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FINAL DESIGN SPECIFICATION

FOR

EOD-LARSYS PROCEDURE 1 FOLLOW-ON

Job Order 71-695

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Prepared By

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For

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LYNDON B. JOHNSON SPACE CENTER

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CONTENTS

1. SCOPE

This document contains a design specification for implementing two Procedure 1 follow-on features. These features are:

- On option, determine the best k of N passes in feature selection.
- On option, include a-priori weighting based on pixel population in clusters in feature selection.

These additions will be made to the SELECT processor of the EOD-LARSYS system.

EOD-LARSYS is operational on the UNIVAC 1108 EXEC II computer system located in Building 12. The system is batch oriented, and operated and maintained according to IDSD procedures. This system is currently being converted to the Purdue-LARS 370/148 system.

This document assumes the reader is familiar with both Procedure 1 and the EOD-LARSYS system.

2. APPLICABLE DOCUMENTS

- Final Design Specification for EOD-LARSYS Procedure 1, Houston, Texas, August 1977, JSC-12742, LEC-10417.
- Job Order: 63-1347-1695

3. SYSTEM DESCRIPTION

3.1 HARDWARE DESCRIPTION

N/A

3.2 SOFTWARE DESCRIPTION

Two new features have been added to the SELECT processor of the EOD-LARSYS system in support of Procedure 1 follow-on requirements.

The first is the selection of the best k of N passes based on the overall separability criterion selected, where N is the total number of passes accounted for in the CHANNELS input and k is any number less than N. The number of channels per pass can be specified.

The second is the modification of intersubclass weights by a multiplier based on the number of pixels in each subclass:

$$\text{FACTOR}\ (i,j) = \sqrt{\frac{N(i)*N(j)}{\text{TOTSUB}\left(\sum_{k=1} N(k)\right)^2}}\ ,$$

where TOTSUB is the number of subclasses and N(i) is the number of pixels in subclass i.

The following example illustrates the besk k of N selection, together with a-priori weighting.

Control cards:

SUBCLA	1, 2, 3, 4, 5
STATFI	UNIT=1, FILE=1
CHANNEL	1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15

```
PROCEED          6
BSPASS           2
APRIOR
NCPASS           5
*END*
```

Here the number of channels per pass is 5, 3 passes are included (deduced from channels included), and the best 2 passes are to be determined.

Each combination of 2 of 3 passes is considered. These are

(1) 1, 2, 4, 5, 6, 7, 9, 10
(2) 1, 2, 4, 5, 11, 12, 14, 15
(3) 6, 7, 9, 10, 11, 12, 14, 15

For each, the overall separability measure is computed, and the optimum set of features (channels) is selected and output, through the INFORM labeled common block, this set is made available to the CLASSIFY processor.

3.2.1 SOFTWARE COMPONENT NO. 1 (SELECT)

The SELECT subprogram is the main driver for the SELECT processor.

3.2.1.1 Linkages

Subprogram SELECT is invoked from the MONTOR monitor routine upon reading the $SELECT control card. It calls subprograms SETUP4, ORDER, PRELIM, EXSRCH, WHRLC, USERIN, GENRPT, PLOT, EVLFET.

3.2.1.2 Interfaces

SELECT interfaces with other routines through a calling sequence, and common blocks FSL, GLOBAL, INFORM, and BESTKN. BESTKN is newly incorporated for these options, it is coded as

COMMON /BESTKN/ KPPPTS(60), IPRIOR, KBEST, NCPASS

3.2.1.3 Inputs

Calling Sequence:

Subr. SELECT(ARRAY, TOP)

Parameter	Dimension	In/Out	Description
ARRAY	TOP (presently set = 10500)	In/out	Utility storage for various arrays
TOP	1	In	Dimension of vector ARRAY

3.2.1.4 Outputs

N/A

3.2.1.5 Storage

Code: 1602_8 Data: 30337_8

3.2.1.6 Description

The changes to subprogram SELECT involve computation of features (channels) to exhaust all combinations of k of N passes. Data vectors INDPER and PERM have been added to assist. Common block BESTKN has been added. For each combination of channels, subprograms EVLFET and GENRPT are invoked for separability measure computation and results printout.

