1.0                                                         INF02086
      DO 10 K=1,2                                                       INF02087
      DD=D**(A4(3)-1.0)                                                 INF02088
      YY=0.0                                                            INF02089
      DO 1 I=1,N1                                                       INF02090
      DO 1 J=1,IREP                                                     INF02091
    1 YY=YY+(Y(I,J)**A4(3)-1.0)/N/DD/A4(3)                              INF02092
      DO 40 I=1,N1                                                      INF02093
      YY2(I)=0.0                                                        INF02094
      DO 40 J=1,IREP                                                    INF02095
   40 YY2(I)=YY2(I)+(Y(I,J)**A4(3)-1.0)/IREP/DD/A4(3)                   INF02096
      TOT=0.0                                                           INF02097
      DO 3 I=1,N1                                                       INF02098
      DO 3 J=1,IREP                                                     INF02099
    3 TOT=TOT+((Y(I,J)**A4(3)-1.0)/DD/A4(3)-YY)**2                      INF02100
```

```
      TREAT=0.0                                                          INF02101
      DO 4 I=1,N1                                                        INF02102
    4 TREAT=TREAT+(YY2(I)-YY)*(YY2(I)-YY)                                INF02103
      TREAT=TREAT*IREP                                                   INF02104
      DO 7 J=1,5                                                         INF02105
    7 XX(J)=0.0                                                          INF02106
      DO 6 I=1,N1                                                        INF02107
      DO 16 J=1,2                                                        INF02108
      X1(J)=X(I,J)**A4(J)                                                INF02109
   16 X1(J+2)=X1(J)*X1(J)                                                INF02110
      X1(5)=X1(1)*X1(2)                                                  INF02111
      DO 6 J=1,5                                                         INF02112
    6 XX(J)=XX(J)+X1(J)/N1                                               INF02113
      DO 39 I=1,5                                                        INF02114
      SSXY(I)=0.0                                                        INF02115
      DO 39 J=1,5                                                        INF02116
   39 SSX2(I,J)=0.0                                                      INF02117
      DO 37 I=1,N1                                                       INF02118
      DO 21 J=1,2                                                        INF02119
      X1(J)=X(I,J)**A4(J)                                                INF02120
   21 X1(J+2)=X1(J)*X1(J)                                                INF02121
      X1(5)=X1(1)*X1(2)                                                  INF02122
      DO 37 J=1,5                                                        INF02123
      SSXY(J)=SSXY(J)+(YY2(I)-YY)*(X1(J)-XX(J))                          INF02124
      DO 37 J1=1,5                                                       INF02125
   37 SSX2(J,J1)=SSX2(J,J1)+(X1(J)-XX(J))*(X1(J1)-XX(J1))                INF02126
      GO TO (27,28),K                                                    INF02127
   27 GO TO (68,28),N4                                                   INF02128
   28 WRITE(P,80)TITL                                                    INF02129
      GO TO (18,26),K                                                    INF02130
   18 WRITE(P,83)                                                        INF02131
      GO TO 19                                                           INF02132
   26 WRITE(P,85)A4                                                      INF02133
      WRITE(P,82)                                                        INF02134
   19 DO 30 I=1,5                                                        INF02135
   30 WRITE(P,79)(SSX2(I,J),J=1,5)                                       INF02136
   68 DO 29 I=1,2                                                        INF02137
   29 X4(I)=SSX2(I,I)                                                    INF02138
      CALL MATV7(SSX2,5,SSXY,0,DET)                                      INF02139
      GO TO (65,33),K                                                    INF02140
   65 GO TO (34,33),N4                                                   INF02141
   33 WRITE(P,86)                                                        INF02142
      DO 42 I=1,5                                                        INF02143
   42 WRITE(P,79)(SSX2(I,J),J=1,5)                                       INF02144
   34 DO 11 J=1,5                                                        INF02145
      B(J)=0.0                                                           INF02146
      DO 11 I=1,5                                                        INF02147
   11 B(J)=B(J)+SSX2(I,J)*SSXY(I)*A4(3)*DD                               INF02148
      AA=YY*A4(3)*DD+1.0                                                 INF02149
      DO 38 J=1,5                                                        INF02150
   38 AA=AA-B(J)*XX(J)                                                   INF02151
```

```
      GO TO (35,36),K                                                  INFO2152
   35 GO TO (45,36),N4                                                 INFO2153
   36 WRITE(P,84)AA,(B(J),J=1,5)                                       INFO2154
   45 CALL ORTH2                                                       INFO2155
      CALL MATV7(SSX2,5,SSXY,0,DET)                                    INFO2156
      DO 46 J=1,5                                                      INFO2157
      B(J)=0.0                                                         INFO2158
      DO 46 I=1,5                                                      INFO2159
   46 B(J)=B(J)+SSX2(I,J)*SSXY(I)                                      INFO2160
      SS7=0.0                                                          INFO2161
      DO 17 I=1,5                                                      INFO2162
   17 SS7=SS7+B(I)*SSXY(I)*IREP                                        INFO2163
      DEV=TREAT-SS7                                                    INFO2164
      DO 12 J=1,2                                                      INFO2165
      DO 12 J1=1,2                                                     INFO2166
   12 SSX1(J,J1)=SSX2(J,J1)                                            INFO2167
      CALL MATV7(SSX1,2,SSXY,0,DET)                                    INFO2168
      SS1=0.0                                                          INFO2169
      DO 14 I=1,2                                                      INFO2170
      DO 14 J=1,2                                                      INFO2171
   14 SS1=SS1+B(J)*SSX1(I,J)*B(I)*IREP                                 INFO2172
      DO 13 J=1,2                                                      INFO2173
      DO 13 J1=1,2                                                     INFO2174
   13 SSX1(J,J1)=SSX2(J+2,J1+2)                                        INFO2175
      CALL MATV7(SSX1,2,SSXY,0,DET)                                    INFO2176
      SS2=0.0                                                          INFO2177
      DO 15 I=1,2                                                      INFO2178
      DO 15 J=1,2                                                      INFO2179
   15 SS2=SS2+B(J+2)*SSX1(I,J)*B(I+2)*IREP                             INFO2180
      DO 31 I=1,5                                                      INFO2181
   31 SS(I)=B(I)*B(I)/SSX2(I,I)*IREP                                   INFO2182
      I1=1                                                             INFO2183
      I2=2                                                             INFO2184
      I3=N1-1                                                          INFO2185
      I5=0                                                             INFO2186
      I6=5                                                             INFO2187
      DO 47 I=1,3                                                      INFO2188
      IF(A4(I)-1.0)48,47,48                                            INFO2189
   48 I5=I5+1                                                          INFO2190
   47 CONTINUE                                                         INFO2191
      NN=N-I3-1                                                        INFO2192
      NNN=N-1                                                          INFO2193
      GO TO (20,22),K                                                  INFO2194
   20 SSY3=DEV                                                         INFO2195
      I4=I3-5                                                          INFO2196
      DEVM=DEV/I4                                                      INFO2197
      GO TO 49                                                         INFO2198
   22 SSY3=SSY3-DEV                                                    INFO2199
      SSY3M=SSY3/I5                                                    INFO2200
      I4=I3-I5-5                                                       INFO2201
      DEVM=DEV/I4                                                      INFO2202
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   49 IF(IREP-1)50,50,51                                                INF02203
   51 RES=TOT-TREAT                                                     INF02204
      RESM=RES/NN                                                       INF02205
      RR=RES+DEV                                                        INF02206
      I7=NN+I4                                                          INF02207
      RRM=RR/I7                                                         INF02208
      F6=SSY3M/RRM                                                      INF02209
      GO TO 52                                                          INF02210
   50 RES=DEV                                                           INF02211
      RR=RES                                                            INF02212
      RESM=DEVM                                                         INF02213
      RRM=DEVM                                                          INF02214
   52 SS1M=SS1/2.0                                                      INF02215
      SS2M=SS2/2.0                                                      INF02216
      TREAM=TREAT/I3                                                    INF02217
      SS7M=SS7/I6                                                       INF02218
      F1=TREAM/RESM                                                     INF02219
      F2=SS1M/RRM                                                       INF02220
      F21=SS(1)/RRM                                                     INF02221
      F22=SS(2)/RRM                                                     INF02222
      F3=SS2M/RRM                                                       INF02223
      F31=SS(3)/RRM                                                     INF02224
      F32=SS(4)/RRM                                                     INF02225
      F33=SS(5)/RRM                                                     INF02226
      F7=SS7M/RRM                                                       INF02227
      F4=DEVM/RESM                                                      INF02228
      DO 67 I=1,5                                                       INF02229
   67 SSY5(I)=(RR/(RR+SS(I)))**(FLOAT(N)/2.0)                           INF02230
      SS3=(RES/(RES+TREAT))**(FLOAT(N)/2.0)                             INF02231
      SS4=(RR/(RR+SS1))**(FLOAT(N)/2.0)                                 INF02232
      SS5=(RR/(RR+SS2))**(FLOAT(N)/2.0)                                 INF02233
      SS6=(RES/RR)**(FLOAT(N)/2.0)                                      INF02234
      SS8=(RR/(RR+SS7))**(FLOAT(N)/2.0)                                 INF02235
      GO TO (53,56),K                                                   INF02236
   53 RRR=RR                                                            INF02237
      GO TO (60,25),N4                                                  INF02238
   56 WRITE(P,81)                                                       INF02239
      RRR=(RR/RRR)**(FLOAT(N)/2.0)                                      INF02240
      GO TO 32                                                          INF02241
   25 WRITE(P,78)                                                       INF02242
   32 IF(IREP-1)101,101,102                                             INF02243
  102 WRITE(P,77)TREAT,I3,TREAM,F1,SS3                                  INF02244
  101 WRITE(P,99)SS7,I6,SS7M,F7,SS8                                     INF02245
      WRITE(P,76)SS1,I2,SS1M,F2,SS4                                     INF02246
      WRITE(P,75)SS(1),I1,SS(1),F21,SSY5(1)                             INF02247
      WRITE(P,74)SS(2),I1,SS(2),F22,SSY5(2)                             INF02248
      WRITE(P,73)SS2,I2,SS2M,F3,SS5                                     INF02249
      WRITE(P,72)SS(3),I1,SS(3),F31,SSY5(3)                             INF02250
      WRITE(P,98)SS(4),I1,SS(4),F32,SSY5(4)                             INF02251
      WRITE(P,97)SS(5),I1,SS(5),F33,SSY5(5)                             INF02252
      GO TO (23,24),K                                                   INF02253
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   24 WRITE(P,91)SSY3,I5,SSY3M,F6,RRR                                INFO2254
   23 IF(IREP-1)62,62,63                                             INFO2255
   62 WRITE(P,94)DEV,I4,DEVM                                         INFO2256
      GO TO 64                                                       INFO2257
   63 WRITE(P,94)RR,I7,RRM                                           INFO2258
      WRITE(P,96)DEV,I4,DEVM,F4,SS6                                  INFO2259
      WRITE(P,100)RES,NN,RESM                                        INFO2260
   64 WRITE(P,93)TOT,NNN                                             INFO2261
   60 DO 5 J=1,3                                                     INFO2262
    5 A4(J)=A3(J)                                                    INFO2263
   10 CONTINUE                                                       INFO2264
      WRITE(P,92)RRR                                                 INFO2265
      DO 59 I=1,3                                                    INFO2266
   59 A4(I)=A5(I)                                                    INFO2267
      GO TO (71,69),N4                                               INFO2268
   71 CALL DATSW(8,J8)                                               INFO2269
      GO TO (70,69),J8                                               INFO2270
   69 CALL LINK(EIGN2)                                               INFO2271
   70 CALL LINK(CUEF2)                                               INFO2272
      END                                                            INFO2273
// DUP                                                               INFO2274
*DELETE              INFO2                                          INFO2275
*STORE      WS  UA  INFO2
```

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// JOB                                                                  COEF2000
// FOR                                                                  COEF2001
*LIST ALL                                                               COEF2002
*NAME COEF2                                                             COEF2003
*EXTENDED PRECISION                                                     COEF2004
*ONE WORD INTEGERS                                                      COEF2005
*IOCS(PLOTTER)                                                          COEF2006
*IOCS(1403 PRINTER)                                                     COEF2007
      INTEGER P,Q                                                       COEF2008
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),COEF2009
     1N4,N5,X2(6),YY2(100),SSXY(7),SSX(7,7),BB(7),I5(4)                 COEF2010
   92 FORMAT('POWER TRANSFORMATIONS  A1='F8.4'  A2='F8.4'  C='F8.4)     COEF2011
   81 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.COEF2012
     14'  A2 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FCOEF2013
     28.4)                                                              COEF2014
   80 FORMAT('1'12A6)                                                   COEF2015
   79 FORMAT(7E15.5)                                                    COEF2016
   78 FORMAT(12A6)                                                      COEF2017
   77 FORMAT('0POINTS PLOTTED FOR MLR GRAPH OF B('I1')'/5(7X'B('I1')'4X)COEF2018
     19X'SSD'13X'R')                                                    COEF2019
   76 FORMAT(F3.1)                                                      COEF2020
   75 FORMAT('VALUE OF B('I1')  -  MLE OF B('I1') ='E10.3)              COEF2021
   74 FORMAT(E10.3)                                                     COEF2022
   73 FORMAT('MAXIMUM LIKELIHOOD RATIO')                               COEF2023
      P=5                                                               COEF2024
      Q=8                                                               COEF2025
      N1=N/IREP                                                         COEF2026
      SSY=0.0                                                           COEF2027
      DO 16 I=1,N1                                                      COEF2028
      DO 16 J=1,IREP                                                    COEF2029
   16 SSY=SSY+(Y(I,J)*Y(I,J))**A3(3)                                    COEF2030
      DO 14 I=1,N1                                                      COEF2031
      YY2(I)=0.0                                                        COEF2032
      DO 14 J=1,IREP                                                    COEF2033
   14 YY2(I)=YY2(I)+Y(I,J)**A3(3)/IREP                                  COEF2034
      X2(1)=1.0                                                         COEF2035
      DO 32 I=1,6                                                       COEF2036
      BB(I)=0.0                                                         COEF2037
      DO 32 J=1,6                                                       COEF2038
   32 SSX(I,J)=0.0                                                      COEF2039
      DO 33 I=1,N1                                                      COEF2040
      DO 31 J=2,3                                                       COEF2041
      X2(J)=X(I,J-1)**A3(J-1)                                           COEF2042
   31 X2(J+2)=X2(J)*X2(J)                                               COEF2043
      X2(6)=X2(2)*X2(3)                                                 COEF2044
      DO 33 J=1,6                                                       COEF2045
      BB(J)=BB(J)+YY2(I)*X2(J)                                          COEF2046
      SSXY(J)=BB(J)                                                     COEF2047
      DO 33 K=1,6                                                       COEF2048
   33 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                     COEF2049
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```
      CALL MATV7(SSX,6,BB,1,DET)                                        COEF2050
      SS=SSY                                                            COEF2051
      DO 15 I=1,6                                                       COEF2052
   15 SS=SS-SSXY(I)*BB(I)*IREP                                          COEF2053
      DO 21 JJ=2,6                                                      COEF2054
      J3=JJ-1                                                           COEF2055
      AN5=44                                                            COEF2056
      IF(BB(JJ))25,25,26                                                COEF2057
   25 X4=2.0*BB(JJ)                                                     COEF2058
      GO TO 27                                                          COEF2059
   26 X4=0.0                                                            COEF2060
   27 A=2.0*ABS(BB(JJ))                                                 COEF2061
      B1=A/20.                                                          COEF2062
      C=X4-A/50.                                                        COEF2063
      D=A/10.                                                           COEF2064
      E=10./A                                                           COEF2065
      F=X4-B1                                                           COEF2066
      G=X4+D                                                            COEF2067
      H=X4+A*1.3                                                        COEF2068
      W=X4-A/15.                                                        COEF2069
      U=X4-A/7.5                                                        COEF2070
      Z=X4-D                                                            COEF2071
      CALL SCALE(E,10.0,X4,0.0)                                         COEF2072
      CALL EGRID(0,X4,0.0,B1,20)                                        COEF2073
      CALL EGRID(1,X4,0.0,0.05,20)                                      COEF2074
      DO 2 I=1,11                                                       COEF2075
      X1=G+D*FLOAT(I-3)+D/2.5                                           COEF2076
      IF(X1)35,36,36                                                    COEF2077
   35 NN1=-1                                                            COEF2078
      GO TO 37                                                          COEF2079
   36 NN1=1                                                             COEF2080
   37 XO=G+D*FLOAT(I-2)*NN1                                             COEF2081
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                  COEF2082
    2 WRITE(7,74)XO                                                     COEF2083
      DO 3 I=1,11                                                       COEF2084
      X1=-0.1+0.1*FLOAT(I)                                              COEF2085
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                      COEF2086
    3 WRITE(7,76)X1                                                     COEF2087
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                   COEF2088
      WRITE(7,75)J3,J3,BB(JJ)                                           COEF2089
      CALL ECHAR(W,0.1,0.1,0.1,1.5709)                                  COEF2090
      WRITE(7,73)                                                       COEF2091
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                                  COEF2092
      WRITE(7,78)TITL                                                   COEF2093
      CALL ECHAR(U,0.0,0.1,0.1,1.5709)                                  COEF2094
      WRITE(7,82)A3                                                     COEF2095
      CALL EPLOT(-2,X4,0.0)                                             COEF2096
      WRITE(P,80)TITL                                                   COEF2097
      WRITE(P,81)A3                                                     COEF2098
      DO 4 I=2,6                                                        COEF2099
      IF(I-JJ)7,4,5                                                     COEF2100
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      7 JJJ=I-1                                                          COEF2101
        GO TO 6                                                          COEF2102
      5 JJJ=I-2                                                          COEF2103
      6 I5(JJJ)=I-1                                                      COEF2104
      4 CONTINUE                                                         COEF2105
        WRITE(P,77)J3,J3,I5                                              COEF2106
        DO 1 KK=1,45                                                     COEF2107
        V2=(KK-1)*A/AN5+X4                                               COEF2108
        SSY1=0.0                                                         COEF2109
        DO 17 I=1,5                                                      COEF2110
        SSXY(I)=0.0                                                      COEF2111
        DO 17 J=1,5                                                      COEF2112
     17 SSX(I,J)=0.0                                                     COEF2113
        DO 18 I=1,N1                                                     COEF2114
        DO 28 J=2,3                                                      COEF2115
        X2(J)=X(I,J-1)**A3(J-1)                                          COEF2116
     28 X2(J+2)=X2(J)*X2(J)                                              COEF2117
        X2(6)=X2(2)*X2(3)                                                COEF2118
        DO 34 J=1,IREP                                                   COEF2119
     34 SSY1=SSY1+(Y(I,J)-V2*X2(JJ))**2                                  COEF2120
        DO 18 J=1,6                                                      COEF2121
        IF(J-JJ)20,16,30                                                 COEF2122
     20 JJJ=J                                                            COEF2123
        GO TO 29                                                         COEF2124
     30 JJJ=J-1                                                          COEF2125
     29 SSXY(JJJ)=SSXY(JJJ)+(YY2(I)-V2*X2(JJ))*X2(J)                     COEF2126
        B(JJJ)=SSXY(JJJ)                                                 COEF2127
        DO 18 K=1,6                                                      COEF2128
        IF(K-JJ)11,18,12                                                 COEF2129
     11 KKK=K                                                            COEF2130
        GO TO 13                                                         COEF2131
     12 KKK=K-1                                                          COEF2132
     13 SSX(JJJ,KKK)=SSX(JJJ,KKK)+X2(J)*X2(K)                            COEF2133
     18 CONTINUE                                                         COEF2134
        CALL MATV7(SSX,5,B,1,DET)                                        COEF2135
        DO 19 I=1,5                                                      COEF2136
     19 SSY1=SSY1-SSXY(I)*B(I)*IREP                                      COEF2137
        R=(SS/SSY1)**(FLOAT(N)/2.0)                                      COEF2138
        WRITE(P,79)V2,(B(J),J=2,5),SSY1,R                                COEF2139
      1 CALL EPLOT(0,V2,R)                                               COEF2140
        CALL EPLOT(1,H,0.0)                                              COEF2141
     21 CONTINUE                                                         COEF2142
        CALL LINK(EIGN2)                                                 COEF2143
        END                                                              COEF2144
// DUP                                                                   COEF2145
*DELETE              COEF2                                               COEF2146
*STORE      WS  UA   COEF2                                               COEF2147
```

```
// JOB                                                                  EIGN2000
// FOR                                                                  EIGN2001
*LIST ALL                                                               EIGN2002
*NAME EIGN2                                                             EIGN2003
*EXTENDED PRECISION                                                     EIGN2004
*ONE WORD INTEGERS                                                      EIGN2005
*IOCS(KEYBOARD)                                                         EIGN2006
*IOCS(TYPEWRITER)                                                       EIGN2007
*IOCS(1403 PRINTER)                                                     EIGN2008
      INTEGER P,Q                                                       EIGN2009
      DIMENSION ALAM1(2),ALAM2(2),PREP1(2,2),PREP2(2,2)                 EIGN2010
      DIMENSION Y(100,13),X(100,2),V(7),A4(3),SSY,NS,NREPS,TITL(12),ID,A3(3EIGN2011
     1),N4,I,YS(2),V1(2,2),ALAMD(2,2),PREP(2,2,2),COE(6),YDEV(100),BA(7,EIGN2012
     27),X1(6),Z(2),A5(3),XC(100,2),NNN(3)                              EIGN2013
      EQUIVALENCE (ALAMD(1,1),ALAM1(1)),(ALAMD(1,2),ALAM2(1))           EIGN2014
      EQUIVALENCE (PREP1(1,1),PREP(1,1,1)),(PREP2(1,1),PREP(1,1,2))     EIGN2015
      EQUIVALENCE (PREP1(1,1),PREP(1,1,1)),(PREP2(1,1),PREP(1,1,2))     EIGN2016
   99 FORMAT(1H0,8X,'EIGEN VALUES',10X,'EIGEN VECTORS AS ROWS',/,)      EIGN2017
   88 FORMAT('0'2(E11.4,'=YS'3X)'IN ORIGINAL UNITS'/)                   EIGN2018
   87 FORMAT(1H0,4(E11.4,'=X'I1'S'2X)' IN ORIGINAL UNITS')              EIGN2019
   86 FORMAT(I4,7E15.6)                                                 EIGN2020
   85 FORMAT(1H0,1X,'TABLE OF RESIDUALS')                               EIGN2021
   84 FORMAT(I3)                                                        EIGN2022
   83 FORMAT('TYPE 1 TO CALL EXIT, EOF TO CONTINUE')                    EIGN2023
   82 FORMAT('1'12A6)                                                   EIGN2024
   81 FORMAT(1H0,5X,3HY -,E15.6,3H = ,2(2H +,E15.6,2H Z,I1,3H SQ),/,)   EIGN2025
   80 FORMAT(1H0,9X,'Y EST',10X,'Y OBS',11X,'DEVN',15X,'VALUES OF Z',18XEIGN2026
     1,'FACTOR LEVELS'/)                                                EIGN2027
   79 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.EIGN2028
     14'  A2 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FEIGN2029
     28.4)                                                              EIGN2030
   78 FORMAT( 52H0 CANONICAL REGRESSION   (Z ARE CANONICAL VARIABLES),/)EIGN2031
   77 FORMAT(29H0  CENTRE OF RESPONSE SURFACE  ,/,)                     EIGN2032
      P=5                                                               EIGN2033
      Q=8                                                               EIGN2034
      DO 27 I=1,3                                                       EIGN2035
   27 A5(I)=A4(I)                                                       EIGN2036
      N1=NS/NREPS                                                       EIGN2037
      GO TO (11,10),N4                                                  EIGN2038
   11 DO 12 I=1,3                                                       EIGN2039
   12 A4(I)=A3(I)                                                       EIGN2040
      GO TO 13                                                          EIGN2041
   10 DO 5 I=1,3                                                        EIGN2042
    5 A4(I)=1.0                                                         EIGN2043
   13 DO 4 LL=1,N4                                                      EIGN2044
      WRITE(P,82)TITL                                                   EIGN2045
      GO TO (14,15),N4                                                  EIGN2046
   15 GO TO (19,14),LL                                                  EIGN2047
   14 WRITE(P,79)A3                                                     EIGN2048
   19 DO 6 I=1,N1                                                       EIGN2049
      YDEV(I)=0.0
```

```
      DO 21 K=1,2                                                    EIGN2050
   21 XC(I,K)=X(I,K)**A4(K)                                          EIGN2051
      DO 6 K=1,NREPS                                                 EIGN2052
    6 YDEV(I)=YDEV(I)+Y(I,K)**A4(3)/NREPS                            EIGN2053
      DO 7 I=1,6                                                     EIGN2054
      V(I)=0.0                                                       EIGN2055
      DO 7 J=1,6                                                     EIGN2056
    7 BA(I,J)=0.0                                                    EIGN2057
      X1(1)=1.0                                                      EIGN2058
      DO 8 K=1,N1                                                    EIGN2059
      DO 3 J=2,3                                                     EIGN2060
    3 X1(J)=X(K,J-1)**A4(J-1)                                        EIGN2061
      X1(4)=X1(2)*X1(2)                                              EIGN2062
      X1(5)=X1(2)*X1(3)                                              EIGN2063
      X1(6)=X1(3)*X1(3)                                              EIGN2064
      DO 8 I=1,6                                                     EIGN2065
      V(I)=V(I)+YDEV(K)*X1(I)                                        EIGN2066
      DO 8 J=1,6                                                     EIGN2067
    8 BA(I,J)=BA(I,J)+X1(I)*X1(J)                                    EIGN2068
      CALL MATV7(BA,6,V,1,DET)                                       EIGN2069
      DO 29 J=1,6                                                    EIGN2070
   29 COE(J)=V(J)                                                    EIGN2071
      NFAK=2                                                         EIGN2072
      KP=NFAK+2                                                      EIGN2073
      DO 32 I=1,NFAK                                                 EIGN2074
      DO 32 J=1,I                                                    EIGN2075
      IF(I-J)31,30,31                                                EIGN2076
   30 PREP(I,J,LL)=V(KP)                                             EIGN2077
      GO TO 32                                                       EIGN2078
   31 PREP(I,J,LL)=V(KP)*0.5                                         EIGN2079
      PREP(J,I,LL)=PREP(I,J,LL)                                      EIGN2080
   32 KP=KP+1                                                        EIGN2081
      DO 33 I=1,NFAK                                                 EIGN2082
   33 V(I)=-V(I+1)*0.500                                             EIGN2083
      DO 34 I=1,NFAK                                                 EIGN2084
      DO 34 J=1,NFAK                                                 EIGN2085
   34 BA(I,J)=PREP(I,J,LL)                                           EIGN2086
      WRITE(P,77)                                                    EIGN2087
      CALL MATV7(BA,NFAK,V,1,DET)                                    EIGN2088
      YS(LL)=COE(1)                                                  EIGN2089
      DO 44 I=1,NFAK                                                 EIGN2090
   44 YS(LL)=YS(LL)+0.5*V(I)*COE(I+1)                                EIGN2091
      GO TO (35,36),N4                                               EIGN2092
   36 GO TO (37,35),LL                                               EIGN2093
   35 I1=1                                                           EIGN2094
      I2=2                                                           EIGN2095
      DO 40 I=1,2                                                    EIGN2096
   40 NNN(I)=V(I)/ABS(V(I))                                          EIGN2097
      V3=ABS(V(1))**(1./A3(1))*NNN(1)                                EIGN2098
      V4=ABS(V(2))**(1./A3(2))*NNN(2)                                EIGN2099
      NNN(3)=YS(LL)/ABS(YS(LL))                                      EIGN2100
```

```
      YS1=ABS(YS(LL))**(1./A3(3))*NNN(3)                                EIGN2101
      WRITE(P,87)(V(I),I,I=1,NFAK),V3,I1,V4,I2                          EIGN2102
      WRITE(P,88)YS(LL),YS1                                             EIGN2103
      GO TO 45                                                          EIGN2104
   37 WRITE(P,87)(V(I),I,I=1,NFAK)                                      EIGN2105
      WRITE(P,88)YS(LL)                                                 EIGN2106
   45 WRITE(P,89)                                                       EIGN2107
      GO TO (22,23),LL                                                  EIGN2108
   22 CALL CAN2(PREP1,ALAM1,NFAK)                                       EIGN2109
      GO TO 24                                                          EIGN2110
   23 CALL CAN2(PREP2,ALAM2,NFAK)                                       EIGN2111
   24 WRITE(P,78)                                                       EIGN2112
      WRITE(P,81)YS(LL),(ALAMD(J,LL),J,J=1,NFAK)                        EIGN2113
      WRITE(P,85)                                                       EIGN2114
      WRITE(P,80)                                                       EIGN2115
      DO 18 J=1,N1                                                      EIGN2116
      YPRED=0.0                                                         EIGN2117
      DO 16 I=1,NFAK                                                    EIGN2118
      Z(I)=0.0                                                          EIGN2119
      DO 16 L=1,NFAK                                                    EIGN2120
   16 Z(I)=Z(I)+(XC(J,L)-V(L))*PREP(I,L,LL)                             EIGN2121
      DO 17 LL=1,NFAK                                                   EIGN2122
   17 YPRED=YPRED+(Z(LL)**2)*ALAMD(LL,LL)                               EIGN2123
      YPRED=YPRED+YS(LL)                                                EIGN2124
      MM1=YPRED/ABS(YPRED)                                              EIGN2125
      YPRED=MM1*ABS(YPRED)**(1.0/A4(3))                                 EIGN2126
      YDEV(J)=0.0                                                       EIGN2127
      DO 51 I=1,NREPS                                                   EIGN2128
   51 YDEV(J)=YDEV(J)+Y(J,I)/NREPS                                      EIGN2129
      YDEV1=YDEV(J)-YPRED                                               EIGN2130
   18 WRITE(P,86)J,YPRED,YDEV(J),YDEV1,(Z(I),I=1,NFAK),(XC(J,II),II=1,NFEIGN2131
     1AK)                                                               EIGN2132
      DO 25 I=1,3                                                       EIGN2133
   25 A4(I)=A3(I)                                                       EIGN2134
      DO 46 I=1,2                                                       EIGN2135
   46 V1(I,LL)=V(I)                                                     EIGN2136
    4 CONTINUE                                                          EIGN2137
      DO 28 I=1,3                                                       EIGN2138
   28 A4(I)=A5(I)                                                       EIGN2139
      CALL DATSW(7,J7)                                                  EIGN2140
      GO TO (50,49),J7                                                  EIGN2141
   50 CALL LINK(CENT2)                                                  EIGN2142
   49 CALL DATSW(10,J10)                                                EIGN2143
      GO TO (48,47),J10                                                 EIGN2144
   48 CALL LINK(CRS2)                                                   EIGN2145
   47 GO TO (9,26),N4                                                   EIGN2146
    9 WRITE(1,83)                                                       EIGN2147
      READ(6,84)N5                                                      EIGN2148
      IF(N5)2,20,2                                                      EIGN2149
   26 IF(ID-98)1,2,1                                                    EIGN2150
    2 CALL EXIT                                                         EIGN2151
```

```
   20 CALL LINK(CRLF2)                                    EIGN2152
    1 CALL LINK(BOX2)                                     EIGN2153
      END                                                 EIGN2154
// DUP                                                    EIGN2155
*DELETE              EIGN2                                EIGN2156
*STORE       WS  UA  EIGN2                                EIGN2157
```

```
// JOB                                                                    CENT2000
// FOR                                                                    CENT2001
*LIST ALL                                                                 CENT2002
*NAME CENT2                                                               CENT2003
*EXTENDED PRECISION                                                       CENT2004
*ONE WORD INTEGERS                                                        CENT2005
*IOCS(1403 PRINTER)                                                       CENT2006
      INTEGER P,Q                                                         CENT2007
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),CENT2008
     1N4,N5,YS(2),V1(2,2),ALAMD(2,2),PREP(2,2,2),R(45,2,2),X2(6),V2(2), CENT2009
     2YY2(100),SSXY(7),A5(3),SSX(7,7),BB(7)                               CENT2010
   81 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.CENT2011
     14'  A2 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FCENT2012
     28.4)                                                                CENT2013
   80 FORMAT('1'12A6)                                                     CENT2014
   79 FORMAT(4E15.5)                                                      CENT2015
   78 FORMAT('0POINTS PLOTTED FOR MLR GRAPH OF X'I1'S'/7X'X1S'12X'X2S'13CENT2016
     1X'SSD'13X'R')                                                       CENT2017
      P=5                                                                 CENT2018
      Q=8                                                                 CENT2019
      N1=N/IREP                                                           CENT2020
      DO 8 I=1,3                                                          CENT2021
    8 A5(I)=A4(I)                                                         CENT2022
      GO TO (9,10),N4                                                     CENT2023
    9 DO 22 I=1,3                                                         CENT2024
   22 A4(I)=A3(I)                                                         CENT2025
      N6=1                                                                CENT2026
      GO TO 23                                                            CENT2027
   10 DO 24 I=1,3                                                         CENT2028
   24 A4(I)=1.0                                                           CENT2029
      N6=2                                                                CENT2030
   23 DO 4 LL=1,N6                                                        CENT2031
      SSY=0.0                                                             CENT2032
      DO 16 I=1,N1                                                        CENT2033
      DO 16 J=1,IREP                                                      CENT2034
   16 SSY=SSY+(Y(I,J)*Y(I,J))**A4(3)                                      CENT2035
      DO 14 I=1,N1                                                        CENT2036
      YY2(I)=0.0                                                          CENT2037
      DO 14 J=1,IREP                                                      CENT2038
   14 YY2(I)=YY2(I)+Y(I,J)**A4(3)/IREP                                    CENT2039
      X2(1)=1.0                                                           CENT2040
      DO 27 I=1,6                                                         CENT2041
      BB(I)=0.0                                                           CENT2042
      DO 27 J=1,6                                                         CENT2043
   27 SSX(I,J)=0.0                                                        CENT2044
      DO 3 I=1,N1                                                         CENT2045
      DO 26 J=2,3                                                         CENT2046
      X2(J)=X(I,J-1)**A4(J-1)                                             CENT2047
   26 X2(J+2)=X2(J)*X2(J)                                                 CENT2048
      X2(6)=X2(2)*X2(3)                                                   CENT2049
```

```
      DO 3 J=1,6                                                        CENT2050
      BB(J)=BB(J)+YY2(I)*X2(J)                                          CENT2051
      DO 3 K=1,6                                                        CENT2052
    3 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                     CENT2053
      CALL MATV7(SSX,6,BB,1,DET)                                        CENT2054
      DO 11 I=1,4                                                       CENT2055
      SSXY(I)=0.0                                                       CENT2056
      DO 11 J=1,4                                                       CENT2057
   11 SSX(I,J)=0.0                                                      CENT2058
      DO 12 I=1,N1                                                      CENT2059
      DO 13 J=2,3                                                       CENT2060
   13 X2(J)=(X(I,J-1)**A4(J-1)-2.0*V1(J-1,LL))*X(I,J-1)**A4(J-1)        CENT2061
      X2(4)=X(I,1)**A4(1)*X(I,2)**A4(2)-V1(1,LL)*X(I,2)**A4(2)-V1(2,LL)*CENT2062
     1X(I,1)**A4(1)                                                     CENT2063
      DO 12 J=1,4                                                       CENT2064
      SSXY(J)=SSXY(J)+YY2(I)*X2(J)                                      CENT2065
      B(J)=SSXY(J)                                                      CENT2066
      DO 12 K=1,4                                                       CENT2067
   12 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                     CENT2068
      CALL MATV7(SSX,4,B,1,DET)                                         CENT2069
      SS=SSY                                                            CENT2070
      DO 15 I=1,4                                                       CENT2071
   15 SS=SS-SSXY(I)*B(I)*IREP                                           CENT2072
      DO 2 JJ=1,2                                                       CENT2073
      J3=3-JJ                                                           CENT2074
      AN5=44                                                            CENT2075
      X1=V1(JJ,LL)                                                      CENT2076
      IF(X1)5,5,6                                                       CENT2077
    5 X4=2.0*X1                                                         CENT2078
      GO TO 7                                                           CENT2079
    6 X4=0.0                                                            CENT2080
    7 A=2.0*ABS(X1)                                                     CENT2081
      WRITE(P,80)TITL                                                   CENT2082
      GO TO (29,30),N4                                                  CENT2083
   30 GO TO (28,29),LL                                                  CENT2084
   29 WRITE(P,81)A3                                                     CENT2085
   28 WRITE(P,78)JJ                                                     CENT2086
      DO 1 KK=1,45                                                      CENT2087
      V2(JJ)=(KK-1)*A/AN5+X4                                            CENT2088
      V2(J3)=-(BB(J3+1)+BB(6)*V2(JJ))/2.0/BB(J3+3)                      CENT2089
      DO 17 I=1,4                                                       CENT2090
      SSXY(I)=0.0                                                       CENT2091
      DO 17 J=1,4                                                       CENT2092
   17 SSX(I,J)=0.0                                                      CENT2093
      DO 18 I=1,N1                                                      CENT2094
      DO 25 J=2,3                                                       CENT2095
   25 X2(J)=(X(I,J-1)**A4(J-1)-2.0*V2(J-1))*X(I,J-1)**A4(J-1)           CENT2096
      X2(4)=X(I,1)**A4(1)*X(I,2)**A4(2)-V2(JJ)*X(I,J3)**A4(J3)-V2(J3)*X(CENT2097
     1I,JJ)**A4(JJ)                                                     CENT2098
      DO 18 J=1,4                                                       CENT2099
      SSXY(J)=SSXY(J)+YY2(I)*X2(J)                                      CENT2100
```

```
      B(J)=SSXY(J)                                                    CENT2101
      DO 18 K=1,4                                                     CENT2102
   18 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                   CENT2103
      CALL MATV7(SSX,4,B,1,DET)                                       CENT2104
      SSY1=SSY                                                        CENT2105
      DO 19 I=1,4                                                     CENT2106
   19 SSY1=SSY1-SSXY(I)*B(I)*IREP                                     CENT2107
      R(KK,JJ,LL)=(SS/SSY1)**(FLOAT(N)/2.0)                           CENT2108
      DO 31 I=1,2                                                     CENT2109
      NN1=V2(I)/ABS(V2(I))                                            CENT2110
   31 V2(I)=ABS(V2(I))**(1.0/A4(I))*NN1                               CENT2111
    1 WRITE(P,79)V2,SSY1,R(KK,JJ,LL)                                  CENT2112
    2 CONTINUE                                                        CENT2113
      DO 20 I=1,3                                                     CENT2114
   20 A4(I)=A3(I)                                                     CENT2115
    4 CONTINUE                                                        CENT2116
      DO 21 I=1,3                                                     CENT2117
   21 A4(I)=A5(I)                                                     CENT2118
      CALL LINK(PCNT2)                                                CENT2119
      END                                                             CENT2120
// DUP                                                                CENT2121
*DELETE              CENT2                                           CENT2122
*STORE       WS  UA  CENT2                                           CENT2123
```

```
// JOB                                                                  PCNT2000
// FOR                                                                  PCNT2001
*LIST ALL                                                               PCNT2002
*NAME PCNT2                                                             PCNT2003
*EXTENDED PRECISION                                                     PCNT2004
*ONE WORD INTEGERS                                                      PCNT2005
*IOCS(KEYBOARD)                                                         PCNT2006
*IOCS(PLOTTER)                                                          PCNT2007
*IOCS(TYPEWRITER)                                                       PCNT2008
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),PCNT2009
     1N4,N5,YS(2),V1(2,2),ALAMD(2,2),PREP(2,2,2),R(45,2,2),A5(3)        PCNT2010
   90 FORMAT('POWER TRANSFORMATIONS  A1='F8.4'  A2='F8.4'  C='F8.4)      PCNT2011
   79 FORMAT(I3)                                                        PCNT2012
   78 FORMAT(12A6)                                                      PCNT2013
   77 FORMAT('TYPE 1 TO CALL EXIT, EOF TO CONTINUE')                    PCNT2014
   76 FORMAT(F3.1)                                                      PCNT2015
   75 FORMAT('VALUE OF X'I1'S  -  CENTRE AT X'I1'S ='F7.3)              PCNT2016
   74 FORMAT(F7.3)                                                      PCNT2017
   73 FORMAT('MAXIMUM LIKELIHOOD RATIO')                               PCNT2018
      DO 24 I=1,3                                                       PCNT2019
   24 A5(I)=A4(I)                                                       PCNT2020
      GO TO (25,26),N4                                                  PCNT2021
   25 DO 27 I=1,3                                                       PCNT2022
   27 A4(I)=A3(I)                                                       PCNT2023
      N6=1                                                              PCNT2024
      GO TO 28                                                          PCNT2025
   26 DO 29 I=1,3                                                       PCNT2026
   29 A4(I)=1.0                                                         PCNT2027
      N6=2                                                              PCNT2028
   28 DO 30 LL=1,N6                                                     PCNT2029
      DO 4 JJ=1,2                                                       PCNT2030
      AN5=44                                                            PCNT2031
      X1=V1(JJ,LL)                                                      PCNT2032
      IF(X1)12,12,13                                                    PCNT2033
   12 X4=2.0*X1                                                         PCNT2034
      GO TO 14                                                          PCNT2035
   13 X4=0.0                                                            PCNT2036
   14 A=2.0*ABS(X1)                                                     PCNT2037
      B1=A/20.                                                          PCNT2038
      C=X4-A/50.                                                        PCNT2039
      D=A/10.                                                           PCNT2040
      E=10./A                                                           PCNT2041
      F=X4-B1                                                           PCNT2042
      G=X4+D                                                            PCNT2043
      H=X4+A*1.3                                                        PCNT2044
      W=X4-A/15.                                                        PCNT2045
      U=X4-A/7.5                                                        PCNT2046
      Z=X4-D                                                            PCNT2047
      CALL SCALE(E,10.0,X4,0.0)                                         PCNT2048
      CALL EGRID(0,X4,0.0,B1,20)                                        PCNT2049
```

```
      CALL EGRID(1,X4,0.0,0.05,20)                                    PCNT2050
      DO 2 I=1,11                                                     PCNT2051
      X1=G-D/5.0+D*FLOAT(I-2)                                         PCNT2052
      NN1=X1/ABS(X1)                                                  PCNT2053
      XU=ABS(G+D*FLOAT(I-2))**(1.0/A4(JJ))*NN1                        PCNT2054
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                PCNT2055
    2 WRITE(7,74)XU                                                   PCNT2056
      DO 3 I=1,11                                                     PCNT2057
      X1=-G.1+0.1*FLOAT(I)                                            PCNT2058
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                    PCNT2059
    3 WRITE(7,76)X1                                                   PCNT2060
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                 PCNT2061
      NN1=V1(JJ,LL)/ABS(V1(JJ,LL))                                    PCNT2062
      V3=ABS(V1(JJ,LL))**(1.0/A4(JJ))*NN1                             PCNT2063
      WRITE(7,75)JJ,JJ,V3                                             PCNT2064
      CALL ECHAR(W,0.1,0.1,0.1,1.5709)                                PCNT2065
      WRITE(7,73)                                                     PCNT2066
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                                PCNT2067
      WRITE(7,78)TITL                                                 PCNT2068
      GO TO (11,9),N4                                                 PCNT2069
    9 GO TO (10,11),LL                                                PCNT2070
   11 CALL ECHAR(U,0.0,0.1,0.1,1.5709)                                PCNT2071
      WRITE(7,80)A3                                                   PCNT2072
   10 CALL EPLOT(-2,X4,0.0)                                           PCNT2073
      DO 1 KK=1,45                                                    PCNT2074
      V2=(KK-1)*A/AN5+X4                                              PCNT2075
    1 CALL EPLOT(0,V2,R(KK,JJ,LL))                                    PCNT2076
      CALL EPLOT(1,H,C.0)                                             PCNT2077
    4 CONTINUE                                                        PCNT2078
      DO 31 I=1,3                                                     PCNT2079
   31 A4(I)=A3(I)                                                     PCNT2080
   30 CONTINUE                                                        PCNT2081
      DO 32 I=1,3                                                     PCNT2082
   32 A4(I)=A5(I)                                                     PCNT2083
      CALL DATSW(10,J10)                                              PCNT2084
      GO TO (16,15),J10                                               PCNT2085
   16 CALL LINK(CRS2)                                                 PCNT2086
   15 GO TO (17,8),N4                                                 PCNT2087
   17 WRITE(1,77)                                                     PCNT2088
      READ(6,79)N5                                                    PCNT2089
      IF(N5)5,6,5                                                     PCNT2090
    8 IF(ID-98)7,5,7                                                  PCNT2091
    5 CALL EXIT                                                       PCNT2092
    6 CALL LINK(CRLF2)                                                PCNT2093
    7 CALL LINK(BOX2)                                                 PCNT2094
      END                                                             PCNT2095
// DUP                                                                PCNT2096
*DELETE              PCNT2                                           PCNT2097
*STORE       WS  UA  PCNT2                                           PCNT2098
```

```
// JOB                                                                  CRS20000
// FOR                                                                  CRS20001
*LIST ALL                                                               CRS20002
*NAME CRS2                                                              CRS20003
*EXTENDED PRECISION                                                     CRS20004
*ONE WORD INTEGERS                                                      CRS20005
*IOCS(DISK)                                                             CRS20006
*IOCS(KEYBOARD)                                                         CRS20007
*IOCS(TYPEWRITER)                                                       CRS20008
*IOCS(1403 PRINTER)                                                     CRS20009
*IOCS(2501 READER)                                                      CRS20010
      INTEGER P,Q                                                       CRS20011
      COMMON Y(100,13),X(100,2),V(7),A4(3),SSY,NS,NREPS,TITL(12),ID,A3(3CRS20012
     1),N4,I,YS(2),XCNTR(2,2),ALAMD(2,2),AVECT(2,2,2),YCONT(10,2),NSAD(3CRS20013
     2),ZLIM(2),IJ(10,2),XH(40),XV(40),A5(3),YP1(5),XP1(5),YCON1(10),YP(CRS20014
     3400),XP(400)                                                      CRS20015
      DEFINE FILE 1(400,6,U,KK1),2(400,6,U,KK2)                         CRS20016
   90 FORMAT('0IMAGINARY POINT CALCULATED ON CONTOUR Y ='F10.2/' TRY CONCRS20017
     1TOURS CLOSER TO THE CENTRE OR CHANGE THE FACTOR LIMITS FOR PLOTTINCRS20018
     2G')                                                               CRS20019
   89 FORMAT('0SADDLE EXISTS  -  CONTOUR POINTS PLOTTED'//5(13X,F6.2,4X)CRS20020
     1/5(10X'X1'9X'X2'))                                                CRS20021
   88 FORMAT('0SADDLE EXISTS  -  CONTOUR POINTS PLOTTED IN ORIGINAL UNITCRS20022
     1S'//5(13X,F6.2,4X)/5(10X2HX19X2HX2))                              CRS20023
   87 FORMAT('0DATA FOR PLOTTING 5 CONTOURS'//'0TRANSFORMED FACTOR LEVELCRS20024
     1S IN ORIGINAL UNITS'//5X5(8X,F6.2,9X)/5(10X2HX19X2HX2))           CRS20025
   86 FORMAT('ENTER 2 FACTOR LIMITS FOR PLOTTING')                      CRS20026
   85 FORMAT('ENTER 10 CONTOUR LEVELS, 5 BELOW THE CENTRE, THEN 5 ABOVE'CRS20027
     1)                                                                 CRS20028
   84 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.CRS20029
     14'  A2 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FCRS20030
     28.4)                                                              CRS20031
   83 FORMAT('1'12A6)                                                   CRS20032
   82 FORMAT(12F6.2)                                                    CRS20033
   81 FORMAT(2X,5(2X,F10.2,1X,F10.2))                                   CRS20034
   80 FORMAT(F10.0)                                                     CRS20035
   79 FORMAT(1H0,10X,'DATA FOR PLOTTING OF 5 CONTOURS'//5X5(8X,F6.2,9X)/CRS20036
     15(10X'X1'9X'X2'))                                                 CRS20037
      P=5                                                               CRS20038
      Q=8                                                               CRS20039
      DO 4 I=1,3                                                        CRS20040
    4 A5(I)=A4(I)                                                       CRS20041
      GO TO (16,66,16),N4                                               CRS20042
   16 WRITE(1,85)                                                       CRS20043
      READ(6,80)YCON1                                                   CRS20044
      WRITE(1,86)                                                       CRS20045
      READ(6,80)ZLIM                                                    CRS20046
      GO TO 18                                                          CRS20047
   66 READ(Q,82)YCON1,ZLIM                                              CRS20048
   18 GO TO (12,74,12),N4                                               CRS20049
```