3.2.1.7 Flowchart

N/A

3.2.1.8 Listing

```
00100     1*      C     //SELECT
00101     2*            SUBROUTINE SELECT(ARRAY,TOP)
00101     3*      C                                                                    SUP40020
00103     4*            IMPLICIT INTEGER (A-H,O-Z)                                     SUP40030
00103     5*      C1----------*---------*---------*---------*---------*---------*-----ISUP40040
00103     6*      C1----------*---------*---------*---------*---------*---------*-----ISUP40050
00103     7*      C1                                                                   ISUP40060
00103     8*      C1    CALL..    CALL SELECT(ARRAY,TOP)
00103     9*      C1                                                                   ISUP40080
00103    10*      C1    ARGS..    ARRAY -  SEE *MONITOR*                               ISUP40090
00103    11*      C1              TOP   -  SEE *MONITOR*                               ISUP40100
00103    12*      C1                                                                   ISUP40110
00103    13*      C1                                                                   ISUP40130
00103    14*      C1                                                                   ISUP40140
00103    15*      C1    PURPOSE.. COORDINATES THE VARIOUS ROUTINES                     ISUP40150
00103    16*      C1              FOR *FEATURE SELECTION* STEP                         ISUP40160
00103    17*      C1                                                                   ISUP40170

00103    18*      C1    RETURNS.. NONE                                                 ISUP40180
00103    19*      C1                                                                   ISUP40190
00103    20*      C1----------*---------*---------*---------*---------*---------*-----ISUP40200
00103    21*      C1----------*---------*---------*---------*---------*---------*-----ISUP40210
00103    22*      C                                                                    SUP40220
00103    23*      C                                                                    SUP40230
00103    24*      C                                                                    SUP40240
00103    25*      C                                                                    SUP40250
00103    26*      C     ----------*---------*---------*---------*---------*---------*-SUP40260
00103    27*      C                                                                    SUP40270
00103    28*      C                                                                    SUP40280
00104    29*            INCLUDE COMBK1,LIST
00104    30*      C                                                                    SUP40400
00104    31*      C     ----------*---------*---------*---------*---------*---------*-SUP40410
00104    32*      C                                                                    SUP40420
00105    32*           COMMON/INFORM/NOCLS2,NOSUB2,NOFET2,VARSZ2,TOTVT2,NOFLD2,
00105    32*          *              AVAR2,COVAR2,CLSID2,SUBNO2,SUBDS2,FLDSV2,VERTA2,
00105    32*          *              FETVC2(30),SUBVC2(75),SUBPTR(75),CLSVC2(60),
00105    32*          *              KEPPTS(60),NOGRP,GRPNAM(60),GRPDEX(61),
00105    32*          *              GRPCHK(61),GROUPS(129)
00106    32*           END
00107    33*           INCLUDE COMBK6,LIST
00110    33*           COMMON/GLOBAL/HEAD(92),MAPTAP,DATAPE,SAVTAP,BMFILE,BMKEY,
00110    33*          *              HISFIL,HISKEY,INFORM,ERRTP,ERRKEY,MAPUNT,NOFILE,
00110    33*          *    DRUMAD,DRMWDS,PAGSIZ,DATFIL,STAFIL,ASAV,ASAVFL
00110    33*          *  ,NHSTUN,NHSTFI,SCTRUN,MAPFIL
00110    33*          *  ,DOTUNT,DOTFIL
00111    33*           END
00112    34*           DIMENSION ARRAY(1),SUBRAY(12000)
00113    35*           DATA SUBSIZ/12000/
00113    36*      C*   THE ARRAY SUBRAY IS USED IN SELECT FOR VARIABLE DIMENSIONING
00115    37*           INCLUDE COMBK7,LIST
00115    38*      C                                                                    SUP40690
00115    39*      C     ----------*---------*---------*---------*---------*---------*-SUP40700
00115    40*      C     ----------*---------*---------*---------*---------*---------*-SUP40710
00115    41*      C                                                                    SUP40720
00116    41*           COMMON/FSL/PRCKEY,CRIKEY,INCFET,INCVEC(30),ICOUNT,SEIWGT,
00116    41*          $            EVALBF(100),CFAC,TOTMSR,FETVC4(30),SEPMSR
00116    41*          *             ,NOFET4,VARSZ4,CORBAS,DTA64,#GHS14,BESTVC(10),DIVSIZ
00116    41*          *    ,STATKY,ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2
00117    41*           INTEGER ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2,STATKY
00120    41*           DOUBLE PRECISION CFAC,TOTMSR,SEPMSR
00121    41*           END
00122    42*           INCLUDE CMBK17,LIST                                            *NEW
00123    42*           COMMON/BESTKN/ KEPPTS(60),IPRIOR,KBEST,NCPASS
00124    42*           END
00125    43*           DIMENSION ILABLA(13),ILABLY(13)
00126    44*           DIMENSION FETVEC(30)
00127    45*           DATA ICODE/0/,IOPT/0/
00132    46*           DATA ILABLA/13*6H      /, ILABLY/13*6H      /
00135    47*           DIMENSION  PER(6),,NOPER(6),PERM(248)                          *NEW
00136    48*           DATA NOPER/1,3,58,136,213,249/                                 *NEW
00140    49*           DATA PERM/1,2,1,3,1,4,1,5,1,6,1,7,                             *NEW
00140    50*          *    1,2,3,1,2,4,1,2,5,1,2,6,1,2,7,1,3,4,1,3,5,1,3,6,1,3,7,    *NEW
00140    51*          *    1,4,5,1,4,6,1,4,7,1,5,6,1,5,7,1,6,7,                      *NEW
00140    52*          *    1,2,3,4,1,2,3,5,1,2,3,6,1,2,3,7,1,2,4,5,1,2,4,6,          *NEW
00140    53*          *    1,2,4,7,1,2,5,6,1,2,5,7,1,2,6,7,1,3,4,5,1,3,4,6,          *NEW
00140    54*          *    1,3,4,7,1,3,5,6,1,3,5,7,1,3,6,7,1,4,5,6.                  *NEW
```

```
00149      55*          *   1,4,5,7,1,4,6,7,1,5,6,7,                                          *NE*
00150      56*          *   1,2,3,4,5,1,2,3,4,6,1,2,3,4,7,1,2,3,5,6,1,2,3,5,7,                *NE*
00151      57*          *   1,2,3,6,7,1,2,4,5,6,1,2,4,5,7,1,2,4,6,7,1,2,5,6,7,                *NE*
00152      58*          *   1,3,4,5,6,1,3,4,5,7,1,3,4,6,7,1,3,5,6,7,1,4,5,6,7,                *NE*
00153      59*          *   1,2,3,4,5,6,1,2,3,4,5,7,1,2,3,4,6,7,1,2,3,5,6,7,                  *NE*
00140      60*          *   1,2,4,5,6,7,1,3,4,5,6,7/                                          *NE*
00142      61*           DIMENSION IPSCHK(8)                                                  *NE*
00143      62*           DIMENSION FETSAV(30),FTSAV(30)                                       *NE*
00144      63*           DOUBLE PRECISION SMALL                                               *NE*
00145      64*           SMALL = 2**35                                                        *NE*
00146      65*           JTIME = 1                                                  SUP40730
00147      66*        10 CONTINUE                                                   SUP40740
00150      67*           CALL SETUP4(ARRAY,TOP,STOPFG,JTIME,SUBRAY,SUBSIZ)
00151      68*           IF(STOPFG.NE.0) GO TO 9                                              *NE*
00153      69*           IF(PRCKEY.NE.6) GO TO 9                                              *NE*
00155      70*           DO 6 I=1,8                                                           *NE*
00160      71*         6 IPSCHK(I) = 0                                                        *NE*
00162      72*           DO 7 I=1,NOFET2                                                      *NE*
00165      73*           K=(FETVC2(I)-1)/NOPASS +1                                            *NE*
00166      74*         7 IPSCHK(K) = 1                                                        *NE*
00170      75*           NPASS = 0                                                            *NE*
00171      76*           DO 8 I=1,8                                                           *NE*
00174      77*         8 NPASS = NPASS + IPSCHK(I)                                            *NE*
00176      78*           NFPPS = NOFET2/NPASS                                                 *NE*
00177      79*           IDUM = NFPPS*NPASS                                                   *NE*
00200      80*           IF(NOFET2.NE.IDUM) GO TO 90                                          *NE*
00202      81*           IF(KBEST.LT.2.OR.KBEST.GE.NPASS) GO TO 90                            *NE*
00204      82*           NOFET4 = NFPPS*KBEST                                                 *NE*
00205      83*           NFSAVE = NOFET4                                                      *NE*
00206      84*           KPASS = KBEST                                                        *NE*
00207      85*         9 CONTINUE                                                             *NE*
00210      86*           JTIME = JTIME+1                                            SUP40760
00211      87*           IF(STOPFG.EQ.0)GO TO 5
00211      88*     C*    SET FETVC2 FOR CLASSIFY
00213      89*           NOFET4=NFSAVE
00214      90*           DO 4 I=1,NOFET4
00217      91*           FETVC2(I) = FETVC4(I)
00220      92*         4 IF(PRCKEY.EQ.6) FETVC2(I) = FETVEC(I)                              *NE*
00223      93*           CALL ORDER(FETVC2,NOFET4)                                          **-1
00224      94*           NOFET2 = NOFET4
00225      95*           RETURN
00226      96*         5 CONTINUE
00226      97*     C*
00226      98*     C*    SET ADRESS FOR RANDOM ACCESS DRUM FILE
00226      99*     C*
00227     100*           ADRESS=DRUMAD
00230     101*           JBEST = 0                                                  SUP40780
00230     102*     C*    PRELIM--TAKE CARE OF PRELIMINARIES
00230     103*     C*    COMPUTE SEPARABILITY MEASURE AND INTERCLASS MEASURES USING ALL
00230     104*     C*    FEATURES, AND SAVE ON SCRATCH FILE FOR LATER PRINTING. IF CRIKEY=1
00230     105*     C*    SET DEFAULT WEIGHTS IF WEIGHTS NOT INPUT, ALSO COMPUTE 'S' MATRIX.
00230     106*     C*
00231     107*           SBASE=1
00232     108*           S1=SBASE
00233     109*           SBASE=S1+NOCLS2*VARSZ2+1
00234     110*           IF(CRIKEY.NE.1)SBASE=1
00236     111*           SLEFT=SUBSIZ-SBASE
00237     112*           CALL PRELIM(ARRAY(COVAR2),ARRAY(AVAR2),ARRAY(DIAB4),
```

```
00237               .          ARRAY(*GHS14),SUBRAY(S1),SUBRAY(SBASE),SLEFT)
00240                    IF(PRCKEY .EQ. 5) GO TO 60
00242                    IF(PRCKEY.EQ.4)GO TO 12
00244                    IF(PRCKEY.EQ.6) GO TO 15                                            .NE.
00246                 11 JBEST=JBEST+1
00247                    NFSAVE=NOFET4
00250                    NOFET4=BESTVC(JBEST)
00251                    IF(NOFET4.LE.0)GO TO 60
00251            C.
00251            C.      IF DAVIDON PROCEDURE INDICATED, FIND BEST SET OF FEATURES BY
00251            C.      WITHOUT REPLACEMENT, IF FIRST GUESS B-MATRIX WAS NOT INPUT.
00251            C.
00253                 12 IF(PRCKEY.NE.3)GO TO 15
00253            C.
00253            C.      SET ADDRESSES FOR RANDOM ACCESS DRUM FILE
00253            C.
00255                    ADRESP=ADRESD+DIVSIZ*2
00256                    ADRESF=ADRESP+NOFET4*NOFET2*2
00257                    ADRSH1=ADRESF+NOFET4*NOFET2*2
00260                    ADRSH2=ADRSH1+(NOFET4*NOFET2*2)**2
00260            C.
00260            C.      WAS FIRST GUESS B-MATRIX INPUT?
00260            C.
00261                    IF(BMKEY.EQ.1)GO TO 15
00263                    SAVPRC=3
00264                    PRCKEY=2
00264            C.
00264            C.      COMPUTE BASES FOR ARRAYS OF *BEST* SET OF FEATURES
00264            C.      TRANSFORMED COVARIANCES AND MEANS STORED IN DOUBLE PRECISION
00264            C.
00265                 15 VARSZ4=NOFET4*(NOFET4+1)/2
00266                    COVAR4=CORBAS
00267                    AVAR4=COVAR4 + NOCLS2*VARSZ4*2
00270                    CORBSS = AVAR4 + NOCLS2 * NOFET4 *2
00271                    IF(CORBSS .LE. TOP) GO TO 20
00273                    WRITE(6,200) CORBSS
00276                    CALL CHERR
00276            C.
00276            C.      SUBRAY STORAGE - STORE *S* ARRAYS ONLY IF CRIKEY=1, STORE PARTIALS
00276            C.      ONLY IF PRCKEY=3, STORE B-MATRIX IF PRCKEY=3 OR 4.
00276            C.
00277                 20 S2=S1 + NOCLS2*VARSZ2
00300                    B1=S2 + NOCLS2*VARSZ4*2
00301                    IF(CRIKEY.NE.1)B1=1
00303                    P1=B1 + NOFET4*NOFET2*2
00304                    SBASE=P1 + NOFET4*NOFET2*2
00305                    IF(PRCKEY.NE.3)SBASE=P1
00307                    IF(PRCKEY.LT.3)SBASE=B1
00311                    SLEFT=SUBSIZ-SBASE
00312                    IF(SBASE.LE.SUBSIZ)GO TO 25
00314                    WRITE(6,100)SBASE
00317                    CALL CHERR
00317            C.
00317            C.      PERFORM THE OPTIMIZATION PROCEDURE INDICATED BY PRCKEY
00317            C.
00320                 25 GO TO (30,35,40,45,85,87),PRCKEY                                    .NE.
00320            C.                                                                          ..-1
00320            C.      EXHAUSTIVE SEARCH PROCEDURE
```

```
00320     171*      C*
00321     172*         35 CALL EXSRCH(ARRAY(COVAR2),ARRAY(AVAR2),ARRAY(DTAB4),ARRAY(&GHSI4)
00321     173*           *            ,ARRAY(COVAR4),ARRAY(AVAR4),SUBRAY(S1),SUBRAY(S2),
00321     174*           *             SUBRAY(SBASE),SLEFT)
00322     175*            GO TO 50
00322     176*      C*
00322     177*      C*    WITHOUT REPLACEMENT PROCEDURE
00322     178*      C*
00323     179*         35 CALL WHRPLC(ARRAY(COVAR2),ARRAY(AVAR2),ARRAY(DTAB4),ARRAY(&GHSI4)
00323     180*           *            ,ARRAY(COVAR4),ARRAY(AVAR4),SUBRAY(S1),SUBRAY(S2),
00323     181*           *             SUBRAY(SBASE),SLEFT)
00324     182*            GO TO 50
00324     183*      C*
00325     184*           40   CONTINUE                                                    *NE*
00325     185*      C*        USER INPUT B-MATRIX                                       **-*
00326     186*           45 CALL USERIN(ARRAY(COVAR2),ARRAY(AVAR2),ARRAY(DTAB4),ARRAY(&GHSI4)
00326     187*           *            ,ARRAY(COVAR4),ARRAY(AVAR4),SUBRAY(S1),SUBRAY(S2)
00326     188*           *            ,SUBRAY(B1),SUBRAY(SBASE),SLEFT)
00326     189*      C*
00326     190*      C*    GENERATE REPORTS
00326     191*      C*
00327     192*         50 CALL GENRPT(ARRAY(CLSID2),ARRAY(&GHSI4),ARRAY(DTAB4),
00327     193*           *    SUBRAY(SBASE),SLEFT,FETVEC)
00330     194*            CALL PLOT(SUBRAY(SBASE),ARRAY(DTAB4),DIVSIZ,MAXX,ILABLX,ILABLY,
00330     195*           *          ICODE,IOPT)
00330     196*      C*
00331     197*            IF(SAVPRC.NE.3)GO TO 11
00333     198*            SAVPRC=0
00334     199*            PRCKEY=3
00335     200*            GO TO 20
00335     201*      C*
00335     202*      C*    PERFORM EVALUATE REQUEST
00335     203*      C*
00336     204*         60 IV=1
00337     205*            ISAVE=PRCKEY
00340     206*            PRCKEY=5
00341     207*         70 NOFET4=EVALBF(IV)
00342     208*            IF(NOFET4.GT.0)GO TO 75
00344     209*            PRCKEY=ISAVE
00345     210*            GO TO 10
00346     211*         75 DO 80 I=1,NOFET4
00351     212*            IV=IV+1
00352     213*         80 FETVEC(I) = EVALBF(IV)
00352     214*      C
00352     215*      C     RENUMBERING CHANNELS IN REFRENCE TO SUBSET OF CHANNELS
00352     216*      C
00354     217*            DO 82 I=1,NOFET2
00357     218*            DO 82 J=1,NOFET4
00362     219*            IF (FETVEC(J) .NE. FETVC2(I)) GO TO 82
00364     220*            FETVC4(J) = I
00365     221*         82 CONTINUE
00370     222*            CALL ORDER(FETVC4,NOFET4)
00370     223*      C*
00370     224*      C*    GO  COMPUTE BASE ADDRESSES FOR REDUCED ARRAYS
00370     225*      C*
00371     226*            GO TO 15
00372     227*         85 CONTINUE
00373     228*            CALL EVLFET(ARRAY(COVAR2),ARRAY(AVAR2),ARRAY(DTAB4),ARRAY(&GHSI4)
```

```
00373    229*          *           ,ARRAY(COVAR4),ARRAY(AVAR4),SUBRAY(S1),SUBRAY(S2)
00373    230*          *           ,SUBRAY(SBASE),SLEFT)
00374    231*           CALL GENRPT(ARRAY(CLSID2),ARRAY(#GHS14),ARRAY(DTAB4)
00374    232*          *  ,SUBRAY(SBASE),SLEFT,FETVEC)
00375    233*           CALL PLOT(SUBRAY(SBASE),ARRAY(DTAB4),DIVSIZ,MAXX,ILABLX,ILABLY,
00375    234*          *          ICODE,IOPT)
00376    235*           IV=IV+1
00377    236*           GO TO 70
00377    237*     C     BEST K OF N PASSES                                          #NE#
00400    238*      87   CONTINUE                                                    #NE#
00401    239*      91   NCNT = NPASS + 1 - KPASS                                   #NE#
00402    240*           IDUM = INDPER(KPASS - 1)                                   #NE#
00403    241*           NCNTP = (INDPER(KPASS) - IDUM)/KPASS                       #NE#
00404    242*           DO 99 I=1,NCNT                                             #NE#
00407    243*           DO 98 II=1,NCNTP                                           #NE#
00412    244*           DO 92 III=1,KPASS                                          #NE#
00415    245*           IDM=IDUM+(II-1)*KPASS+III-1                                #NE#
00416    246*           PER(III) = PERM(IDM) + I -1                                #NE#
00417    247*           IF (PER(III)-GT-NPASS) GO TO 97                            #NE#
00421    248*      92   CONTINUE                                                    #NE#
00423    249*           DO 99 III=1,KPASS                                          #NE#
00426    250*           IDM=PER(III)                                               #NE#
00427    251*           DO 93 IIII = 1,NFPPS                                       #NE#
00432    252*           IDMA = NFPPS*(III-1) + IIII                                #NE#
00433    253*           IDMB = NFPPS*(IDM-1) + IIII                                #NE#
00434    254*           FETVC4(IDMA) = IDMB                                        #NE#
00435    255*      93   FETVEC(IDMA) = FETVC2(IDMB)                               #NE#
00437    256*      94   CONTINUE                                                    #NE#
00441    257*           CALL EVLFET(ARRAY(COVAR2),ARRAY(AVAR2),                    #NE#
00441    258*          *  ARRAY(DTAB4),ARRAY(#GHS14),ARRAY(COVAR4),ARRAY(AVAR4),   #NE#
00441    259*          *   SUBRAY(S1),SUBRAY(S2),SUBRAY(SBASE),SLEFT)               #NE#
00442    260*           IF(SMALL-LT-SEPMSR) GO TO 96                               #NE#
00444    261*           DO 95 III = 1,NOFET4                                       #NE#
00447    262*           FTSAV(III) = FETVEC(III)                                   #NE#
00450    263*      95   FETSAV(III) = FETVC4(III)                                  #NE#
00452    264*           SMALL = SEPMSR                                             #NE#
00453    265*      96   CONTINUE                                                    #NE#
00454    266*           CALL GENRPT(ARRAY(CLSID2),ARRAY(#GHS14),                   #NE#
00454    267*          *   ARRAY(DTAB4),SUBRAY(SBASE),SLEFT,FETVEC)                 #NE#
00455    268*      97   CONTINUE                                                    #NE#
00456    269*      98   CONTINUE                                                    #NE#
00460    270*      99   CONTINUE                                                    #NE#
00462    271*           DO 101 I=1,NOFET4                                          #NE#
00465    272*           FETVEC(I) = FTSAV(I)                                       #NE#
00466    273*     101    FETVC4(I) = FETSAV(I)                                    #NE#
00470    274*           #RITE(6,1010)                                              #NE#
00472    275*     1010 FORMAT(1H1, 'BEST SEPARABILITY MEASURE',///)                #NE#
00473    276*           #RITE(6,1000) SMALL                                        #NE#
00476    277*           #RITE(6,1020)                                              #NE#
00500    278*     1020 FORMAT(// '  CORRESPONDING FEATURES',///)                    #NE#
00501    279*           #RITE(6,1000) (FETVEC(I), I=1,NOFET4)                      #NE#
00507    280*     1000 FORMAT( )                                                   #NE#
00510    281*           GO TO 10                                                   #NE#
00511    282*      90   #RITE(6,250) NOFET4,(FETVC2(I),I=1,NOFET2)                 #NE#
00520    283*     250   FORMAT('  ERROR IN INPUT CHANNELS'//,1X,I2,30(1X,I2))      #NE#
00521    284*           CALL CHERR                                                 #NE#
00522    285*      100 FORMAT(' CORE OVERFLO# IN SUBRAY-',I6,' STORAGE LOCATIONS NECESSAR
00522    286*         #Y FOR THIS PROBLEM')
```