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12 DO 23 I=1,3                                                    CRS20050
23 A4(I)=A3(I)                                                    CRS20051
   N6=1                                                           CRS20052
   GO TO 24                                                       CRS20053
74 DO 28 I=1,3                                                    CRS20054
28 A4(I)=1.0                                                      CRS20055
   N6=2                                                           CRS20056
24 DO 15 LL=1,N6                                                  CRS20057
   LL9=LL                                                         CRS20058
   DO 29 I=1,10                                                   CRS20059
   IF(A4(3))77,75,75                                              CRS20060
77 J=11-I                                                         CRS20061
   GO TO 29                                                       CRS20062
75 J=I                                                            CRS20063
29 YCONT(I,LL)=YCON1(J)                                           CRS20064
   DO 61 I=1,400                                                  CRS20065
   XP(I)=0.0                                                      CRS20066
61 YP(I)=0.0                                                      CRS20067
   NSWCH=0                                                        CRS20068
   NSAD(LL)=0                                                     CRS20069
   KCY=0                                                          CRS20070
   IH=1                                                           CRS20071
   IV=2                                                           CRS20072
   N1=ALAMD(IH,LL)/ABS(ALAMD(IH,LL))                              CRS20073
   N2=ALAMD(IV,LL)/ABS(ALAMD(IV,LL))                              CRS20074
   NSIGN=N1*N2                                                    CRS20075
   IF(NSIGN)11,11,30                                              CRS20076
11 NSAD(LL)=1                                                     CRS20077
   IF(N1)40,40,14                                                 CRS20078
14 IDUM=IH                                                        CRS20079
   IH=IV                                                          CRS20080
   IV=IDUM                                                        CRS20081
   NSWCH=1                                                        CRS20082
   GO TO 40                                                       CRS20083
30 IF(N1)40,40,45                                                 CRS20084
45 DO 46 I=1,5                                                    CRS20085
   IF(A4(3))76,78,78                                              CRS20086
76 J=I                                                            CRS20087
   GO TO 46                                                       CRS20088
78 J=I+5                                                          CRS20089
46 YCONT(I,LL)=YCON1(J)                                           CRS20090
40 CONTINUE                                                       CRS20091
   KCY=KCY+1                                                      CRS20092
   IJ(KCY,LL)=0                                                   CRS20093
   ZFRST=SQRT((YCONT(KCY,LL)**A4(3)-YS(LL))/ALAMD(IH,LL))         CRS20094
   ZEND=ZLIM(IH)**A4(IH)-ZFRST                                    CRS20095
   XH(1)=ZFRST                                                    CRS20096
   XV(1)=0.0                                                      CRS20097
   THETA=0.0                                                      CRS20098
   DO 1 I=2,10                                                    CRS20099
   THETA=THETA+0.15710                                            CRS20100
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```
      IF(NSAD(LL))51,51,52                                              CRS20101
   51 XH(I)=ZFRST*COS(THETA)                                            CRS20102
      GO TO 53                                                          CRS20103
   52 XH(I)=ZFRST+ZEND-ZEND*COS(THETA)                                  CRS20104
   53 ARG=(YCONT(KCY,LL)**A4(3)-YS(LL)-ALAMD(IH,LL)*(XH(I)**2))/ALAMD(IVCRS20105
     1,LL)                                                              CRS20106
      IF(ARG)5,6,6                                                      CRS20107
    5 WRITE(P,90)YCONT(KCY,LL)                                          CRS20108
      IJ(KCY,LL)=1                                                      CRS20109
      CALL DATSW(6,KJ6)                                                 CRS20110
      GO TO (16,95),KJ6                                                 CRS20111
    6 XV(I)=SQRT(ARG)                                                   CRS20112
      IL=42-I                                                           CRS20113
      XH(IL)=XH(I)                                                      CRS20114
      XV(IL)=-XV(I)                                                     CRS20115
    1 CONTINUE                                                          CRS20116
      IF(NSAD(LL))54,54,55                                              CRS20117
   54 XH(11)=0.0                                                        CRS20118
      ARGG=(YCONT(KCY,LL)**A4(3)-YS(LL))/ALAMD(IV,LL)                   CRS20119
      XV(11)=SQRT(ARGG)                                                 CRS20120
      GO TO 56                                                          CRS20121
   55 XH(11)=ZLIM(IH)**A4(IH)                                           CRS20122
      ARG=(YCONT(KCY,LL)**A4(3)-YS(LL)-ALAMD(IH,LL)*(XH(I)**2))/ALAMD(IVCRS20123
     1,LL)                                                              CRS20124
      XV(11)=SQRT(ARG)                                                  CRS20125
   56 DO 2 I=12,21                                                      CRS20126
      LL1=22-I                                                          CRS20127
      II=42-I                                                           CRS20128
      XH(I)=-XH(LL1)                                                    CRS20129
      XV(I)=XV(LL1)                                                     CRS20130
      XH(II)=XH(I)                                                      CRS20131
    2 XV(II)=-XV(I)                                                     CRS20132
      XV(31)=-XV(11)                                                    CRS20133
      XH(31)=XH(11)                                                     CRS20134
      IF(NSWCH)31,31,32                                                 CRS20135
   32 I1=IV                                                             CRS20136
      I2=IH                                                             CRS20137
      DO 33 I=1,40                                                      CRS20138
      XDUM=XH(I)                                                        CRS20139
      XH(I)=XV(I)                                                       CRS20140
   33 XV(I)=XDUM                                                        CRS20141
      GO TO 60                                                          CRS20142
   31 I1=IH                                                             CRS20143
      I2=IV                                                             CRS20144
   60 DO 41 I=1,40                                                      CRS20145
      L=(KCY-1)*40+I                                                    CRS20146
      XP(L)=AVECT(I1,I1,LL)*XH(I)+AVECT(I2,I1,LL)*XV(I)+XCNTR(I1,LL)    CRS20147
   41 YP(L)=AVECT(I1,I2,LL)*XH(I)+AVECT(I2,I2,LL)*XV(I)+XCNTR(I2,LL)    CRS20148
   95 IF(KCY-5)40,34,34                                                 CRS20149
   34 IF(NSAD(LL)-1)35,47,47                                            CRS20150
   47 IF(KCY-10)48,35,35                                                CRS20151
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48 IF(KCY-5)40,36,40                                              CRS20152
36 IF(NSWCH)38,38,39                                              CRS20153
38 NSWCH=1                                                        CRS20154
   GO TO 37                                                       CRS20155
39 NSWCH=0                                                        CRS20156
37 IDUM=IH                                                        CRS20157
   IH=IV                                                          CRS20158
   IV=IDUM                                                        CRS20159
   GO TO 40                                                       CRS20160
35 JJ=1                                                           CRS20161
   DO 96 I=1,5                                                    CRS20162
96 JJ=JJ*IJ(I,LL)                                                 CRS20163
   IF(JJ)9,10,9                                                   CRS20164
10 WRITE(P,83)TITL                                                CRS20165
   GO TO (19,20,19),N4                                            CRS20166
20 GO TO (21,19),LL                                               CRS20167
19 WRITE(P,84)A3                                                  CRS20168
21 WRITE(P,79)(YCONT(I,LL),I=1,5)                                 CRS20169
   DO 3 I=1,40                                                    CRS20170
   DO 49 J=1,5                                                    CRS20171
   L1=(J-1)*40+I                                                  CRS20172
   XP1(J)=XP(L1)                                                  CRS20173
   YP1(J)=YP(L1)                                                  CRS20174
   GO TO (49,26,49),N4                                            CRS20175
26 GO TO (27,49),LL                                               CRS20176
27 WRITE(1'L1)XP(L1),YP(L1)                                       CRS20177
49 CONTINUE                                                       CRS20178
 3 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                               CRS20179
 9 IF(NSAD(LL))73,73,44                                           CRS20180
44 KK=1                                                           CRS20181
   DO 8 I=6,10                                                    CRS20182
 8 KK=KK*IJ(I,LL)                                                 CRS20183
   IF(KK)73,17,73                                                 CRS20184
17 WRITE(P,83)TITL                                                CRS20185
   GO TO (50,57,50),N4                                            CRS20186
57 GO TO (58,50),LL                                               CRS20187
50 WRITE(P,84)A3                                                  CRS20188
58 WRITE(P,89)(YCONT(I,LL),I=6,10)                                CRS20189
   DO 42 I=1,40                                                   CRS20190
   DO 59 J=1,5                                                    CRS20191
   L1=200+(J-1)*40+I                                              CRS20192
   XP1(J)=XP(L1)                                                  CRS20193
   YP1(J)=YP(L1)                                                  CRS20194
   GO TO (59,43,59),N4                                            CRS20195
43 GO TO (22,59),LL                                               CRS20196
22 WRITE(1'L1)XP(L1),YP(L1)                                       CRS20197
59 CONTINUE                                                       CRS20198
42 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                               CRS20199
73 DO 62 I=1,3                                                    CRS20200
62 A4(I)=A3(I)                                                    CRS20201
15 CONTINUE                                                       CRS20202
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      DO 63 I=1,3                                                    CRS20203
   63 A4(I)=A5(I)                                                    CRS20204
      IF(JJ)97,91,97                                                 CRS20205
   91 WRITE(P,83)TITL                                                CRS20206
      GO TO (92,93,92),N4                                            CRS20207
   93 GO TO (94,92),LL9                                              CRS20208
   92 WRITE(P,84)A3                                                  CRS20209
   94 WRITE(P,87)(YCONT(I,LL9),I=1,5)                                CRS20210
      DO 65 I=1,40                                                   CRS20211
      DO 64 J=1,5                                                    CRS20212
      L1=(J-1)*40+I                                                  CRS20213
      NN1=XP(L1)/ABS(XP(L1))                                         CRS20214
      NN2=YP(L1)/ABS(YP(L1))                                         CRS20215
      XP1(J)=ABS(XP(L1))**(1.0/A3(1))*NN1                            CRS20216
      YP1(J)=ABS(YP(L1))**(1.0/A3(2))*NN2                            CRS20217
   64 WRITE(LL9'L1)XP1(J),YP1(J)                                     CRS20218
   65 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                               CRS20219
   97 IF(NSAD(LL9))13,13,67                                          CRS20220
   67 IF(KK)13,25,13                                                 CRS20221
   25 WRITE(P,83)TITL                                                CRS20222
      GO TO (68,69,68),N4                                            CRS20223
   69 GO TO (70,68),LL9                                              CRS20224
   68 WRITE(P,84)A3                                                  CRS20225
   70 WRITE(P,88)(YCONT(I,LL9),I=6,10)                               CRS20226
      DO 71 I=1,40                                                   CRS20227
      DO 72 J=1,5                                                    CRS20228
      L1=200+(J-1)*40+I                                              CRS20229
      NN1=XP(L1)/ABS(XP(L1))                                         CRS20230
      NN2=YP(L1)/ABS(YP(L1))                                         CRS20231
      XP1(J)=ABS(XP(L1))**(1.0/A3(1))*NN1                            CRS20232
      YP1(J)=ABS(YP(L1))**(1.0/A3(2))*NN2                            CRS20233
   72 WRITE(LL9'L1)XP1(J),YP1(J)                                     CRS20234
   71 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                               CRS20235
   13 CALL LINK(PRS2)                                                CRS20236
      END                                                            CRS20237
// DUP                                                               CRS20238
*DELETE              CRS2                                           CRS20239
*STORE      WS  UA  CRS2                                           CRS20240
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// JOB                                                                  PRS20000
// FOR                                                                  PRS20001
*LIST ALL                                                               PRS20002
*NAME PRS2                                                              PRS20003
*EXTENDED PRECISION                                                     PRS20004
*ONE WORD INTEGERS                                                      PRS20005
*IOCS(DISK)                                                            PRS20006
*IOCS(KEYBOARD)                                                        PRS20007
*IOCS(PLOTTER)                                                         PRS20008
*IOCS(TYPEWRITER)                                                      PRS20009
      COMMON A(100,13),B(100,2),V(7),A4(3),SSY,NS,NREPS,TITL(12),ID,A3(3PRS20010
     1),N4,I,YS(2),XCNTR(2,2),ALAMD(2,2),AVECT(2,2,2),YCONT(10,2),NSAD(3PRS20011
     2),ZLIM(2),IJ(10,2),XP(5),YP(5),XS(2),YA(2),UPI(2),A5(3),YB,L5(5)  PRS20012
      DEFINE FILE 1(400,6,U,KK1),2(400,6,U,KK2)                         PRS20013
   86 FORMAT(3X'POWER TRANSFORMATIONS - A1='F8.4'  A2='F8.4'  C='F8.4)   PRS20014
   85 FORMAT(12A6)                                                      PRS20015
   84 FORMAT(I3)                                                        PRS20016
   83 FORMAT('TYPE 1 TO CALL EXIT, EOF TO CONTINUE')                    PRS20017
   82 FORMAT(1X,'  X1 - X2 COORDINATES FOR RESPONSE CONTOURS',10F6.2)    PRS20018
   81 FORMAT(F7.2)                                                      PRS20019
   80 FORMAT(F6.2)                                                      PRS20020
      DO 25 I=1,3                                                       PRS20021
   25 A5(I)=A4(I)                                                       PRS20022
      GO TO (5,9,5),N4                                                  PRS20023
    5 DO 20 I=1,3                                                       PRS20024
   20 A4(I)=A3(I)                                                       PRS20025
      N6=1                                                              PRS20026
      GO TO 21                                                          PRS20027
    9 DO 22 I=1,3                                                       PRS20028
   22 A4(I)=1.0                                                         PRS20029
      N6=2                                                              PRS20030
   21 DO 6 LL=1,N6                                                      PRS20031
      IF(NSAD(LL))1,1,2                                                 PRS20032
    1 NN5=5                                                             PRS20033
      GO TO 3                                                           PRS20034
    2 NN5=10                                                            PRS20035
    3 J=1                                                               PRS20036
      DO 53 I=1,NN5                                                     PRS20037
   53 J=J*IJ(I,LL)                                                      PRS20038
      IF(J)6,63,6                                                       PRS20039
   63 DO 24 I=1,2                                                       PRS20040
      XS(I)=8.0/ZLIM(I)                                                 PRS20041
      UPI(I)=1.0/XS(I)                                                  PRS20042
   24 YA(I)=ZLIM(I)+UPI(I)                                              PRS20043
      CALL SCALE(XS(1),XS(2),0.0,0.0)                                   PRS20044
      CALL EPLOT(-2,0.0,0.0)                                            PRS20045
      X=ZLIM(1)                                                         PRS20046
      Y=0.0                                                             PRS20047
      DO 11 J=1,9                                                       PRS20048
      CALL EPLOT(-1,X,Y)                                                PRS20049
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      IF(J-9)4,11,11                                                    PRS20050
    4 Y=Y+UPI(2)                                                        PRS20051
      CALL EPLOT(-2,X,Y)                                                PRS20052
      IF(X)32,32,33                                                     PRS20053
   32 X=ZLIM(1)                                                         PRS20054
      GO TO 11                                                          PRS20055
   33 X=0.0                                                             PRS20056
   11 CONTINUE                                                          PRS20057
      CALL EPLOT(-2,X,Y)                                                PRS20058
      Y=0.0                                                             PRS20059
      DO 13 J=1,9                                                       PRS20060
      CALL EPLOT(-1,X,Y)                                                PRS20061
      X=X-UPI(1)                                                        PRS20062
      IF(J-9)12,13,13                                                   PRS20063
   12 CALL EPLOT(-2,X,Y)                                                PRS20064
      IF(Y)34,34,35                                                     PRS20065
   34 Y=ZLIM(2)                                                         PRS20066
      GO TO 13                                                          PRS20067
   35 Y=0.0                                                             PRS20068
   13 CONTINUE                                                          PRS20069
      CALL EPLOT(1,X,Y)                                                 PRS20070
      DO 27 J=1,9                                                       PRS20071
      Y=UPI(2)*FLOAT(J-1)                                               PRS20072
      CALL ECHAR(-UPI(1),Y,0.1,0.1,0.0)                                 PRS20073
   27 WRITE(7,81)Y                                                      PRS20074
      CALL ECHAR(0.0,YA(2),0.1,0.1,0.0)                                 PRS20075
      WRITE(7,85)TITL                                                   PRS20076
      GO TO (46,47,46),N4                                               PRS20077
   47 GO TO (48,46),LL                                                  PRS20078
   46 YB=ZLIM(2)+UPI(2)/3.0                                             PRS20079
      CALL ECHAR(0.0,YB,0.1,0.1,0.0)                                    PRS20080
      WRITE(7,86)A3                                                     PRS20081
   48 YC=ZLIM(2)+UPI(2)/1.5                                             PRS20082
      CALL ECHAR(0.0,YC,0.1,0.1,0.0)                                    PRS20083
      WRITE(7,82)(YCONT(I,LL),I=1,NN5)                                  PRS20084
      DO 28 J=1,9                                                       PRS20085
      X=-UPI(1)*1.4+UPI(1)*FLOAT(J)                                     PRS20086
      XA=-UPI(2)/5.0                                                    PRS20087
      XO=UPI(1)*FLOAT(J-1)                                              PRS20088
      CALL ECHAR(X,XA,0.1,0.1,0.0)                                      PRS20089
   28 WRITE(7,81)XO                                                     PRS20090
      DO 44 I=1,NN5                                                     PRS20091
      IF(IJI(I,LL))44,54,44                                             PRS20092
   54 DO 43 J=1,40                                                      PRS20093
      K=J+40*(I-1)                                                      PRS20094
      READ(LL'K)X,Y                                                     PRS20095
      IF(X-ZLIM(1))30,29,38                                             PRS20096
   38 X=ZLIM(1)                                                         PRS20097
      GO TO 29                                                          PRS20098
   30 IF(X)31,29,29                                                     PRS20099
   31 X=0.0                                                             PRS20100
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   29 IF(Y-ZLIM(2))40,39,42                                          PRS20101
   42 Y=ZLIM(2)                                                      PRS20102
      GO TO 39                                                       PRS20103
   40 IF(Y)41,39,39                                                  PRS20104
   41 Y=0.0                                                          PRS20105
   39 IF(J-1)43,14,15                                                PRS20106
   14 CALL EPLOT(-2,X,Y)                                             PRS20107
      XA=X                                                           PRS20108
      XO=Y                                                           PRS20109
      GO TO 43                                                       PRS20110
   15 IF(NSAD(LL))7,7,8                                              PRS20111
    8 IF(J-12)7,36,10                                                PRS20112
   10 IF(J-31)7,36,7                                                 PRS20113
   36 CALL EPLOT(1,X,Y)                                              PRS20114
      CALL EPLOT(2,X,Y)                                              PRS20115
      GO TO 43                                                       PRS20116
    7 CALL EPLOT(0,X,Y)                                              PRS20117
   43 CONTINUE                                                       PRS20118
      CALL EPLOT(-1,XA,XO)                                           PRS20119
      CALL ECHAR(XA,XO,0.075,0.075,0.0)                              PRS20120
      WRITE(7,80)YCONT(I,LL)                                         PRS20121
   44 CONTINUE                                                       PRS20122
      XOR=ZLIM(1)+6.0*UPI(1)                                         PRS20123
      CALL EPLOT(1,XOR,0.0)                                          PRS20124
      DO 23 I=1,3                                                    PRS20125
   23 A4(I)=A3(I)                                                    PRS20126
    6 CONTINUE                                                       PRS20127
      DO 26 I=1,3                                                    PRS20128
   26 A4(I)=A5(I)                                                    PRS20129
      GO TO (18,19,18),N4                                            PRS20130
   18 WRITE(1,83)                                                    PRS20131
      READ(6,84)N5                                                   PRS20132
      IF(N5)17,45,17                                                 PRS20133
   45 GO TO (51,19,52),N4                                            PRS20134
   19 IF(ID-98)16,17,16                                              PRS20135
   17 CALL EXIT                                                      PRS20136
   51 CALL LINK(CRLF2)                                               PRS20137
   52 CALL LINK(PRRE2)                                               PRS20138
   16 CALL LINK(BOX2)                                                PRS20139
      END                                                            PRS20140
// DUP                                                               PRS20141
*DELETE              PRS2                                           PRS20142
*STORE       WS  UA  PRS2                                           PRS20143
```

```
// JOB                                                                  CMLE2000
// FOR                                                                  CMLE2001
*LIST ALL                                                               CMLE2002
*NAME CMLE2                                                             CMLE2003
*EXTENDED PRECISION                                                     CMLE2004
*ONE WORD INTEGERS                                                      CMLE2005
      SUBROUTINE CMLE2(K4,ITER,V2,J3)                                   CMLE2006
      DIMENSION SSXY(7),SSX(7,7),A5(3),X1(8),Y(100),YY2(100),XX(8)      CMLE2007
      COMMON Y1(100,13),W(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3)CMLE2008
     1,N4,N5,AN5,NNNN,DDD,R(75,3)                                       CMLE2009
      N1=N/IREP                                                         CMLE2010
      K5=1                                                              CMLE2011
      D=EXP(DDD/FLOAT(N))                                               CMLE2012
      ITER=0.0                                                          CMLE2013
      IF(J3-7)53,53,54                                                  CMLE2014
   54 MM=5                                                              CMLE2015
      GO TO 2                                                           CMLE2016
   53 MM=4                                                              CMLE2017
    2 ITER=ITER+1                                                       CMLE2018
      IF(ITER-NNNN)30,30,52                                             CMLE2019
   52 K5=2                                                              CMLE2020
   30 DO 51 I=1,3                                                       CMLE2021
   51 A5(I)=A4(I)                                                       CMLE2022
      DD=D**(A4(3)-1.)                                                  CMLE2023
      DO 8 J=1,N1                                                       CMLE2024
      Y(J)=0.0                                                          CMLE2025
      DO 8 I=1,IREP                                                     CMLE2026
    8 Y(J)=Y(J)+(Y1(J,I)**A4(3)-1.)/A4(3)/DD/IREP                       CMLE2027
      YY=0.0                                                            CMLE2028
      DO 32 I=1,N1                                                      CMLE2029
   32 YY=YY+Y(I)/N1                                                     CMLE2030
      DO 24 J=1,7                                                       CMLE2031
   24 XX(J)=0.0                                                         CMLE2032
      DO 1 I=1,N1                                                       CMLE2033
      DO 15 J=1,2                                                       CMLE2034
      X1(J)=W(I,J)**A4(J)                                               CMLE2035
   15 X1(J+2)=X1(J)*X1(J)                                               CMLE2036
      X1(5)=X1(1)*X1(2)                                                 CMLE2037
      DO 1 J=1,5                                                        CMLE2038
    1 XX(J)=XX(J)+X1(J)/N1                                              CMLE2039
      SSY=0.0                                                           CMLE2040
      DO 4 J=1,7                                                        CMLE2041
      SSXY(J)=0.0                                                       CMLE2042
      DO 4 K=1,7                                                        CMLE2043
    4 SSX(J,K)=0.0                                                      CMLE2044
      DO 5 I=1,N1                                                       CMLE2045
      DO 58 J=1,2                                                       CMLE2046
      X1(J)=W(I,J)**A4(J)                                               CMLE2047
   58 X1(J+2)=X1(J)*X1(J)                                               CMLE2048
      X1(5)=X1(1)*X1(2)                                                 CMLE2049
```

```
      DO 7 J=1,IREP                                                    CMLE2050
      YY2(1)=(YL(I,J)**A4(3)-1.)/A4(3)/DD-YY-V2*(X1(J3)-XX(J3))        CMLE2051
    7 SSY=SSY+YY2(1)*YY2(1)                                            CMLE2052
      DO 5 J=1,5                                                       CMLE2053
      IF(J-J3)60,5,61                                                  CMLE2054
   60 JJ=J                                                             CMLE2055
      GO TO 62                                                         CMLE2056
   61 JJ=J-1                                                           CMLE2057
   62 SSXY(JJ)=SSXY(JJ)+(Y(I)-YY-V2*(X1(J3)-XX(J3)))*(X1(J)-XX(J))     CMLE2058
      B(JJ)=SSXY(JJ)                                                   CMLE2059
      DO 5 K=1,5                                                       CMLE2060
      IF(K-J3)63,5,56                                                  CMLE2061
   63 KK=K                                                             CMLE2062
      GO TO 55                                                         CMLE2063
   56 KK=K-1                                                           CMLE2064
   55 SSX(JJ,KK)=SSX(JJ,KK)+(X1(J)-XX(J))*(X1(K)-XX(K))                CMLE2065
    5 CONTINUE                                                         CMLE2066
      CALL MATV7(SSX,MM,B,1,DET)                                       CMLE2067
      DO 28 J=1,MM                                                     CMLE2068
   28 SSY=SSY-B(J)*SSXY(J)*IREP                                        CMLE2069
      DO 50 J=1,5                                                      CMLE2070
      JJ=6-J                                                           CMLE2071
      IF(JJ-J3)50,13,6                                                 CMLE2072
    6 B(JJ)=B(JJ-1)                                                    CMLE2073
      GO TO 50                                                         CMLE2074
   13 B(JJ)=V2                                                         CMLE2075
   50 CONTINUE                                                         CMLE2076
      GO TO (27,26),K5                                                 CMLE2077
   26 ITER=ITER-1                                                      CMLE2078
      RETURN                                                           CMLE2079
   27 GO TO (41,42,41),N5                                              CMLE2080
   41 GO TO (43,43,42,43),K4                                           CMLE2081
   43 DO 35 I=1,N1                                                     CMLE2082
      YY2(I)=YY                                                        CMLE2083
      DO 44 J=1,2                                                      CMLE2084
      X1(J)=W(I,J)**A4(J)                                              CMLE2085
   44 X1(J+2)=X1(J)*X1(J)                                              CMLE2086
      X1(5)=X1(1)*X1(2)                                                CMLE2087
      DO 35 J=1,5                                                      CMLE2088
   35 YY2(I)=YY2(I)+B(J)*(X1(J)-XX(J))                                 CMLE2089
   42 GO TO (25,25,29,29),K4                                           CMLE2090
   29 GO TO (25,25,40),N5                                              CMLE2091
   40 GO TO (31,31,26,31),K4                                           CMLE2092
   25 DO 9 J=1,7                                                       CMLE2093
      SSXY(J)=0.0                                                      CMLE2094
      DO 9 K=1,7                                                       CMLE2095
    9 SSX(J,K)=0.0                                                     CMLE2096
      DO 3 I=1,N1                                                      CMLE2097
      DO 45 J=1,2                                                      CMLE2098
      X1(J)=W(I,J)**A4(J)                                              CMLE2099
   45 X1(J+2)=X1(J)*X1(J)                                              CMLE2100
```

```
      X1(5)=X1(1)*X1(2)                                                  CMLE2101
      DO 46 J=1,2                                                        CMLE2102
   46 X1(J+5)=(B(J)*X1(J)+2.0*B(J+2)*X1(J+2)+X1(5)*B(5))*ALOG(W(I,J))    CMLE2103
      DO 3 J=6,7                                                         CMLE2104
    3 XX(J)=XX(J)+X1(J)/N1                                               CMLE2105
      DO 10 I=1,N1                                                       CMLE2106
      DO 47 J=1,2                                                        CMLE2107
      X1(J)=W(I,J)**A4(J)                                                CMLE2108
   47 X1(J+2)=X1(J)*X1(J)                                                CMLE2109
      X1(5)=X1(1)*X1(2)                                                  CMLE2110
      DO 48 J=1,2                                                        CMLE2111
   48 X1(J+5)=(B(J)*X1(J)+2.0*B(J+2)*X1(J+2)+X1(5)*B(5))*ALOG(W(I,J))    CMLE2112
      DO 10 J=1,7                                                        CMLE2113
      SSXY(J)=SSXY(J)+(Y(I)-YY)*(X1(J)-XX(J))                            CMLE2114
      DO 10 K=1,7                                                        CMLE2115
   10 SSX(J,K)=SSX(J,K)+(X1(J)-XX(J))*(X1(K)-XX(K))                      CMLE2116
      DO 11 J=1,7                                                        CMLE2117
   11 B(J)=SSXY(J)                                                       CMLE2118
      GO TO (17,18,19,19),K4                                             CMLE2119
   19 CALL MATV7(SSX,7,B,1,DET)                                          CMLE2120
      DO 59 I=1,2                                                        CMLE2121
   59 A4(I)=B(I+5)+A4(I)                                                 CMLE2122
      DO 49 I=1,2                                                        CMLE2123
      IF(ABS(B(I+5)/A4(I))-0.001)49,49,14                                CMLE2124
   49 CONTINUE                                                           CMLE2125
      GO TO 16                                                           CMLE2126
   17 SSXY(6)=SSXY(7)                                                    CMLE2127
      DO 20 J=1,6                                                        CMLE2128
      SSX(J,6)=SSX(J,7)                                                  CMLE2129
   20 SSX(6,J)=SSX(7,J)                                                  CMLE2130
      SSX(6,6)=SSX(7,7)                                                  CMLE2131
   18 CALL MATV7(SSX,6,SSXY,0,DET)                                       CMLE2132
      DO 21 J=1,6                                                        CMLE2133
      B(J)=0.0                                                           CMLE2134
      DO 21 K=1,6                                                        CMLE2135
   21 B(J)=B(J)+SSX(J,K)*SSXY(K)                                         CMLE2136
      GO TO (22,23),K4                                                   CMLE2137
   23 A4(1)=B(6)+A4(1)                                                   CMLE2138
      IF(ABS(B(6)/A4(1))-0.001)16,16,14                                  CMLE2139
   22 A4(2)=B(6)+A4(2)                                                   CMLE2140
      IF(ABS(B(6)/A4(2))-0.001)16,16,14                                  CMLE2141
   14 K5=1                                                               CMLE2142
      GO TO 33                                                           CMLE2143
   16 K5=2                                                               CMLE2144
   33 GO TO (34,2,34),N5                                                 CMLE2145
   34 GO TO (31,31,2,31),K4                                              CMLE2146
   31 B(1)=0.0                                                           CMLE2147
      B(2)=0.0                                                           CMLE2148
      DO 36 I=1,N1                                                       CMLE2149
      DO 36 J=1,IREP                                                     CMLE2150
      B(4)=(Y1(I,J)**A4(3)-1.)/A4(3)/DD                                  CMLE2151
```