FETVC4(I) = FTSAV(I)

```
00523    287*      200 FORMAT(' CORE OVERFLO# IN ARRAY-',I6,' STORAGE LOCATIONS NEEDED FO
00523    288*         #R THIS PROBLEM')
00524    289*           END
```

3.2.2 SOFTWARE COMPONENT NO.2 (SETUP4)

Subprogram SETUP4 reads the control cards and initializes data and option switches for the SLECT processor.

3.2.2.1 Linkages

SETUP4 is called by routine SELECT and calls subprograms NUMBER, ORDER, NXTCHR, FIND, WGTSLN, CRDSTA, GRPSCN, BMFIL, REDSAV, BSTCHK, PRTFLD, and WGTCHK.

3.2.2.2 Interfaces

SETUP4 interfaces with other routines through a calling sequence and common blocks INFORM, GLOBAL, FSL, and BESTKN.

3.2.2.3 Inputs

Calling sequence:
Subr. SETUP4 (ARRAY, TOP, STOPFG, JTIME, SUBRAY, SUBSIZ)

Parameter	Dimension	In/Out	Description
ARRAY	TOP	In/Out	Utility storage for various arrays
TOP	1	In	Dimension of ARRAY vector
STOPFG	1	Out	Stop switch, set equal to 1 when $END* control board is read
JTIME	1	Out	Counter for number of times SELECT processor is invoked

Parameter	Dimension	In/Out	Description
SUBRAY	SUBSIZ (= 12000)	Out	Utility storage vector
SUBSIZ	1	In	Dimension of vector SUBRAY

New Control Cards:

APRIOR	(Default- omit card)	This card sets the switch to modify inter-subclass weights
BSPASS	N (no default)	N is the number of passes to be included in the best set
NCPASS	N (default 4)	N = number of channels per pass (acquisition)

Revised Control Cards:

PROCED	N (no default)	Set N = 6 to invoke the best k of N option

SETUP4 inputs a statistics file (SAVTAP) (or cards) and a feature reduction file (BMFIL).