```
      B(5)=Y1(I,J)**A4(3)*ALOG(Y1(I,J))/A4(3)/DD                    CMLE2152
      B(6)=B(5)-B(4)/A4(3)-B(4)*ALOG(D)                             CMLE2153
      B(1)=R(1)+B(6)*B(6)                                           CMLE2154
   36 B(2)=B(2)+B(6)*(YY2(I)-B(4))                                  CMLE2155
      A4(3)=A4(3)+R(2)/B(1)                                         CMLE2156
      IF(ABS((A4(3)-A5(3))/A4(3))-0.001)37,37,38                    CMLE2157
   38 K5=1                                                          CMLE2158
      GO TO 2                                                       CMLE2159
   37 GO TO (2,2,39),N5                                             CMLE2160
   39 K5=2                                                          CMLE2161
      GO TO 2                                                       CMLE2162
      END                                                           CMLE2163
// DUP                                                             CMLE2164
*DELETE              CMLE2                                        CMLE2165
*STORE      WS  UA   CMLE2                                        CMLE2166
```

```
// JOB                                                                  MATV7000
// FOR                                                                  MATV7001
*LIST ALL                                                               MATV7002
* NAME MATV7                                                           MATV7003
*EXTENDED PRECISION                                                    MATV7004
*ONE WORD INTEGERS                                                     MATV7005
      SUBROUTINE MATV7(A,N,B,M,DETM)                                    MATV7006
      DIMENSION IPVOT(7),A(7,7),B(7,1),INDEX(7,7),PIVOT(7)              MATV7007
      EQUIVALENCE (IROW,JROW),(ICLUM,JCLUM),(AMAX,T,SWAP)               MATV7008
      DETM=1.0                                                          MATV7009
      DO 20 J=1,N                                                       MATV7010
   20 IPVOT(J)=0                                                        MATV7011
      DO 550 I=1,N                                                      MATV7012
      AMAX=0.0                                                          MATV7013
      DO 105 J=1,N                                                      MATV7014
      IF(IPVOT(J)-1)60,105,60                                           MATV7015
   60 DO 100 K=1,N                                                      MATV7016
      IF(IPVOT(K)-1)80,100,740                                          MATV7017
   80 IF(ABS(AMAX)-ABS(A(J,K)))85,100,100                               MATV7018
   85 IROW=J                                                            MATV7019
      ICLUM=K                                                           MATV7020
      AMAX=A(J,K)                                                       MATV7021
  100 CONTINUE                                                          MATV7022
  105 CONTINUE                                                          MATV7023
      IPVOT(ICLUM)=IPVOT(ICLUM)+1                                       MATV7024
      IF(IROW-ICLUM)140,260,140                                         MATV7025
  140 DETM=-DETM                                                        MATV7026
      DO 200 L=1,N                                                      MATV7027
      SWAP=A(IROW,L)                                                    MATV7028
      A(IROW,L)=A(ICLUM,L)                                              MATV7029
  200 A(ICLUM,L)=SWAP                                                   MATV7030
      IF(M)260,260,210                                                  MATV7031
  210 DO 250 L=1,M                                                      MATV7032
      SWAP=B(IROW,L)                                                    MATV7033
      B(IROW,L)=B(ICLUM,L)                                              MATV7034
  250 B(ICLUM,L)=SWAP                                                   MATV7035
  260 INDEX(I,1)=IROW                                                   MATV7036
      INDEX(I,2)=ICLUM                                                  MATV7037
      PIVOT(I)=A(ICLUM,ICLUM)                                           MATV7038
      DETM=DETM*PIVOT(I)                                                MATV7039
      A(ICLUM,ICLUM)=1.0                                                MATV7040
      DO 350 L=1,N                                                      MATV7041
  350 A(ICLUM,L)=A(ICLUM,L)/PIVOT(I)                                    MATV7042
      IF(M)380,380,360                                                  MATV7043
  360 DO 370 L=1,M                                                      MATV7044
  370 B(ICLUM,L)=B(ICLUM,L)/PIVOT(I)                                    MATV7045
  380 DO 550 L1=1,N                                                     MATV7046
      IF(L1-ICLUM)400,550,400                                           MATV7047
  400 T=A(L1,ICLUM)                                                     MATV7048
      A(L1,ICLUM)=0.0                                                   MATV7049
```

```
      DO 450 L=1,N                                                      MATV7050
  450 A(L1,L)=A(L1,L)-A(ICLUM,L)*T                                      MATV7051
      IF(M)550,550,460                                                  MATV7052
  460 DO 500 L=1,M                                                      MATV7053
  500 B(L1,L)=B(L1,L)-B(ICLUM,L)*T                                      MATV7054
  550 CONTINUE                                                          MATV7055
      DO 710 I=1,N                                                      MATV7056
      L=N+1-I                                                           MATV7057
      IF(INDEX(L,1)-INDEX(L,2))630,710,630                              MATV7058
  630 JROW=INDEX(L,1)                                                   MATV7059
      JCLUM=INDEX(L,2)                                                  MATV7060
      DO 705 K=1,N                                                      MATV7061
      SWAP=A(K,JROW)                                                    MATV7062
      A(K,JROW)=A(K,JCLUM)                                              MATV7063
      A(K,JCLUM)=SWAP                                                   MATV7064
  705 CONTINUE                                                          MATV7065
  710 CONTINUE                                                          MATV7066
  740 IF(DETM-0.000001)750,750,760                                      MATV7067
  750 DETM=0.0                                                          MATV7068
  760 RETURN                                                            MATV7069
      END                                                               MATV7070
// DUP                                                                  MATV7071
*DELETE              MATV7                                            MATV7072
*STORE      WS  UA   MATV7                                            MATV7073
```

```
// JOB                                                                    ORTH2000
// FOR                                                                    ORTH2001
*LIST ALL                                                                 ORTH2002
*NAME ORTH2                                                               ORTH2003
*EXTENDED PRECISION                                                       ORTH2004
*ONE WORD INTEGERS                                                        ORTH2005
      SUBROUTINE ORTH2                                                    ORTH2006
      INTEGER P,Q                                                         ORTH2007
      DIMENSION W(100,5)                                                  ORTH2008
      COMMON Y(100,13),X(100,2),B(7),A4(3),SSY,N,IREP,TITL(12),ID,A3(3),ORTH2009
     1N4,K,SSX2(7,7),XX(7),YY2(100),A5(3),SSXY(7),X4(2),YY,X3(2),X1(2)  ORTH2010
   85 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.ORTH2011
     14'  A2 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIABLE - C ='FORTH2012
     28.4)                                                                ORTH2013
   84 FORMAT(5E15.5)                                                      ORTH2014
   83 FORMAT('0CROSS PRODUCT MATRIX'/)                                    ORTH2015
   82 FORMAT('0NORMAL ORTHOGONAL POLYNOMIALS'//10X'X1'13X'X2'11X'X1*X1'10ORTH2016
     10X'X2*X2'10X'X1*X2')                                                ORTH2017
   81 FORMAT('1'12A6)                                                     ORTH2018
      P=5                                                                 ORTH2019
      Q=8                                                                 ORTH2020
      N1=N/IREP                                                           ORTH2021
      DO 1 I=1,N1                                                         ORTH2022
      DO 1 J=1,2                                                          ORTH2023
    1 W(I,J)=(X(I,J)**A4(J)-XX(J))/SQRT(X4(J))                            ORTH2024
      DO 2 J=1,2                                                          ORTH2025
      X1(J)=0.0                                                           ORTH2026
      X3(J)=0.0                                                           ORTH2027
      AA2=A4(J)*2.0                                                       ORTH2028
      DO 2 I=1,N1                                                         ORTH2029
      X1(J)=X1(J)+X(I,J)**AA2                                             ORTH2030
    2 X3(J)=X3(J)+X(I,J)**AA2*(X(I,J)**A4(J)-XX(J))                       ORTH2031
      DO 3 I=1,N1                                                         ORTH2032
      DO 3 J=1,2                                                          ORTH2033
    3 W(I,J+2)=(X(I,J)*X(I,J))**A4(J)-X1(J)/N1-(X(I,J)**A4(J)-XX(J))*X3(ORTH2034
     1J)/X4(J)                                                            ORTH2035
      DO 4 J=1,2                                                          ORTH2036
      X3(J)=0.0                                                           ORTH2037
      DO 4 I=1,N1                                                         ORTH2038
    4 X3(J)=X3(J)+W(I,J+2)*W(I,J+2)                                       ORTH2039
      WW=0.0                                                              ORTH2040
      DO 5 I=1,N1                                                         ORTH2041
      W(I,5)=W(I,1)*W(I,2)                                                ORTH2042
      WW=WW+W(I,5)/N1                                                     ORTH2043
      DO 5 J=3,4                                                          ORTH2044
    5 W(I,J)=W(I,J)/SQRT(X3(J-2))                                         ORTH2045
      DO 7 I=1,5                                                          ORTH2046
      SSXY(I)=0.0                                                         ORTH2047
      DO 7 J=1,5                                                          ORTH2048
    7 SSX2(I,J)=0.0                                                       ORTH2049
```

```
      W5=0.0                                                        ORTH2050
      DO 13 I=1,N1                                                  ORTH2051
      W(I,5)=W(I,1)*W(I,2)                                          ORTH2052
   13 W5=W5+(W(I,5)-WW)**2                                          ORTH2053
      DO 14 I=1,N1                                                  ORTH2054
   14 W(I,5)=(W(I,5)-WW)/SQRT(W5)                                   ORTH2055
      DO 8 I=1,N1                                                   ORTH2056
      DO 8 J=1,5                                                    ORTH2057
      SSXY(J)=SSXY(J)+(YY2(I)-YY)*W(I,J)                            ORTH2058
      DO 8 J1=1,5                                                   ORTH2059
    8 SSX2(J,J1)=SSX2(J,J1)+W(I,J)*W(I,J1)                          ORTH2060
      GO TO (6,9),K                                                 ORTH2061
    6 GO TO (10,9),N4                                               ORTH2062
    9 WRITE(P,81)TITL                                               ORTH2063
      GO TO (11,12),K                                               ORTH2064
   12 WRITE(P,85)A4                                                 ORTH2065
   11 WRITE(P,82)                                                   ORTH2066
      WRITE(P,84)((W(I,J),J=1,5),I=1,N1)                            ORTH2067
      WRITE(P,83)                                                   ORTH2068
      WRITE(P,84)((SSX2(I,J),J=1,5),I=1,5)                          ORTH2069
   10 RETURN                                                        ORTH2070
      END                                                           ORTH2071
// DUP                                                              ORTH2072
*DELETE              ORTH2                                        ORTH2073
*STORE       WS  UA  ORTH2                                        ORTH2074
```

```
// JOB                                                          CAN20000
// FOR                                                          CAN20001
*LIST ALL                                                       CAN20002
*NAME CAN2                                                      CAN20003
*EXTENDED PRECISION                                             CAN20004
*ONE WORD INTEGERS                                              CAN20005
      SUBROUTINE CAN2(AA,AMBDA,N)                               CAN20006
      INTEGER P,Q                                               CAN20007
      DIMENSION AA(2,2),AMBDA(2),E(4),D(4)                      CAN20008
   80 FORMAT(4X,I2,5X,E15.6,5X,2E15.6)                          CAN20009
      P=5                                                       CAN20010
      Q=8                                                       CAN20011
      NQ=+1                                                     CAN20012
      K=1                                                       CAN20013
      DO 1 I=1,N                                                CAN20014
      DO 1 J=1,I                                                CAN20015
      E(K)=AA(I,J)                                              CAN20016
    1 K=K+1                                                     CAN20017
      CALL JACOB(E,D,AMBDA,N,NQ)                                CAN20018
      K=1                                                       CAN20019
      DO 2 I=1,N                                                CAN20020
      DO 2 J=1,N                                                CAN20021
      AA(I,J)=D(K)                                              CAN20022
    2 K=K+1                                                     CAN20023
      DO 3 I=1,N                                                CAN20024
    3 WRITE(P,80)I,AMBDA(I),(AA(I,J),J=1,N)                     CAN20025
      RETURN                                                    CAN20026
      END                                                       CAN20027
// DUP                                                          CAN20028
*DELETE            CAN2                                       CAN20029
*STORE      WS  UA  CAN2                                       CAN20030
```

```
// JOB                                                          JACOB000
// FOR                                                          JACOB001
*LIST ALL                                                       JACOB002
*NAME JACOB                                                     JACOB003
*EXTENDED PRECISION                                             JACOB004
*ONE WORD INTEGERS                                              JACOB005
      SUBROUTINE JACOB(A,R,C,NAA,NQ)                            JACOB006
      INTEGER P,Q                                               JACOB007
      DIMENSION A(2),R(2),C(2)                                  JACOB008
  901 FORMAT(25H EIGENVALUE NOT CONVERGED  )                    JACOB009
      P=5                                                       JACOB010
      Q=8                                                       JACOB011
      LOOPC=0                                                   JACOB012
      NA=NAA                                                    JACOB013
      NN=(NA*(NA+1))/2                                          JACOB014
      IF (NQ) 120,100,100                                       JACOB015
  100 K=1                                                       JACOB016
      DO 115 I=1,NA                                             JACOB017
      DO 115 J=1,NA                                             JACOB018
      IF(I-J)105,110,105                                        JACOB019
  105 R(K)=0.                                                   JACOB020
      GO TO 115                                                 JACOB021
  110 R(K)=1.                                                   JACOB022
  115 K=K+1                                                     JACOB023
  120 SUM=0.                                                    JACOB024
      IF(NA-1)325,310,125                                       JACOB025
  125 K=1                                                       JACOB026
      AMAX=0.                                                   JACOB027
      DO 155 I=1,NA                                             JACOB028
      DO 150 J=1,I                                              JACOB029
      IF(I-J)135,145,135                                        JACOB030
  135 IF(ABS(A(K))-AMAX)145,145,140                             JACOB031
  140 AMAX=ABS(A(K))                                            JACOB032
  145 TERM=A(K)*A(K)                                            JACOB033
      SUM=SUM+TERM+TERM                                         JACOB034
  150 K=K+1                                                     JACOB035
  155 SUM=SUM-TERM                                              JACOB036
      SUM=SQRT(SUM)                                             JACOB037
      THRES=SUM/SQRT(FLOAT(NA))                                 JACOB038
      THRSH=THRES*1.0E-08                                       JACOB039
      IF(THRSH-AMAX)165,310,310                                 JACOB040
  165 THRES=AMAX/3.                                             JACOB041
      IF(THRES-THRSH)175,180,180                                JACOB042
  175 THRES=THRSH                                               JACOB043
  180 K=2                                                       JACOB044
      N=0                                                       JACOB045
      JD=1                                                      JACOB046
      DO 270 J=2,NA                                             JACOB047
      JD=JD+J                                                   JACOB048
      JJ=J-1                                                    JACOB049
```

```
      ID=0                                                          JACOB050
      DO 265 I=1,JJ                                                 JACOB051
      ID=ID+I                                                       JACOB052
      IF(ABS(A(K))-THRES)265,265,195                                JACOB053
  195 N=N+1                                                         JACOB054
      ALPHA=(A(JD)-A(ID))/(2.*A(K))                                 JACOB055
      BETA=1./(1.+ALPHA*ALPHA)                                      JACOB056
      ROOT=1.0+ABS(ALPHA)*SQRT(BETA)                                JACOB057
      IF(ALPHA)205,200,200                                          JACOB058
  200 SSQ=0.5*BETA/ROOT                                             JACOB059
      CSQ=0.5*ROOT                                                  JACOB060
      GO TO 210                                                     JACOB061
  205 CSQ=0.5*BETA/ROOT                                             JACOB062
      SSQ=0.5*ROOT                                                  JACOB063
  210 CC=SQRT(CSQ)                                                  JACOB064
      S=-SQRT(SSQ)                                                  JACOB065
      TWOSC=CC*S*2.                                                 JACOB066
      TEMPA=CSQ*A(ID)+TWOSC*A(K)+SSQ*A(JD)                          JACOB067
      A(JD)=CSQ*A(JD)-TWOSC*A(K)+SSQ*A(ID)                          JACOB068
      A(ID)=TEMPA                                                   JACOB069
      A(K)=0.                                                       JACOB070
      KA=JD-J                                                       JACOB071
      KB=ID-I                                                       JACOB072
      KC=NA*(I-1)                                                   JACOB073
      KD=NA*(J-1)                                                   JACOB074
      DO 260 L=1,NA                                                 JACOB075
      KC=KC+1                                                       JACOB076
      KD=KD+1                                                       JACOB077
      TEMPA=CC*B(KC)+S*B(KD)                                        JACOB078
      B(KD)=-S*B(KC)+CC*B(KD)                                       JACOB079
      B(KC)=TEMPA                                                   JACOB080
      IF(I-L)230,220,245                                            JACOB081
  220 KB=KB+1                                                       JACOB082
  225 KA=KA+1                                                       JACOB083
      GO TO 260                                                     JACOB084
  230 KB=KB+L-1                                                     JACOB085
      IF(J-L)240,225,250                                            JACOB086
  240 KA=KA+L-1                                                     JACOB087
      GO TO 255                                                     JACOB088
  245 KB=KB+1                                                       JACOB089
  250 KA=KA+1                                                       JACOB090
  255 TEMPA=CC*A(KB)+S*A(KA)                                        JACOB091
      A(KA)=-S*A(KB)+CC*A(KA)                                       JACOB092
      A(KB)=TEMPA                                                   JACOB093
  260 CONTINUE                                                      JACOB094
  265 K=K+1                                                         JACOB095
  270 K=K+1                                                         JACOB096
      LOOPC=LOOPC+1                                                 JACOB097
      IF(LOOPC-50)275,305,305                                       JACOB098
  275 IF(N-NN/8)280,280,180                                         JACOB099
  280 IF(THRES-THRSH)285,300,285                                    JACOB100
```

```
  285 THRES=THRSH/3.                                                    JACOB101
      IF(THRES-THRSH)295,180,180                                        JACOB102
  295 THRES=THRSH                                                       JACOB103
      GO TO 180                                                         JACOB104
  300 IF(N)180,310,180                                                  JACOB105
  305 WRITE(P,901)                                                      JACOB106
  310 LL=0                                                              JACOB107
      DO 320 L=1,NA                                                     JACOB108
      LL=LL+L                                                           JACOB109
  320 C(L)=A(LL)                                                        JACOB110
  325 RETURN                                                            JACOB111
      END                                                               JACOB112
// DUP                                                                  JACOB113
*DELETE              JACOB                                            JACOB114
*STORE      WS  UA  JACOB                                             JACOB115
```

```
// JOB                                                                  CONPL000
// FOR                                                                  CONPL001
*LIST ALL                                                               CONPL002
*ONE WORD INTEGERS                                                      CONPL003
*EXTENDED PRECISION                                                     CONPL004
*IOCS(2501 READER)                                                      CONPL005
*IOCS(1403 PRINTER)                                                     CONPL006
*NAME CONPL                                                            CONPL007
C                                                                       CONPL008
C     THIS PROGRAM LISTS POINTS ON THE TWO-DIMENSIONAL LIKELIHOOD SURFACECONPL009
C  FOR POWER TRANSFORMATIONS OF THE INDEPENDENT VARIABLES IN A TWO-FACTORCONPL010
C  NORMAL THEORY RESPONSE SURFACE ANALYSIS (BOX2). A FIXED POWER TRANS  CONPL011
C  FORMATION OF THE RESPONSE MAY BE SUPPLIED.                           CONPL012
C                                                                       CONPL013
C     THE DATA DECK FOR BOX2 MAY BE USED.                               CONPL014
C                                                                       CONPL015
C    SUBROUTINE CALLED                                                  CONPL016
C                                                                       CONPL017
C   MATV7 - INVERTS MATRICES                                            CONPL018
C                                                                       CONPL019
C    MAKEUP OF DATA DECK                                                CONPL020
C                                                                       CONPL021
C 1.TITLE CARD - (12A6)                                                 CONPL022
C 2.CONTROL CARD - (1X,2I2,4F5.3,6X,F5.3,I3)                            CONPL023
C       I2 - NUMBER OF TREATMENT COMBINATIONS                           CONPL024
C       I2 - NUMBER OF OBSERVATION SETS                                 CONPL025
C       2F5.3 - ESTIMATES OF POWER PARAMETERS FOR INDEPEDENT VARIABLES   CONPL026
C       F5.3 - FIXED VALUE OF POWER TRANSFORMATION OF DEPENDENT VARIABLE CONPL027
C       F5.3 - HALF SIZE OF INTERVAL AROUND GIVEN ESTIMATES             CONPL028
C       I3 - NUMBER OF VALUES OF EACH TRANSFORMATION USED - SUGGEST 10 - CONPL029
C            SQUARE OF THIS GIVES NUMBER OF POINTS LISTED               CONPL030
C 3.TREATMENT COMBINATIONS IN PAIRS - (16F5.3)                          CONPL031
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION          CONPL032
C       ONE SET PER CARD - (13F6.3)                                     CONPL033
C 5.99 IN COLS.79-80 INDICATES END OF DATA, ANOTHER DECK TO FOLLOW      CONPL034
C    98 IN COLS.79-80 INDICATES END OF JOB - CALL EXIT AFTER THIS DECK  CONPL035
C 6.REPEAT 1. TO 5. AS REQUIRED                                         CONPL036
C                                                                       CONPL037
      DIMENSION Y(100,13),X1(100,2),X(100,6),TITL(12),AA(3),Y1(13),X4(2)CONPL038
     1,A(2),S(7),SS(7,7),SS1(10),A4(10,2)                               CONPL039
   90 FORMAT(29H0POINTS ON LIKELIHOOD SURFACE)                          CONPL040
   89 FORMAT('0*** VARIABLES FITTED'//17X16HOBSERVATION SETS/4X2HX15X2HXCONPL041
     122X13(3XI2,2X))                                                   CONPL042
   88 FORMAT(10F12.5/10F12.5/10E12.4/)                                  CONPL043
   87 FORMAT(1X2F7.3,13F7.2)                                            CONPL044
   86 FORMAT(23HOCONSTANT ADDED     Y + F8.3/5HOA1 =F6.3,6H  A2 =F6.3,5H CONPL045
     1 C =F6.3)                                                         CONPL046
   85 FORMAT(66HOINCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXTCONPL047
     1 DATA DECK)                                                       CONPL048
   84 FORMAT(16F5.3)                                                    CONPL049
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```
83 FORMAT(1X,2I2,4F5.3,6X,F5.3,I3)                                    CONPL050
82 FORMAT(1H112A6)                                                    CONPL051
81 FORMAT(13F6.3,I2)                                                  CONPL052
80 FORMAT(12A6)                                                       CONPL053
   M=5                                                                CONPL054
   L=8                                                                CONPL055
 5 READ(L,80)TITL                                                     CONPL056
   READ(L,83)N1,IREP,CONST,AA,AN4,N4                                  CONPL057
   READ(L,84)((X1(I,J),J=1,2),I=1,N1)                                 CONPL058
   I=0                                                                CONPL059
22 I=I+1                                                              CONPL060
   READ(L,81)Y1,ID                                                    CONPL061
   IF(ID-98)9,23,23                                                   CONPL062
 9 DO 12 II=1,IREP                                                    CONPL063
12 Y(I,II)=Y1(II)+CONST                                               CONPL064
   GO TO 22                                                           CONPL065
23 IF(N1-I+1)2,4,2                                                    CONPL066
 2 WRITE(M,85)                                                        CONPL067
   IF(ID-98)5,6,5                                                     CONPL068
 6 CALL EXIT                                                          CONPL069
 4 N=N1*IREP                                                          CONPL070
   WRITE(M,82)TITL                                                    CONPL071
   WRITE(M,86)CONST,AA                                                CONPL072
   WRITE(M,89)(I,I=1,IREP)                                            CONPL073
   DO 29 I=1,N1                                                       CONPL074
29 WRITE(M,87)X1(I,1),X1(I,2),(Y(I,J),J=1,IREP)                       CONPL075
   DO 8 I=1,N1                                                        CONPL076
 8 X(I,1)=1.0                                                         CONPL077
   DO 3 I=1,N1                                                        CONPL078
   DO 3 J=1,IREP                                                      CONPL079
 3 Y(I,J)=Y(I,J)**AA(3)                                               CONPL080
   DO 18 I=1,N1                                                       CONPL081
   DO 19 J=2,3                                                        CONPL082
   X(I,J)=X1(I,J-1)**AA(J-1)                                          CONPL083
19 X(I,J+2)=X(I,J)*X(I,J)                                             CONPL084
18 X(I,6)=X(I,2)*X(I,3)                                               CONPL085
   DO 20 I=1,6                                                        CONPL086
   S(I)=0.0                                                           CONPL087
   DO 20 J=1,6                                                        CONPL088
20 SS(I,J)=0.0                                                        CONPL089
   DO 21 I=1,N1                                                       CONPL090
   DO 21 I1=1,6                                                       CONPL091
   DO 24 J=1,IREP                                                     CONPL092
24 S(I1)=S(I1)+X(I,I1)*Y(I,J)                                         CONPL093
   DO 21 J1=1,6                                                       CONPL094
21 SS(I1,J1)=SS(I1,J1)+X(I,I1)*X(I,J1)*IREP                           CONPL095
   CALL MATV7(SS,6,S,1,DET)                                           CONPL096
   SS3=0.0                                                            CONPL097
   DO 25 I=1,N1                                                       CONPL098
   DO 25 J=1,IREP                                                     CONPL099
   U=Y(I,J)                                                           CONPL100
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      DO 26 J1=1,6                                                    CONPL101
   26 U=U-S(J1)*X(I,J1)                                               CONPL102
   25 SS3=SS3+U*U                                                     CONPL103
      DO 7 I=1,2                                                      CONPL104
      X4(I)=AA(I)-AN4                                                 CONPL105
    7 A(I)=2.0*(AA(I)-X4(I))                                          CONPL106
      WRITE(M,82)TITL                                                 CONPL107
      WRITE(M,90)                                                     CONPL108
      KK=0                                                            CONPL109
      KKK=0                                                           CONPL110
      DO 1 II=1,N4                                                    CONPL111
      DO 1 JJ=1,N4                                                    CONPL112
      KK=KK+1                                                         CONPL113
      KKK=KKK+1                                                       CONPL114
      A4(KK,1)=(II-1)*A(1)/FLOAT(N4-1)+X4(1)                          CONPL115
      A4(KK,2)=(JJ-1)*A(2)/FLOAT(N4-1)+X4(2)                          CONPL116
      DO 10 I=1,N1                                                    CONPL117
      DO 11 J=1,2                                                     CONPL118
      X(I,J+1)=X1(I,J)**A4(KK,J)                                      CONPL119
   11 X(I,J+3)=X(I,J+1)*X(I,J+1)                                      CONPL120
   10 X(I,6)=X(I,2)*X(I,3)                                            CONPL121
      DO 13 I=1,6                                                     CONPL122
      S(I)=0.0                                                        CONPL123
      DO 13 J=1,6                                                     CONPL124
   13 SS(I,J)=0.0                                                     CONPL125
      DO 14 I=1,N1                                                    CONPL126
      DO 14 I1=1,6                                                    CONPL127
      DO 15 J=1,IREP                                                  CONPL128
   15 S(I1)=S(I1)+X(I,I1)*Y(I,J)                                      CONPL129
      DO 14 J1=1,6                                                    CONPL130
   14 SS(I1,J1)=SS(I1,J1)+X(I,I1)*X(I,J1)*IREP                        CONPL131
      CALL MATV7(SS,6,S,1,DET)                                        CONPL132
      SSY=0.0                                                         CONPL133
      DO 16 I=1,N1                                                    CONPL134
      DO 16 J=1,IREP                                                  CONPL135
      U=Y(I,J)                                                        CONPL136
      DO 17 J1=1,6                                                    CONPL137
   17 U=U-S(J1)*X(I,J1)                                               CONPL138
   16 SSY=SSY+U*U                                                     CONPL139
      SS1(KK)=(SS3/SSY)**(FLOAT(N)/2.0)                               CONPL140
      IF(KK-10)1,27,27                                                CONPL141
   27 WRITE(M,88)((A4(I,J),I=1,10),J=1,2),(SS1(K),K=1,10)             CONPL142
      KK=0                                                            CONPL143
      IF(KKK-130)1,1,30                                               CONPL144
   30 WRITE(M,82)TITL                                                 CONPL145
      WRITE(M,90)                                                     CONPL146
      KKK=0                                                           CONPL147
    1 CONTINUE                                                        CONPL148
      IF(KK)31,31,32                                                  CONPL149
   32 KK1=KK+1                                                        CONPL150
      DO 33 I=KK1,10                                                  CONPL151
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      DO 33 J=1,2                                                    CONPL152
      A4(I,J)=0.0                                                    CONPL153
   33 SS1(I)=0.0                                                     CONPL154
      WRITE(M,88)((A4(I,J),I=1,10),J=1,2),(SS1(K),K=1,10)            CONPL155
   31 IF(ID-98)5,6,5                                                 CONPL156
      END                                                            CONPL157
// DUP                                                              CONPL158
*DELETE              CONPL                                         CONPL159
*STORE       WS  UA  CONPL                                         CONPL160
```

```
// JOB                                                                  BOX30000
// FOR                                                                  BOX30001
*LIST ALL                                                               BOX30002
*NAME BOX3                                                              BOX30003
*EXTENDED PRECISION                                                     BOX30004
*ONE WORD INTEGERS                                                      BOX30005
*IOCS(DISK)                                                             BOX30006
*IOCS(1403 PRINTER)                                                     BOX30007
*IOCS(2501 READER)                                                      BOX30008
C                                                                       BOX30009
C      THIS PROGRAM ANALYZES THE DATA FROM RESPONSE SURFACE EXPERIMENTS  BOX30010
C  WHEN THREE FACTORS ARE MEASURED.  OPTIONS ALLOW CALCULATION OF MAXIMUMBOX30011
C  LIKELIHOOD ESTIMATES OF POWER TRANSFORMATIONS OF BOTH INDEPENDENT AND BOX30012
C  DEPENDENT VARIABLES, AND THE PLOTTING OF THEIR MAXIMIZED RELATIVE     BOX30013
C  LIKELIHOOD GRAPHS, AS A MEASURE OF THE PRECISION OF THE ESTIMATES.    BOX30014
C  THE DATA IS THEN SUBJECTED TO ANALYSIS OF VARIANCE, USING ORTHOGONAL  BOX30015
C  POLYNOMIALS, AND CANONICAL ANALYSIS, AND SPECIFIED CONTOURS           BOX30016
C  OF THE DEPENDENT VARIABLE ARE PLOTTED AS SLICES THROUGH THE CENTRE OF BOX30017
C  THE SURFACE, BOTH WITHOUT AND WITH TRANSFORMATION.                    BOX30018
C                                                                       BOX30019
C      OPTIONS ALLOW THE CALCULATION OF MAXIMUM RELATIVE LIKELIHOOD      BOX30020
C  GRAPHS FOR THE B(J) COEFFICIENTS IN THE NON-LINEAR CASE, AND FOR THE  BOX30021
C  X(I) COORDINATES OF THE CENTRE.                                       BOX30022
C                                                                       BOX30023
C      UP TO 99 POINTS IN THE FACTOR SPACE (TREATMENT COMBINATIONS) ARE  BOX30024
C  ALLOWED, WITH UP TO 10 OBSERVATIONS AT EACH POINT (OBSERVATION SETS). BOX30025
C                                                                       BOX30026
C     NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                BOX30027
C                                                                       BOX30028
C      TO TRY OTHER VALUES OF THE POWER TRANSFORMATIONS THAN THE ML      BOX30029
C  ESTIMATES, USE CRLF3.                                                BOX30030
C                                                                       BOX30031
C      TO TRY OTHER RESPONSE EQUATIONS WITH SOME B(J)=0, USE PRRE3       BOX30032
C                                                                       BOX30033
C      TO TRY OTHER SLICES THAN THROUGH THE RESPONSE SURFACE CENTRE, USE BOX30034
C  SRS3.                                                                BOX30035
C                                                                       BOX30036
C    LINKS CALLED                                                       BOX30037
C                                                                       BOX30038
C    SUBROUTINES CALLED                                                 BOX30039
C                                                                       BOX30040
C   CMLE3 - CALCULATES ML AND RML ESTIMATES                             BOX30041
C   MATV  - INVERTS MATRICES                                            BOX30042
C   CAN3  - DIAGONALIZES MATRICES                                       BOX30043
C   JACOB - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES     BOX30044
C                                                                       BOX30045
C    OPTIONS                                                            BOX30046
C                                                                       BOX30047
C   BOX3  - CALCULATES ML ESTIMATES AND POINTS FOR THE MLR GRAPHS       BOX30048
C   PMLR3 - PLOTS MLR GRAPHS OF THE POWER TRANSFORMATIONS               BOX30049
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C  CPAR3 - CALCULATES POINTS FOR THE MLR GRAPHS OF B(J) IN THE                BOX30050
C NON-LINEAR CASE                                                            BOX30051
C  PPAR3 - PLOTS MLR GRAPHS OF THE B(J) COEFFICIENTS                         BOX30052
C  INF03 - CALULATES INFORMATION AND VARIANCE-COVARIANCE MATRICES            BOX30053
C  ANVA3 - PERFORMS ANALYSIS OF VARIANCE                                     BOX30054
C  COEF3 - CALCULATES AND PLOTS POINTS FOR MLR GRAPHS OF THE B(J)            BOX30055
C COEFFICIENTS                                                               BOX30056
C  EIGN3 - PERFORMS CANONICAL ANALYSIS                                       BOX30057
C  CENT3 - CALCULATES POINTS FOR THE MLR GRAPHS OF THE CENTRE                BOX30058
C          COORDINATES                                                       BOX30059
C  PCNT3 - PLOTS MLR GRAPHS OF THE COORDINATES OF THE RESPONSE CENTRE        BOX30060
C  SLIC3 - CALCULATES EIGENVALUES AND VECTORS FOR SLICES OF RESPONSE         BOX30061
C SURFACE                                                                    BOX30062
C  CRS3  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS               BOX30063
C  PRS3  - PLOTS RESPONSE SURFACE CONTOURS                                   BOX30064
C                                                                           BOX30065
C SWITCH 10 UP - PLOT RESPONSE SURFACE CONTOURS                              BOX30066
C SWITCH  9 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF POWER TRANSFORMATIONSBOX30067
C SWITCH  8 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF B(J) COEFFICIENTS      BOX30068
C SWITCH  7 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF THE CENTRE             BOX30069
C                COORDINATES                                              BOX30070
C SWITCH  6 UP - ENTER ALTERNATE CONTOUR LEVELS IF IMAGINARY POINT FOUNDBOX30071
C                WHEN PLOTTING CONTOURS                                   BOX30072
C                                                                         BOX30073
C   MAKEUP OF DATA DECK                                                   BOX30074
C                                                                         BOX30075
C 1.TITLE CARD FIRST - (12A6)                                             BOX30076
C 2.CONTROL CARD - (I1,2I2,5F5.3,2I3,F5.3,I3)                             BOX30077
C     I1 - OPTION  -  0 - POWER TRANS. FOR IND. AND DEP. VARIABLES        BOX30078
C                     1 - POWER TRANS. FOR IND. VARIABLES ONLY            BOX30079
C                     2 - POWER TRANS. FOR DEP. VARIABLE ONLY             BOX30080
C     I2 - NUMBER OF TREATMENT COMBINATIONS                               BOX30081
C     I2 - NUMBER OF OBSERVATION SETS                                     BOX30082
C     F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                      BOX30083
C     4F5.3 - INITIAL ESTIMATES OF PARAMETERS - A1,A2,A3,C                BOX30084
C           0.0 YIELDS NATURAL LOG TRANSFORMATION                         BOX30085
C           +100. YIELDS POSITIVE EXPONENTIAL TRANSFORMATION              BOX30086
C           -100. YIELDS NEGATIVE EXPONENTIAL TRANSFORMATION              BOX30087
C     I3 - MAXIMUM NUMBER OF ITERATIONS ALLOWED FOR ML ESTIMATE           BOX30088
C    THE FOLLOWING REQUIRED ONLY WITH OPTION 9                            BOX30089
C     I3 - MAXIMUM NUMBER OF ITERATIONS ALLOWED FOR POINTS OF LIKELIHOODBOX30090
C          GRAPH                                                          BOX30091
C     F5.3 - HALF SIZE OF INTERVAL TO BE PLOTTED AROUND MAXIMUM -         BOX30092
C - SUGGEST 2.5                                                           BOX30093
C     I3 - NUMBER OF POINTS TO BE PLOTTED (MAX= 75)                       BOX30094
C 3.TREATMENT COMBINATIONS IN TRIPLETS - (16F5.3)                         BOX30095
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION            BOX30096
C     ONE SET PER CARD - (10F6.3)                                         BOX30097
C 5.99 IN COLS. 79-80 INDICATES END OF DATA, ANOTHER DECK TO FOLLOW       BOX30098
C   98 IN COLS. 79-80 INDICATES END OF JOB - CALL EXIT AFTER THIS DECK    BOX30099
C 6.IF OPTION 10 IS USED, CONTROL CARD - (13F6.2)                         BOX30100
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C    10F6.2 - 10 CONTOUR LEVELS IN UNITS OF THE DEPENDENT VARIABLE          BOX30101
C    3F6.2 - 3 FACTOR LIMITS FOR PLOTTING IN UNITS OF THE INDEPENDENT       BOX30102
C VARIABLES                                                                 BOX30103
C 7.REPEAT 1. TO 6. AS REQUIRED                                             BOX30104
C                                                                           BOX30105
C   STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWBOX30106
C PAPER                                                                     BOX30107
C                                                                           BOX30108
      INTEGER P,Q                                                           BOX30109
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)BOX30110
     1,N4,N5,AN4,NNNN,D,AA(4),CONST                                         BOX30111
      DEFINE FILE 21(320,6,U,KK1)                                           BOX30112
   88 FORMAT(50HOZERO Y OBSERVATION - PROCEEDING TO NEXT DATA DECK///)      BOX30113
   87 FORMAT(50HOZERO X OBSERVATION - PROCEEDING TO NEXT DATA DECK///)      BOX30114
   86 FORMAT('0CONSTANT ADDED    Y + 'F5.3/'0INITIAL ESTIMATES'//7X'A1'1BOX30115
     13X'A2'13X'A3'13X'C'/4E15.7/)                                          BOX30116
   85 FORMAT(' INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DBOX30117
     1ATA DECK'///)                                                         BOX30118
   84 FORMAT(16F5.3)                                                        BOX30119
   83 FORMAT(I1,2I2,5F5.3,2I3,F5.3,I3)                                      BOX30120
   82 FORMAT('1'12A6)                                                       BOX30121
   81 FORMAT(10F6.3,18X,I2)                                                 BOX30122
   80 FORMAT(12A6)                                                          BOX30123
   79 FORMAT(6E15.5,I6)                                                     BOX30124
   78 FORMAT('0MAXIMUM LIKELIHOOD ESTIMATES'//7X'A1'13X'A2'13X'A3'13X'C'BOX30125
     114X'SSD'10X'ITER    ALLOWED'/5E15.7,2I7/)                           BOX30126
   77 FORMAT('0'6X'A1'13X'A2'13X'A3'13X'C'14X'SSD'13X'R'9X'ITER')          BOX30127
      P=5                                                                   BOX30128
      Q=8                                                                   BOX30129
      V2=0.0                                                                BOX30130
      J3=13                                                                 BOX30131
    5 READ(Q,80)TITL                                                        BOX30132
      WRITE(P,82)TITL                                                       BOX30133
      READ(Q,83)N5,N1,IREP,CONST,AA,N10,N11,AN4,N4                          BOX30134
      IF(N4-75)24,24,25                                                     BOX30135
   25 N4=75                                                                 BOX30136
   24 WRITE(P,86)CONST,AA                                                   BOX30137
      N5=N5+1                                                               BOX30138
      READ(Q,84)((X(I,J),J=1,3),I=1,N1)                                     BOX30139
      I=0                                                                   BOX30140
   22 I=I+1                                                                 BOX30141
      READ(Q,81)(Y(I,J),J=1,10),ID                                          BOX30142
      IF(ID-98)9,23,23                                                      BOX30143
    9 DO 39 J=1,IREP                                                        BOX30144
   39 Y(I,J)=Y(I,J)+CONST                                                   BOX30145
      GO TO 22                                                              BOX30146
   23 N2=I-1                                                                BOX30147
      IF(N1-N2)2,4,2                                                        BOX30148
    2 WRITE(P,85)                                                           BOX30149
   44 IF(ID-98)45,6,45                                                      BOX30150
   45 CALL DATSW(10,J10)                                                    BOX30151
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      GO TO (46,5),J10                                          BOX30152
   46 READ(Q,81)B                                               BOX30153
      GO TO 5                                                   BOX30154
    6 CALL EXIT                                                 BOX30155
    4 N=N1*IREP                                                 BOX30156
      DO 40 I=1,N1                                              BOX30157
      DO 41 J=1,3                                               BOX30158
      IF(X(I,J))42,42,41                                        BOX30159
   41 CONTINUE                                                  BOX30160
      DO 40 J=1,IREP                                            BOX30161
      IF(Y(I,J))43,43,40                                        BOX30162
   40 CONTINUE                                                  BOX30163
      GO TO 47                                                  BOX30164
   42 WRITE(P,87)                                               BOX30165
      GO TO 44                                                  BOX30166
   43 WRITE(P,88)                                               BOX30167
      GO TO 44                                                  BOX30168
   47 DO 16 J=1,3                                               BOX30169
      IF(AA(J))26,17,26                                         BOX30170
   17 DO 18 I=1,N1                                              BOX30171
   18 X(I,J)=ALOG(X(I,J))                                       BOX30172
      GO TO 29                                                  BOX30173
   26 IF(ABS(AA(J))-100.0)16,27,16                              BOX30174
   27 DO 28 I=1,N1                                              BOX30175
   28 X(I,J)=EXP(AA(J)*X(I,J)/100.)                             BOX30176
   29 AA(J)=1.0                                                 BOX30177
   16 CONTINUE                                                  BOX30178
      IF(AA(4))19,20,19                                         BOX30179
   20 DO 21 I=1,N1                                              BOX30180
      DO 21 J=1,IREP                                            BOX30181
   21 Y(I,J)=ALOG(Y(I,J))                                       BOX30182
      GO TO 33                                                  BOX30183
   19 IF(ABS(AA(4))-100.)31,30,31                               BOX30184
   30 DO 32 I=1,N1                                              BOX30185
      DO 32 J=1,IREP                                            BOX30186
   32 Y(I,J)=EXP(AA(4)*Y(I,J)/100.)                             BOX30187
   33 AA(4)=1.0                                                 BOX30188
   31 D=0.0                                                     BOX30189
      DO 15 I=1,N1                                              BOX30190
      DO 15 J=1,IREP                                            BOX30191
   15 D=D+ALOG(Y(I,J))                                          BOX30192
      DO 7 J=1,4                                                BOX30193
    7 A4(J)=AA(J)                                               BOX30194
      NNNN=N10                                                  BOX30195
      CALL CMLE3(5,ITER,V2,J3)                                  BOX30196
      WRITE(P,78)A4,SSY,ITER,NNNN                               BOX30197
      DO 3 J=1,4                                                BOX30198
    3 A3(J)=A4(J)                                               BOX30199
      CALL DATSW(9,J9)                                          BOX30200
      GO TO (13,12),J9                                          BOX30201
   12 CALL DATSW(8,J8)                                          BOX30202
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      GO TO (34,35),J8                                          BOX30203
   34 CALL LINK(CPAR3)                                          BOX30204
   35 N4=2                                                      BOX30205
      CALL LINK(INFO3)                                          BOX30206
   13 SSY1=SSY                                                  BOX30207
      AN5=N4-1                                                  BOX30208
      DO 1 J=1,4                                                BOX30209
      GO TO (10,10,10,11),J                                     BOX30210
   10 GO TO (14,14,1),N5                                        BOX30211
   11 GO TO (14,1,14),N5                                        BOX30212
   14 WRITE(P,77)                                               BOX30213
      X4=A3(J)-AN4                                              BOX30214
      A=2.0*(A3(J)-X4)                                          BOX30215
      DO 8 JJ=1,4                                               BOX30216
    8 A4(JJ)=A3(JJ)                                             BOX30217
      DO 38 I=1,N4                                              BOX30218
      DO 36 K=1,4                                               BOX30219
      IF(ABS(A4(K))-5.0)36,36,37                                BOX30220
   37 A4(K)=A3(K)                                               BOX30221
   36 CONTINUE                                                  BOX30222
      A4(J)=I*A/AN5+X4-A/AN5                                    BOX30223
      NNNN=N11                                                  BOX30224
      CALL CMLE3(J,ITER,V2,J3)                                  BOX30225
      R=N*ALOG(SSY1/SSY)/2.0                                    BOX30226
      R=EXP(R)                                                  BOX30227
      WRITE(P,79)A4,SSY,R,ITER                                  BOX30228
      K=(J-1)*N4+I                                              BOX30229
      WRITE(21'K)R                                              BOX30230
   38 CONTINUE                                                  BOX30231
    1 CONTINUE                                                  BOX30232
      CALL LINK(PMLR3)                                          BOX30233
      END                                                       BOX30234
// DUP                                                          BOX30235
*DELETE            BOX3                                        BOX30236
*STORE      WS  UA  BOX3                                        BOX30237
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// JOB                                                                  CRLF3000
// FOR                                                                  CRLF3001
*LIST ALL                                                               CRLF3002
*NAME CRLF3                                                             CRLF3003
*EXTENDED PRECISION                                                     CRLF3004
*ONE WORD INTEGERS                                                      CRLF3005
*IOCS(KEYBOARD)                                                         CRLF3006
*IOCS(TYPEWRITER)                                                       CRLF3007
*IOCS(1403 PRINTER)                                                     CRLF3008
*IOCS(2501 READER)                                                      CRLF3009
C                                                                       CRLF3010
C      THIS PROGRAM IS DESIGNED FOR COMPLETE CONSOLE CONTROL.           CRLF3011
C                                                                       CRLF3012
C      THIS PROGRAM ANALYZES DATA IN THE SAME MANNER AS BOX3, BUT ONLY  CRLF3013
C FOR TEST VALUES OF THE POWER TRANSFORMATIONS WHICH ARE ENTERED ON THE CRLF3014
C CONSOLE TYPEWRITER.  THE RELATIVE LIKELIHOOD OF THESE TEST VALUES, AS CRLF3015
C COMPARED WITH THE MAXIMUM LIKELIHOOD ESTIMATES, IS CALCULATED.        CRLF3016
C VARIOUS TEST VALUES MAY BE ENTERED, AND THE COMPLETE ANALYSIS DONE ON CRLF3017
C ANY LIKELY VALUES SELECTED FROM THESE.  SEE BOX3 FOR DETAILS OF THE   CRLF3018
C ANALYSIS.                                                             CRLF3019
C                                                                       CRLF3020
C      PREDICTED VALUES OF THE RESPONSE VARIABLE MAY BY CALCULATED FOR  CRLF3021
C ANY SPECIFIED FACTOR VALUES. THE CANONICAL VARIABLES MAY BE CALCULATEDCRLF3022
C FROM GIVEN FACTOR VALUES AND VICE VERSA.  FORMAT(F15.5)               CRLF3023
C                                                                       CRLF3024
C    NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                 CRLF3025
C                                                                       CRLF3026
C    LINKS CALLED                                                       CRLF3027
C                                                                       CRLF3028
C    CRLF3 - CALCULATES RELATIVE LIKELIHOODS OF VARIOUS TEST VALUES OF  CRLF3029
C  TRANSFORMS                                                           CRLF3030
C    INFO3 - CALULATES INFORMATION AND VARIANCE-COVARIANCE MATRICES     CRLF3031
C    ANVA3 - PERFORMS ANALYSIS OF VARIANCE                              CRLF3032
C    COEF3 - CALCULATES AND PLOTS POINTS FOR MLR GRAPHS OF THE B(J)     CRLF3033
C  COEFFICIENTS                                                         CRLF3034
C    EIGN3 - PERFORMS CANONICAL ANALYSIS                                CRLF3035
C    CENT3 - CALCULATES POINTS FOR THE MLR GRAPHS OF THE CENTRE         CRLF3036
C            COORDINATES                                                CRLF3037
C    PCNT3 - PLOTS MLR GRAPHS OF THE COORDINATES OF THE RESPONSE CENTRE CRLF3038
C    CRS3  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS        CRLF3039
C    PRS3  - PLOTS RESPONSE SURFACE CONTOURS                            CRLF3040
C                                                                       CRLF3041
C    SUBROUTINES CALLED                                                 CRLF3042
C                                                                       CRLF3043
C    MATV  - INVERTS MATRICES                                           CRLF3044
C    CAN3  - DIAGONALIZES MATRICES                                      CRLF3045
C    JACOB - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES    CRLF3046
C                                                                       CRLF3047
C    OPTIONS                                                            CRLF3048
C                                                                       CRLF3049
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C SWITCH 10 UP - PLOT RESPONSE SURFACE CONTOURS                          CRLF3050
C SWITCH  8 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF B(J) COEFFICIENTS     CRLF3051
C SWITCH  7 UP - PLOT MAXIMUM LIKELIHOOD RATIOS OF THE CENTRE            CRLF3052
C                COORDINATES                                             CRLF3053
C SWITCH  6 UP - ENTER ALTERNATE CONTOUR LEVELS IF IMAGINARY POINT FOUNDCRLF3054
C                WHEN PLOTTING CONTOURS                                  CRLF3055
C                                                                        CRLF3056
C   MAKEUP OF DATA DECK                                                  CRLF3057
C                                                                        CRLF3058
C 1.TITLE CARD FIRST - (12A6)                                            CRLF3059
C 2.CONTROL CARD - (1X,2I2,F5.3)                                         CRLF3060
C      I2 - NUMBER OF TREATMENT COMBINATIONS                             CRLF3061
C      I2 - NUMBER OF OBSERVATION SETS                                   CRLF3062
C      F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                    CRLF3063
C 3.TREATMENT COMBINATIONS IN TRIPLETS - (16F5.3)                        CRLF3064
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION           CRLF3065
C      ONE SET PER CARD - (10F6.3)                                       CRLF3066
C 5.98 OR 99 IN COLS. 79-80 INDICATES END OF DATA                        CRLF3067
C 6.REPEAT 1. TO 5. AS REQUIRED                                          CRLF3068
C                                                                        CRLF3069
C   STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWCRLF3070
C PAPER                                                                  CRLF3071
C                                                                        CRLF3072
      INTEGER P,Q                                                        CRLF3073
      DIMENSION EVA(12),EVE(12,12),ZZ(3),X3(3),XS(3),X4(12)              CRLF3074
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY1,N,IREP,TITL(12),ID,A3(4CRLF3075
     1),N4,X1(10),SSXY(10),YY1(100),SSX(12,12)                          CRLF3076
      COMMON Y2(100,10)                                                  CRLF3077
      EQUIVALENCE (X3(1),X4(1))                                          CRLF3078
   99 FORMAT('TYPE IN X1, X2 AND X3 IN UNTRANSFORMED UNITS')             CRLF3079
   98 FORMAT('0X VARIABLES CALCULATED FROM CANONICAL VARIABLES')         CRLF3080
   97 FORMAT('TYPE IN Z1, Z2 AND Z3')                                    CRLF3081
   96 FORMAT('TYPE IN EIGENVALUES AND -VECTORS BY ROWS AS IN PRINTOUT')  CRLF3082
   95 FORMAT(4E15.5)                                                     CRLF3083
   94 FORMAT('0PREDICTED VALUE OF Y FOR GIVEN X1, X2 AND X3'/'0'7X'Y'13XCRLF3084
     1'X1'13X'X2'13X'X3')                                               CRLF3085
   93 FORMAT('0VALUES OF B(J) COEFFICIENTS'/10E12.5)                     CRLF3086
   92 FORMAT('0TEST VALUES OF POWER TRANSFORMATIONS'/'0'6X'A1'13X'A2'13XCRLF3087
     1'A3'13X'C'/4E15.5)                                                CRLF3088
   91 FORMAT('TYPE IN VALUES OF X1, X2 AND X3')                          CRLF3089
   90 FORMAT(I2)                                                         CRLF3090
   89 FORMAT('TYPE IN NUMBER OF VALUES OF Y TO BE PREDICTED  I2 FORMAT')CRLF3091
   88 FORMAT('0CONSTANT ADDED    Y + 'F7.3)                              CRLF3092
   87 FORMAT('INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DACRLF3093
     1TA DECK')                                                         CRLF3094
   86 FORMAT(16F5.3)                                                     CRLF3095
   85 FORMAT('IF RELATIVE LIKELIHOOD IS SATISFACTORY, PRESS EOF'/ 'IF NOCRLF3096
     1T, TYPE 1 TO TRY NEW TEST VALUES, -1 TO READ MORE DATA OR CALL EXICRLF3097
     2T')                                                               CRLF3098
   84 FORMAT('0TEST VALUES OF POWER TRANSFORMATIONS'/'0'6X'A1'13X'A2'13XCRLF3099
     1'A3'13X'C'14X'SSD'13X'R'/6E15.5)                                  CRLF3100
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83 FORMAT('0MAXIMUM LIKELIHOOD ESTIMATES'//7X'A1'13X'A2'13X'A3'13X'C'CRLF3101
  114X'SSD'/5E15.5)                                                CRLF3102
82 FORMAT('1'12A6)                                                 CRLF3103
81 FORMAT(10F6.3,18X,I2)                                           CRLF3104
80 FORMAT(12A6)                                                    CRLF3105
79 FORMAT('TYPE IN THREE MAXIMUM LIKELIHOOD ESTIMATES OF POWER TRANSFCRLF3106
  10RMATIONS FOR INDEPENDENT VARIABLES'/'THEN, ONE ML ESTIMATE FOR DECRLF3107
  2PENDENT VARIABLE')                                              CRLF3108
78 FORMAT(1X,2I2,F5.3)                                             CRLF3109
77 FORMAT('TYPE 1 TO READ NEW DATA DECK, EOF TO READ NEW TEST VALUES CRLF3110
  10N SAME DATA, -1 TO CALL EXIT')                                 CRLF3111
76 FORMAT(I3)                                                      CRLF3112
75 FORMAT(F15.5)                                                   CRLF3113
74 FORMAT('TYPE IN THREE TEST VALUES OF POWER TRANSFORMATIONS FOR INDCRLF3114
  1EPENDENT VARIABLES'/'THEN, ONE FOR DEPENDENT VARIABLE'/'TYPE 0.0 FCRLF3115
  2OR LOG TRANSFORM, + OR - 100 FOR EXPONENTIAL TRANSFORM'/'DATA DECKCRLF3116
  3 MUST BE REREAD TO REGAIN ORIGINAL VARIABLE VALUES WITH THESE 3') CRLF3117
73 FORMAT('RELATIVE LIKELIHOOD IS'F8.5)                            CRLF3118
72 FORMAT('SWITCH 10 UP TO PLOT RESPONSE CONTOURS'/'SWITCH  8 UP TO PCRLF3119
  1LOT MLR GRAPHS OF B(J) COEFFICIENTS'/'SWITCH  7 UP TO PLOT MLR GRACRLF3120
  2PHS OF THE COORDINATES OF THE RESPONSE CENTRE'/'SWITCH 6 UP TO ENTCRLF3121
  3ER NEW CONTOUR LEVELS OR FACTOR LIMITS IF IMAGINARY POINTS ARE FOUCRLF3122
  4ND')                                                            CRLF3123
71 FORMAT('TYPE IN EOF TO CONTINUE,-1 TO CALCULATE CANONICAL VARIABLECRLF3124
  1S FROM X''S,'/' OR 1 TO CALCULATE X''S FROM CANONICAL VARIABLES') CRLF3125
70 FORMAT('TYPE IN NUMBER OF SOLUTIONS  FORMAT I2')                CRLF3126
69 FORMAT('TYPE IN COORDINATES OF CENTRE, X1S, X2S, X3S, AND YS IN UNCRLF3127
  1TRANSFORMED UNITS')                                             CRLF3128
67 FORMAT('0CANONICAL VARIABLES CALCULATED FROM X VARIABLES')      CRLF3129
66 FORMAT('0'9X'Y EST'11X'X1'13X'X2'13X'X3'13X'Z1'13X'Z2'13X'Z3')  CRLF3130
65 FORMAT(7F15.3)                                                  CRLF3131
   P=5                                                             CRLF3132
   Q=8                                                             CRLF3133
   WRITE(1,72)                                                     CRLF3134
18 WRITE(1,77)                                                     CRLF3135
   READ(6,76)N5                                                    CRLF3136
   N6=1                                                            CRLF3137
   N4=1                                                            CRLF3138
   IF(N5)19,1,2                                                    CRLF3139
 2 READ(Q,80)TITL                                                  CRLF3140
   WRITE(1,80)TITL                                                 CRLF3141
   READ(Q,78)N1,IREP,CONST                                         CRLF3142
   N=N1*IREP                                                       CRLF3143
   READ(Q,86)((X(I,J),J=1,3),I=1,N1)                               CRLF3144
   I=0                                                             CRLF3145
10 I=I+1                                                           CRLF3146
   READ(Q,81)(Y(I,J),J=1,10),ID                                    CRLF3147
   IF(ID-98)21,11,11                                               CRLF3148
21 DO 61 J=1,IREP                                                  CRLF3149
61 Y(I,J)=Y(I,J)+CONST                                             CRLF3150
   GO TO 10                                                        CRLF3151
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11 N2=I-1                                                          CRLF3152
   IF(N1-N2)22,1,22                                                CRLF3153
22 WRITE(1,87)                                                     CRLF3154
   GO TO 18                                                        CRLF3155
 1 N1=N/IREP                                                       CRLF3156
   D=0.0                                                           CRLF3157
   DO 27 I=1,N1                                                    CRLF3158
   DO 27 J=1,IREP                                                  CRLF3159
27 D=D+ALOG(Y(I,J))                                                CRLF3160
   IF(N5)20,25,20                                                  CRLF3161
20 WRITE(1,79)                                                     CRLF3162
   READ(6,75)A3                                                    CRLF3163
36 DD=EXP(D*(A3(4)-1.)/FLOAT(N))                                   CRLF3164
   DO 41 I=1,N1                                                    CRLF3165
   DO 41 J=1,IREP                                                  CRLF3166
41 Y2(I,J)=(Y(I,J)**A3(4)-1.)/A3(4)/DD                             CRLF3167
 8 SSY2=0.0                                                        CRLF3168
   DO 24 K=1,N1                                                    CRLF3169
   DO 24 J=1,IREP                                                  CRLF3170
24 SSY2=SSY2+Y2(K,J)*Y2(K,J)                                       CRLF3171
   DO 26 I=1,N1                                                    CRLF3172
   YY1(I)=0.0                                                      CRLF3173
   DO 26 J=1,IREP                                                  CRLF3174
26 YY1(I)=YY1(I)+Y2(I,J)/IREP                                      CRLF3175
   DO 3 I=1,10                                                     CRLF3176
   B(I)=0.0                                                        CRLF3177
   DO 3 J=1,10                                                     CRLF3178
 3 SSX(I,J)=0.0                                                    CRLF3179
   X1(1)=1.0                                                       CRLF3180
   DO 4 K=1,N1                                                     CRLF3181
   DO 5 J=2,4                                                      CRLF3182
   X1(J)=X(K,J-1)**A3(J-1)                                         CRLF3183
 5 X1(J+3)=X1(J)*X1(J)                                             CRLF3184
   X1(8)=X1(2)*X1(3)                                               CRLF3185
   X1(9)=X1(2)*X1(4)                                               CRLF3186
   X1(10)=X1(3)*X1(4)                                              CRLF3187
   DO 4 I=1,10                                                     CRLF3188
   B(I)=B(I)+YY1(K)*X1(I)                                          CRLF3189
   DO 4 J=1,10                                                     CRLF3190
 4 SSX(I,J)=SSX(I,J)+X1(I)*X1(J)                                   CRLF3191
   DO 9 I=1,10                                                     CRLF3192
 9 SSXY(I)=B(I)                                                    CRLF3193
   CALL MATV(SSX,10,B,1,DET)                                       CRLF3194
   IF(N6)14,13,14                                                  CRLF3195
13 SSY=SSY2                                                        CRLF3196
   DO 15 I=1,10                                                    CRLF3197
15 SSY=SSY-B(I)*SSXY(I)*IREP                                       CRLF3198
   GO TO 12                                                        CRLF3199
14 SSY1=SSY2                                                       CRLF3200
   DO 6 I=1,10                                                     CRLF3201
 6 SSY1=SSY1-B(I)*SSXY(I)*IREP                                     CRLF3202
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      DO 7 I=1,4                                                    CRLF3203
    7 A4(I)=A3(I)                                                   CRLF3204
   25 WRITE(1,74)                                                   CRLF3205
      READ(6,75)A3                                                  CRLF3206
      N6=0                                                          CRLF3207
      DO 28 J=1,3                                                   CRLF3208
      IF(A3(J))32,23,32                                             CRLF3209
   23 DO 29 I=1,N1                                                  CRLF3210
   29 X(I,J)=ALOG(X(I,J))                                           CRLF3211
      GO TO 33                                                      CRLF3212
   32 IF(ABS(A3(J))-100.)28,34,28                                   CRLF3213
   34 DO 35 I=1,N1                                                  CRLF3214
   35 X(I,J)=EXP(A3(J)*X(I,J)/100.)                                 CRLF3215
   33 A3(J)=1.0                                                     CRLF3216
   28 CONTINUE                                                      CRLF3217
      IF(A3(4))30,31,30                                             CRLF3218
   31 DO 16 I=1,N1                                                  CRLF3219
      DO 16 J=1,IREP                                                CRLF3220
      Y(I,J)=ALOG(Y(I,J))                                           CRLF3221
   16 Y2(I,J)=Y(I,J)*EXP(D/FLOAT(N))                                CRLF3222
      GO TO 37                                                      CRLF3223
   30 IF(ABS(A3(4))-100.)36,38,36                                   CRLF3224
   38 DD=0.0                                                        CRLF3225
      DO 40 I=1,N1                                                  CRLF3226
      DO 40 J=1,IREP                                                CRLF3227
   40 DD=DD+Y(I,J)/N                                                CRLF3228
      DD=EXP(-A3(4)*DD/100.)                                        CRLF3229
      DO 39 I=1,N1                                                  CRLF3230
      DO 39 J=1,IREP                                                CRLF3231
      Y(I,J)=EXP(A3(4)*Y(I,J)/100.)                                 CRLF3232
   39 Y2(I,J)=Y(I,J)*DD*A3(4)/100.                                  CRLF3233
   37 A3(4)=1.0                                                     CRLF3234
      GO TO 8                                                       CRLF3235
   12 R1=N*ALOG(SSY1/SSY)/2.0                                       CRLF3236
      R1=EXP(R1)                                                    CRLF3237
      WRITE(1,89)                                                   CRLF3238
      READ(6,90)N7                                                  CRLF3239
      IF(N7)43,43,44                                                CRLF3240
   44 WRITE(P,82)TITL                                               CRLF3241
      WRITE(P,92)A3                                                 CRLF3242
      DO 45 I=1,10                                                  CRLF3243
   45 B(I)=B(I)*A3(4)*DD                                            CRLF3244
      B(1)=B(1)+1.0                                                 CRLF3245
      WRITE(P,93)(B(I),I=1,10)                                      CRLF3246
      WRITE(P,94)                                                   CRLF3247
      DO 42 J=1,N7                                                  CRLF3248
      WRITE(1,91)                                                   CRLF3249
      READ(6,75)XX1,XX2,XX3                                         CRLF3250
      XX1=XX1**A3(1)                                                CRLF3251
      XX2=XX2**A3(2)                                                CRLF3252
      XX3=XX3**A3(3)                                                CRLF3253
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   Z=B(1)+B(2)*XX1+B(3)*XX2+B(4)*XX3+B(5)*XX1*XX1+B(6)*XX2*XX2+B(7)*XCRLF3254
  1X3*XX3+B(8)*XX1*XX2+B(9)*XX1*XX3+B(10)*XX2*XX3                  CRLF3255
   Z=Z**(1.0/A3(4))                                                CRLF3256
   XX1=XX1**(1.0/A3(1))                                            CRLF3257
   XX2=XX2**(1.0/A3(2))                                            CRLF3258
   XX3=XX3**(1.0/A3(3))                                            CRLF3259
42 WRITE(P,95)Z,XX1,XX2,XX3                                        CRLF3260
43 WRITE(1,71)                                                     CRLF3261
   READ(6,76)N8                                                    CRLF3262
   IF(N8)47,46,47                                                  CRLF3263
47 WRITE(P,82)TITL                                                 CRLF3264
   WRITE(P,92)A3                                                   CRLF3265
   IF(N8)56,46,57                                                  CRLF3266
56 WRITE(P,67)                                                     CRLF3267
   GO TO 58                                                        CRLF3268
57 WRITE(P,98)                                                     CRLF3269
58 WRITE(P,66)                                                     CRLF3270
   WRITE(1,70)                                                     CRLF3271
   READ(6,90)N7                                                    CRLF3272
   WRITE(1,69)                                                     CRLF3273
   READ(6,75)XS,YS                                                 CRLF3274
   WRITE(1,96)                                                     CRLF3275
   READ(6,75)(EVA(I),(EVE(I,J),J=1,3),I=1,3)                       CRLF3276
   IF(N8)59,46,60                                                  CRLF3277
60 CALL MATV(EVE,3,X4,0,DET)                                       CRLF3278
59 DO 53 II=1,N7                                                   CRLF3279
   IF(N8)48,46,49                                                  CRLF3280
49 WRITE(1,97)                                                     CRLF3281
   READ(6,75)ZZ                                                    CRLF3282
   DO 50 I=1,3                                                     CRLF3283
   X3(I)=0.0                                                       CRLF3284
   DO 50 J=1,3                                                     CRLF3285
50 X3(I)=X3(I)+ZZ(J)*EVE(I,J)                                      CRLF3286
   DO 54 I=1,3                                                     CRLF3287
54 X3(I)=(X3(I)+XS(I)**A3(I))**(1.0/A3(I))                         CRLF3288
   GO TO 52                                                        CRLF3289
48 WRITE(1,99)                                                     CRLF3290
   READ(6,75)X3                                                    CRLF3291
   DO 55 I=1,3                                                     CRLF3292
   ZZ(I)=0.0                                                       CRLF3293
   DO 55 J=1,3                                                     CRLF3294
55 ZZ(I)=ZZ(I)+(X3(J)**A3(J)-XS(J)**A3(J))*EVE(I,J)                CRLF3295
52 Z=YS                                                            CRLF3296
   DO 51 I=1,3                                                     CRLF3297
51 Z=Z+ZZ(I)**2*EVA(I)                                             CRLF3298
53 WRITE(P,65)Z,X3,ZZ                                              CRLF3299
46 WRITE(1,73)R1                                                   CRLF3300
   WRITE(P,82)TITL                                                 CRLF3301
   WRITE(P,88)CONST                                                CRLF3302
   WRITE(P,83)A4,SSY1                                              CRLF3303
   WRITE(P,84)A3,SSY,R1                                            CRLF3304
```

```
      WRITE(1,85)                                          CRLF3305
      READ(6,76)N5                                         CRLF3306
      IF(N5)18,17,25                                       CRLF3307
   17 CALL LINK(INF03)                                     CRLF3308
   19 CALL EXIT                                            CRLF3309
      END                                                  CRLF3310
// DUP                                                     CRLF3311
*DELETE              CRLF3                                CRLF3312
*STORE       WS  UA  CRLF3                                CRLF3313
```

```
// JOB                                                                  PRRE3000
// FOR                                                                  PRRE3001
*LIST ALL                                                               PRRE3002
*NAME PRRE3                                                             PRRE3003
*EXTENDED PRECISION                                                     PRRE3004
*ONE WORD INTEGERS                                                      PRRE3005
*IOCS(KEYBOARD)                                                         PRRE3006
*IOCS(TYPEWRITER)                                                       PRRE3007
*IOCS(1403 PRINTER)                                                     PRRE3008
*IOCS(2501 READER)                                                      PRRE3009
C                                                                       PRRE3010
C      THIS PROGRAM PLOTS THE RESPONSE SURFACE FOR A REDUCED EQUATION,  PRRE3011
C  WITH SOME B(J) COEFFICIENTS ZERO, FROM THE DATA OF BOX3. THE NEW     PRRE3012
C  COEFFICIENTS TO BE SUPPLIED MAY BE CALCULATED USING A MULTIPLE       PRRE3013
C  REGRESSION PROGRAM SUCH AS MREG1.                                    PRRE3014
C                                                                       PRRE3015
C     NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                PRRE3016
C                                                                       PRRE3017
C    LINKS CALLED                                                       PRRE3018
C                                                                       PRRE3019
C  SLIC3 - CALCULATES EIGENVALUES AND VECTORS FOR SLICES OF RESPONSE    PRRE3020
C SURFACE                                                               PRRE3021
C  CRS3  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS          PRRE3022
C  PRS3  - PLOTS RESPONSE SURFACE CONTOURS                              PRRE3023
C                                                                       PRRE3024
C    SUBROUTINES CALLED                                                 PRRE3025
C                                                                       PRRE3026
C  MATV  - INVERTS MATRICES                                             PRRE3027
C  CAN3  - DIAGONALIZES MATRICES                                        PRRE3028
C  JACOB - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES      PRRE3029
C                                                                       PRRE3030
C    OPTIONS                                                            PRRE3031
C                                                                       PRRE3032
C SWITCH  6 UP - ENTER ALTERNATE CONTOUR LEVELS IF IMAGINARY POINT FOUNDPRRE3033
C                WHEN PLOTTING CONTOURS                                 PRRE3034
C                                                                       PRRE3035
C    MAKEUP OF DATA DECK                                                PRRE3036
C                                                                       PRRE3037
C 1.TITLE CARD FIRST - (12A6)                                           PRRE3038
C 2.CONTROL CARD - (1X,2I2,F5.3)                                        PRRE3039
C       I2 - NUMBER OF TREATMENT COMBINATIONS                           PRRE3040
C       I2 - NUMBER OF OBSERVATION SETS                                 PRRE3041
C       F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                  PRRE3042
C 3.TREATMENT COMBINATIONS IN TRIPLETS - (16F5.3)                       PRRE3043
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION          PRRE3044
C       ONE SET PER CARD - (10F6.3)                                     PRRE3045
C 5.98 OR 99 IN COLS. 79-80 INDICATES END OF DATA                       PRRE3046
C 6.REPEAT 1. TO 5. AS REQUIRED                                         PRRE3047
C                                                                       PRRE3048
C    STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWPRRE3049
```

```
C PAPER                                                                 PRRE3050
C                                                                       PRRE3051
      INTEGER P,Q                                                       PRRE3052
      DIMENSION ALAM1(3),ALAM2(3),PREP1(3,3),PREP2(3,3)                 PRRE3053
      COMMON Y(100,10),X(100,3),V(12),A4(4),SSY,NS,NREPS,TITL(12),ID,A3(PRRE3054
     14),N4,N5,YS2(6),V1(3,2),ALAMD(3,2),PREP(3,3,2),Z(3),YDEV(100),COE(PRRE3055
     212),NNN(4),XC(100,3),BA(12,12)                                    PRRE3056
      EQUIVALENCE (ALAMD(1,1),ALAM1(1)),(ALAMD(1,2),ALAM2(1)),(PREP(1,1,PRRE3057
     11),PREP1(1,1)),(PREP(1,1,2),PREP2(1,1))                           PRRE3058
   99 FORMAT('INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DAPRRE3059
     1TA DECK')                                                         PRRE3060
   98 FORMAT('TYPE 1 TO READ NEW DATA DECK, EOF TO READ NEW TEST VALUES PRRE3061
     1ON SAME DATA, -1 TO CALL EXIT')                                   PRRE3062
   97 FORMAT(10F6.3,18X,I2)                                             PRRE3063
   96 FORMAT('TYPE IN 3 VALUES OF POWER TRANSFORMATIONS FOR INDEPENDENT PRRE3064
     1VARIABLES,'/'THEN, ONE FOR DEPENDENT VARIABLE'/'TYPE 0.0 FOR LOG TPRRE3065
     2RANSFORM, + OR - 100 FOR EXPONENTIAL TRANSFORM'/'DATA DECK MUST BEPRRE3066
     3 REREAD TO REGAIN ORIGINAL VARIABLE VALUES WITH THESE 3')          PRRE3067
   95 FORMAT(F15.5)                                                     PRRE3068
   94 FORMAT(52HTYPE IN 10 B(J) COEFFICIENTS - E13.6 - +0.000000E 00)   PRRE3069
   93 FORMAT('0VALUES OF B(J) COEFFICIENTS'/1X10E12.4)                  PRRE3070
   92 FORMAT(16F5.3)                                                    PRRE3071
   91 FORMAT(1X,2I2,F5.3)                                               PRRE3072
   90 FORMAT(12A6)                                                      PRRE3073
   89 FORMAT(1HO,8X,'EIGEN VALUES',10X,'EIGEN VECTORS AS ROWS',/,)      PRRE3074
   88 FORMAT('0'2(E11.4,'=YS'3X)'IN ORIGINAL UNITS'/)                   PRRE3075
   87 FORMAT(1HO,6(E11.4,'=X'I1'S'2X)' IN ORIGINAL UNITS')              PRRE3076
   86 FORMAT(I3,9E13.5)                                                 PRRE3077
   85 FORMAT(1HO,1X,'TABLE OF RESIDUALS')                               PRRE3078
   84 FORMAT(I3)                                                        PRRE3079
   83 FORMAT(E13.6)                                                     PRRE3080
   82 FORMAT('1'12A6)                                                   PRRE3081
   81 FORMAT(1HO,5X,3HY -,E15.6,3H = ,3(2H +,E15.6,2H Z,I1,3H SQ),/,)   PRRE3082
   80 FORMAT(1HO,7X,'Y EST',8X,'Y OBS',9X,'DEVN',17X,'VALUES OF Z',28X,'PRRE3083
     1FACTOR LEVELS'/)                                                  PRRE3084
   79 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.PRRE3085
     14'  A2 ='F8.4'  A3 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIPRRE3086
     2ABLE - C ='F8.4)                                                  PRRE3087
   78 FORMAT( 52HO CANONICAL REGRESSION   (Z ARE CANONICAL VARIABLES),/)PRRE3088
   77 FORMAT(29HO  CENTRE OF RESPONSE SURFACE  ,/,)                     PRRE3089
      P=5                                                               PRRE3090
      Q=8                                                               PRRE3091
      N4=3                                                              PRRE3092
      LL=1                                                              PRRE3093
    9 WRITE(1,98)                                                       PRRE3094
      READ(6,84)N5                                                      PRRE3095
      IF(N5)41,1,2                                                      PRRE3096
   41 CALL EXIT                                                         PRRE3097
    2 READ(Q,90)TITL                                                    PRRE3098
      READ(Q,91)N1,NREPS,CONST                                          PRRE3099
      NS=N1*NREPS                                                       PRRE3100
```