3.2.2.4 Outputs

N/A

3.2.2.5 Storage

Code: 1772_8 Data: 1460_8

3.2.2.6 Description

Subprogram has been modified to handle three additional control cards and an expanded option list for existing control card

PROCED and print these options as part of the ordinary user input summary. Control card data or switches are passed through variables IPRIOR, KBEST and NCPASS of common block BESTKN.

3.2.2.7 Flowchart

N/A

3.2.2.8 Listing

```
00100     1*   C      //SETUP4                                                          SET40000
00101     2*          SUBROUTINE SETUP4(ARRAY,TOP,STOPFG,JTIME,SUBRAY,SUBSIZ)
00101     3*   C                                                                        SET40020
00103     4*          IMPLICIT INTEGER (A-H,O-Z)                                        SET40030
00103     5*   CI--------------------------------------------------------------------ISET40040
00103     6*   CI--------------------------------------------------------------------ISET40050

00103     7*   CI                                                                      ISET40060
00103     8*   CI                                                                      ISET40170
00103     9*   CI     PURPOSE.. COORDINATES ROUTINES TO ANALYZE SUPERVISOR             ISET40180
00103    10*   CI               CONTROL CARDS FOR 'SELECT' PROCESSOR                   ISET40190
00103    11*   CI                                                                      ISET40200
00103    12*   CI     RETURNS.. SUPERVISOR INFORMATION  AND REDUCED STATISTICS         ISET40210
00103    13*   CI                                                                      ISET40220
00103    14*   CI--------------------------------------------------------------------ISET40230
00103    15*   CI--------------------------------------------------------------------ISET40240
00103    16*   C                                                                        SET40250
00103    17*   C                                                                        SET40260
00103    18*   C                                                                        SET40270
00103    19*   C      ---------------------------------------------------------------SET40280
00103    20*   C                                                                        SET40290
00103    21*   C                                                                        SET40300
00104    22*          INCLUDE COMBK1,LIST
00105    22*          COMMON/INFORM/NOCLS2,NUSUB2,NOFET2,VARSZ2,TOTVT2,NOFLD2,
00105    22*        *            AVAR2,COVAR2,CLSID2,SUBNO2,SUBDS2,FLDSV2,VERTX2,
00105    22*        *            FETVC2(30),SUBVC2(75),SUBPTR(75),CLSVC2(60),
00105    22*        *            KEPPTS(60),NOGRP,GRPNAM(60),GRPDEX(61),
00105    22*                     GRPCHK(61),GROUPS(124)
00106    22*          END
00107    23*          INCLUDE COMBK4,LIST
00110    23*          DIMENSION HED1(10),HED2(10),DATE(2),COMENT(10)
00111    23*          EQUIVALENCE (HED1(1),HEAD(3)),(DATE(1),HEAD(15)),
00111    23*        *        (HED2(1),H.-D(20)),(COMENT(1),HEAD(32))
00112    23*          END
00113    24*          DIMENSION CODVEC(23)
00114    25*          DIMENSION WGHBUF(400),NUMVEC(30),CUMVEC(2)
00115    26*          DIMENSION EQUVEC(2)
00116    27*          DATA EQUVEC/1,'='/
00120    28*          DATA CODMAX /23/                                                     *NE*
00122    29*          DATA WSIZ/400/,ESIZ/100/,BLANK/1H /,COMVEC/1,',',/                   **-1
00127    30*          DATA SYMMAX/60/
00131    31*          DATA CODVEC/'CHANNE','SUBCLA','BEST  ','OPTION','WEIGHT',
00131    32*        *            'EVALUA','MODULE','GROUP ','PROCED','CRITER',
00131    33*        *            'B-MATR','INCLUD','ICOUNT','DATE  ','HED1  ',
00131    34*        *'HED2  ', 'COMMEN', '*END* ', '$END* ', 'STATFI', 'APRIOR',           *NE*
00131    35*        *'BSPASS', 'NCPASS'/                                                  *NE*
00133    36*          INCLUDE COMBK6,LIST                                                  **-1
00134    36*          COMMON/GLOBAL/HEAD(42),MAPTAP,DATAPE,SAVTAP,BMFILE,BMKEY,
00134    36*        *           HISFIL,HISKEY,TRFORM,ERIPTP,ERPKEY,MAPUNT,NOFILE,
00134    36*        *    DRUMAD,DRMWDS,PAGSIZ,DATFIL,STAFIL,ASAV,ASAVFL
00134    36*        *   ,NHSTUN,NHSTFI,SCTRUN,MAPFIL
00134    36*        *    ,DOTUNT,DOTFIL
00135    36*          END
00136    37*          INCLUDE COMBK7,LIST
00137    37*          COMMON/FSL/PRCKEY,CRIKEY,INCFET,INCVEC(30),ICOUNT,SETWGT,
00137    37*        $           EVALBF(100),CFAC,TOTMSR,FETVC4(30),SEPMSR
00137    37*        *           ,NOFET4,VARSZ4,CORBAS,DTAB4,WGHS14,BESTVC(10),DIVSIZ
00137    37*        *      ,STATKY,ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2
00140    37*          INTEGER ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2,STATKY
00141    37*          DOUBLE PRECISION CFAC,TOTMSR,SEPMSR
00142    37*          END
00143    38*          INCLUDE CMBK17,LIST                                                  *NE*
00144    38*          COMMON/BESTKN/ KPPPTS(60),IPRIOR,KBEST,NCPASS
00145    38*          END
00146    39*          DIMENSION PROC(2,6),CRI(2,3)                                         *NE*
```