```
      READ(Q,92)((X(I,J),J=1,3),I=1,N1)                          PRRE3101
      I=0                                                        PRRE3102
   10 I=I+1                                                      PRRE3103
      READ(Q,97)(Y(I,J),J=1,10),ID                               PRRE3104
      IF(ID-98)21,11,11                                          PRRE3105
   21 DO 61 J=1,NREPS                                            PRRE3106
   61 Y(I,J)=Y(I,J)+CONST                                        PRRE3107
      GO TO 10                                                   PRRE3108
   11 N2=I-1                                                     PRRE3109
      IF(N1-N2)43,1,43                                           PRRE3110
   43 WRITE(1,99)                                                PRRE3111
      GO TO 9                                                    PRRE3112
    1 N1=NS/NREPS                                                PRRE3113
      WRITE(P,82)TITL                                            PRRE3114
      WRITE(1,90)TITL                                            PRRE3115
      WRITE(1,94)                                                PRRE3116
      READ(6,83)(V(I),I=1,10)                                    PRRE3117
      WRITE(1,96)                                                PRRE3118
      READ(6,95)A3                                               PRRE3119
      WRITE(P,79)A3                                              PRRE3120
      WRITE(P,93)(V(I),I=1,10)                                   PRRE3121
      DO 42 J=1,3                                                PRRE3122
      IF(A3(J))5,12,5                                            PRRE3123
   12 DO 13 I=1,N1                                               PRRE3124
   13 X(I,J)=ALOG(X(I,J))                                        PRRE3125
      GO TO 14                                                   PRRE3126
    5 IF(ABS(A3(J))-100.)42,15,42                                PRRE3127
   15 DO 19 I=1,N1                                               PRRF3128
   19 X(I,J)=EXP(A3(J)*X(I,J)/100.)                              PRRE3129
   14 A3(J)=1.0                                                  PRRE3130
   42 CONTINUE                                                   PRRE3131
      IF(A3(4))20,25,20                                          PRRE3132
   25 DO 26 I=1,N1                                               PRRE3133
      DO 26 J=1,NREPS                                            PRRE3134
   26 Y(I,J)=ALOG(Y(I,J))                                        PRRE3135
      GO TO 27                                                   PRRE3136
   20 IF(ABS(A3(4))-100.)28,38,28                                PRRE3137
   38 DO 39 I=1,N1                                               PRRE3138
      DO 39 J=1,NREPS                                            PRRE3139
   39 Y(I,J)=EXP(A3(4)*Y(I,J)/100.)                              PRRE3140
   27 A3(4)=1.0                                                  PRRE3141
   28 DO 45 I=1,N1                                               PRRE3142
      DO 45 J=1,3                                                PRRE3143
   45 XC(I,J)=X(I,J)**A3(J)                                      PRRE3144
      TEMP=V(7)                                                  PRRE3145
      V(7)=V(6)                                                  PRRE3146
      V(6)=V(8)                                                  PRRE3147
      V(8)=V(9)                                                  PRRE3148
      V(9)=V(10)                                                 PRRE3149
      V(10)=TEMP                                                 PRRE3150
      DO 29 J=1,10                                               PRRE3151
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29 COE(J)=V(J)                                                    PRRE3152
   NFAK=3                                                         PRRE3153
   KP=NFAK+2                                                      PRRE3154
   DO 32 I=1,NFAK                                                 PRRE3155
   DO 32 J=1,I                                                    PRRE3156
   IF(I-J)31,30,31                                                PRRE3157
30 PREP(I,J,LL)=V(KP)                                             PRRE3158
   GO TO 32                                                       PRRE3159
31 PREP(I,J,LL)=V(KP)*0.5                                         PRRE3160
   PREP(J,I,LL)=PREP(I,J,LL)                                      PRRE3161
32 KP=KP+1                                                        PRRE3162
   DO 33 I=1,NFAK                                                 PRRE3163
33 V(I)=-V(I+1)*0.500                                             PRRE3164
   DO 34 I=1,NFAK                                                 PRRE3165
   DO 34 J=1,NFAK                                                 PRRE3166
34 BA(I,J)=PREP(I,J,LL)                                           PRRE3167
   WRITE(P,77)                                                    PRRE3168
   CALL MATV(BA,NFAK,V,1,DET)                                     PRRE3169
   YS=COE(1)                                                      PRRE3170
   DO 44 I=1,NFAK                                                 PRRE3171
44 YS=YS+0.500*V(I)*COE(I+1)                                      PRRE3172
   I1=1                                                           PRRE3173
   I2=2                                                           PRRE3174
   I3=3                                                           PRRE3175
   DO 40 I=1,3                                                    PRRE3176
40 NNN(I)=V(I)/ABS(V(I))                                          PRRE3177
   V3=ABS(V(1))**(1./A3(1))*NNN(1)                                PRRE3178
   V4=ABS(V(2))**(1./A3(2))*NNN(2)                                PRRE3179
   V5=ABS(V(3))**(1./A3(3))*NNN(3)                                PRRE3180
   NNN(4)=YS/ABS(YS)                                              PRRE3181
   YS1=ABS(YS)**(1./A3(4))*NNN(4)                                 PRRE3182
   WRITE(P,87)(V(I),I,I=1,NFAK),V3,I1,V4,I2,V5,I3                 PRRE3183
   WRITE(P,88)YS,YS1                                              PRRE3184
   WRITE(P,89)                                                    PRRE3185
   CALL CAN3(PREP1,ALAM1,NFAK)                                    PRRE3186
   WRITE(P,78)                                                    PRRE3187
   WRITE(P,81)YS,(ALAMD(J,LL),J,J=1,NFAK)                         PRRE3188
   WRITE(P,85)                                                    PRRE3189
   WRITE(P,80)                                                    PRRE3190
   DO 18 J=1,N1                                                   PRRE3191
   YPRED=YS                                                       PRRE3192
   DO 16 I=1,NFAK                                                 PRRE3193
   Z(I)=0.0                                                       PRRE3194
   DO 16 L=1,NFAK                                                 PRRE3195
16 Z(I)=Z(I)+(XC(J,L)-V(L))*PREP(I,L,LL)                          PRRE3196
   DO 17 L1=1,NFAK                                                PRRE3197
17 YPRED=YPRED+(Z(L1)**2)*ALAMD(L1,LL)                            PRRE3198
   MM1=YPRED/ABS(YPRED)                                           PRRE3199
   YPRED=MM1*ABS(YPRED)**(1.0/A3(4))                              PRRE3200
   YDEV(J)=0.0                                                    PRRE3201
   DO 51 I=1,NREPS                                                PRRE3202
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   51 YDEV(J)=YDEV(J)+Y(J,I)/NREPS                                    PRRE3203
      YDEV1=YDEV(J)-YPRED                                             PRRE3204
   18 WRITE(P,86)J,YPRED,YDEV(J),YDEV1,(Z(I),I=1,NFAK),(X(J,II),II=1,NFAPRRE3205
     1K)                                                              PRRE3206
      DO 46 I=1,3                                                     PRRE3207
   46 V1(I,LL)=V(I)                                                   PRRE3208
      DO 47 I=1,5                                                     PRRE3209
   47 V(I)=COE(I)                                                     PRRE3210
      V(6)=COE(7)                                                     PRRE3211
      V(7)=COE(10)                                                    PRRE3212
      V(8)=COE(6)                                                     PRRE3213
      V(9)=COE(8)                                                     PRRE3214
      V(10)=COE(9)                                                    PRRE3215
      CALL LINK(SLIC3)                                                PRRE3216
      END                                                             PRRE3217
// DUP                                                                PRRE3218
*DELETE              PRRE3                                          PRRE3219
*STORE       WS  UA  PRRE3                                          PRRE3220
```

```
// JOB                                                                  SRS30000
// FOR                                                                  SRS30001
*LIST ALL                                                               SRS30002
*NAME SRS3                                                              SRS30003
*EXTENDED PRECISION                                                     SRS30004
*ONE WORD INTEGERS                                                      SRS30005
*IOCS(KEYBOARD)                                                         SRS30006
*IOCS(TYPEWRITER)                                                       SRS30007
*IOCS(2501 READER)                                                      SRS30008
C                                                                       SRS30009
C      THIS PROGRAM PLOTS CONTOURS OF THE RESPONSE SURFACE FOR GIVEN    SRS30010
C POWER TRANSFORMATIONS (ENTERED ON THE CONSOLE TYPEWRITER) ON GIVEN     SRS30011
C PLANES PARALLEL TO THE AXES OF THE FACTOR SPACE, DEFINED BY X(I)=KI    SRS30012
C (KI ENTERED ON THE CONSOLE TYPEWRITER).  FOR EACH PLOT, 3 PLANES ARE   SRS30013
C USED, CORRESPONDING TO THE 3 FACTOR AXES.                             SRS30014
C                                                                       SRS30015
C     NEGATIVE VALUES OF X AND Y + CONST ARE NOT ALLOWED                SRS30016
C                                                                       SRS30017
C   LINKS CALLED                                                        SRS30018
C                                                                       SRS30019
C   SLIC3 - CALCULATES EIGENVALUES AND VECTORS FOR SLICES OF RESPONSE    SRS30020
C SURFACE                                                               SRS30021
C   CRS3  - CALCULATES POINTS FOR THE RESPONSE SURFACE CONTOURS          SRS30022
C   PRS3  - PLOTS RESPONSE SURFACE CONTOURS                             SRS30023
C                                                                       SRS30024
C   SUBROUTINES CALLED                                                  SRS30025
C                                                                       SRS30026
C  MATV   - INVERTS MATRICES                                            SRS30027
C  CAN3   - DIAGONALIZES MATRICES                                       SRS30028
C  JACOB  - CALCULATES EIGENVALUES AND VECTORS OF DIAGONAL MATRICES     SRS30029
C                                                                       SRS30030
C   MAKEUP OF DATA DECK                                                 SRS30031
C                                                                       SRS30032
C 1.TITLE CARD FIRST - (12A6)                                           SRS30033
C 2.CONTROL CARD - (1X,2I2,F5.3)                                        SRS30034
C      I2 - NUMBER OF TREATMENT COMBINATIONS                            SRS30035
C      I2 - NUMBER OF OBSERVATION SETS                                  SRS30036
C      F5.3 - CONSTANT ADDED TO DEPENDENT VARIABLE, Y                   SRS30037
C 3.TREATMENT COMBINATIONS IN TRIPLETS - (16F5.3)                       SRS30038
C 4.DATA - SETS OF OBSERVATIONS FOR EACH TREATMENT COMBINATION          SRS30039
C      ONE SET PER CARD - (10F6.3)                                      SRS30040
C 5.98 OR 99 IN COLS. 79-80 INDICATES END OF DATA                       SRS30041
C 6.REPEAT 1. TO 5. AS REQUIRED                                         SRS30042
C                                                                       SRS30043
C   STATION PLOTTER PEN EXACTLY 1.4 INCHES FROM THE RIGHT EDGE OF NARROWSRS30044
C PAPER                                                                 SRS30045
C                                                                       SRS30046
      INTEGER P,Q                                                       SRS30047
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY1,N,IREP,TITL(12),ID,A3(4SRS30048
     1),N4,N5,YS(6),VV1(3,2)                                            SRS30049
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```
84 FORMAT('TYPE IN 3 FACTOR LEVELS FOR SLICES IN UNTRANSFORMED UNITS'SRS30050
   1)                                                                SRS30051
83 FORMAT('TYPE IN 3 VALUES OF POWER TRANSFORMATIONS FOR INDEPENDENT SRS30052
   1VARIABLES,'/'THEN, ONE FOR DEPENDENT VARIABLE'/'TYPE 0.0 FOR LOG TSRS30053
   2RANSFORM, + OR - 100 FOR EXPONENTIAL TRANSFORM'/'DATA DECK MUST BESRS30054
   3 REREAD TO REGAIN ORIGINAL VARIABLE VALUES WITH THESE 3')        SRS30055
82 FORMAT(16F5.3)                                                    SRS30056
81 FORMAT(10F6.3,18X,I2)                                             SRS30057
80 FORMAT(12A6)                                                      SRS30058
79 FORMAT('INCORRECT NUMBER OF OBSERVATION SETS - SKIPPING TO NEXT DASRS30059
   1TA DECK')                                                        SRS30060
78 FORMAT(1X,2I2,F5.3)                                               SRS30061
77 FORMAT('TYPE 1 TO READ NEW DATA DECK, 2 TO READ NEW FACTOR LEVELS SRS30062
   1FOR SLICES'/'3 TO READ NEW TRANSFORMATION VALUES AND FACTOR LEVELSSRS30063
   2')                                                               SRS30064
76 FORMAT(I1)                                                        SRS30065
75 FORMAT(F10.5)                                                     SRS30066
   P=5                                                               SRS30067
   Q=8                                                               SRS30068
   WRITE(1,77)                                                       SRS30069
   N4=4                                                              SRS30070
   READ(6,76)N6                                                      SRS30071
   GO TO (2,3,1),N6                                                  SRS30072
 2 READ(Q,80)TITL                                                    SRS30073
   WRITE(1,80)TITL                                                   SRS30074
   READ(Q,78)N1,IREP,CONST                                           SRS30075
   N=N1*IREP                                                         SRS30076
   READ(Q,82)((X(I,J),J=1,3),I=1,N1)                                 SRS30077
   I=0                                                               SRS30078
23 I=I+1                                                             SRS30079
   READ(Q,81)(Y(I,J),J=1,10),ID                                      SRS30080
   IF(ID-98)8,9,9                                                    SRS30081
 8 DO 24 J=1,IREP                                                    SRS30082
24 Y(I,J)=Y(I,J)+CONST                                               SRS30083
   GO TO 23                                                          SRS30084
 9 N2=I-1                                                            SRS30085
   IF(N1-N2)7,1,7                                                    SRS30086
 7 WRITE(1,79)                                                       SRS30087
 1 WRITE(1,83)                                                       SRS30088
   READ(6,75)A3                                                      SRS30089
   DO 10 J=1,3                                                       SRS30090
   IF(A3(J))11,12,11                                                 SRS30091
12 DO 13 I=1,N1                                                      SRS30092
13 X(I,J)=ALOG(X(I,J))                                               SRS30093
   GO TO 16                                                          SRS30094
11 IF(ABS(A3(J))-100.)10,14,10                                       SRS30095
14 DO 15 I=1,N1                                                      SRS30096
15 X(I,J)=EXP(A3(J)*X(I,J)/100.)                                     SRS30097
16 A3(J)=1.0                                                         SRS30098
10 CONTINUE                                                          SRS30099
   IF(A3(4))17,18,17                                                 SRS30100
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   18 DO 19 I=1,N1                                                    SRS30101
      DO 19 J=1,IREP                                                  SRS30102
   19 Y(I,J)=ALOG(Y(I,J))                                             SRS30103
      GO TO 20                                                        SRS30104
   17 IF(ABS(A3(4))-100.)3,21,3                                       SRS30105
   21 DO 22 I=1,N1                                                    SRS30106
      DO 22 J=1,IREP                                                  SRS30107
   22 Y(I,J)=EXP(A3(3)*Y(I,J)/100.)                                   SRS30108
   20 A3(4)=1.0                                                       SRS30109
    3 WRITE(1,84)                                                     SRS30110
      READ(6,75)(VV1(I,1),I=1,3)                                      SRS30111
      DO 4 I=1,3                                                      SRS30112
      NN1=VV1(I,1)/ABS(VV1(I,1))                                      SRS30113
    4 VV1(I,1)=ABS(VV1(I,1))**A3(I)*NN1                               SRS30114
      CALL LINK(SLIC3)                                                SRS30115
      END                                                             SRS30116
// DUP                                                                SRS30117
*DELETE              SRS3                                           SRS30118
*STORE       WS  UA  SRS3                                           SRS30119
```

```
// JOB                                                                  PMLR3000
// FOR                                                                  PMLR3001
*LIST ALL                                                               PMLR3002
*NAME PMLR3                                                             PMLR3003
*EXTENDED PRECISION                                                     PMLR3004
*ONE WORD INTEGERS                                                      PMLR3005
*IOCS(DISK)                                                            PMLR3006
*IOCS(PLOTTER)                                                         PMLR3007
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)PMLR3008
     1,N4,N5,AN4,NNNN                                                   PMLR3009
      DEFINE FILE 21(320,6,U,KK1)                                       PMLR3010
   78 FORMAT(12A6)                                                      PMLR3011
   77 FORMAT('VALUE OF C    MAXIMUM AT C ='F8.4)                       PMLR3012
   76 FORMAT(F3.1)                                                      PMLR3013
   75 FORMAT('VALUE OF A'I1'    MAXIMUM AT A'I1' ='F7.3)                PMLR3014
   74 FORMAT(F6.3)                                                      PMLR3015
   73 FORMAT('MAXIMUM LIKELIHOOD RATIO')                               PMLR3016
      AN5=N4-1                                                          PMLR3017
      DO 4 J=1,4                                                        PMLR3018
      GO TO (8,8,8,9),J                                                 PMLR3019
    8 GO TO (10,10,4),N5                                                PMLR3020
    9 GO TO (10,4,10),N5                                                PMLR3021
   10 X1=A3(J)                                                          PMLR3022
      X4=A3(J)-AN4                                                      PMLR3023
      A=2.0*AN4                                                         PMLR3024
      B1=A/20.                                                          PMLR3025
      C=X4-A/50.                                                        PMLR3026
      D=A/10.                                                           PMLR3027
      E=10./A                                                           PMLR3028
      F=X4-B1                                                           PMLR3029
      G=X4+D                                                            PMLR3030
      H=X4+A*1.3                                                        PMLR3031
      W=X4-A/15.                                                        PMLR3032
      Z=X4-D                                                            PMLR3033
      CALL SCALE(E,10.0,X4,0.0)                                         PMLR3034
      CALL EGRID(0,X4,0.0,B1,20)                                        PMLR3035
      CALL EGRID(1,X4,0.0,0.05,20)                                      PMLR3036
      DO 2 I=1,11                                                       PMLR3037
      X1=G-D/10.0+D*FLOAT(I-2)                                          PMLR3038
      X0=G+D*FLOAT(I-2)                                                 PMLR3039
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                  PMLR3040
    2 WRITE(7,74)X0                                                     PMLR3041
      DO 3 I=1,11                                                       PMLR3042
      X1=-0.1+0.1*FLOAT(I)                                              PMLR3043
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                      PMLR3044
    3 WRITE(7,76)X1                                                     PMLR3045
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                   PMLR3046
      GO TO (5,5,5,6),J                                                 PMLR3047
    5 WRITE(7,75)J,J,A3(J)                                              PMLR3048
      GO TO 7                                                           PMLR3049
```

```
    6 WRITE(7,77)A3(J)                                          PMLR3050
    7 CALL ECHAR(W,0.1,0.1,0.1,1.5709)                          PMLR3051
      WRITE(7,73)                                               PMLR3052
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                          PMLR3053
      WRITE(7,78)TITL                                           PMLR3054
      CALL EPLOT(-2,X4,0.0)                                     PMLR3055
      DO 1 I=1,N4                                               PMLR3056
      A4(J)=I*A/AN5+X4-A/AN5                                    PMLR3057
      K=(J-1)*N4+I                                              PMLR3058
      READ(21'K)R                                               PMLR3059
      IF(R-1.0)1,1,11                                           PMLR3060
   11 R=1.0                                                     PMLR3061
    1 CALL EPLOT(0,A4(J),R)                                     PMLR3062
      CALL EPLOT(1,H,0.0)                                       PMLR3063
    4 CONTINUE                                                  PMLR3064
      CALL DATSW(8,J8)                                          PMLR3065
      GO TO (12,13),J8                                          PMLR3066
   13 N4=2                                                      PMLR3067
      CALL LINK(INFO3)                                          PMLR3068
   12 CALL LINK(CPAR3)                                          PMLR3069
      END                                                       PMLR3070
// DUP                                                          PMLR3071
*DELETE              PMLR3                                      PMLR3072
*STORE      WS  UA   PMLR3                                      PMLR3073
```

```
// JOB                                                                  CPAR3000
// FOR                                                                  CPAR3001
*LIST ALL                                                               CPAR3002
*NAME CPAR3                                                             CPAR3003
*EXTENDED PRECISION                                                     CPAR3004
*ONE WORD INTEGERS                                                      CPAR3005
*IOCS(DISK)                                                             CPAR3006
*IOCS(1403 PRINTER)                                                     CPAR3007
      INTEGER P,Q                                                       CPAR3008
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)CPAR3009
     1,N4,N5,AN4,NNNN,D,RRR(4),BB(9)                                    CPAR3010
      DEFINE FILE 21(320,6,U,KK1)                                       CPAR3011
   80 FORMAT('1'12A6)                                                   CPAR3012
   79 FORMAT(9E13.5/26X6E13.5,I6)                                       CPAR3013
   78 FORMAT('0POINTS PLOTTED FOR MLR GRAPH OF B('I1')'//9(6X'B('I1')'3XCPAR3014
     1)/6X'A1'11X'A2'11X'A3'11X'C'11X'SSD'12X'R'10X'ITER')              CPAR3015
      P=5                                                               CPAR3016
      Q=8                                                               CPAR3017
      N1=N/IREP                                                         CPAR3018
      DO 14 I=1,4                                                       CPAR3019
   14 A4(I)=A3(I)                                                       CPAR3020
      V2=0.0                                                            CPAR3021
      J3=13                                                             CPAR3022
      D=0.0                                                             CPAR3023
      DO 11 I=1,N1                                                      CPAR3024
      DO 11 J=1,IREP                                                    CPAR3025
   11 D=D+ALOG(Y(I,J))                                                  CPAR3026
      DD=EXP(D/FLOAT(N))                                                CPAR3027
      CALL CMLE3(5,ITER,V2,J3)                                          CPAR3028
      SS=SSY                                                            CPAR3029
      DO 5 I=1,9                                                        CPAR3030
    5 BB(I)=B(I)                                                        CPAR3031
      IF(N4-35)8,8,9                                                    CPAR3032
    8 AN5=N4-1                                                          CPAR3033
      GO TO 10                                                          CPAR3034
    9 N4=35                                                             CPAR3035
      AN5=34                                                            CPAR3036
   10 DO 1 J3=1,9                                                       CPAR3037
      IF(BB(J3))2,2,3                                                   CPAR3038
    2 X4=2.0*BB(J3)                                                     CPAR3039
      GO TO 13                                                          CPAR3040
    3 X4=0.0                                                            CPAR3041
   13 A=2.0*ABS(BB(J3))                                                 CPAR3042
      WRITE(P,80)TITL                                                   CPAR3043
      WRITE(P,78)J3,(I,I=1,9)                                           CPAR3044
      DO 4 I=1,4                                                        CPAR3045
    4 A4(I)=A3(I)                                                       CPAR3046
      DO 1 KK=1,N4                                                      CPAR3047
      DO 15 I=1,4                                                       CPAR3048
      IF(ABS(A4(I))-5.0)15,15,16                                        CPAR3049
```

```
   16 A4(I)=A3(I)                                                    CPAR3050
   15 CONTINUE                                                       CPAR3051
      V2=(KK-1)*A/AN5+X4                                             CPAR3052
      CALL CMLE3(5,ITER,V2,J3)                                       CPAR3053
      R=N*ALOG(SS/SSY)/2.0                                           CPAR3054
      R=EXP(R)                                                       CPAR3055
      LLL=(J3-1)*N4+KK                                               CPAR3056
      WRITE(21'LLL)R                                                 CPAR3057
      DO 6 J=1,9                                                     CPAR3058
    6 B(J)=A4(4)*DD**(A4(4)-1.0)*B(J)                                CPAR3059
      WRITE(P,79)(B(J),J=1,9),A4,SSY,R,ITER                          CPAR3060
    1 CONTINUE                                                       CPAR3061
      DO 12 I=1,4                                                    CPAR3062
   12 A4(I)=A3(I)                                                    CPAR3063
      V2=0.0                                                         CPAR3064
      J3=13                                                          CPAR3065
      CALL CMLE3(5,ITER,V2,J3)                                       CPAR3066
      DO 7 J=1,9                                                     CPAR3067
    7 B(J)=A4(4)*DD**(A4(4)-1.0)*B(J)                                CPAR3068
      CALL LINK(PPAR3)                                               CPAR3069
      END                                                            CPAR3070
// DUP                                                               CPAR3071
*DELETE              CPAR3                                          CPAR3072
*STORE       WS  UA  CPAR3                                          CPAR3073
```

```
// JOB                                                                    PPAR3000
// FOR                                                                    PPAR3001
*LIST ALL                                                                 PPAR3002
*NAME PPAR3                                                               PPAR3003
*EXTENDED PRECISION                                                       PPAR3004
*ONE WORD INTEGERS                                                        PPAR3005
*IOCS(DISK)                                                              PPAR3006
*IOCS(PLOTTER)                                                           PPAR3007
      COMMON Y(100,10),X(100,3),BB(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4PPAR3008
     1),N4,N5                                                           PPAR3009
      DEFINE FILE 21(320,6,U,KK1)                                       PPAR3010
   78 FORMAT(12A6)                                                      PPAR3011
   77 FORMAT('MAXIMUM LIKELIHOOD RATIO')                                PPAR3012
   76 FORMAT(F3.1)                                                      PPAR3013
   75 FORMAT('VALUE OF B('I1') - MLE OF B('I1') ='E10.3)                PPAR3014
   74 FORMAT(E10.3)                                                     PPAR3015
      IF(N4-35)8,8,9                                                    PPAR3016
    8 AN5=N4-1                                                          PPAR3017
      GO TO 10                                                          PPAR3018
    9 N4=35                                                             PPAR3019
      AN5=34                                                            PPAR3020
   10 DO 4 J3=1,9                                                       PPAR3021
      IF(BB(J3))5,5,6                                                   PPAR3022
    5 X4=2.0*BB(J3)                                                     PPAR3023
      GO TO 7                                                           PPAR3024
    6 X4=0.0                                                            PPAR3025
    7 A=2.0*ABS(BB(J3))                                                 PPAR3026
      B1=A/20.                                                          PPAR3027
      C=X4-A/50.                                                        PPAR3028
      D=A/10.                                                           PPAR3029
      E=10./A                                                           PPAR3030
      F=X4-B1                                                           PPAR3031
      G=X4+D                                                            PPAR3032
      H=X4+A*1.3                                                        PPAR3033
      W=X4-A/15.                                                        PPAR3034
      Z=X4-D                                                            PPAR3035
      CALL SCALE(E,10.0,X4,0.0)                                         PPAR3036
      CALL EGRID(0,X4,0.0,B1,20)                                        PPAR3037
      CALL EGRID(1,X4,0.0,0.05,20)                                      PPAR3038
      DO 2 I=1,11                                                       PPAR3039
      X1=G+D*FLOAT(I-3)+D/2.5                                           PPAR3040
      XO=G+D*FLOAT(I-2)                                                 PPAR3041
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                  PPAR3042
    2 WRITE(7,74)XO                                                     PPAR3043
      DO 3 I=1,11                                                       PPAR3044
      X1=-0.1+0.1*FLOAT(I)                                              PPAR3045
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                      PPAR3046
    3 WRITE(7,76)X1                                                     PPAR3047
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                   PPAR3048
      WRITE(7,75)J3,J3,BB(J3)                                           PPAR3049
```

```
      CALL ECHAR(W,0.1,0.1,0.1,1.5709)                          PPAR3050
      WRITE(7,77)                                               PPAR3051
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                          PPAR3052
      WRITE(7,78)TITL                                           PPAR3053
      CALL EPLOT(-2,X4,0.0)                                     PPAR3054
      DO 1 KK=1,N4                                              PPAR3055
      V2=(KK-1)*A/AN5+X4                                        PPAR3056
      LLL=(J3-2)*N4+KK                                          PPAR3057
      READ(21'LLL)R                                             PPAR3058
      IF(R-1.0)1,1,11                                           PPAR3059
   11 R=1.0                                                     PPAR3060
    1 CALL EPLOT(0,V2,R)                                        PPAR3061
      CALL EPLOT(1,H,0.0)                                       PPAR3062
    4 CONTINUE                                                  PPAR3063
      N4=2                                                      PPAR3064
      CALL LINK(INFO3)                                          PPAR3065
      END                                                       PPAR3066
// DUP                                                          PPAR3067
*DELETE              PPAR3                                      PPAR3068
*STORE       WS  UA  PPAR3                                      PPAR3069
```

```
// JOB                                                                  INF03000
// FOR                                                                  INF03001
*LIST ALL                                                               INF03002
*NAME INF03                                                             INF03003
*EXTENDED PRECISION                                                     INF03004
*ONE WORD INTEGERS                                                      INF03005
*IOCS(1403 PRINTER)                                                     INF03006
      INTEGER P,Q                                                       INF03007
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)INF03008
     1,N4,XX(12),YY2(100),A5(4),SSXY(12),YY,X1(12),YY1(10),SSY1(10),SSX2INF03009
     2(12,12)                                                           INF03010
   89 FORMAT(' STANDARD DEVIATIONS WITHIN OBSERVATION SETS'/25X10F8.2)   INF03011
   88 FORMAT(' VARIANCES WITHIN OBSERVATION SETS'/25X10F8.2)            INF03012
   87 FORMAT(' MEANS WITHIN OBSERVATION SETS'/25X10F8.2)                INF03013
   86 FORMAT('0VARIANCE-COVARIANCE MATRIX'/)                            INF03014
   85 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.INF03015
     14'  A2 ='F8.4'  A3 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIINF03016
     2ABLE - C ='F8.4)                                                  INF03017
   84 FORMAT('0B(J) COEFFICIENTS'/'0'10E12.4)                           INF03018
   83 FORMAT('0INFORMATION MATRIX FOR PARAMETERS OF UNTRANSFORMED DATA'/INF03019
     1)                                                                 INF03020
   82 FORMAT('0INFORMATION MATRIX FOR PARAMETERS OF TRANSFORMED DATA'/) INF03021
   81 FORMAT(1X,3F8.3,12F8.2)                                           INF03022
   80 FORMAT('1'12A6)                                                   INF03023
   79 FORMAT(' '9E13.4)                                                 INF03024
   78 FORMAT('0*** VARIABLES FITTED'//57X16HOBSERVATION SETS/4X2HX16X2HXINF03025
     126X2HX33X10(3XI2,3X)14H  MEAN    VAR.)                           INF03026
      P=5                                                               INF03027
      Q=8                                                               INF03028
      N1=N/IREP                                                         INF03029
      D=0.0                                                             INF03030
      DO 66 I=1,N1                                                      INF03031
      DO 66 J=1,IREP                                                    INF03032
   66 D=D+ALOG(Y(I,J))                                                  INF03033
      D=EXP(D/FLOAT(N))                                                 INF03034
      DO 7 I=1,4                                                        INF03035
    7 A5(I)=A4(I)                                                       INF03036
      WRITE(P,80)TITL                                                   INF03037
      IF(IREP-10)37,38,38                                               INF03038
   37 N2=IREP+1                                                         INF03039
      DO 9 I=1,N1                                                       INF03040
      DO 9 J=N2,10                                                      INF03041
    9 Y(I,J)=0.0                                                        INF03042
   38 WRITE(P,78)(I,I=1,10)                                             INF03043
      DO 14 I=1,N1                                                      INF03044
      YYY=0.0                                                           INF03045
      DO 12 J=1,IREP                                                    INF03046
   12 YYY=YYY+Y(I,J)/IREP                                               INF03047
      SYY=0.0                                                           INF03048
      IF(IREP-1)14,14,39                                                INF03049
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```
39 DO 13 J=1,IREP                                                    INFO3050
13 SYY=SYY+(Y(I,J)-YYY)*(Y(I,J)-YYY)/FLOAT(IREP-1)                   INFO3051
14 WRITE(P,81)(X(I,J),J=1,3),(Y(I,J),J=1,10),YYY,SYY                 INFO3052
   DO 8 I=1,IREP                                                     INFO3053
   YY1(I)=0.0                                                        INFO3054
   DO 8 J=1,N1                                                       INFO3055
 8 YY1(I)=YY1(I)+Y(J,I)/N1                                           INFO3056
   DO 15 I=1,IREP                                                    INFO3057
   SSY1(I)=0.0                                                       INFO3058
   DO 15 J=1,N1                                                      INFO3059
15 SSY1(I)=SSY1(I)+(Y(J,I)-YY1(I))*(Y(J,I)-YY1(I))/FLOAT(N1-1)       INFO3060
   WRITE(P,87)(YY1(I),I=1,IREP)                                      INFO3061
   WRITE(P,88)(SSY1(I),I=1,IREP)                                     INFO3062
   DO 16 I=1,IREP                                                    INFO3063
16 SSY1(I)=SQRT(SSY1(I))                                             INFO3064
   WRITE(P,89)(SSY1(I),I=1,IREP)                                     INFO3065
   DO 17 J=1,4                                                       INFO3066
17 A4(J)=1.0                                                         INFO3067
   DO 10 K=1,2                                                       INFO3068
   DD=D**(A4(4)-1.0)                                                 INFO3069
   YY=0.0                                                            INFO3070
   DO 61 I=1,N1                                                      INFO3071
   DO 61 J=1,IREP                                                    INFO3072
61 YY=YY+(Y(I,J)**A4(4)-1.0)/N/DD/A4(4)                              INFO3073
   GO TO (20,22),K                                                   INFO3074
20 GO TO (23,22),N4                                                  INFO3075
22 DO 36 J=1,9                                                       INFO3076
36 XX(J)=0.0                                                         INFO3077
   DO 6 I=1,N1                                                       INFO3078
   DO 4 J1=1,3                                                       INFO3079
   X1(J1)=X(I,J1)**A4(J1)                                            INFO3080
 4 X1(J1+3)=X1(J1)*X1(J1)                                            INFO3081
   X1(7)=X1(1)*X1(2)                                                 INFO3082
   X1(8)=X1(1)*X1(3)                                                 INFO3083
   X1(9)=X1(2)*X1(3)                                                 INFO3084
   DO 6 J=1,9                                                        INFO3085
 6 XX(J)=XX(J)+X1(J)/N1                                              INFO3086
   DO 24 I=1,N1                                                      INFO3087
   YY2(I)=0.0                                                        INFO3088
   DO 24 J=1,IREP                                                    INFO3089
24 YY2(I)=YY2(I)+(Y(I,J)**A4(4)-1.0)/IREP/DD/A4(4)                   INFO3090
   DO 25 I=1,9                                                       INFO3091
   SSXY(I)=0.0                                                       INFO3092
   DO 25 J=1,9                                                       INFO3093
25 SSX2(I,J)=0.0                                                     INFO3094
   DO 27 I=1,N1                                                      INFO3095
   DO 3 J=1,3                                                        INFO3096
   X1(J)=X(I,J)**A4(J)                                               INFO3097
 3 X1(J+3)=X1(J)*X1(J)                                               INFO3098
   X1(7)=X1(1)*X1(2)                                                 INFO3099
   X1(8)=X1(1)*X1(3)                                                 INFO3100
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```
      X1(9)=X1(2)*X1(3)                                                 INFO3101
      DO 27 J=1,9                                                       INFO3102
      SSXY(J)=SSXY(J)+(YY2(I)-YY)*(X1(J)-XX(J))                         INFO3103
      DO 27 J1=1,9                                                      INFO3104
   27 SSX2(J,J1)=SSX2(J,J1)+(X1(J)-XX(J))*(X1(J1)-XX(J1))               INFO3105
      WRITE(P,80)TITL                                                   INFO3106
      GO TO (18,26),K                                                   INFO3107
   18 WRITE(P,83)                                                       INFO3108
      GO TO 19                                                          INFO3109
   26 WRITE(P,85)A4                                                     INFO3110
      WRITE(P,82)                                                       INFO3111
   19 DO 30 I=1,9                                                       INFO3112
   30 WRITE(P,79)(SSX2(I,J),J=1,9)                                      INFO3113
      CALL MATV(SSX?,9,SSXY,0,DET)                                      INFO3114
      GO TO (28,29),K                                                   INFO3115
   28 GO TO (31,29),N4                                                  INFO3116
   29 WRITE(P,86)                                                       INFO3117
      DO 5 I=1,9                                                        INFO3118
    5 WRITE(P,79)(SSX2(I,J),J=1,9)                                      INFO3119
   31 DO 11 J=1,9                                                       INFO3120
      B(J)=0.0                                                          INFO3121
      DO 11 I=1,9                                                       INFO3122
   11 B(J)=B(J)+SSX2(I,J)*SSXY(I)*A4(4)*DD                              INFO3123
      AA=YY*A4(4)*DD+1.0                                                INFO3124
      DO 32 J=1,9                                                       INFO3125
   32 AA=AA-B(J)*XX(J)                                                  INFO3126
      GO TO (33,34),K                                                   INFO3127
   33 GO TO (23,34),N4                                                  INFO3128
   34 WRITE(P,84)AA,(B(J),J=1,9)                                        INFO3129
   23 DO 21 I=1,4                                                       INFO3130
   21 A4(I)=A3(I)                                                       INFO3131
   10 CONTINUE                                                          INFO3132
      DO 2 I=1,4                                                        INFO3133
    2 A4(I)=A5(I)                                                       INFO3134
      CALL LINK(ANVA3)                                                  INFO3135
      END                                                               INFO3136
// DUP                                                                  INFO3137
*DELETE              INFO3                                             INFO3138
*STORE       WS  UA  INFO3                                             INFO3139
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// JOB                                                                  ANVA3000
// FOR                                                                  ANVA3001
*LIST ALL                                                               ANVA3002
*NAME ANVA3                                                             ANVA3003
*EXTENDED PRECISION                                                     ANVA3004
*ONE WORD INTEGERS                                                      ANVA3005
*IOCS(1403 PRINTER)                                                     ANVA3006
      INTEGER P,Q                                                       ANVA3007
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)ANVA3008
     1,N4,XX(9),YY2(100),A5(4),SSXY(12),YY,X1(9),SS(9),YY1(4),SSY1(4),SSANVA3009
     2Y5(9),SSX3(12,12),SSX1(12,12),W(100,9)                            ANVA3010
   88 FORMAT(' PURE ERROR  'F14.4,I4,F12.2)                             ANVA3011
   87 FORMAT(' REGRESSION  'F14.4,I4,2F12.2,E16.6)                      ANVA3012
   86 FORMAT('ORELATIVE LIKELIHOOD OF NO TRANSFORMATION VS. ML ESTIMATESANVA3013
     1 ='E14.5)                                                         ANVA3014
   85 FORMAT('OPOWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.ANVA3015
     14'  A2 ='F8.4'  A3 ='F8.4/'OPOWER TRANSFORMATION OF DEPENDENT VARIANVA3016
     2ABLE - C ='F8.4)                                                  ANVA3017
   84 FORMAT(9E13.5)                                                    ANVA3018
   83 FORMAT('OCROSS PRODUCT MATRIX'/)                                  ANVA3019
   82 FORMAT('ONORMAL ORTHOGONAL POLYNOMIALS'//7X'X1'10X'X2'11X'X3'10X'XANVA3020
     11*X1'8X'X2*X2'8X'X3*X3'8X'X1*X2'8X'X1*X3'8X'X2*X3')               ANVA3021
   81 FORMAT('OANALYSIS OF VARIANCE TABLE - TRANSFORMED DATA'/'0   SOURCANVA3022
     1E'11X'SS'6X'D.F.'5X'MSS'7X'APPROX. F'6X'MLR')                     ANVA3023
   80 FORMAT('1'12A6)                                                   ANVA3024
   79 FORMAT('   X2 * X3   'F14.4,I4,2F12.2,E16.6)                      ANVA3025
   78 FORMAT('OANALYSIS OF VARIANCE TABLE - UNTRANSFORMED DATA'/'0   SOUANVA3026
     1RCE'11X'SS'6X'D.F.'5X'MSS'11X'F'9X'MLR')                          ANVA3027
   77 FORMAT(' TREATMENTS  'F14.4,I4,2F12.2,E16.6)                      ANVA3028
   76 FORMAT('  LINEAR     'F14.4,I4,2F12.2,E16.6)                      ANVA3029
   75 FORMAT('   X1 LINEAR 'F14.4,I4,2F12.2,E16.6)                      ANVA3030
   74 FORMAT('   X2 LINEAR 'F14.4,I4,2F12.2,E16.6)                      ANVA3031
   73 FORMAT('  QUADRATIC  'F14.4,I4,2F12.2,E16.6)                      ANVA3032
   72 FORMAT('   X1 QUAD.  'F14.4,I4,2F12.2,E16.6)                      ANVA3033
   71 FORMAT('   X2 QUAD.  'F14.4,I4,2F12.2,E16.6)                      ANVA3034
   70 FORMAT('   X1 * X2   'F14.4,I4,2F12.2,E16.6)                      ANVA3035
   69 FORMAT('  LACK OF FIT'F14.4,I4,2F12.2,E16.6)                      ANVA3036
   68 FORMAT('   X1 * X3   'F14.4,I4,2F12.2,E16.6)                      ANVA3037
   67 FORMAT(' RESIDUAL    'F14.4,I4, F12.2)                           ANVA3038
   66 FORMAT(' TOTAL       'F14.4,I4)                                  ANVA3039
   65 FORMAT('  TRANSFORM  'F14.4,I4,2F12.2,E16.6)                      ANVA3040
   64 FORMAT('   X3 LINEAR 'F14.4,I4,2F12.2,E16.6)                      ANVA3041
   63 FORMAT('   X3 QUAD.  'F14.4,I4,2F12.2,E16.6)                      ANVA3042
   62 FORMAT('  INTERACTION'F14.4,I4,2F12.2,E16.6)                      ANVA3043
      P=5                                                               ANVA3044
      Q=8                                                               ANVA3045
      N1=N/IREP                                                         ANVA3046
      D=0.0                                                             ANVA3047
      DO 52 I=1,N1                                                      ANVA3048
      DO 52 J=1,IREP                                                    ANVA3049
```