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ORIGINAL PAGE IS
OF POOR QUALITY

```
00147     40•          DATA CRI/'DIVERGENCE  ','TRANS. DIV. ','BHATT. DIST.'/                    ••-1
00151     41•          DATA PROC/'EX.  SEARCH ' ,  'WITHOUT RFLC',
00151     42•         • 'DAVIDON     ','EVL B MATRIX','EVALUATE    ','BEST K  PASS'/            •NE•
00153     43•          DIMENSION ARRAY(1),CARD(62)                                              ••-1
00154     44•          DIMENSION SUBRAY(1)
00154     45•     C                                                                        SET40510
00154     46•     C                                                                        SET40530
00154     47•     C                                                                        SET40540
00154     48•     C    ------------------------------------------------------------------SET40550
00154     49•     C                                                                        SET40560
00154     50•     C                                                                        SET40650
00154     51•     C    ------------------------------------------------------------------SET40660
00155     52•          NOGRP=0
00155     53•     C    ------------------------------------------------------------------SET40670
00156     54•          INCFET=0
00157     55•          PRCKEY=2
00160     56•          NOFET2=0
00161     57•          WPTR=0
00162     58•          EPTR=0
00163     59•          GRPTR=0
00164     60•          ICOUNT=300
00165     61•          STOPFG=0
00166     62•          NOCLS2=0
00167     63•          NOSUB2=0
00170     64•          DATSWT=0
00171     65•          SETWGT=0
00172     66•          WTKEY = 0
00173     67•          NOGRP=0
00174     68•          IPRIOR = 0                                                               •NE•
00175     69•          NCPASS=4                                                                 •NE•
00176     70•          DO 2 I=1,61
00201     71•          GRPCHK(I)=0              $INITIATE GROUP ARRAY
00202     72•        2 CONTINUE
00204     73•          DO 5 I=1,10
00207     74•        5 BESTVC(I)=0
00211     75•          CRIKEY=1
00212     76•          NOFET2=0
00213     77•          IF(JTIME.EQ.1)GO TO 10
00215     78•          WRITE(6,HEAD)
00217     79•          WRITE(6,1000)
00221     80•       10 READ(5,2000)CODE,CARD
00230     81•          WRITE(6,3000)CODE,CARD
00237     82•          COL=0
00240     83•          DO 20 I=1,CODMAX
00243     84•       20 IF(CODVEC(I).EQ.CODE)GO TO(30,40,50,60,70,80,100,120,130,140,
00243     85•         •150,160,170,180,190,200,210,220,250,215,205,207,208),I                   •NE•
00246     86•          WRITE(6,8000)                                                            ••-1
00250     87•          GO TO 10
00250     88•     C•
00250     89•     C•   CHANNELS CARD
00250     90•     C•   FEATURES CARD - IF B-MATRIX IS INPUT IGNORE THIS CARD
00251     91•       30 IF(BMSWT.EQ.1)GO TO 10
00253     92•          NOFET2=NUMBER(CARD,COL,FETVC2,NOFET2)
00254     93•          CALL ORDER(FETVC2,NOFET2)
00255     94•          GO TO 10
00255     95•     C•
00255     96•     C•   SUBCLASSES CARD
00255     97•     C•
```

```
00256      98•          40 NOSUB2=NUMBER(CARD,COL,SUBVC2,NOSUB2)
00257      99•             CALL ORDER(SUBVC2,NOSUB2)
00260     100•             GO TO 10
00260     101•       C•
00260     102•       C•    BEST CARD
00260     103•       C•
00261     104•          50 NOBEST=NUMBER(CARD,COL,BESTVC,NOBEST)
00262     105•             GO TO 10
00262     106•       C•
00262     107•       C•    OPTION CARD - OPTIONS ARE STATS OR PUNCH
00262     108•       C•
00263     109•          60 J=NXTCHR(CARD,COL)
00264     110•             IF(J.EQ.'C')MTKEY = 1
00266     111•             IF(J.EQ.'S')STATKY=1
00270     112•             IF(J.EQ.'P')PCHKEY=1
00272     113•             IF(J.EQ.BLANK)GO TO 10
00274     114•             J=FIND(CARD,COL,COMVEC)
00275     115•             IF(J.EQ.-1)GOTO 10
00277     116•             GO TO 60
00277     117•       C•
00277     118•       C•    WEIGHTS CARD
00277     119•       C•
00300     120•          70 CALL WGTSCN(CARD,COL,SUBRAY,WGHBUF,WSIZ,WPTR)
00301     121•             SETWGT=2
00302     122•             GO TO 10
00302     123•       C•
00302     124•       C•    EVALUATE CARD - A SET OF FEATURES TO BE EVALUATED ACCORDING TO
00302     125•       C•                    REQUESTED CRITERIA
00302     126•       C•
00303     127•          80 IF(EPTR.GE.ESIZ)GO TO 10
00305     128•             J=NUMBER(CARD,COL,NUMVEC,0)
00306     129•             EPTR=EPTR+1
00307     130•             EVALBF(EPTR)=J
00310     131•             IF(EPTR*2+J  .LE.ESIZ)GO TO 85
00312     132•             WRITE(6,4000)
00314     133•             EPTR=ESIZ
00315     134•             GO TO 10
00316     135•          85 DO 90 L=1,J
00321     136•             EPTR = EPTR+1
00322     137•             EVALBF(EPTR)=NUMVEC(L)
00323     138•          90 CONTINUE
00325     139•             GO TO 10
00325     140•       C•
00325     141•       C•    MODULE CARD DECK - READ CARD DECK AND STORE ON STAT FILE.
00325     142•       C•
00326     143•         100 CALL CRDSTA(ARRAY,TOP)
00327     144•             GO TO 10
00327     145•       C•
00327     146•       C•    GROUP CARD
00327     147•       C•
00330     148•         120 J=GRPSCN(CARD,SYMMAX,GRPTR)
00331     149•             IF(J.EQ.0)GO TO 10
00333     150•             WRITE(6,5000)
00335     151•             GO TO 10
00335     152•       C•
00335     153•       C•    PROCEDURE CARD  1=EXHAUSTIVE SEARCH
00335     154•       C•                    2=WITHOUT REPLACEMENT (DEFAULT)
00335     155•       C•                    3=DAVIDON
```

```
00335    156*      C*                    4=USER INPUT
00335    157*      C*                    5=EVALUATE FEATURE CHANNELS
00336    158*        130 J=NUMBER(CARD,COL,NUMVEC,0)
00337    159*            PRCKEY=NUMVEC(1)
00340    160*            GO TO 10                                                  **-1
00340    161*      C*
00340    162*      C*    CRITERIA CARD   1=AVERAGE WEIGHTED DIVERGENCE