```
52 D=D+ALOG(Y(I,J))                                                    ANVA3050
   D=EXP(D/FLOAT(N))                                                   ANVA3051
   DO 51 I=1,4                                                         ANVA3052
   A5(I)=A4(I)                                                         ANVA3053
51 A4(I)=1.0                                                           ANVA3054
   DO 10 K=1,2                                                         ANVA3055
   DD=D**(A4(4)-1.0)                                                   ANVA3056
   YY=0.0                                                              ANVA3057
   DO 1 I=1,N1                                                         ANVA3058
   DO 1 J=1,IREP                                                       ANVA3059
 1 YY=YY+(Y(I,J)**A4(4)-1.0)/N/DD/A4(4)                                ANVA3060
   DO 40 I=1,N1                                                        ANVA3061
   YY2(I)=0.0                                                          ANVA3062
   DO 40 J=1,IREP                                                      ANVA3063
40 YY2(I)=YY2(I)+(Y(I,J)**A4(4)-1.0)/IREP/DD/A4(4)                     ANVA3064
   TOT=0.0                                                             ANVA3065
   DO 3 I=1,N1                                                         ANVA3066
   DO 3 J=1,IREP                                                       ANVA3067
 3 TOT=TOT+((Y(I,J)**A4(4)-1.0)/DD/A4(4)-YY)**2                        ANVA3068
   TREAT=0.0                                                           ANVA3069
   DO 4 I=1,N1                                                         ANVA3070
 4 TREAT=TREAT+(YY2(I)-YY)*(YY2(I)-YY)                                 ANVA3071
   TREAT=TREAT*IREP                                                    ANVA3072
   DO 6 J=1,3                                                          ANVA3073
   XX(J)=0.0                                                           ANVA3074
   DO 6 I=1,N1                                                         ANVA3075
   X1(J)=X(I,J)**A4(J)                                                 ANVA3076
 6 XX(J)=XX(J)+X1(J)/N1                                                ANVA3077
   DO 39 I=1,3                                                         ANVA3078
39 B(I)=0.0                                                            ANVA3079
   DO 37 I=1,N1                                                        ANVA3080
   DO 37 J=1,3                                                         ANVA3081
   X1(J)=X(I,J)**A4(J)                                                 ANVA3082
37 B(J)=B(J)+(X1(J)-XX(J))*(X1(J)-XX(J))                               ANVA3083
   DO 5 I=1,N1                                                         ANVA3084
   DO 5 J=1,3                                                          ANVA3085
 5 W(I,J)=(X(I,J)**A4(J)-XX(J))/SQRT(B(J))                             ANVA3086
   DO 7 J=1,3                                                          ANVA3087
   X1(J)=0.0                                                           ANVA3088
   SS(J)=0.0                                                           ANVA3089
   AA2=A4(J)*2.0                                                       ANVA3090
   DO 7 I=1,N1                                                         ANVA3091
   X1(J)=X1(J)+X(I,J)**AA2                                             ANVA3092
 7 SS(J)=SS(J)+X(I,J)**AA2*(X(I,J)**A4(J)-XX(J))                       ANVA3093
   DO 8 I=1,N1                                                         ANVA3094
   DO 8 J=1,3                                                          ANVA3095
 8 W(I,J+3)=(X(I,J)*X(I,J))**A4(J)-X1(J)/N1-(X(I,J)**A4(J)-XX(J))*SS(ANVA3096
  1J)/B(J)                                                             ANVA3097
   DO 9 J=1,3                                                          ANVA3098
   SS(J)=0.0                                                           ANVA3099
   DO 9 I=1,N1                                                         ANVA3100
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```
 9 SS(J)=SS(J)+W(I,J+3)*W(I,J+3)                                    ANVA3101
   DO 11 I=1,N1                                                     ANVA3102
   DO 11 J=4,6                                                      ANVA3103
11 W(I,J)=W(I,J)/SQRT(SS(J-3))                                      ANVA3104
   DO 16 I=1,9                                                      ANVA3105
   SSXY(I)=0.0                                                      ANVA3106
   DO 16 J=1,9                                                      ANVA3107
16 SSX1(I,J)=0.0                                                    ANVA3108
   DO 57 J=1,3                                                      ANVA3109
57 SS(J)=0.0                                                        ANVA3110
   DO 58 I=1,N1                                                     ANVA3111
   W(I,7)=W(I,1)*W(I,2)                                             ANVA3112
   W(I,8)=W(I,1)*W(I,3)                                             ANVA3113
   W(I,9)=W(I,2)*W(I,3)                                             ANVA3114
   DO 58 J=1,3                                                      ANVA3115
58 SS(J)=SS(J)+W(I,J+6)/N1                                          ANVA3116
   DO 59 J=1,3                                                      ANVA3117
   SS(J+3)=0.0                                                      ANVA3118
   DO 59 I=1,N1                                                     ANVA3119
59 SS(J+3)=SS(J+3)+(W(I,J+6)-SS(J))**2                              ANVA3120
   DO 89 J=1,3                                                      ANVA3121
   DO 89 I=1,N1                                                     ANVA3122
89 W(I,J+6)=(W(I,J+6)-SS(J))/SQRT(SS(J+3))                          ANVA3123
   DO 18 I=1,N1                                                     ANVA3124
   DO 18 J=1,9                                                      ANVA3125
   SSXY(J)=SSXY(J)+(YY2(I)-YY)*W(I,J)                               ANVA3126
   DO 18 J1=1,9                                                     ANVA3127
18 SSX1(J,J1)=SSX1(J,J1)+W(I,J)*W(I,J1)                             ANVA3128
   GO TO (19,26),K                                                  ANVA3129
19 GO TO (27,26),N4                                                 ANVA3130
26 WRITE(P,80)TITL                                                  ANVA3131
   GO TO (28,29),K                                                  ANVA3132
29 WRITE(P,85)A4                                                    ANVA3133
28 WRITE(P,82)                                                      ANVA3134
   WRITE(P,84)((W(I,J),J=1,9),I=1,N1)                               ANVA3135
   WRITE(P,83)                                                      ANVA3136
   WRITE(P,84)((SSX1(I,J),J=1,9),I=1,9)                             ANVA3137
27 CALL MATV(SSX1,9,SSXY,0,DET)                                     ANVA3138
   DO 30 J=1,9                                                      ANVA3139
   B(J)=0.0                                                         ANVA3140
   DO 30 I=1,9                                                      ANVA3141
30 B(J)=B(J)+SSX1(I,J)*SSXY(I)                                      ANVA3142
   SS9=0.0                                                          ANVA3143
   DO 17 J=1,9                                                      ANVA3144
17 SS9=SS9+B(J)*SSXY(J)*IREP                                        ANVA3145
   DEV=TREAT-SS9                                                    ANVA3146
   DO 12 J=1,3                                                      ANVA3147
   DO 12 J1=1,3                                                     ANVA3148
12 SSX3(J,J1)=SSX1(J,J1)                                            ANVA3149
   CALL MATV(SSX3,3,SSXY,0,DET)                                     ANVA3150
   SS1=0.0                                                          ANVA3151
```