00340    163*      C*                    2=TRANSFORMED DIVERGENCE
00340    164*      C*                    3=BHATTACHARYYA
00340    165*      C*
00341    166*        140 J=NUMBER(CARD,COL,NUMVEC,0)
00342    167*            CRIKEY=NUMVEC(1)
00343    168*            IF (CRIKEY .LT. 1 .OR. CRIKEY .GT. 3) CRIKEY = 1
00345    169*            GO TO 10
00345    170*      C*
00345    171*      C*    B-MATRIX - CARDS OR FILE
00345    172*      C*             - BMSWT=1 MEANS B-MATRIX INPUT AND ON FILE,NOT IN CORE
00345    173*      C*
00346    174*        150 J=NXTCHR(CARD,COL)
00347    175*            BMSWT=1
00350    176*            BMKEY=1
00351    177*            IF(J.NE.'C')GO TO 10
00353    178*            CALL BMFIL (ARRAY,NOFET4,NOFET2,FETVC2,1)
00353    179*      C*    SET DATSWT BACK TO ZERO TO INDICATE STATS MAY HAVE BEEN OVERWRITEN
00354    180*            DATSWT=0
00355    181*            GO TO 10
00355    182*      C*
00355    183*      C*    INCLUDE CARD - FEATURES TO BE INCLUDED IN 'BEST' SET,
00355    184*      C*                   WITHOUT REPLACEMENT PROCEDURE
00355    185*      C*
00356    186*        160 INCFET= NUMBER(CARD,COL,INCVEC,INCFET)
00357    187*            GO TO 10
00357    188*      C*
00357    189*      C*    ICOUNT CARD - NO. OF ITERATIONS FOR DAVIDON PROCEDURE
00357    190*      C*
00360    191*        170 J=NUMBER(CARD,COL,NUMVEC,0)
00361    192*            ICOUNT=NUMVEC(1)
00362    193*            GO TO 10
00362    194*      C*
00362    195*      C*    DATE CARD
00363    196*        180 READ(30,6000)DATE
00371    197*            GO TO 10
00371    198*      C*
00371    199*      C*    HED1 CARD
00372    200*        190 READ(30,6000)HED1
00400    201*            GO TO 10
00400    202*      C*
00400    203*      C*    HED2 CARD
00401    204*        200 READ(30,6000)HED2
00407    205*            GO TO 10
00407    206*      C     APRIORI CARD                                              *NE*
00410    207*       205  IPRIOR = 1                                                *NE*
00411    208*            GO TO 10                                                  *NE*
00412    209*       207  J = NUMBER(CARD,COL,NUMVEC,0)                           *NE*
00413    210*            KBEST = NUMVEC(1)                                         *NE*
00414    211*            GO TO 10                                                  *NE*
00415    212*       208  J=NUMBER(CARD,COL,NUMVEC,0)                             *NE*
00416    213*            NCPASS=NUMVEC(1)                                          *NE*
```

```
00417         GO TO 10                                                   .NE*
00417   C.
00417   C.    COMMENT CARD
00426     210 READ(30,6000)COMENT
00426         GO TO 10
00426   C.
00426   C.    STAT FILE NO.
00426   C.
00427     215 M = NXTCHR(CARD ,COL)
00430         IF (M .EQ. 1H )  GO TO 10
00432         IF(M.EQ.'U') GO TO 1702
00434         IF(M.EQ.'F') GO TO 1703
00436    1723 WRITE(6,755)
00440     755 FORMAT(' ERROR ON STAT FILE CARD ')
00441         GO TO 10
00442    1702 J=FIND(CARD ,COL,EQUVEC)
00443         IF(J.EQ.-1) GO TO 1723
00445         M=NUMBER(CARD ,COL,SAVTAP,ZERO)
00446         COL=COL-1
00447         GO TO 215
00450    1703 J=FIND(CARD ,COL,EQUVEC)
00451         IF(J.EQ.-1) GO TO 1723
00453         FILNO = NUMBER(CARD ,COL,STAFIL,FILNO)
00454         STAFIL = STAFIL - 1
00455         COL=COL-1
00456         GO TO 215
00456   C.
00456   C.    .END.  -  END OF THIS SET OF CONTROL CARDS
00456   C.           -  GET STATS AND FETVEC INTO CORE
00457     220 CONTINUE
00457   C.
00457   C.    IF B-MATRIX IS INPUT, OBTAIN DIMENSIONING INFORMATION AND
00457   C.       FETVC2 FROM BMFILE.
00460     225 IF(BMSWT.EQ.0)GO TO 230
00462         CALL BMFIL (DUMMY,NOFET4,NOFET2,FETVC2,3)
00462   C.
00462   C.    READ AND REDUCE STATS
00462   C.
00463     230 CALL REDSAV(ARRAY,TOP,BMSWT)
00463   C.
00463   C.    CHECK 'BEST' REQUESTS
00463   C.
00464     260 IF(NOBEST.EQ.0)GO TO 270
00466         CALL BSTCHK(NOBEST)
00467         IF(NOBEST.GT.0)GO TO 260
00471     270 NOBEST=1
00472         BESTVC(NOBEST)=0
00472   C.
00472   C.    CHECK ON EVALUATE REQUESTS
00472   C.
00473     280 CONTINUE
00474         EPTR=EPTR+1                                                .NE*
00475         IF(PRCKEY.EQ.6) BESTVC(1) = KBEST                          ..-1
00477         EVALBF(EPTR)=0                                             .NE*
00477   C.
00477   C.    PRINT USER REQUESTS
00500         WRITE(6,9300) PROC(1,PRCKEY),PROC(2,PRCKEY)
00500        .          ,  CRI(1,CRIKEY),CRI(2,CRIKEY)
```

```
00506    272*            WRITE(6,9310)(BESTVC(I),I=1,NOBEST)
00514    273*            WRITE(6,9320)(FETVC2(I),I=1,NOFET2)
00522    274*            IF(INCFET.GT.0)WRITE(6,9330)(INCVEC(I),I=1,INCFET)
00531    275*            IF(SETWGT.EW.2)WRITE(6,9340)
00534    276*            IF(ATKEY.EW.1) WRITE(6,9360)
00537    277*            IF(SETWGT.NE.2.AND.ATKEY.NE.1)WRITE(6,9350)
00542    278*            IF (IPRIOR.NE.0) WRITE(6,9370)                                    *NE*
00545    279*            WRITE (6,9380) NCPASS                                             *NE*
00545    280*      C*
00545    281*      C*    PRINT OUT SAVED TRAINING FIELDS AND REDUCED COVARIANCES.
00545    282*      C*
00550    283*            CALL PRTFLD(ARRAY(COVAR2),ARRAY(AVAR2),ARRAY(FLDSV2),
00550    284*           *             ARRAY(VERTA2),ARRAY(CLSID2),ARRAY(SUBDS2))
00550    285*      C*
00550    286*      C*
00550    287*      C*    IF CLSWT OPTION IS INPUT, SET UP WEIGHT ARRAY FOR INTERCLASS
00550    288*      C*     SUBCLASS WEIGHTS.
00550    289*      C*
00551    290*            W1 = 1 + NPTR * 9
00552    291*            IF(ATKEY.EW.1)CALL INTWGT(SUBRAY(W1),ARRAY(SUBND2),NOSUB2,NOCLS2)
00552    292*      C*    STORAGE FOR FIELD INFORMATION NO LONGER NEEDED.
00552    293*      C*    MOVE CLASS ID INFORMATION
00552    294*      C*    AND MEANS AND COVARIANCES.
00552    295*      C*
00552    296*      C*     ---REDSAV STORES INTO ARRAY IN THE FOLLOWING ORDER
00552    297*      C*               1.CLASS DESCRIPTIONS
00552    298*      C*               2.NO. OF SUBCLASSES IN EACH CLASS
00552    299*      C*               3.SUBCLASS DESCRIPTIONS