```
      DO 14 I=1,3                                                    ANVA3152
      DO 14 J=1,3                                                    ANVA3153
   14 SS1=SS1+B(J)*SSX3(I,J)*B(I)*IREP                               ANVA3154
      DO 13 J=1,3                                                    ANVA3155
      DO 13 J1=1,3                                                   ANVA3156
   13 SSX3(J,J1)=SSX1(J+3,J1+3)                                      ANVA3157
      CALL MATV(SSX3,3,SSXY,0,DET)                                   ANVA3158
      SS2=0.0                                                        ANVA3159
      DO 15 I=1,3                                                    ANVA3160
      DO 15 J=1,3                                                    ANVA3161
   15 SS2=SS2+B(J+3)*SSX3(I,J)*B(I+3)*IREP                           ANVA3162
      DO 41 J=1,3                                                    ANVA3163
      DO 41 J1=1,3                                                   ANVA3164
   41 SSX3(J,J1)=SSX1(J+6,J1+6)                                      ANVA3165
      CALL MATV(SSX3,3,SSXY,0,DET)                                   ANVA3166
      SS3=0.0                                                        ANVA3167
      DO 42 I=1,3                                                    ANVA3168
      DO 42 J=1,3                                                    ANVA3169
   42 SS3=SS3+B(J+6)*SSX3(I,J)*B(I+6)*IREP                           ANVA3170
      DO 31 I=1,9                                                    ANVA3171
   31 SS(I)=B(I)*B(I)/SSX1(I,I)*IREP                                 ANVA3172
      I1=1                                                           ANVA3173
      I2=3                                                           ANVA3174
      I3=N1-1                                                        ANVA3175
      I5=0                                                           ANVA3176
      I6=9                                                           ANVA3177
      DO 33 I=1,4                                                    ANVA3178
      IF(A4(I)-1.0)34,33,34                                          ANVA3179
   34 I5=I5+1                                                        ANVA3180
   33 CONTINUE                                                       ANVA3181
      NN=N-I3-1                                                      ANVA3182
      NNN=N-1                                                        ANVA3183
      GO TO (20,22),K                                                ANVA3184
   20 SSY3=DEV                                                       ANVA3185
      I4=I3-9                                                        ANVA3186
      DEVM=DEV/I4                                                    ANVA3187
      GO TO 35                                                       ANVA3188
   22 SSY3=SSY3-DEV                                                  ANVA3189
      SSY3M=SSY3/I5                                                  ANVA3190
      I4=I3-I5-9                                                     ANVA3191
      DEVM=DEV/I4                                                    ANVA3192
   35 IF(IREP-1)36,36,38                                             ANVA3193
   38 RES=TOT-TREAT                                                  ANVA3194
      RESM=RES/NN                                                    ANVA3195
      RR=RES+DEV                                                     ANVA3196
      I7=NN+I4                                                       ANVA3197
      RRM=RR/I7                                                      ANVA3198
      F6 =SSY3M/RRM                                                  ANVA3199
      GO TO 43                                                       ANVA3200
   36 RES=DEV                                                        ANVA3201
      RESM=DEVM                                                      ANVA3202
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```
      RR=RES                                                        ANVA3203
      RRM=DEVM                                                      ANVA3204
   43 SS1M=SS1/3.0                                                  ANVA3205
      SS2M=SS2/3.0                                                  ANVA3206
      SS3M=SS3/3.0                                                  ANVA3207
      SS9M=SS9/I6                                                   ANVA3208
      TREAM=TREAT/I3                                                ANVA3209
      F1=TREAM/RESM                                                 ANVA3210
      F2=SS1M/RRM                                                   ANVA3211
      F21=SS(1)/RRM                                                 ANVA3212
      F22=SS(2)/RRM                                                 ANVA3213
      F23=SS(3)/RRM                                                 ANVA3214
      F3 =SS2M /RRM                                                 ANVA3215
      F31=SS(4)/RRM                                                 ANVA3216
      F32=SS(5)/RRM                                                 ANVA3217
      F33=SS(6)/RRM                                                 ANVA3218
      F44=SS3M/RRM                                                  ANVA3219
      F41=SS(7)/RRM                                                 ANVA3220
      F42=SS(8)/RRM                                                 ANVA3221
      F43=SS(9)/RRM                                                 ANVA3222
      F4=DEVM/RESM                                                  ANVA3223
      F7 =SS9M /RRM                                                 ANVA3224
      DO 53 I=1,9                                                   ANVA3225
   53 SSY5(I)=(RR/(RR+SS(I)))**(FLOAT(N)/2.0)                       ANVA3226
      SS4=(RES/(RES+TREAT))**(FLOAT(N)/2.0)                         ANVA3227
      SS5=(RR/(RR+SS1))**(FLOAT(N)/2.0)                             ANVA3228
      SS6=(RR/(RR+SS2))**(FLOAT(N)/2.0)                             ANVA3229
      SS7=(RR/(RR+SS3))**(FLOAT(N)/2.0)                             ANVA3230
      SS8=(RES/RR)**(FLOAT(N)/2.0)                                  ANVA3231
      SS10=(RR/(RR+SS9))**(FLOAT(N)/2.0)                            ANVA3232
      GO TO (44,45),K                                               ANVA3233
   44 RRR=RR                                                        ANVA3234
      GO TO (50,25),N4                                              ANVA3235
   45 WRITE(P,80)TITL                                               ANVA3236
      WRITE(P,85)A4                                                 ANVA3237
      WRITE(P,81)                                                   ANVA3238
      RRR=(RR/RRR)**(FLOAT(N)/2.0)                                  ANVA3239
      GO TO 32                                                      ANVA3240
   25 WRITE(P,80)TITL                                               ANVA3241
      WRITE(P,78)                                                   ANVA3242
   32 IF(IREP-1)60,60,61                                            ANVA3243
   61 WRITE(P,77)TREAT,I3,TREAM,F1,SS4                              ANVA3244
   60 WRITE(P,87)SS9,I6,SS9M,F7,SS10                                ANVA3245
      WRITE(P,76)SS1,I2,SS1M,F2,SS5                                 ANVA3246
      WRITE(P,75)SS(1),I1,SS(1),F21,SSY5(1)                         ANVA3247
      WRITE(P,74)SS(2),I1,SS(2),F22,SSY5(2)                         ANVA3248
      WRITE(P,64)SS(3),I1,SS(3),F23,SSY5(3)                         ANVA3249
      WRITE(P,73)SS2,I2,SS2M,F3,SS6                                 ANVA3250
      WRITE(P,72)SS(4),I1,SS(4),F31,SSY5(4)                         ANVA3251
      WRITE(P,71)SS(5),I1,SS(5),F32,SSY5(5)                         ANVA3252
      WRITE(P,63)SS(6),I1,SS(6),F33,SSY5(6)                         ANVA3253
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      WRITE(P,62)SS3,I2,SS3M,F44,SS7                                    ANVA3254
      WRITE(P,70)SS(7),I1,SS(7),F41,SSY5(7)                             ANVA3255
      WRITE(P,68)SS(8),I1,SS(8),F42,SSY5(8)                             ANVA3256
      WRITE(P,79)SS(9),I1,SS(9),F43,SSY5(9)                             ANVA3257
      GO TO (23,24),K                                                   ANVA3258
   24 WRITE(P,65)SSY3,I5,SSY3M,F6,RRR                                   ANVA3259
   23 IF(IREP-1)47,47,48                                                ANVA3260
   47 WRITE(P,67)DEV,I4,DEVM                                            ANVA3261
      GO TO 49                                                          ANVA3262
   48 WRITE(P,67)RR,I7,RRM                                              ANVA3263
      WRITE(P,69)DEV,I4,DEVM,F4,SS8                                     ANVA3264
      WRITE(P,88)RES,NN,RESM                                            ANVA3265
   49 WRITE(P,66)TOT,NNN                                                ANVA3266
   50 DO 21 I=1,4                                                       ANVA3267
   21 A4(I)=A3(I)                                                       ANVA3268
   10 CONTINUE                                                          ANVA3269
      WRITE(P,86)RRR                                                    ANVA3270
      DO 2 I=1,4                                                        ANVA3271
    2 A4(I)=A5(I)                                                       ANVA3272
      GO TO (56,55),N4                                                  ANVA3273
   56 CALL DATSW(8,J8)                                                  ANVA3274
      GO TO (54,55),J8                                                  ANVA3275
   54 CALL LINK(COEF3)                                                  ANVA3276
   55 CALL LINK(EIGN3)                                                  ANVA3277
      END                                                               ANVA3278
// DUP                                                                  ANVA3279
*DELETE              ANVA3                                             ANVA3280
*STORE       WS  UA  ANVA3                                             ANVA3281
```

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// JOB                                                                  COEF3000
// FOR                                                                  COEF3001
*LIST ALL                                                               COEF3002
*NAME COEF3                                                             COEF3003
*EXTENDED PRECISION                                                     COEF3004
*ONE WORD INTEGERS                                                      COEF3005
*IOCS(PLOTTER)                                                          COEF3006
*IOCS(1403 PRINTER)                                                     COEF3007
      INTEGER P,Q                                                       COEF3008
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)COEF3009
     1,N4,N5,X2(10),YY2(100),SSXY(12),BB(12),I5(8),SSX(12,12)           COEF3010
   82 FORMAT('POWER TRANSFORMATIONS  A1='F8.4'  A2='F8.4'  A3='F8.4'  C=COEF3011
     1'F8.4)                                                            COEF3012
   81 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.COEF3013
     14'  A2 ='F8.4'  A3='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIACOEF3014
     2BLE - C ='F8.4)                                                   COEF3015
   80 FORMAT('1'12A6)                                                   COEF3016
   79 FORMAT(11E10.3)                                                   COEF3017
   78 FORMAT(12A6)                                                      COEF3018
   77 FORMAT('0POINTS PLOTTED FOR MLR GRAPH OF B('I1')'/9(4X'B('I1')'2X)COEF3019
     14X'SSD'8X'R')                                                     COEF3020
   76 FORMAT(F3.1)                                                      COEF3021
   75 FORMAT('VALUE OF B('I1')  -  MLE OF B('I1') ='E10.3)              COEF3022
   74 FORMAT(E10.3)                                                     COEF3023
   73 FORMAT('MAXIMUM LIKELIHOOD RATIO')                               COEF3024
      P=5                                                               COEF3025
      Q=8                                                               COEF3026
      N1=N/IREP                                                         COEF3027
      SSY=0.0                                                           COEF3028
      DO 16 I=1,N1                                                      COEF3029
      DO 16 J=1,IREP                                                    COEF3030
   16 SSY=SSY+(Y(I,J)*Y(I,J))**A3(4)                                    COEF3031
      DO 14 I=1,N1                                                      COEF3032
      YY2(I)=0.0                                                        COEF3033
      DO 14 J=1,IREP                                                    COEF3034
   14 YY2(I)=YY2(I)+Y(I,J)**A3(4)/IREP                                  COEF3035
      X2(1)=1.0                                                         COEF3036
      DO 32 I=1,10                                                      COEF3037
      BB(I)=0.0                                                         COEF3038
      DO 32 J=1,10                                                      COEF3039
   32 SSX(I,J)=0.0                                                      COEF3040
      DO 33 I=1,N1                                                      COEF3041
      DO 31 J=2,4                                                       COEF3042
      X2(J)=X(I,J-1)**A3(J-1)                                           COEF3043
   31 X2(J+3)=X2(J)*X2(J)                                               COEF3044
      X2(8)=X2(2)*X2(3)                                                 COEF3045
      X2(9)=X2(2)*X2(4)                                                 COEF3046
      X2(10)=X2(3)*X2(4)                                                COEF3047
      DO 33 J=1,10                                                      COEF3048
      BB(J)=BB(J)+YY2(I)*X2(J)                                          COEF3049
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      SSXY(J)=BB(J)                                                    COEF3050
      DO 33 K=1,10                                                     COEF3051
   33 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                    COEF3052
      CALL MATV(SSX,10,BB,1,DET)                                       COEF3053
      SS=SSY                                                           COEF3054
      DO 15 I=1,10                                                     COEF3055
   15 SS=SS-SSXY(I)*BB(I)*IREP                                         COEF3056
      DO 21 JJ=2,10                                                    COEF3057
      J3=JJ-1                                                          COEF3058
      AN5=44                                                           COEF3059
      IF(BB(JJ))25,25,26                                               COEF3060
   25 X4=2.0*BB(JJ)                                                    COEF3061
      GO TO 27                                                         COEF3062
   26 X4=0.0                                                           COEF3063
   27 A=2.0*ABS(BB(JJ))                                                COEF3064
      B1=A/20.                                                         COEF3065
      C=X4-A/50.                                                       COEF3066
      D=A/10.                                                          COEF3067
      E=10./A                                                          COEF3068
      F=X4-B1                                                          COEF3069
      G=X4+D                                                           COEF3070
      H=X4+A*1.3                                                       COEF3071
      W=X4-A/15.                                                       COEF3072
      U=X4-A/7.5                                                       COEF3073
      Z=X4-D                                                           COEF3074
      CALL SCALE(E,10.0,X4,0.0)                                        COEF3075
      CALL EGRID(0,X4,0.0,B1,20)                                       COEF3076
      CALL EGRID(1,X4,0.0,0.05,20)                                     COEF3077
      DO 2 I=1,11                                                      COEF3078
      X1=G+D*FLOAT(I-3)+D/2.5                                          COEF3079
      IF(X1)35,36,36                                                   COEF3080
   35 NN1=-1                                                           COEF3081
      GO TO 37                                                         COEF3082
   36 NN1=1                                                            COEF3083
   37 XO=G+D*FLOAT(I-2)*NN1                                            COEF3084
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                 COEF3085
    2 WRITE(7,74)XO                                                    COEF3086
      DO 3 I=1,11                                                      COEF3087
      X1=-0.1+0.1*FLOAT(I)                                             COEF3088
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                     COEF3089
    3 WRITE(7,76)X1                                                    COEF3090
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                  COEF3091
      WRITE(7,75)J3,J3,BB(JJ)                                          COEF3092
      CALL ECHAR(W,0.1,0.1,0.1,1.5709)                                 COEF3093
      WRITE(7,73)                                                      COEF3094
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                                 COEF3095
      WRITE(7,78)TITL                                                  COEF3096
      CALL ECHAR(U,0.0,0.1,0.1,1.5709)                                 COEF3097
      WRITE(7,82)A3                                                    COEF3098
      CALL EPLOT(-2,X4,0.0)                                            COEF3099
      WRITE(P,80)TITL                                                  COEF3100
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      WRITE(P,81)A3                                                  COEF3101
      DO 4 I=2,10                                                    COEF3102
      IF(I-JJ)7,4,5                                                  COEF3103
    7 JJ=I-1                                                         COEF3104
      GO TO 6                                                        COEF3105
    5 JJ=I-2                                                         COEF3106
    6 I5(JJ)=I-1                                                     COEF3107
    4 CONTINUE                                                       COEF3108
      WRITE(P,77)J3,J3,I5                                            COEF3109
      DO 1 KK=1,45                                                   COEF3110
      V2=(KK-1)*A/AN5+X4                                             COEF3111
      SSY1=0.0                                                       COEF3112
      DO 17 I=1,9                                                    COEF3113
      SSXY(I)=0.0                                                    COEF3114
      DO 17 J=1,9                                                    COEF3115
   17 SSX(I,J)=0.0                                                   COEF3116
      DO 18 I=1,N1                                                   COEF3117
      DO 28 J=2,4                                                    COEF3118
      X2(J)=X(I,J-1)**A3(J-1)                                        COEF3119
   28 X2(J+3)=X2(J)*X2(J)                                            COEF3120
      X2(8)=X2(2)*X2(3)                                              COEF3121
      X2(9)=X2(2)*X2(4)                                              COEF3122
      X2(10)=X2(3)*X2(4)                                             COEF3123
      DO 34 J=1,IREP                                                 COEF3124
   34 SSY1=SSY1+(Y(I,J)-V2*X2(JJ))**2                                COEF3125
      DO 18 J=1,10                                                   COEF3126
      IF(J-JJ)20,18,30                                               COEF3127
   20 JJJ=J                                                          COEF3128
      GO TO 29                                                       COEF3129
   30 JJJ=J-1                                                        COEF3130
   29 SSXY(JJJ)=SSXY(JJJ)+(YY2(I)-V2*X2(JJ))*X2(J)                   COEF3131
      B(JJJ)=SSXY(JJJ)                                               COEF3132
      DO 18 K=1,10                                                   COEF3133
      IF(K-JJ)11,18,12                                               COEF3134
   11 KKK=K                                                          COEF3135
      GO TO 13                                                       COEF3136
   12 KKK=K-1                                                        COEF3137
   13 SSX(JJJ,KKK)=SSX(JJJ,KKK)+X2(J)*X2(K)                          COEF3138
   18 CONTINUE                                                       COEF3139
      CALL MATV(SSX,9,B,1,DET)                                       COEF3140
      DO 19 I=1,9                                                    COEF3141
   19 SSY1=SSY1-SSXY(I)*B(I)*IREP                                    COEF3142
      R=(SS/SSY1)**(FLOAT(N)/2.0)                                    COEF3143
      WRITE(P,79)V2,(B(J),J=2,9),SSY1,R                              COEF3144
    1 CALL EPLOT(0,V2,R)                                             COEF3145
      CALL EPLOT(1,H,0.0)                                            COEF3146
   21 CONTINUE                                                       COEF3147
      CALL LINK(EIGN3)                                               COEF3148
      END                                                            COEF3149
// DUP                                                               COEF3150
*DELETE              COEF3                                          COEF3151
*STORE       WS  UA  COEF3                                          COEF3152
```

```
// JOB                                                                  EIGN3000
// FOR                                                                  EIGN3001
*LIST ALL                                                               EIGN3002
*NAME EIGN3                                                             EIGN3003
*EXTENDED PRECISION                                                     EIGN3004
*ONE WORD INTEGERS                                                      EIGN3005
*IOCS(KEYBOARD)                                                         EIGN3006
*IOCS(TYPEWRITER)                                                       EIGN3007
*IOCS(1403 PRINTER)                                                     EIGN3008
      INTEGER P,Q                                                       EIGN3009
      DIMENSION ALAM1(3),ALAM2(3),PREP1(3,3),PREP2(3,3)                 EIGN3010
      COMMON Y(100,10),X(100,3),V(12),A4(4),SSY,NS,NREPS,TITL(12),ID,A3(EIGN3011
     14),N4,N5,YS2(6),V1(3,2),ALAMD(3,2),PREP(3,3,2),X1(10),Z(3),YDEV(10EIGN3012
     20),A5(4),COE(12),NNN(4),XC(100,3),BA(12,12)                       EIGN3013
      EQUIVALENCE (ALAMD(1,1),ALAM1(1)),(ALAMD(1,2),ALAM2(1)),(PREP(1,1,EIGN3014
     11),PREP1(1,1)),(PREP(1,1,2),PREP2(1,1))                           EIGN3015
   89 FORMAT(1HO,8X,'EIGEN VALUES',10X,'EIGEN VECTORS AS ROWS',/,)      EIGN3016
   88 FORMAT('0'2(E11.4,'='YS'3X)'IN ORIGINAL UNITS'/)                  EIGN3017
   87 FORMAT(1HO,6(E11.4,'='X'I1'S'2X)' IN ORIGINAL UNITS')             EIGN3018
   86 FORMAT(I3,9E13.5)                                                 EIGN3019
   85 FORMAT(1HO,1X,'TABLE OF RESIDUALS')                               EIGN3020
   84 FORMAT(I3)                                                        EIGN3021
   83 FORMAT('TYPE 1 TO CALL EXIT, EOF TO CONTINUE')                    EIGN3022
   82 FORMAT('1'12A6)                                                   EIGN3023
   81 FORMAT(1HO,5X,3HY -,E15.6,3H = ,3(2H +,E15.6,2H Z,I1,3H SO),/,)   EIGN3024
   80 FORMAT(1HO,7X,'Y EST',8X,'Y OBS',9X,'DEVN',17X,'VALUES OF Z',28X,'EIGN3025
     1FACTOR LEVELS'/)                                                  EIGN3026
   79 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.EIGN3027
     14'  A2 ='F8.4'  A3 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARIEIGN3028
     2ABLE - C ='F8.4)                                                  EIGN3029
   78 FORMAT( 52HO CANONICAL REGRESSION   (Z ARE CANONICAL VARIABLES),/)EIGN3030
   77 FORMAT(29HO  CENTRE OF RESPONSE SURFACE  ,/,)                     EIGN3031
      P=5                                                               EIGN3032
      Q=8                                                               EIGN3033
      N5=1                                                              EIGN3034
      DO 27 I=1,4                                                       EIGN3035
   27 A5(I)=A4(I)                                                       EIGN3036
      N1=NS/NREPS                                                       EIGN3037
      GO TO (11,10),N4                                                  EIGN3038
   11 DO 12 I=1,4                                                       EIGN3039
   12 A4(I)=A3(I)                                                       EIGN3040
      GO TO 13                                                          EIGN3041
   10 DO 5 I=1,4                                                        EIGN3042
    5 A4(I)=1.0                                                         EIGN3043
   13 DO 4 LL=1,N4                                                      EIGN3044
      WRITE(P,82)TITL                                                   EIGN3045
      GO TO (14,15),N4                                                  EIGN3046
   15 GO TO (19,14),LL                                                  EIGN3047
   14 WRITE(P,79)A3                                                     EIGN3048
   19 DO 6 I=1,N1                                                       EIGN3049
```

```
      DO 20 K=1,3                                                       EIGN3050
   20 XC(I,K)=X(I,K)**A4(K)                                             EIGN3051
      YDEV(I)=0.0                                                       EIGN3052
      DO 6 K=1,NREPS                                                    EIGN3053
    6 YDEV(I)=YDEV(I)+Y(I,K)**A4(4)/NREPS                               EIGN3054
      DO 7 I=1,10                                                       EIGN3055
      V(I)=0.0                                                          EIGN3056
      DO 7 J=1,10                                                       EIGN3057
    7 BA(I,J)=0.0                                                       EIGN3058
      X1(1)=1.0                                                         EIGN3059
      DO 8 K=1,N1                                                       EIGN3060
      DO 3 J=2,4                                                        EIGN3061
    3 X1(J)=X(K,J-1)**A4(J-1)                                           EIGN3062
      X1(5)=X1(2)*X1(2)                                                 EIGN3063
      X1(6)=X1(2)*X1(3)                                                 EIGN3064
      X1(7)=X1(3)*X1(3)                                                 EIGN3065
      X1(8)=X1(2)*X1(4)                                                 EIGN3066
      X1(9)=X1(3)*X1(4)                                                 EIGN3067
      X1(10)=X1(4)*X1(4)                                                EIGN3068
      DO 8 I=1,10                                                       EIGN3069
      V(I)=V(I)+YDEV(K)*X1(I)                                           EIGN3070
      DO 8 J=1,10                                                       EIGN3071
    8 BA(I,J)=BA(I,J)+X1(I)*X1(J)                                       EIGN3072
      CALL MATV(BA,10,V,1,DET)                                          EIGN3073
      DO 29 J=1,10                                                      EIGN3074
   29 COE(J)=V(J)                                                       EIGN3075
      NFAK=3                                                            EIGN3076
      KP=NFAK+2                                                         EIGN3077
      DO 32 I=1,NFAK                                                    EIGN3078
      DO 32 J=1,I                                                       EIGN3079
      IF(I-J)31,30,31                                                   EIGN3080
   30 PREP(I,J,LL)=V(KP)                                                EIGN3081
      GO TO 32                                                          EIGN3082
   31 PREP(I,J,LL)=V(KP)*0.5                                            EIGN3083
      PREP(J,I,LL)=PREP(I,J,LL)                                         EIGN3084
   32 KP=KP+1                                                           EIGN3085
      DO 33 I=1,NFAK                                                    EIGN3086
   33 V(I)=-V(I+1)*0.500                                                EIGN3087
      DO 34 I=1,NFAK                                                    EIGN3088
      DO 34 J=1,NFAK                                                    EIGN3089
   34 BA(I,J)=PREP(I,J,LL)                                              EIGN3090
      WRITE(P,77)                                                       EIGN3091
      CALL MATV(BA,NFAK,V,1,DET)                                        EIGN3092
      YS=COE(1)                                                         EIGN3093
      DO 44 I=1,NFAK                                                    EIGN3094
   44 YS=YS+0.500*V(I)*COE(I+1)                                         EIGN3095
      GO TO (35,36),N4                                                  EIGN3096
   36 GO TO (37,35),LL                                                  EIGN3097
   35 I1=1                                                              EIGN3098
      I2=2                                                              EIGN3099
      I3=3                                                              EIGN3100
```

```
      DO 40 I=1,3                                                       EIGN3101
   40 NNN(I)=V(I)/ABS(V(I))                                             EIGN3102
      V3=ABS(V(1))**(1./A3(1))*NNN(1)                                   EIGN3103
      V4=ABS(V(2))**(1./A3(2))*NNN(2)                                   EIGN3104
      V5=ABS(V(3))**(1./A3(3))*NNN(3)                                   EIGN3105
      NNN(4)=YS/ABS(YS)                                                 EIGN3106
      YS1=ABS(YS)**(1./A3(4))*NNN(4)                                    EIGN3107
      WRITE(P,87)(V(I),I,I=1,NFAK),V3,I1,V4,I2,V5,I3                    EIGN3108
      WRITE(P,88)YS,YS1                                                 EIGN3109
      GO TO 45                                                          EIGN3110
   37 WRITE(P,87)(V(I),I,I=1,NFAK)                                      EIGN3111
      WRITE(P,88)YS                                                     EIGN3112
   45 WRITE(P,89)                                                       EIGN3113
      GO TO (22,23),LL                                                  EIGN3114
   22 CALL CAN3(PREP1,ALAM1,NFAK)                                       EIGN3115
      GO TO 24                                                          EIGN3116
   23 CALL CAN3(PREP2,ALAM2,NFAK)                                       EIGN3117
   24 WRITE(P,78)                                                       EIGN3118
      WRITE(P,81)YS,(ALAMD(J,LL),J,J=1,NFAK)                            EIGN3119
      WRITE(P,85)                                                       EIGN3120
      WRITE(P,80)                                                       EIGN3121
      DO 18 J=1,N1                                                      EIGN3122
      YPRED=YS                                                          EIGN3123
      DO 16 I=1,NFAK                                                    EIGN3124
      Z(I)=0.0                                                          EIGN3125
      DO 16 L=1,NFAK                                                    EIGN3126
   16 Z(I)=Z(I)+(XC(J,L)-V(L))*PREP(I,L,LL)                             EIGN3127
      DO 17 L1=1,NFAK                                                   EIGN3128
   17 YPRED=YPRED+(7(L1)**2)*ALAMD(L1,LL)                               EIGN3129
      MM1=YPRED/ABS(YPRED)                                              EIGN3130
      YPRED=MM1*ABS(YPRED)**(1.0/A4(4))                                 EIGN3131
      YDEV(J)=0.0                                                       EIGN3132
      DO 51 I=1,NREPS                                                   EIGN3133
   51 YDEV(J)=YDEV(J)+Y(J,I)/NREPS                                      EIGN3134
      YDEV1=YDEV(J)-YPRED                                               EIGN3135
   18 WRITE(P,86)J,YPRED,YDEV(J),YDEV1,(Z(I),I=1,NFAK),(XC(J,II),II=1,NFEIGN3136
     1AK)                                                               EIGN3137
      DO 25 I=1,4                                                       EIGN3138
   25 A4(I)=A3(I)                                                       EIGN3139
      DO 46 I=1,3                                                       EIGN3140
   46 V1(I,LL)=V(I)                                                     EIGN3141
    4 CONTINUE                                                          EIGN3142
      DO 28 I=1,4                                                       EIGN3143
   28 A4(I)=A5(I)                                                       EIGN3144
      CALL DATSW(7,J7)                                                  EIGN3145
      GO TO (49,50),J7                                                  EIGN3146
   49 CALL LINK(CENT3)                                                  EIGN3147
   50 CALL DATSW(10,J10)                                                EIGN3148
      GO TO (48,47),J10                                                 EIGN3149
   48 CALL LINK(SLIC3)                                                  EIGN3150
   47 GO TO (9,26),N4                                                   EIGN3151
```

```
    9 WRITE(1,83)                                          EIGN3152
      READ(6,84)N5                                         EIGN3153
      IF(N5)2,21,2                                         EIGN3154
   26 IF(ID-98)1,2,1                                       EIGN3155
    2 CALL EXIT                                            EIGN3156
   21 CALL LINK(CRLF3)                                     EIGN3157
    1 CALL LINK(BOX3)                                      EIGN3158
      END                                                  EIGN3159
// DUP                                                     EIGN3160
*DELETE              EIGN3                                 EIGN3161
*STORE      WS  UA   EIGN3                                 EIGN3162
```

```
// JOB                                                                  CENT3000
// FOR                                                                  CENT3001
*LIST ALL                                                               CENT3002
*NAME CENT3                                                             CENT3003
*EXTENDED PRECISION                                                     CENT3004
*ONE WORD INTEGERS                                                      CENT3005
*IOCS(1403 PRINTER)                                                     CENT3006
      INTEGER P,Q                                                       CENT3007
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)CENT3008
     1,N4,N5,YS(6),V1(3,2),R(45,3,2),X2(10),V2(3),YY2(100),SSXY(10),A5(4CENT3009
     2),SSX(12,12),BB(12)                                               CENT3010
   81 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.CENT3011
     14'  A2 ='F8.4'  A3 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARICENT3012
     2ABLE - C ='F8.4)                                                  CENT3013
   80 FORMAT('1'12A6)                                                   CENT3014
   79 FORMAT(5E15.5)                                                    CENT3015
   78 FORMAT('0POINTS PLOTTED FOR MLR GRAPH OF X'I1'S'/7X'X1S'12X'X2S'12CENT3016
     1X'X3S'13X'SSD'13X'R')                                             CENT3017
      P=5                                                               CENT3018
      Q=8                                                               CENT3019
      N1=N/IREP                                                         CENT3020
      DO 8 I=1,4                                                        CENT3021
    8 A5(I)=A4(I)                                                       CENT3022
      GO TO (9,10),N4                                                   CENT3023
    9 DO 22 I=1,4                                                       CENT3024
   22 A4(I)=A3(I)                                                       CENT3025
      N6=1                                                              CENT3026
      GO TO 23                                                          CENT3027
   10 DO 24 I=1,4                                                       CENT3028
   24 A4(I)=1.0                                                         CENT3029
      N6=2                                                              CENT3030
   23 DO 4 LL=1,N6                                                      CENT3031
      SSY=0.0                                                           CENT3032
      DO 16 I=1,N1                                                      CENT3033
      DO 16 J=1,IREP                                                    CENT3034
   16 SSY=SSY+(Y(I,J)*Y(I,J))**A4(4)                                    CENT3035
      DO 14 I=1,N1                                                      CENT3036
      YY2(I)=0.0                                                        CENT3037
      DO 14 J=1,IREP                                                    CENT3038
   14 YY2(I)=YY2(I)+Y(I,J)**A4(4)/IREP                                  CENT3039
      X2(1)=1.0                                                         CENT3040
      DO 27 I=1,10                                                      CENT3041
      BB(I)=0.0                                                         CENT3042
      DO 27 J=1,10                                                      CENT3043
   27 SSX(I,J)=0.0                                                      CENT3044
      DO 3 I=1,N1                                                       CENT3045
      DO 26 J=2,4                                                       CENT3046
      X2(J)=X(I,J-1)**A4(J-1)                                           CENT3047
   26 X2(J+3)=X2(J)*X2(J)                                               CENT3048
      X2(8)=X2(2)*X2(3)                                                 CENT3049
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      X2(9)=X2(2)*X2(4)                                                 CENT3050
      X2(10)=X2(3)*X2(4)                                                CENT3051
      DO 3 J=1,10                                                       CENT3052
      BB(J)=BB(J)+YY2(I)*X2(J)                                          CENT3053
      DO 3 K=1,10                                                       CENT3054
    3 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                     CENT3055
      CALL MATV(SSX,10,BB,1,DET)                                        CENT3056
      DO 11 I=1,7                                                       CENT3057
      SSXY(I)=0.0                                                       CENT3058
      DO 11 J=1,7                                                       CENT3059
   11 SSX(I,J)=0.0                                                      CENT3060
      DO 12 I=1,N1                                                      CENT3061
      DO 13 J=1,2                                                       CENT3062
      J1=J+1                                                            CENT3063
      DO 13 J2=J1,3                                                     CENT3064
      J3=J+J2-2                                                         CENT3065
      X2(J3+1)=(X(I,J3)**A4(J3)-2.0*V1(J3,LL))*X(I,J3)**A4(J3)          CENT3066
   13 X2(J3+4)=X(I,J)**A4(J)*X(I,J2)**A4(J2)-V1(J,LL)*X(I,J2)**A4(J2)-V1CENT3067
     1(J2,LL)*X(I,J)**A4(J)                                             CENT3068
      DO 12 J=1,7                                                       CENT3069
      SSXY(J)=SSXY(J)+YY2(I)*X2(J)                                      CENT3070
      B(J)=SSXY(J)                                                      CENT3071
      DO 12 K=1,7                                                       CENT3072
   12 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                     CENT3073
      CALL MATV(SSX,7,B,1,DET)                                          CENT3074
      SS=SSY                                                            CENT3075
      DO 15 I=1,7                                                       CENT3076
   15 SS=SS-SSXY(I)*B(I)*IREP                                           CENT3077
      DO 2 J1=1,2                                                       CENT3078
      J2=J1+1                                                           CENT3079
      DO 2 J3=J2,3                                                      CENT3080
      JJ=J1+J3-2                                                        CENT3081
      J4=4-J1                                                           CENT3082
      J5=4-J3                                                           CENT3083
      J6=4-JJ                                                           CENT3084
      AN5=44                                                            CENT3085
      X1=V1(JJ,LL)                                                      CENT3086
      IF(X1)5,5,6                                                       CENT3087
    5 X4=2.0*X1                                                         CENT3088
      GO TO 7                                                           CENT3089
    6 X4=0.0                                                            CENT3090
    7 A=2.0*ABS(X1)                                                     CENT3091
      WRITE(P,80)TITL                                                   CENT3092
      GO TO (29,30),N4                                                  CENT3093
   30 GO TO (28,29),LL                                                  CENT3094
   29 WRITE(P,81)A3                                                     CENT3095
   28 WRITE(P,78)JJ                                                     CENT3096
      DO 1 KK=1,45                                                      CENT3097
      V2(JJ)=(KK-1)*A/AN5+X4                                            CENT3098
      SSX(1,1)=BB(J4+4)                                                 CENT3099
      SSX(2,2)=BB(J5+4)                                                 CENT3100
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      SSX(1,2)=BB(J6+7)/2.0                                          CENT3101
      SSX(2,1)=SSX(1,2)                                              CENT3102
      B(1)=-(BB(J4+1)+BB(J3+7)*V2(JJ))/2.0                           CENT3103
      B(2)=-(BB(J5+1)+BB(J1+7)*V2(JJ))/2.0                           CENT3104
      CALL MATV(SSX,2,B,1,DET)                                       CENT3105
      V2(J4)=B(1)                                                    CENT3106
      V2(J5)=B(2)                                                    CENT3107
      DO 17 I=1,7                                                    CENT3108
      SSXY(I)=0.0                                                    CENT3109
      DO 17 J=1,7                                                    CENT3110
   17 SSX(I,J)=0.0                                                   CENT3111
      DO 18 I=1,N1                                                   CENT3112
      DO 25 J=1,2                                                    CENT3113
      JJ1=J+1                                                        CENT3114
      DO 25 JJ2=JJ1,3                                                CENT3115
      JJ3=J+JJ2-2                                                    CENT3116
      X2(JJ3+1)=(X(I,JJ3)**A4(JJ3)-2.0*V2(JJ3))*X(I,JJ3)**A4(JJ3)   CENT3117
   25 X2(JJ3+4)=X(I,J)**A4(J)*X(I,JJ2)**A4(JJ2)-V2(J)*X(I,JJ2)**A4(JJ2)-CENT3118
     1V2(JJ2)*X(I,J)**A4(J)                                          CENT3119
      DO 18 J=1,7                                                    CENT3120
      SSXY(J)=SSXY(J)+YY2(I)*X2(J)                                   CENT3121
      B(J)=SSXY(J)                                                   CENT3122
      DO 18 K=1,7                                                    CENT3123
   18 SSX(J,K)=SSX(J,K)+X2(J)*X2(K)                                  CENT3124
      CALL MATV(SSX,7,B,1,DET)                                       CENT3125
      SSY1=SSY                                                       CENT3126
      DO 19 I=1,7                                                    CENT3127
   19 SSY1=SSY1-SSXY(I)*B(I)*IREP                                    CENT3128
      R(KK,JJ,LL)=(SS/SSY1)**(FLOAT(N)/2.0)                          CENT3129
      DO 31 I=1,3                                                    CENT3130
      NN1=V2(I)/ABS(V2(I))                                           CENT3131
   31 V2(I)=ABS(V2(I))**(1.0/A4(I))*NN1                              CENT3132
    1 WRITE(P,79)V2,SSY1,R(KK,JJ,LL)                                 CENT3133
    2 CONTINUE                                                       CENT3134
      DO 20 I=1,4                                                    CENT3135
   20 A4(I)=A3(I)                                                    CENT3136
    4 CONTINUE                                                       CENT3137
      DO 21 I=1,4                                                    CENT3138
   21 A4(I)=A5(I)                                                    CENT3139
      CALL LINK(PCNT3)                                               CENT3140
      END                                                            CENT3141
// DUP                                                               CENT3142
*DELETE              CENT3                                          CENT3143
*STORE       WS  UA  CENT3                                          CENT3144
```

```
// JOB                                                                  PCNT3000
// FOR                                                                  PCNT3001
*LIST ALL                                                               PCNT3002
*NAME PCNT3                                                             PCNT3003
*EXTENDED PRECISION                                                     PCNT3004
*ONE WORD INTEGERS                                                      PCNT3005
*IOCS(KEYBOARD)                                                         PCNT3006
*IOCS(PLOTTER)                                                          PCNT3007
*IOCS(TYPEWRITER)                                                       PCNT3008
      COMMON Y(100,10),X(100,3),B(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4)PCNT3009
     1,N4,N5,YS(6),V1(3,2),R(45,3,2),A5(4)                              PCNT3010
   80 FORMAT('POWER TRANSFORMATIONS  A1='F8.4'  A2='F8.4'  A3='F8.4'  C=PCNT3011
     1'F8.4)                                                            PCNT3012
   79 FORMAT(I3)                                                        PCNT3013
   78 FORMAT(12A6)                                                      PCNT3014
   77 FORMAT('TYPE 1 TO CALL EXIT, EOF TO CONTINUE')                    PCNT3015
   76 FORMAT(F3.1)                                                      PCNT3016
   75 FORMAT('VALUE OF X'I1'S  -  CENTRE AT X'I1'S ='F7.3)              PCNT3017
   74 FORMAT(F7.3)                                                      PCNT3018
   73 FORMAT('MAXIMUM LIKELIHOOD RATIO')                               PCNT3019
      AN5=44                                                            PCNT3020
      DO 24 I=1,4                                                       PCNT3021
   24 A5(I)=A4(I)                                                       PCNT3022
   25 DO 27 I=1,4                                                       PCNT3023
      GO TO (25,26),N4                                                  PCNT3024
   27 A4(I)=A3(I)                                                       PCNT3025
      N6=1                                                              PCNT3026
      GO TO 28                                                          PCNT3027
   26 DO 29 I=1,4                                                       PCNT3028
   29 A4(I)=1.0                                                         PCNT3029
      N6=2                                                              PCNT3030
   28 DO 30 LL=1,N6                                                     PCNT3031
      DO 4 JJ=1,3                                                       PCNT3032
      X1=V1(JJ,LL)                                                      PCNT3033
      IF(X1)12,12,13                                                    PCNT3034
   12 X4=2.0*X1                                                         PCNT3035
      GO TO 14                                                          PCNT3036
   13 X4=0.0                                                            PCNT3037
   14 A=2.0*ABS(X1)                                                     PCNT3038
      B1=A/20.                                                          PCNT3039
      C=X4-A/50.                                                        PCNT3040
      D=A/10.                                                           PCNT3041
      E=10./A                                                           PCNT3042
      F=X4-B1                                                           PCNT3043
      G=X4+D                                                            PCNT3044
      H=X4+A*1.3                                                        PCNT3045
      W=X4-A/15.                                                        PCNT3046
      U=X4-A/7.5                                                        PCNT3047
      Z=X4-D                                                            PCNT3048
      CALL SCALE(E,10.0,X4,0.0)                                         PCNT3049
```

```
      CALL EGRID(0,X4,0.0,81,20)                                        PCNT3050
      CALL EGRID(1,X4,0.0,0.05,20)                                      PCNT3051
      DO 2 I=1,11                                                       PCNT3052
      X1=G-D/5.0+D*FLOAT(I-2)                                           PCNT3053
      NN1=X1/ABS(X1)                                                    PCNT3054
      XO=ABS(G+D*FLOAT(I-2))**(1.0/A4(JJ))*NN1                          PCNT3055
      CALL ECHAR(X1,-0.02,0.1,0.1,0.0)                                  PCNT3056
    2 WRITE(7,74)XO                                                     PCNT3057
      DO 3 I=1,11                                                       PCNT3058
      X1=-0.1+0.1*FLOAT(I)                                              PCNT3059
      CALL ECHAR(F,X1,0.1,0.1,0.0)                                      PCNT3060
    3 WRITE(7,76)X1                                                     PCNT3061
      CALL ECHAR(G,-0.04,0.1,0.1,0.0)                                   PCNT3062
      NN1=V1(JJ,LL)/ABS(V1(JJ,LL))                                      PCNT3063
      V3=ABS(V1(JJ,LL))**(1.0/A4(JJ))*NN1                               PCNT3064
      WRITE(7,75)JJ,JJ,V3                                               PCNT3065
      CALL ECHAR(W,0.1,0.1,0.1,1.5709)                                  PCNT3066
      WRITE(7,73)                                                       PCNT3067
      CALL ECHAR(Z,0.0,0.1,0.1,1.5709)                                  PCNT3068
      WRITE(7,78)TITL                                                   PCNT3069
      GO TO (11,9),N4                                                   PCNT3070
    9 GO TO (10,11),LL                                                  PCNT3071
   11 CALL ECHAR(U,0.0,0.1,0.1,1.5709)                                  PCNT3072
      WRITE(7,80)A3                                                     PCNT3073
   10 CALL EPLOT(-2,X4,0.0)                                             PCNT3074
      DO 1 KK=1,45                                                      PCNT3075
      V2=(KK-1)*A/AN5+X4                                                PCNT3076
    1 CALL EPLOT(0,V2,R(KK,JJ,LL))                                      PCNT3077
      CALL EPLOT(1,H,0.0)                                               PCNT3078
    4 CONTINUE                                                          PCNT3079
      DO 31 I=1,4                                                       PCNT3080
   31 A4(I)=A3(I)                                                       PCNT3081
   30 CONTINUE                                                          PCNT3082
      DO 32 I=1,4                                                       PCNT3083
   32 A4(I)=A5(I)                                                       PCNT3084
      CALL DATSW(10,J10)                                                PCNT3085
      GO TO (16,15),J10                                                 PCNT3086
   16 CALL LINK(SLIC3)                                                  PCNT3087
   15 GO TO (17,8),N4                                                   PCNT3088
   17 WRITE(1,77)                                                       PCNT3089
      READ(6,79)N5                                                      PCNT3090
      IF(N5)5,6,5                                                       PCNT3091
    8 IF(ID-98)7,5,7                                                    PCNT3092
    5 CALL EXIT                                                         PCNT3093
    6 CALL LINK(CRLF3)                                                  PCNT3094
    7 CALL LINK(BOX3)                                                   PCNT3095
      END                                                               PCNT3096
// DUP                                                                  PCNT3097
*DELETE              PCNT3                                             PCNT3098
*STORE       WS  UA  PCNT3                                             PCNT3099
```

```
// JOB                                                                  SLIC3000
// FOR                                                                  SLIC3001
*LIST ALL                                                               SLIC3002
*NAME SLIC3                                                             SLIC3003
*EXTENDED PRECISION                                                     SLIC3004
*ONE WORD INTEGERS                                                      SLIC3005
*IOCS(1403 PRINTER)                                                     SLIC3006
      INTEGER P,Q                                                       SLIC3007
      COMMON Y(100,10),X(100,3),V(12),A4(4),SSY,NS,NREPS,TITL(12),ID,A3(SLIC3008
     14),N4,N5,YS(6),VV1(3,2),V1(2,6),ALAMD(2,6),PREP(2,2,6),X1(10),YDEVSLIC3009
     2(100),A5(4),CNE(6),ALAM1(3),PREP1(3,3),VV(10),BA(12,12),NNN(3)    SLIC3010
   82 FORMAT('1'12A6)                                                   SLIC3011
   81 FORMAT(1HO,8X,'EIGEN VALUES',10X,'EIGEN VECTORS AS ROWS',/,)      SLIC3012
   80 FORMAT(1HO,4(E11.4,'='X'I1'S'2X)' IN ORIGINAL UNITS')             SLIC3013
   79 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.SLIC3014
     14'  A2 ='F8.4'  A3 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARISLIC3015
     2ABLE - C ='F8.4)                                                  SLIC3016
   78 FORMAT('0'2(E11.4,'='YS'3X)'IN ORIGINAL UNITS')                   SLIC3017
   77 FORMAT(//'0  CENTRE OF RESPONSE SURFACE FOR THE PLANE X'I1'='F8.2)SLIC3018
      P=5                                                               SLIC3019
      Q=8                                                               SLIC3020
      N1=NS/NREPS                                                       SLIC3021
      DO 2 I=1,4                                                        SLIC3022
    2 A5(I)=A4(I)                                                       SLIC3023
      GO TO (11,10,11,11),N4                                            SLIC3024
   11 DO 12 I=1,4                                                       SLIC3025
   12 A4(I)=A3(I)                                                       SLIC3026
      N6=1                                                              SLIC3027
      GO TO 13                                                          SLIC3028
   10 DO 5 I=1,4                                                        SLIC3029
    5 A4(I)=1.0                                                         SLIC3030
      N6=2                                                              SLIC3031
   13 DO 4 LL=1,N6                                                      SLIC3032
      WRITE(P,82)TITL                                                   SLIC3033
      GO TO (21,22,21,21),N4                                            SLIC3034
   22 GO TO (23,21),LL                                                  SLIC3035
   21 WRITE(P,79)A3                                                     SLIC3036
      GO TO (23,23,31,23),N4                                            SLIC3037
   23 DO 6 I=1,N1                                                       SLIC3038
      YDEV(I)=0.0                                                       SLIC3039
      DO 6 K=1,NREPS                                                    SLIC3040
    6 YDEV(I)=YDEV(I)+Y(I,K)**A4(4)/NREPS                               SLIC3041
      DO 7 I=1,10                                                       SLIC3042
      VV(I)=0.0                                                         SLIC3043
      DO 7 J=1,10                                                       SLIC3044
    7 BA(I,J)=0.0                                                       SLIC3045
      X1(1)=1.0                                                         SLIC3046
      DO 8 K=1,N1                                                       SLIC3047
      DO 3 J=2,4                                                        SLIC3048
      X1(J)=X(K,J-1)**A4(J-1)                                           SLIC3049
    3 X1(J+3)=X1(J)*X1(J)                                               SLIC3050
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      X1(8)=X1(2)*X1(3)                                                  SLIC3051
      X1(9)=X1(2)*X1(4)                                                  SLIC3052
      X1(10)=X1(3)*X1(4)                                                 SLIC3053
      DO 8 I=1,10                                                        SLIC3054
      VV(I)=VV(I)+YDEV(K)*X1(I)                                          SLIC3055
      DO 8 J=1,10                                                        SLIC3056
    8 BA(I,J)=BA(I,J)+X1(I)*X1(J)                                        SLIC3057
      CALL MATV(9A,10,VV,1,DET)                                          SLIC3058
      GO TO 33                                                           SLIC3059
   31 DO 32 I=1,10                                                       SLIC3060
   32 VV(I)=V(I)                                                         SLIC3061
   33 DO 1 LL1=2,3                                                       SLIC3062
      LL2=LL1+1                                                          SLIC3063
      DO 1 LL3=LL2,4                                                     SLIC3064
      LL4=LL1+LL3-4                                                      SLIC3065
      LL5=(LL-1)*3+4-LL4                                                 SLIC3066
      LL6=4-LL4                                                          SLIC3067
      LL7=12-LL1                                                         SLIC3068
      LL8=12-LL3                                                         SLIC3069
      L1=LL1-1                                                           SLIC3070
      L3=LL3-1                                                           SLIC3071
      V(1)=VV(1)+VV(LL6+1)*VV1(LL6,LL)+VV(LL6+4)*VV1(LL6,LL)*VV1(LL6,LL) SLIC3072
      V(2)=VV(LL1)+VV(LL8)*VV1(LL6,LL)                                   SLIC3073
      V(3)=VV(LL3)+VV(LL7)*VV1(LL6,LL)                                   SLIC3074
      V(4)=VV(LL1+3)                                                     SLIC3075
      V(5)=VV(LL4+7)                                                     SLIC3076
      V(6)=VV(LL3+3)                                                     SLIC3077
      DO 17 J=1,6                                                        SLIC3078
   17 COE(J)=V(J)                                                        SLIC3079
      NFAK=2                                                             SLIC3080
      KP=NFAK+2                                                          SLIC3081
      DO 14 I=1,NFAK                                                     SLIC3082
      DO 14 J=1,I                                                        SLIC3083
      IF(I-J)15,16,15                                                    SLIC3084
   16 PREP1(I,J)=V(KP)                                                   SLIC3085
      GO TO 14                                                           SLIC3086
   15 PREP1(I,J)=V(KP)*0.5                                               SLIC3087
      PREP1(J,I)=PREP1(I,J)                                              SLIC3088
   14 KP=KP+1                                                            SLIC3089
      DO 9 I=1,NFAK                                                      SLIC3090
    9 V(I)=-V(I+1)*0.500                                                 SLIC3091
      DO 34 I=1,NFAK                                                     SLIC3092
      DO 34 J=1,NFAK                                                     SLIC3093
   34 BA(I,J)=PREP1(I,J)                                                 SLIC3094
      CALL MATV(BA,NFAK,V,1,DET)                                         SLIC3095
      NN1=VV1(LL6,LL)/ABS(VV1(LL6,LL))                                   SLIC3096
      VVV=ABS(VV1(LL6,LL))**(1./A4(LL6))*NN1                             SLIC3097
      WRITE(P,77)LL6,VVV                                                 SLIC3098
      YS(LL5)=COE(1)                                                     SLIC3099
      DO 24 I=1,NFAK                                                     SLIC3100
   24 YS(LL5)=YS(LL5)+0.5*V(I)*COE(I+1)                                  SLIC3101
```

```
      GO TO (25,26,25,25),N4                                          SLIC3102
   26 GO TO (27,25),LL                                                SLIC3103
   25 DO 30 I=1,2                                                     SLIC3104
   30 NNN(I)=V(I)/ABS(V(I))                                           SLIC3105
      V3=ABS(V(1))**(1./A3(L1))*NNN(1)                                SLIC3106
      V4=ABS(V(2))**(1./A3(L3))*NNN(2)                                SLIC3107
      NNN(3)=YS(LL5)/ABS(YS(LL5))                                     SLIC3108
      YS1=ABS(YS(LL5))**(1./A3(4))*NNN(3)                             SLIC3109
      WRITE(P,80)V(1),L1,V(2),L3,V3,L1,V4,L3                          SLIC3110
      WRITE(P,78)YS(LL5),YS1                                          SLIC3111
      GO TO 35                                                        SLIC3112
   27 WRITE(P,80)V(1),L1,V(2),L3                                      SLIC3113
      WRITE(P,78)YS(LL5)                                              SLIC3114
   35 WRITE(P,81)                                                     SLIC3115
      CALL CAN3(PREP1,ALAM1,NFAK)                                     SLIC3116
      DO 19 I=1,2                                                     SLIC3117
      V1(I,LL5)=V(I)                                                  SLIC3118
      ALAMD(I,LL5)=ALAM1(I)                                           SLIC3119
      DO 19 J=1,2                                                     SLIC3120
   19 PREP(I,J,LL5)=PREP1(I,J)                                        SLIC3121
    1 CONTINUE                                                        SLIC3122
      DO 20 I=1,4                                                     SLIC3123
   20 A4(I)=A3(I)                                                     SLIC3124
    4 CONTINUE                                                        SLIC3125
      DO 18 I=1,4                                                     SLIC3126
   18 A4(I)=A5(I)                                                     SLIC3127
      CALL LINK(CRS3)                                                 SLIC3128
      END                                                             SLIC3129
// DUP                                                                SLIC3130
*DELETE              SLIC3                                           SLIC3131
*STORE      WS  UA  SLIC3                                           SLIC3132
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// JOB                                                                  CRS30000
// FOR                                                                  CRS30001
*NAME CRS3                                                              CRS30002
*LIST ALL                                                               CRS30003
*EXTENDED PRECISION                                                     CRS30004
*ONE WORD INTEGERS                                                      CRS30005
*IOCS(DISK)                                                             CRS30006
*IOCS(KEYBOARD)                                                         CRS30007
*IOCS(TYPEWRITER)                                                       CRS30008
*IOCS(1403 PRINTER)                                                     CRS30009
*IOCS(2501 READER)                                                      CRS30010
      INTEGER P,Q                                                       CRS30011
      DIMENSION XP1(5),YP1(5)                                           CRS30012
      COMMON Y(100,10),X(100,3),ZZ(8),A5(4),A4(4),SSY,NS,NREPS,TITL(12),CRS30013
     1ID,A3(4),N4,N5,YS(6),XCNT(6),XCNTR(2,6),ALAMD(2,6),AVECT(2,2,6),YCCRS30014
     2ONT(10,6),NSAD(6),ZLIM1(3),IJ(10,3,2),YP(400),XP(400),XH(40),XV(40CRS30015
     3),YCUN1(10),ZLIM(2)                                               CRS30016
      DEFINE FILE 1(400,6,U,KK1),2(400,6,U,KK2),3(400,6,U,KK3),4(400,6,UCRS30017
     1,KK4),5(400,6,U,KK5),6(400,6,U,KK6)                               CRS30018
   91 FORMAT('0IMAGINARY POINT CALCULATED ON CONTOUR Y ='F10.2/' TRY CONCRS30019
     1TOURS CLOSER TO THE CENTRE OR CHANGE THE FACTOR LIMITS FOR PLOTTINCRS30020
     2G')                                                               CRS30021
   90 FORMAT(1H0,10X,'DATA FOR PLOTTING OF 5 CONTOURS (X'I1'='F6.2')'//5CRS30022
     1X5(8X,F6.2,9X)/5(10X'X'I1,9X'X'I1))                              CRS30023
   89 FORMAT('0SADDLE EXISTS  -  CONTOUR POINTS PLOTTED IN ORIGINAL UNITCRS30024
     1S (X'I1'='F6.2')'//5(13X,F6.2,4X)/5(10X'X'I1,9X'X'I1))           CRS30025
   88 FORMAT('0SADDLE EXISTS  -  CONTOUR POINTS PLOTTED (X'I1'='F6.2')'/CRS30026
     1/5(13X,F6.2,4X)/5(10X'X'I1,9X'X'I1))                             CRS30027
   87 FORMAT('0DATA FOR PLOTTING 5 CONTOURS (X'I1'='F6.2')'///'0TRANSFORMCRS30028
     1ED FACTOR LEVELS IN ORIGINAL UNITS'//5X5(8X,F6.2,9X)/5(10X'X'I1,9XCRS30029
     2'X'I1))                                                           CRS30030
   86 FORMAT('ENTER 3 FACTOR LIMITS FOR PLOTTING')                      CRS30031
   85 FORMAT('ENTER 10 CONTOUR LEVELS, 5 BELOW THE CENTRE, THEN 5 ABOVE'CRS30032
     1)                                                                 CRS30033
   84 FORMAT('0POWER TRANSFORMATIONS OF INDEPENDENT VARIABLES - A1 ='F8.CRS30034
     14'  A2 ='F8.4'  A3 ='F8.4/'0POWER TRANSFORMATION OF DEPENDENT VARICRS30035
     2ABLE - C ='F8.4)                                                  CRS30036
   83 FORMAT('1'12A6)                                                   CRS30037
   82 FORMAT(13F6.2)                                                    CRS30038
   81 FORMAT(2X,5(1X,F11.2,1X,F10.2))                                   CRS30039
   80 FORMAT(F10.0)                                                     CRS30040
      P=5                                                               CRS30041
      Q=8                                                               CRS30042
      DO 4 I=1,4                                                        CRS30043
    4 A5(I)=A4(I)                                                       CRS30044
      GO TO (16,66,16,16),N4                                            CRS30045
   16 WRITE(1,85)                                                       CRS30046
      READ(6,80)YCON1                                                   CRS30047
      WRITE(1,86)                                                       CRS30048
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      READ(6,80)ZLIM1                                                   CRS30049
      GO TO 18                                                          CRS30050
   66 READ(0,82)YCON1,ZLIM1                                             CRS30051
   18 GO TO (12,97,12,12),N4                                            CRS30052
   12 DO 23 I=1,4                                                       CRS30053
   23 A4(I)=A3(I)                                                       CRS30054
      N6=1                                                              CRS30055
      GO TO 24                                                          CRS30056
   97 DO 28 I=1,4                                                       CRS30057
   28 A4(I)=1.0                                                         CRS30058
      N6=2                                                              CRS30059
   24 DO 96 LL=1,N6                                                     CRS30060
      DO 15 LL1=1,2                                                     CRS30061
      LL3=LL1+1                                                         CRS30062
      DO 15 LL2=LL3,3                                                   CRS30063
      LL4=LL1+LL2-2                                                     CRS30064
      LL5=(LL-1)*3+4-LL4                                                CRS30065
      LL6=4-LL4                                                         CRS30066
      DO 29 I=1,10                                                      CRS30067
      IF(A4(4))6,98,98                                                  CRS30068
    6 J=11-I                                                            CRS30069
      GO TO 29                                                          CRS30070
   98 J=I                                                               CRS30071
   29 YCONT(I,LL5)=YCON1(J)                                             CRS30072
      DO 61 I=1,400                                                     CRS30073
      XP(I)=0.0                                                         CRS30074
   61 YP(I)=0.0                                                         CRS30075
      NSWCH=0                                                           CRS30076
      NSAD(LL5)=0                                                       CRS30077
      KCY=0                                                             CRS30078
      IH=1                                                              CRS30079
      IV=2                                                              CRS30080
      LLH=LL1                                                           CRS30081
      LLV=LL2                                                           CRS30082
      ZLIM(1)=ZLIM1(LL1)                                                CRS30083
      ZLIM(2)=ZLIM1(LL2)                                                CRS30084
      N1=ALAMD(IH,LL5)/ABS(ALAMD(IH,LL5))                               CRS30085
      N2=ALAMD(IV,LL5)/ABS(ALAMD(IV,LL5))                               CRS30086
      NSIGN=N1*N2                                                       CRS30087
      IF(NSIGN)11,11,30                                                 CRS30088
   11 NSAD(LL5)=1                                                       CRS30089
      IF(N1)13,13,14                                                    CRS30090
   14 IDUM=IH                                                           CRS30091
      IH=IV                                                             CRS30092
      IV=IDUM                                                           CRS30093
      IDUM=LLH                                                          CRS30094
      LLH=LLV                                                           CRS30095
      LLV=IDUM                                                          CRS30096
      NSWCH=1                                                           CRS30097
      GO TO 13                                                          CRS30098
   30 IF(N1)13,13,45                                                    CRS30099
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45 DO 46 I=1,5                                                    CRS30100
   IF(A4(4))99,10,10                                              CRS30101
99 J=I                                                            CRS30102
   GO TO 46                                                       CRS30103
10 J=I+5                                                          CRS30104
46 YCONT(I,LL5)=YCON1(J)                                          CRS30105
13 CONTINUE                                                       CRS30106
   KCY=KCY+1                                                      CRS30107
   IJ(KCY,LL4,LL)=0                                               CRS30108
   ZFRST=SQRT((YCONT(KCY,LL5)**A4(4)-YS(LL5))/ALAMD(IH,LL5))      CRS30109
   ZEND=ZLIM(IH)**A4(LLH)-ZFRST                                   CRS30110
   XH(1)=ZFRST                                                    CRS30111
   XV(1)=0.0                                                      CRS30112
   THETA=0.0                                                      CRS30113
   DO 1 I=2,10                                                    CRS30114
   THETA=THETA+0.15710                                            CRS30115
   IF(NSAD(LL5))51,51,52                                          CRS30116
51 XH(I)=ZFRST*COS(THETA)                                         CRS30117
   GO TO 53                                                       CRS30118
52 XH(I)=ZFRST+ZEND-ZEND*COS(THETA)                               CRS30119
53 ARG=(YCONT(KCY,LL5)**A4(4)-YS(LL5)-ALAMD(IH,LL5)*(XH(I)**2))/ALAMDCRS30120
  1(IV,LL5)                                                       CRS30121
   IF(ARG)8,7,7                                                   CRS30122
 8 WRITE(P,91)YCONT(KCY,LL5)                                      CRS30123
   IJ(KCY,LL4,LL)=1                                               CRS30124
   CALL DATSW(6,KJ6)                                              CRS30125
   GO TO (16,17),KJ6                                              CRS30126
 7 XV(I)=SQRT(ARG)                                                CRS30127
   IL=42-I                                                        CRS30128
   XH(IL)=XH(I)                                                   CRS30129
   XV(IL)=-XV(I)                                                  CRS30130
 1 CONTINUE                                                       CRS30131
   IF(NSAD(LL5))54,54,55                                          CRS30132
54 XH(11)=0.0                                                     CRS30133
   ARGG=(YCONT(KCY,LL5)**A4(4)-YS(LL5))/ALAMD(IV,LL5)             CRS30134
   XV(11)=SQRT(ARGG)                                              CRS30135
   GO TO 56                                                       CRS30136
55 XH(11)=ZLIM(IH)**A4(LLH)                                       CRS30137
   ARG=(YCONT(KCY,LL5)**A4(4)-YS(LL5)-ALAMD(IH,LL5)*(XH(I)**2))/ALAMDCRS30138
  1(IV,LL5)                                                       CRS30139
   XV(11)=SQRT(ARG)                                               CRS30140
56 DO 2 I=12,21                                                   CRS30141
   LLL5=22-I                                                      CRS30142
   II=42-I                                                        CRS30143
   XH(I)=-XH(LLL5)                                                CRS30144
   XV(I)=XV(LLL5)                                                 CRS30145
   XH(II)=XH(I)                                                   CRS30146
 2 XV(II)=-XV(I)                                                  CRS30147
   XV(31)=-XV(11)                                                 CRS30148
   XH(31)=XH(11)                                                  CRS30149
   IF(NSWCH)31,31,32                                              CRS30150
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```
32 I1=IV                                                          CRS30151
   I2=IH                                                          CRS30152
   DO 33 I=1,40                                                   CRS30153
   XDUM=XH(I)                                                     CRS30154
   XH(I)=XV(I)                                                    CRS30155
33 XV(I)=XDUM                                                     CRS30156
   GO TO 60                                                       CRS30157
31 I1=IH                                                          CRS30158
   I2=IV                                                          CRS30159
60 DO 41 I=1,40                                                   CRS30160
   L=(KCY-1)*40+I                                                 CRS30161
   XP(L)=AVECT(I1,I1,LL5)*XH(I)+AVECT(I2,I1,LL5)*XV(I)+XCNTR(I1,LL5) CRS30162
41 YP(L)=AVECT(I1,I2,LL5)*XH(I)+AVECT(I2,I2,LL5)*XV(I)+XCNTR(I2,LL5) CRS30163
17 IF(KCY-5)13,34,34                                              CRS30164
34 IF(NSAD(LL5)-1)35,47,47                                        CRS30165
47 IF(KCY-10)48,35,35                                             CRS30166
48 IF(KCY-5)13,36,13                                              CRS30167
36 IF(NSWCH)38,38,39                                              CRS30168
38 NSWCH=1                                                        CRS30169
   GO TO 37                                                       CRS30170
39 NSWCH=0                                                        CRS30171
37 IDUM=IH                                                        CRS30172
   IH=IV                                                          CRS30173
   IV=IDUM                                                        CRS30174
   IDUM=LLH                                                       CRS30175
   LLH=LLV                                                        CRS30176
   LLV=IDUM                                                       CRS30177
   GO TO 13                                                       CRS30178
35 JJ=1                                                           CRS30179
   DO 22 I=1,5                                                    CRS30180
22 JJ=JJ*IJ(I,LL4,LL)                                             CRS30181
   IF(JJ)77,78,77                                                 CRS30182
78 WRITE(P,83)TITL                                                CRS30183
   NN1=XCNT(LL5)/ABS(XCNT(LL5))                                   CRS30184
   XCN=ABS(XCNT(LL5))**(1./A4(LL6))*NN1                           CRS30185
   GO TO (19,20,19,19),N4                                         CRS30186
20 GO TO (21,19),LL                                               CRS30187
19 WRITE(P,84)A3                                                  CRS30188
21 WRITE(P,90)LL6,XCN,(YCONT(I,LL5),I=1,5),(LL1,LL2,J=1,5)        CRS30189
   DO 3 I=1,40                                                    CRS30190
   DO 49 J=1,5                                                    CRS30191
   L1=(J-1)*40+I                                                  CRS30192
   XP1(J)=XP(L1)                                                  CRS30193
   YP1(J)=YP(L1)                                                  CRS30194
   GO TO (49,71,49,49),N4                                         CRS30195
71 GO TO (72,49),LL                                               CRS30196
72 LL7=3*(LL-1)+LL4                                               CRS30197
   WRITE(LL7'L1)XP(L1),YP(L1)                                     CRS30198
49 CONTINUE                                                       CRS30199
 3 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                               CRS30200
77 IF(NSAD(LL5))43,43,44                                          CRS30201
```

```
44 KK=1                                                                 CRS30202
   DO 79 I=6,10                                                         CRS30203
79 KK=KK*IJ(I,LL4,LL)                                                   CRS30204
   IF(KK)43,92,43                                                       CRS30205
92 WRITE(P,83)TITL                                                      CRS30206
   GO TO (50,57,50,50),N4                                               CRS30207
57 GO TO (58,50),LL                                                     CRS30208
50 WRITE(P,84)A3                                                        CRS30209
58 WRITE(P,88)LL6,XCN,(YCONT(I,LL5),I=6,10),(LL1,LL2,J=1,5)             CRS30210
   DO 42 I=1,40                                                         CRS30211
   DO 59 J=1,5                                                          CRS30212
   L1=200+(J-1)*40+I                                                    CRS30213
   XP1(J)=XP(L1)                                                        CRS30214
   YP1(J)=YP(L1)                                                        CRS30215
   GO TO (59,73,59,59),N4                                               CRS30216
73 GO TO (74,59),LL                                                     CRS30217
74 LL7=3*(LL-1)+LL4                                                     CRS30218
   WRITE(LL7'L1)XP(L1),YP(L1)                                           CRS30219
59 CONTINUE                                                             CRS30220
42 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                                     CRS30221
43 IF(JJ)76,25,76                                                       CRS30222
25 GO TO (40,9,40,40),N4                                                CRS30223
 9 GO TO (15,40),LL                                                     CRS30224
40 WRITE(P,83)TITL                                                      CRS30225
   GO TO (26,27,26,26),N4                                               CRS30226
27 GO TO (70,26),LL                                                     CRS30227
26 WRITE(P,84)A3                                                        CRS30228
70 WRITE(P,87)LL6,XCN,(YCONT(I,LL5),I=1,5),(LL1,LL2,J=1,5)              CRS30229
   DO 65 I=1,40                                                         CRS30230
   DO 64 J=1,5                                                          CRS30231
   L1=(J-1)*40+I                                                        CRS30232
   NN1=XP(L1)/ABS(XP(L1))                                               CRS30233
   NN2=YP(L1)/ABS(YP(L1))                                               CRS30234
   XP1(J)=ABS(XP(L1))**(1.0/A3(LL1))*NN1                                CRS30235
   YP1(J)=ABS(YP(L1))**(1.0/A3(LL2))*NN2                                CRS30236
   LL7=3*(LL-1)+LL4                                                     CRS30237
64 WRITE(LL7'L1)XP1(J),YP1(J)                                           CRS30238
65 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                                     CRS30239
76 IF(NSAD(LL5))15,15,67                                                CRS30240
67 IF(KK)15,75,15                                                       CRS30241
75 WRITE(P,83)TITL                                                      CRS30242
   GO TO (68,69,68,68),N4                                               CRS30243
69 GO TO (93,68),LL                                                     CRS30244
68 WRITE(P,84)A3                                                        CRS30245
93 WRITE(P,89)LL6,XCN,(YCONT(I,LL5),I=6,10),(LL1,LL2,J=1,5)             CRS30246
   DO 95 I=1,40                                                         CRS30247
   DO 94 J=1,5                                                          CRS30248
   L1=200+(J-1)*40+I                                                    CRS30249
   NN1=XP(L1)/ABS(XP(L1))                                               CRS30250
   NN2=YP(L1)/ABS(YP(L1))                                               CRS30251
   XP1(J)=ABS(XP(L1))**(1.0/A3(LL1))*NN1                                CRS30252
```

```
      YP1(J)=ABS(YP(LL1))**(1.0/A3(LL2))*NN2                    CRS30253
      LL7=3*(LL-1)+LL4                                          CRS30254
   94 WRITE(LL7'LL1)XP1(J),YP1(J)                               CRS30255
   95 WRITE(P,81)(XP1(J),YP1(J),J=1,5)                          CRS30256
   15 CONTINUE                                                  CRS30257
      DO 62 I=1,4                                               CRS30258
   62 A4(I)=A3(I)                                               CRS30259
   96 CONTINUE                                                  CRS30260
      DO 63 I=1,4                                               CRS30261
   63 A4(I)=A5(I)                                               CRS30262
      CALL LINK(PRS3)                                           CRS30263
      END                                                       CRS30264
// DUP                                                          CRS30265
*DELETE              CRS3                                      CRS30266
*STORE      WS  UA  CRS3                                       CRS30267
```

```
// JOB                                                                  PRS30000
// FOR                                                                  PRS30001
*LIST ALL                                                               PRS30002
*NAME PRS3                                                              PRS30003
*EXTENDED PRECISION                                                     PRS30004
*ONE WORD INTEGERS                                                      PRS30005
*IOCS(DISK)                                                             PRS30006
*IOCS(KEYBOARD)                                                         PRS30007
*IOCS(PLOTTER)                                                          PRS30008
*IOCS(TYPEWRITER)                                                       PRS30009
      COMMON A(100,10),B(100,3),V(12),A4(4),SSY,NS,NREPS,TITL(12),ID,A3(PRS30010
     14),N4,N8,YS(6),XCNT(3,2),XCNT1(2,6),ALAM1(2,6),AVEC1(2,2,6),YCONT(PRS30011
     210,3,2),NSAD(3,2),ZLIM1(3),IJ(10,3,2),A5(4),ZLIM(2),XS(2),YA(2),UPPRS30012
     31(2)                                                              PRS30013
      DEFINE FILE 1(400,6,U,KK1),2(400,6,U,KK2),3(400,6,U,KK3),4(400,6,UPRS30014
     1,KK4),5(400,6,U,KK5),6(400,6,U,KK6)                               PRS30015
   86 FORMAT(3X'POWER TRANSFORMATIONS - A1='F8.4'  A2='F8.4'  A3='F8.4' PRS30016
     1 C='F8.4)                                                         PRS30017
   85 FORMAT(12A6)                                                      PRS30018
   84 FORMAT(I3)                                                        PRS30019
   83 FORMAT('TYPE 1 TO CALL EXIT, EOF TO CONTINUE')                    PRS30020
   82 FORMAT(3X'X'I1' - X'I1' COORDINATES FOR RESPONSE CONTOURS (X'I1'='PRS30021
     1F6.2')'10F6.2)                                                    PRS30022
   81 FORMAT(F7.2)                                                      PRS30023
   80 FORMAT(F6.2)                                                      PRS30024
      DO 25 I=1,4                                                       PRS30025
   25 A5(I)=A4(I)                                                       PRS30026
      GO TO (5,9,5,5),N4                                                PRS30027
    5 DO 20 I=1,4                                                       PRS30028
   20 A4(I)=A3(I)                                                       PRS30029
      N6=1                                                              PRS30030
      GO TO 21                                                          PRS30031
    9 DO 22 I=1,4                                                       PRS30032
   22 A4(I)=1.0                                                         PRS30033
      N6=2                                                              PRS30034
   21 DO 46 LL=1,N6                                                     PRS30035
      DO 6 LL1=1,2                                                      PRS30036
      LL3=LL1+1                                                         PRS30037
      DO 6 LL2=LL3,3                                                    PRS30038
      LL4=LL1+LL2-2                                                     PRS30039
      LL6=4-LL4                                                         PRS30040
      IF(NSAD(LL6,LL))1,1,2                                             PRS30041
    1 NN5=5                                                             PRS30042
      GO TO 3                                                           PRS30043
    2 NN5=10                                                            PRS30044
    3 J=1                                                               PRS30045
      DO 7 I=1,NN5                                                      PRS30046
    7 J=J*IJ(I,LL4,LL)                                                  PRS30047
      IF(J)6,63,6                                                       PRS30048
   63 ZLIM(1)=ZLIM1(LL1)                                                PRS30049
```

```
      ZLIM(2)=ZLIM1(LL2)                                                PRS30050
      DO 24 I=1,2                                                       PRS30051
      XS(I)=8.0/ZLIM(I)                                                 PRS30052
      UPI(I)=1.0/XS(I)                                                  PRS30053
   24 YA(I)=ZLIM(I)+UPI(I)                                              PRS30054
      CALL SCALE(XS(1),XS(2),0.0,0.0)                                   PRS30055
      CALL EPLOT(-2,0.0,0.0)                                            PRS30056
      X=ZLIM(1)                                                         PRS30057
      Y=0.0                                                             PRS30058
      DO 11 J=1,9                                                       PRS30059
      CALL EPLOT(-1,X,Y)                                                PRS30060
      IF(J-9)4,11,11                                                    PRS30061
    4 Y=Y+UPI(2)                                                        PRS30062
      CALL EPLOT(-2,X,Y)                                                PRS30063
      IF(X)32,32,33                                                     PRS30064
   32 X=ZLIM(1)                                                         PRS30065
      GO TO 11                                                          PRS30066
   33 X=0.0                                                             PRS30067
   11 CONTINUE                                                          PRS30068
      CALL EPLOT(-2,X,Y)                                                PRS30069
      Y=0.0                                                             PRS30070
      DO 13 J=1,9                                                       PRS30071
      CALL EPLOT(-1,X,Y)                                                PRS30072
      X=X-UPI(1)                                                        PRS30073
      IF(J-9)12,13,13                                                   PRS30074
   12 CALL EPLOT(-2,X,Y)                                                PRS30075
      IF(Y)34,34,35                                                     PRS30076
   34 Y=ZLIM(2)                                                         PRS30077
      GO TO 13                                                          PRS30078
   35 Y=0.0                                                             PRS30079
   13 CONTINUE                                                          PRS30080
      CALL EPLOT(1,X,Y)                                                 PRS30081
      DO 27 J=1,9                                                       PRS30082
      Y=UPI(2)*FLOAT(J-1)                                               PRS30083
      CALL ECHAR(-UPI(1),Y,0.1,0.1,0.0)                                 PRS30084
   27 WRITE(7,81)Y                                                      PRS30085
      CALL ECHAR(0.0,YA(2),0.1,0.1,0.0)                                 PRS30086
      WRITE(7,85)TITL                                                   PRS30087
      GO TO (50,51,50,50),N4                                            PRS30088
   51 GO TO (52,50),LL                                                  PRS30089
   50 YB=ZLIM(2)+UPI(2)/3.0                                             PRS30090
      CALL ECHAR(0.0,YB,0.1,0.1,0.0)                                    PRS30091
      WRITE(7,86)A3                                                     PRS30092
   52 YC=ZLIM(2)+UPI(2)/1.5                                             PRS30093
      CALL ECHAR(0.0,YC,0.1,0.1,0.0)                                    PRS30094
      NN1=XCNT(LL6,LL)/ABS(XCNT(LL6,LL))                                PRS30095
      XCN=ABS(XCNT(LL6,LL))**(1./A4(LL6))*NN1                           PRS30096
      WRITE(7,82)LL1,LL2,LL6,XCN,(YCONT(I,LL6,LL),I=1,NN5)              PRS30097
      DO 28 J=1,9                                                       PRS30098
      X=-UPI(1)*1.4+UPI(1)*FLOAT(J)                                     PRS30099
      XA=-UPI(2)/5.0                                                    PRS30100
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```
      XO=UPI(1)*FLOAT(J-1)                                          PRS30101
      CALL ECHAR(X,XA,0.1,0.1,0.0)                                  PRS30102
   28 WRITE(7,81)XO                                                 PRS30103
      DO 44 I=1,NN5                                                 PRS30104
      IF(IJ(I,LL4,LL))44,8,44                                       PRS30105
    8 DO 43 J=1,40                                                  PRS30106
      K=J+40*(I-1)                                                  PRS30107
      LL7=3*(LL-1)+LL4                                              PRS30108
      READ(LL7'K)X,Y                                                PRS30109
      IF(X-ZLIM(1))30,29,38                                         PRS30110
   38 X=ZLIM(1)                                                     PRS30111
      GO TO 29                                                      PRS30112
   30 IF(X)31,29,29                                                 PRS30113
   31 X=0.0                                                         PRS30114
   29 IF(Y-ZLIM(2))40,39,42                                         PRS30115
   42 Y=ZLIM(2)                                                     PRS30116
      GO TO 39                                                      PRS30117
   40 IF(Y)41,39,39                                                 PRS30118
   41 Y=0.0                                                         PRS30119
   39 IF(J-1)43,14,15                                               PRS30120
   14 CALL EPLOT(-2,X,Y)                                            PRS30121
      XA=X                                                          PRS30122
      XO=Y                                                          PRS30123
      GO TO 43                                                      PRS30124
   15 IF(NSAD(LL6,LL))37,37,47                                      PRS30125
   47 IF(J-12)37,36,10                                              PRS30126
   10 IF(J-31)37,36,37                                              PRS30127
   36 CALL EPLOT(1,X,Y)                                             PRS30128
      CALL EPLOT(2,X,Y)                                             PRS30129
      GO TO 43                                                      PRS30130
   37 CALL EPLOT(3,X,Y)                                             PRS30131
   43 CONTINUE                                                      PRS30132
      CALL EPLOT(-1,XA,XO)                                          PRS30133
      CALL ECHAR(XA,XO,0.075,0.075,0.0)                             PRS30134
      WRITE(7,80)YCONT(I,LL6,LL)                                    PRS30135
   44 CONTINUE                                                      PRS30136
      XOR=ZLIM(1)+6.0*UPI(1)                                        PRS30137
      CALL EPLOT(1,XOR,0.0)                                         PRS30138
    6 CONTINUE                                                      PRS30139
      DO 23 I=1,4                                                   PRS30140
   23 A4(I)=A3(I)                                                   PRS30141
   46 CONTINUE                                                      PRS30142
      DO 26 I=1,4                                                   PRS30143
   26 A4(I)=A5(I)                                                   PRS30144
      GO TO (18,19,18,18),N4                                        PRS30145
   18 WRITE(1,83)                                                   PRS30146
      READ(6,84)N5                                                  PRS30147
      IF(N5)17,45,17                                                PRS30148
   19 IF(ID-98)16,17,16                                             PRS30149
   17 CALL EXIT                                                     PRS30150
   45 GO TO (58,19,60,59),N4                                        PRS30151
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   58 CALL LINK(CRLF3)                                    PRS30152
   59 CALL LINK(SRS3)                                     PRS30153
   60 CALL LINK(PRRE3)                                    PRS30154
   16 CALL LINK(BOX3)                                     PRS30155
      END                                                 PRS30156
// DUP                                                    PRS30157
*DELETE              PRS3                                PRS30158
*STORE      WS  UA   PRS3                                PRS30159
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```
// JOB                                                                    CMLE3000
// FOR                                                                    CMLE3001
*LIST ALL                                                                 CMLE3002
*NAME CMLE3                                                               CMLE3003
*EXTENDED PRECISION                                                       CMLE3004
*ONE WORD INTEGERS                                                        CMLE3005
      SUBROUTINE CMLE3(K4,ITER,V2,J3)                                     CMLE3006
      DIMENSION X1(13),SSXY(12),SSX(12,12),XX(13),Y(100),YY2(100)         CMLE3007
      COMMON Y1(100,10),X(100,3),R(12),A4(4),SSY,N,IREP,TITL(12),ID,A3(4CMLE3008
     1),N4,N5,AN5,NNNN,DDD,A5(4)                                          CMLE3009
      N1=N/IREP                                                           CMLE3010
      K5=1                                                                CMLE3011
      D=EXP(DDD/FLOAT(N))                                                 CMLE3012
      ITER=0.0                                                            CMLE3013
      IF(J3-12)13,13,37                                                   CMLE3014
   37 MM=9                                                                CMLE3015
      GO TO 7                                                             CMLE3016
   13 MM=8                                                                CMLE3017
    2 ITER=ITER+1                                                         CMLE3018
      IF(ITER-NNNN)65,65,60                                               CMLE3019
   60 K5=2                                                                CMLE3020
   65 DO 40 I=1,4                                                         CMLE3021
   40 A5(I)=A4(I)                                                         CMLE3022
      DD=D**(A4(4)-1.)                                                    CMLE3023
      DO 8 J=1,N1                                                         CMLE3024
      Y(J)=0.0                                                            CMLE3025
      DO 8 I=1,IREP                                                       CMLE3026
    8 Y(J)=Y(J)+(Y1(J,I)**A4(4)-1.)/A4(4)/DD/IREP                         CMLE3027
      YY=0.0                                                              CMLE3028
      DO 32 I=1,N1                                                        CMLE3029
   32 YY=YY+Y(I)/N1                                                       CMLE3030
      DO 24 J=1,12                                                        CMLE3031
   24 XX(J)=0.0                                                           CMLE3032
      DO 1 I=1,N1                                                         CMLE3033
      DO 15 J=1,3                                                         CMLE3034
      X1(J)=X(I,J)**A4(J)                                                 CMLE3035
   15 X1(J+3)=X1(J)*X1(J)                                                 CMLE3036
      X1(7)=X1(1)*X1(2)                                                   CMLE3037
      X1(8)=X1(1)*X1(3)                                                   CMLE3038
      X1(9)=X1(2)*X1(3)                                                   CMLE3039
      DO 1 J=1,9                                                          CMLE3040
    1 XX(J)=XX(J)+X1(J)/N1                                                CMLE3041
      SSY=0.0                                                             CMLE3042
      DO 4 J=1,12                                                         CMLE3043
      SSXY(J)=0.0                                                         CMLE3044
      DO 4 K=1,12                                                         CMLE3045
    4 SSX(J,K)=0.0                                                        CMLE3046
      DO 5 I=1,N1                                                         CMLE3047
      DO 58 J=1,3                                                         CMLE3048
      X1(J)=X(I,J)**A4(J)                                                 CMLE3049
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58 X1(J+3)=X1(J)*X1(J)                                                  CMLE3050
   X1(7)=X1(1)*X1(2)                                                    CMLE3051
   X1(8)=X1(1)*X1(3)                                                    CMLE3052
   X1(9)=X1(2)*X1(3)                                                    CMLE3053
   DO 7 J=1,IREP                                                        CMLE3054
   YY2(1)=(Y1(I,J)**A4(4)-1.)/A4(4)/DD-YY-V2*(X1(J3)-XX(J3))            CMLE3055
 7 SSY=SSY+YY2(1)*YY2(1)                                                CMLE3056
   DO 5 J=1,9                                                           CMLE3057
   IF(J-J3)70,5,71                                                      CMLE3058
70 JJ=J                                                                 CMLE3059
   GO TO 52                                                             CMLE3060
71 JJ=J-1                                                               CMLE3061
52 SSXY(JJ)=SSXY(JJ)+(Y(I)-YY-V2*(X1(J3)-XX(J3)))*(X1(J)-XX(J))        CMLE3062
   B(JJ)=SSXY(JJ)                                                       CMLE3063
   DO 5 K=1,9                                                           CMLE3064
   IF(K-J3)33,5,54                                                      CMLE3065
33 KK=K                                                                 CMLE3066
   GO TO 50                                                             CMLE3067
54 KK=K-1                                                               CMLE3068
50 SSX(JJ,KK)=SSX(JJ,KK)+(X1(J)-XX(J))*(X1(K)-XX(K))                    CMLE3069
 5 CONTINUE                                                             CMLE3070
   CALL MATV(SSX,MM,B,1,DET)                                            CMLE3071
   DO 28 J=1,MM                                                         CMLE3072
28 SSY=SSY-B(J)*SSXY(J)*IREP                                            CMLE3073
   DO 38 J=1,9                                                          CMLE3074
   JJ=10-J                                                              CMLE3075
   IF(JJ-J3)38,29,6                                                     CMLE3076
 6 B(JJ)=B(JJ-1)                                                        CMLE3077
   GO TO 38                                                             CMLE3078
29 B(JJ)=V2                                                             CMLE3079
38 CONTINUE                                                             CMLE3080
   GO TO (57,26),K5                                                     CMLE3081
26 ITER=ITER-1                                                          CMLE3082
   RETURN                                                               CMLE3083
57 GO TO (41,42,41),N5                                                  CMLE3084
41 GO TO (43,43,43,42,43),K4                                            CMLE3085
43 DO 55 I=1,N1                                                         CMLE3086
   YY2(I)=YY                                                            CMLE3087
   DO 44 J=1,3                                                          CMLE3088
   X1(J)=X(I,J)**A4(J)                                                  CMLE3089
44 X1(J+3)=X1(J)*X1(J)                                                  CMLE3090
   X1(7)=X1(1)*X1(2)                                                    CMLE3091
   X1(8)=X1(1)*X1(3)                                                    CMLE3092
   X1(9)=X1(2)*X1(3)                                                    CMLE3093
   DO 55 J=1,9                                                          CMLE3094
55 YY2(I)=YY2(I)+B(J)*(X1(J)-XX(J))                                     CMLE3095
42 GO TO (25,25,25,59,59),K4                                            CMLE3096
59 GO TO (25,25,62),N5                                                  CMLE3097
62 GO TO (61,61,61,26,61),K4                                            CMLE3098
25 DO 9 J=1,12                                                          CMLE3099
   SSXY(J)=0.0                                                          CMLE3100
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      DO 9 K=1,12                                                       CMLE3101
    9 SSX(J,K)=0.0                                                      CMLE3102
      DO 3 I=1,N1                                                       CMLE3103
      DO 45 J=1,3                                                       CMLE3104
      X1(J)=X(I,J)**A4(J)                                               CMLE3105
   45 X1(J+3)=X1(J)*X1(J)                                               CMLE3106
      X1(7)=X1(1)*X1(2)                                                 CMLE3107
      X1(8)=X1(1)*X1(3)                                                 CMLE3108
      X1(9)=X1(2)*X1(3)                                                 CMLE3109
      DO 46 L1=1,2                                                      CMLE3110
      L2=L1+1                                                           CMLE3111
      DO 46 L3=L2,3                                                     CMLE3112
      L4=L1+L3-2                                                        CMLE3113
   46 X1(L4+9)=(B(L4)*X1(L4)+2.0*B(L4+3)*X1(L4+3)+B(L1+6)*X1(L1+6)+B(L3+CMLE3114
     16)*X1(L3+6))*ALOG(X(I,L4))                                        CMLE3115
      DO 3 J=10,12                                                      CMLE3116
    3 XX(J)=XX(J)+X1(J)/N1                                              CMLE3117
      DO 10 I=1,N1                                                      CMLE3118
      DO 47 J=1,3                                                       CMLE3119
      X1(J)=X(I,J)**A4(J)                                               CMLE3120
   47 X1(J+3)=X1(J)*X1(J)                                               CMLE3121
      X1(7)=X1(1)*X1(2)                                                 CMLE3122
      X1(8)=X1(1)*X1(3)                                                 CMLE3123
      X1(9)=X1(2)*X1(3)                                                 CMLE3124
      DO 48 L1=1,2                                                      CMLE3125
      L2=L1+1                                                           CMLE3126
      DO 48 L3=L2,3                                                     CMLE3127
      L4=L1+L3-2                                                        CMLE3128
   48 X1(L4+9)=(B(L4)*X1(L4)+2.0*B(L4+3)*X1(L4+3)+B(L1+6)*X1(L1+6)+B(L3+CMLE3129
     16)*X1(L3+6))*ALOG(X(I,L4))                                        CMLE3130
      DO 10 J=1,12                                                      CMLE3131
      SSXY(J)=SSXY(J)+(Y(I)-YY)*(X1(J)-XX(J))                           CMLE3132
      DO 10 K=1,12                                                      CMLE3133
   10 SSX(J,K)=SSX(J,K)+(X1(J)-XX(J))*(X1(K)-XX(K))                     CMLE3134
      DO 11 J=1,12                                                      CMLE3135
   11 B(J)=SSXY(J)                                                      CMLE3136
      GO TO (17,18,19,27,27),K4                                         CMLE3137
   27 CALL MATV(SSX,12,B,1,DET)                                         CMLE3138
      DO 66 I=1,3                                                       CMLE3139
   66 A4(I)=B(I+9)+A4(I)                                                CMLE3140
      DO 49 I=1,3                                                       CMLE3141
      IF(ABS(B(I+9)/A4(I))-0.001)49,49,14                               CMLE3142
   49 CONTINUE                                                          CMLE3143
      GO TO 16                                                          CMLE3144
   17 SSXY(10)=SSXY(11)                                                 CMLE3145
      DO 20 J=1,10                                                      CMLE3146
      SSX(J,10)=SSX(J,11)                                               CMLE3147
   20 SSX(10,J)=SSX(11,J)                                               CMLE3148
      SSX(10,10)=SSX(11,11)                                             CMLE3149
   18 SSXY(11)=SSXY(12)                                                 CMLE3150
      DO 31 J=1,11                                                      CMLE3151
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```
      SSX(J,11)=SSX(J,12)                                          CMLE3152
   31 SSX(11,J)=SSX(12,J)                                          CMLE3153
      SSX(11,11)=SSX(12,12)                                        CMLE3154
   19 CALL MATV(SSX,11,SSXY,0,DET)                                 CMLE3155
      DO 21 J=1,11                                                 CMLE3156
      B(J)=0.0                                                     CMLE3157
      DO 21 K=1,11                                                 CMLE3158
   21 B(J)=B(J)+SSX(J,K)*SSXY(K)                                   CMLE3159
      GO TO (22,23,30),K4                                          CMLE3160
   22 DO 67 I=2,3                                                  CMLE3161
   67 A4(I)=B(I+8)+A4(I)                                           CMLE3162
      DO 51 I=2,3                                                  CMLE3163
      IF(ABS(B(I+8)/A4(I))-0.001)51,51,14                          CMLE3164
   51 CONTINUE                                                     CMLE3165
      GO TO 16                                                     CMLE3166
   23 A4(1)=B(10)+A4(1)                                            CMLE3167
      A4(3)=B(11)+A4(3)                                            CMLE3168
      DO 35 I=1,3,2                                                CMLE3169
      II=(I+1)/2                                                   CMLE3170
      IF(ABS(B(II+9)/A4(I))-0.001)35,35,14                         CMLE3171
   35 CONTINUE                                                     CMLE3172
      GO TO 16                                                     CMLE3173
   30 DO 68 I=1,2                                                  CMLE3174
   68 A4(I)=B(I+9)+A4(I)                                           CMLE3175
      DO 53 I=1,2                                                  CMLE3176
      IF(ABS(B(I+9)/A4(I))-0.001)53,53,14                          CMLE3177
   53 CONTINUE                                                     CMLE3178
   16 K5=2                                                         CMLE3179
      GO TO 63                                                     CMLE3180
   14 K5=1                                                         CMLE3181
   63 GO TO (64,2,64),N5                                           CMLE3182
   64 GO TO (61,61,61,2,61),K4                                     CMLE3183
   61 B(1)=0.0                                                     CMLE3184
      B(2)=0.0                                                     CMLE3185
      DO 36 I=1,N1                                                 CMLE3186
      DO 36 J=1,IREP                                               CMLE3187
      B(4)=(Y1(I,J)**A4(4)-1.)/A4(4)/DD                            CMLE3188
      B(5)=Y1(I,J)**A4(4)*ALOG(Y1(I,J))/A4(4)/DD                   CMLE3189
      B(6)=B(5)-B(4)/A4(4)-B(4)*ALOG(D)                            CMLE3190
      B(1)=B(1)+B(6)*B(6)                                          CMLE3191
   36 B(2)=B(2)+B(6)*(YY2(I)-B(4))                                 CMLE3192
      A4(4)=A4(4)+B(2)/B(1)                                        CMLE3193
      IF(ABS((A4(4)-A5(4))/A4(4))-0.001)34,34,56                   CMLE3194
   56 K5=1                                                         CMLE3195
      GO TO 2                                                      CMLE3196
   34 GO TO (2,2,39),N5                                            CMLE3197
   39 K5=2                                                         CMLE3198
      GO TO 2                                                      CMLE3199
      END                                                          CMLE3200
// DUP                                                             CMLE3201
*DELETE              CMLE3                                        CMLE3202
*STORE      WS  UA  CMLE3                                        CMLE3203
```

```
// JOB                                                                  MATV0000
// FOR                                                                  MATV0001
*LIST ALL                                                               MATV0002
*NAME MATV                                                              MATV0003
*EXTENDED PRECISION                                                     MATV0004
*ONE WORD INTEGERS                                                      MATV0005
      SUBROUTINE MATV(A,N,B,M,DETM)                                     MATV0006
      DIMENSION IPVOT(12),A(12,12),B(12,1),INDEX(12,12),PIVOT(12)       MATV0007
      EQUIVALENCE (IROW,JROW),(ICLUM,JCLUM),(AMAX,T,SWAP)               MATV0008
      DETM=1.0                                                          MATV0009
      DO 20 J=1,N                                                       MATV0010
   20 IPVOT(J)=0                                                        MATV0011
      DO 550 I=1,N                                                      MATV0012
      AMAX=0.0                                                          MATV0013
      DO 105 J=1,N                                                      MATV0014
      IF(IPVOT(J)-1)60,105,60                                           MATV0015
   60 DO 100 K=1,N                                                      MATV0016
      IF(IPVOT(K)-1)80,100,740                                          MATV0017
   80 IF(ABS(AMAX)-ABS(A(J,K)))85,100,100                               MATV0018
   85 IROW=J                                                            MATV0019
      ICLUM=K                                                           MATV0020
      AMAX=A(J,K)                                                       MATV0021
  100 CONTINUE                                                          MATV0022
  105 CONTINUE                                                          MATV0023
      IPVOT(ICLUM)=IPVOT(ICLUM)+1                                       MATV0024
      IF(IROW-ICLUM)140,260,140                                         MATV0025
  140 DETM=-DETM                                                        MATV0026
      DO 200 L=1,N                                                      MATV0027
      SWAP=A(IROW,L)                                                    MATV0028
      A(IROW,L)=A(ICLUM,L)                                              MATV0029
  200 A(ICLUM,L)=SWAP                                                   MATV0030
      IF(M)260,260,210                                                  MATV0031
  210 DO 250 L=1,M                                                      MATV0032
      SWAP=B(IROW,L)                                                    MATV0033
      B(IROW,L)=B(ICLUM,L)                                              MATV0034
  250 B(ICLUM,L)=SWAP                                                   MATV0035
  260 INDEX(I,1)=IROW                                                   MATV0036
      INDEX(I,2)=ICLUM                                                  MATV0037
      PIVOT(I)=A(ICLUM,ICLUM)                                           MATV0038
      DETM=DETM*PIVOT(I)                                                MATV0039
      A(ICLUM,ICLUM)=1.0                                                MATV0040
      DO 350 L=1,N                                                      MATV0041
  350 A(ICLUM,L)=A(ICLUM,L)/PIVOT(I)                                    MATV0042
      IF(M)380,380,360                                                  MATV0043
  360 DO 370 L=1,M                                                      MATV0044
  370 B(ICLUM,L)=B(ICLUM,L)/PIVOT(I)                                    MATV0045
  380 DO 550 L1=1,N                                                     MATV0046
      IF(L1-ICLUM)400,550,400                                           MATV0047
  400 T=A(L1,ICLUM)                                                     MATV0048
      A(L1,ICLUM)=0.0                                                   MATV0049
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```
      DO 450 L=1,N                                                    MATV0050
  450 A(L1,L)=A(L1,L)-A(ICLUM,L)*T                                    MATV0051
      IF(M)550,550,460                                                MATV0052
  460 DO 500 L=1,M                                                    MATV0053
  500 B(L1,L)=B(L1,L)-B(ICLUM,L)*T                                    MATV0054
  550 CONTINUE                                                        MATV0055
      DO 710 I=1,N                                                    MATV0056
      L=N+1-I                                                         MATV0057
      IF(INDEX(L,1)-INDEX(L,2))630,710,630                            MATV0058
  630 JROW=INDEX(L,1)                                                 MATV0059
      JCLUM=INDEX(L,2)                                                MATV0060
      DO 705 K=1,N                                                    MATV0061
      SWAP=A(K,JROW)                                                  MATV0062
      A(K,JROW)=A(K,JCLUM)                                            MATV0063
      A(K,JCLUM)=SWAP                                                 MATV0064
  705 CONTINUE                                                        MATV0065
  710 CONTINUE                                                        MATV0066
  740 IF(DETM-0.000001)750,750,760                                    MATV0067
  750 DETM=0.0                                                        MATV0068
  760 RETURN                                                          MATV0069
      END                                                             MATV0070
// DUP                                                                MATV0071
*DELETE              MATV                                           MATV0072
*STORE      WS  UA   MATV                                           MATV0073
```

```
// JOB                                                              CAN30001
// FOR                                                              CAN30002
*LIST ALL                                                           CAN30003
*NAME CAN3                                                          CAN30004
*EXTENDED PRECISION                                                 CAN30005
*ONE WORD INTEGERS                                                  CAN30006
      SUBROUTINE CAN3(AA,AMBDA,N)                                   CAN30007
      INTEGER P,Q                                                   CAN30008
      DIMENSION AA(3,3),AMBDA(3),E(9),D(9)                          CAN30009
   80 FORMAT(4X,I2,5X,E15.6,5X,3E15.6)                              CAN30010
      P=5                                                           CAN30011
      Q=8                                                           CAN30012
      NQ=+1                                                         CAN30013
      K=1                                                           CAN30014
      DO 1 I=1,N                                                    CAN30015
      DO 1 J=1,I                                                    CAN30016
      E(K)=AA(I,J)                                                  CAN30017
    1 K=K+1                                                         CAN30018
      CALL JACOB(E,D,AMBDA,N,NQ)                                    CAN30019
      K=1                                                           CAN30020
      DO 2 I=1,N                                                    CAN30021
      DO 2 J=1,N                                                    CAN30022
      AA(I,J)=D(K)                                                  CAN30023
    2 K=K+1                                                         CAN30024
      DO 3 I=1,N                                                    CAN30025
    3 WRITE(P,80)I,AMBDA(I),(AA(I,J),J=1,N)                         CAN30026
      RETURN                                                        CAN30027
      END                                                           CAN30028
// DUP                                                              CAN30029
*DELETE            CAN3                                           CAN30030
*STORE      WS  UA  CAN3
```

```
// JOB                                                          JACOB000
// FOR                                                          JACOB001
*LIST ALL                                                       JACOB002
*NAME JACOB                                                     JACOB003
*EXTENDED PRECISION                                             JACOB004
*ONE WORD INTEGERS                                              JACOB005
      SUBROUTINE JACOB(A,B,C,NAA,NQ)                            JACOB006
      INTEGER P,Q                                               JACOB007
      DIMENSION A(2),B(2),C(2)                                  JACOB008
  901 FORMAT(25H EIGENVALUE NOT CONVERGED  )                    JACOB009
      P=5                                                       JACOB010
      Q=8                                                       JACOB011
      LOOPC=0                                                   JACOB012
      NA=NAA                                                    JACOB013
      NN=(NA*(NA+1))/2                                          JACOB014
      IF (NQ) 120,100,100                                       JACOB015
  100 K=1                                                       JACOB016
      DO 115 I=1,NA                                             JACOB017
      DO 115 J=1,NA                                             JACOB018
      IF(I-J)105,110,105                                        JACOB019
  105 B(K)=0.                                                   JACOB020
      GO TO 115                                                 JACOB021
  110 B(K)=1.                                                   JACOB022
  115 K=K+1                                                     JACOB023
  120 SUM=0.                                                    JACOB024
      IF(NA-1)325,310,125                                       JACOB025
  125 K=1                                                       JACOB026
      AMAX=0.                                                   JACOB027
      DO 155 I=1,NA                                             JACOB028
      DO 150 J=1,I                                              JACOB029
      IF(I-J)135,145,135                                        JACOB030
  135 IF(ABS(A(K))-AMAX)145,145,140                             JACOB031
  140 AMAX=ABS(A(K))                                            JACOB032
  145 TERM=A(K)*A(K)                                            JACOB033
      SUM=SUM+TERM+TERM                                         JACOB034
  150 K=K+1                                                     JACOB035
  155 SUM=SUM-TERM                                              JACOB036
      SUM=SQRT(SUM)                                             JACOB037
      THRES=SUM/SQRT(FLOAT(NA))                                 JACOB038
      THRSH=THRES*1.0E-08                                       JACOB039
      IF(THRSH-AMAX)165,310,310                                 JACOB040
  165 THRES=AMAX/3.                                             JACOB041
      IF(THRES-THRSH)175,180,180                                JACOB042
  175 THRES=THRSH                                               JACOB043
  180 K=2                                                       JACOB044
      N=0                                                       JACOB045
      JD=1                                                      JACOB046
      DO 270 J=2,NA                                             JACOB047
      JD=JD+J                                                   JACOB048
      JJ=J-1                                                    JACOB049
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```
      ID=0                                                          JACOB050
      DO 265 I=1,JJ                                                 JACOB051
      ID=ID+I                                                       JACOB052
      IF(ABS(A(K))-THRES)265,265,195                                JACOB053
  195 N=N+1                                                         JACOB054
      ALPHA=(A(JD)-A(ID))/(2.*A(K))                                 JACOB055
      BETA=1./(1.+ALPHA*ALPHA)                                      JACOB056
      ROOT=1.0+ABS(ALPHA)*ESQRT(BETA)                               JACOB057
      IF(ALPHA)205,200,200                                          JACOB058
  200 SSQ=0.5*BETA/ROOT                                             JACOB059
      CSQ=0.5*ROOT                                                  JACOB060
      GO TO 210                                                     JACOB061
  205 CSQ=0.5*BETA/ROOT                                             JACOB062
      SSQ=0.5*ROOT                                                  JACOB063
  210 CC=SQRT(CSQ)                                                  JACOB064
      S=-SQRT(SSQ)                                                  JACOB065
      TWOSC=CC*S*2.                                                 JACOB066
      TEMPA=CSQ*A(ID)+TWOSC*A(K)+SSQ*A(JD)                          JACOB067
      A(JD)=CSQ*A(JD)-TWOSC*A(K)+SSQ*A(ID)                          JACOB068
      A(ID)=TEMPA                                                   JACOB069
      A(K)=0.                                                       JACOB070
      KA=JD-J                                                       JACOB071
      KB=ID-I                                                       JACOB072
      KC=NA*(I-1)                                                   JACOB073
      KD=NA*(J-1)                                                   JACOB074
      DO 260 L=1,NA                                                 JACOB075
      KC=KC+1                                                       JACOB076
      KD=KD+1                                                       JACOB077
      TEMPA=CC*B(KC)+S*B(KD)                                        JACOB078
      B(KD)=-S*B(KC)+CC*B(KD)                                       JACOB079
      B(KC)=TEMPA                                                   JACOB080
      IF(I-L)230,220,245                                            JACOB081
  220 KB=KB+1                                                       JACOB082
  225 KA=KA+1                                                       JACOB083
      GO TO 260                                                     JACOB084
  230 KB=KB+L-1                                                     JACOB085
      IF(J-L)240,225,250                                            JACOB086
  240 KA=KA+L-1                                                     JACOB087
      GO TO 255                                                     JACOB088
  245 KB=KB+1                                                       JACOB089
  250 KA=KA+1                                                       JACOB090
  255 TEMPA=CC*A(KB)+S*A(KA)                                        JACOB091
      A(KA)=-S*A(KB)+CC*A(KA)                                       JACOB092
      A(KB)=TEMPA                                                   JACOB093
  260 CONTINUE                                                      JACOB094
  265 K=K+1                                                         JACOB095
  270 K=K+1                                                         JACOB096
      LOOPC=LOOPC+1                                                 JACOB097
      IF(LOOPC-50)275,305,305                                       JACOB098
  275 IF(N-NN/8)280,280,180                                         JACOB099
  280 IF(THRES-THRSH)285,300,285                                    JACOB100
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  285 THRES=THRSH/3.                                          JACOB101
      IF(THRES-THRSH)295,180,180                              JACOB102
  295 THRES=THRSH                                             JACOB103
      GO TO 180                                               JACOB104
  300 IF(N)180,310,180                                        JACOB105
  305 WRITE(P,901)                                            JACOB106
  310 LL=0                                                    JACOB107
      DO 320 L=1,NA                                           JACOB108
      LL=LL+L                                                 JACOB109
  320 C(L)=A(LL)                                              JACOB110
  325 RETURN                                                  JACOB111
      END                                                     JACOB112
// DUP                                                        JACOB113
*DELETE              JACOB                                    JACOB114
*STORE      WS  UA   JACOB                                    JACOB115
```