00552    300*      C*               4.TRAINING FIELD INFO.
00552    301*      C*               5.TRAINING FIELD VERTICES
00552    302*      C*               6.COVARIANCE MATRICES
00552    303*      C*               7.MEAN VECTORS
00552    304*      C*
00552    305*      C*     ITEMS 1,2,4,5 ARE NOT NEEDED AFTER PRINTING, SO THE STORAGE
00552    306*      C*     IS REASSIGNED AS FOLLOWS, ADDING STORAGE FOR OTHER ARRAYS.
00552    307*      C*               1. SUBCLASS DESCRIPTIONS
00552    308*      C*               2. COVARIANCE MATRICES
00552    309*      C*               3. MEAN VECTORS
00552    310*      C*               4. INTER(SUB)CLASS WEIGHTS
00552    311*      C*               5. INTER(SUB)CLASS SEPARABILITY MEASURE TABLE
00552    312*      C*     IN SELECT DRIVER 'ARRAY' IS ALSO USED TO STORE ADDITIONAL INFO.
00552    313*      C*
00554    314*            CALL MOVE(ARRAY(CLSID2),ARRAY(SUBDS2),NOSUB2)
00555    315*            SUBDS2=CLSID2
00556    316*            NA=SUBDS2 + NOSUB2
00557    317*            I*RDS = (VARSZ2*NOFET2)*NOSUB2
00560    318*            CALL MOVE(ARRAY(NA),ARRAY(COVAR2),I*RDS)
00561    319*            COVAR2=NA
00562    320*            AVAR2=COVAR2 + NOSUB2*VARSZ2
00562    321*      C*
00562    322*      C*    FROM HERE ON THROUGH SELECT SUBCLASSES ARE REFERRED TO AS CLASSES
00562    323*      C*
00563    324*            NOCLS2=NOSUB2
00563    325*      C*
00563    326*      C*    COMPUTE BASES FOR OTHER ARRAYS.
00563    327*      C*
00564    328*            DIVSIZ=NOCLS2*(NOCLS2-1)/2
00565    329*            WGHSIZ=AVAR2  + NOFET2*NOCLS2
```

```
00566     330*            DTAB4 =#GHS14 + DIVSIZ
00567     331*            CORBAS = DTAB4 + DIVSIZ*2
00570     332*            IC=CORBAS
00571     333*            IF(CORBAS .LT.TOP)GO TO 300
00573     334*            #RITE(6,9100)IC
00576     335*            CALL CHEKR
00576     336*      C*
00576     337*      C*    SET UP ARRAY OF INTERCLASS #EIGHTS IF INPUT - IF DEFAULT IS TAKEN
00576     338*      C*    #EIGHTS ARE COMPUTED IN PRELIM.
00576     339*      C*
00577     340*        300 IF(SETWGT.NE.2.AND.WTKEY.NE.1) GO TO 310
00577     341*      C*    PASS KEYS TO SUBROUTINE IN ALREADY EXISTING STORAGE
00601     342*            ARRAY(WGHS14) = SETWGT
00602     343*            NT = WGHS14 + 1
00603     344*            ARRAY(NT) = ATKEY
00604     345*            CALL WGTCHK(ARRAY(WGHS14),ARRAY(CLSID2),SUBRAY,WGHBUF,WPTR,
00604     346*           *                SUBRAY(W1),NOCLS2)
00605     347*            SETWGT = 2    WSET FLAG THAT WEIGHT ARRAY HAS BEEN SET
00606     348*        310 CONTINUE
00607     349*            RETURN
00607     350*      C*
00607     351*      C*    $END*  CARD
00610     352*        350 STOPFG=1
00611     353*            RETURN
00612     354*       1000 FORMAT(' $SELECT')
00613     355*       2000 FORMAT(A6,4X,62A1)
00614     356*       3000 FORMAT(5X,A6,4X,62A1)
00615     357*       4000 FORMAT(' TOO MANY EVALUATE REQUESTS--REMAINDER IGNORED')
00616     358*       5000 FORMAT(' GROUP CARD IN ERROR - IGNORED')
00617     359*       6000 FORMAT(10X,10A6)
00620     360*       7000 FORMAT(' PROGRAM CANNOT PROCESS LESS THAN 2 CHANNELS')
00621     361*       8000 FORMAT(' INVALID CONTROL CARD - IGNORED')
00622     362*       9000 FORMAT(' PROGRAM CANNOT PROCESS LESS THAN 2 CLASSES')
00623     363*       9100 FORMAT(' CORE NEEDED IN ARRAY FOR THIS PROBLEM IS',I6,' WORDS')
00624     364*       9200 FORMAT(' ERROR IN ATTEMPT TO READ STATISTICS FILE-EXECUTION TERMIN
00624     365*           *ATED FROM SETUP4')
00625     366*       9300 FORMAT(//' YOU HAVE SELECTED THE FOLLOWING OPTIONS:'/
00625     367*           * 5X,'PROCEDURE',T35,2A6/5X,'CRITERION',T35,2A6)
00626     368*       9310 FORMAT(5X,'SELECT THE BEST SET(S) OF',T35,10(I2,','))
00627     369*       9320 FORMAT(5X,'FROM CHANNELS',T35,30(I2,','))
00630     370*       9340 FORMAT(5X,'USE INPUT #EIGHTS')
00631     371*       9350 FORMAT(5X,'USE DEFAULT #EIGHTS')
00632     372*       9330 FORMAT(5X,'INCLUDE IN THE BEST SET, CHANNELS',30(I2,','))
00633     373*       9360 FORMAT(5X,'USE AUTOMATIC INTERCLASS SUBCLASS #EIGHTS')
00634     374*       9370 FORMAT(5X,'USE APRIORI #EIGHTING TO MODIFY INTERSUBCLASS #TS')          *NE*
00635     375*       9380 FORMAT(5X, 'NUMBER CHANNELS PER PASS IS',T35,I5)                        *NE*
00635     376*      C
00635     377*      C     INTERNAL ROUTINE TO MOVE DATA FROM ONE STORAGE ARRAY TO ANOTHER
00635     378*      C
00636     379*            SUBROUTINE MOVE(A1,A2,IK)
00641     380*            DIMENSION A1(1),A2(1)
00642     381*            DO 500 IJ=1,IK
00645     382*        500 A1(IJ)=A2(IJ)
00647     383*            RETURN
00647     384*      C*
00647     385*      C*    INTERNAL ROUTINE TO ASSIGN INTERCLASS SUBCLASS #EIGHTS IN
00647     386*      C*       WORKING ARRAY
00647     387*      C*
```

```
00647     388•      C•  ROUTINE BREAKS DOWN CLASS PAIRS INTO INTERSUBCLASS PAIRS AND ASSIGNS
00647     389•      C•          CLASS(I),CLASS(J)  WEIGHT = 1.0  (I.NE.J)
00647     390•      C•          CLASS(I),CLASS(J)  WEIGHT = 0.0  (I.EQ.J)
00647     391•      C•
00650     392•            SUBROUTINE INTWGT(SUBWGT,CLSUB,NOSUB2,NOCLS2)
00653     393•            REAL SUBWGT(NOSUB2,NOSUB2)
00654     394•            DIMENSION CLSUB(NOCLS2)
00655     395•            IMPLICIT INTEGER(A-H,O-Z)
00655     396•      C•
00655     397•      C•    INITIALIZE ALL SUBCLASS WEIGHT PAIRS TO 0.0 IN WORKING ARRAY
00655     398•      C•
00656     399•            DO 100 IK=1,NOSUB2
00661     400•            DO 100 JK=1,NOSUB2
00664     401•            SUBWGT(IK,JK) = 0.0
00665     402•        100 SUBWGT(JK,IK) = 0.0
00665     403•      C•
00665     404•      C•    REPLACE INTERCLASS SUBCLASS PAIRS WITH WEIGHT = 1.0
00665     405•      C•
00670     406•            END1 = 0
00671     407•            NK = NOCLS2 - 1
00672     408•            DO 200 KI = 1,NK
00675     409•            JJ1 = CLSUB(KI)
00676     410•            START1 = END1 + 1
00677     411•            END1 = START1 + JJ1 - 1
00700     412•            DO 300 I = START1,END1
00703     413•            END2 = END1
00704     414•            D = KI + 1
00705     415•            DO 400 K2 = D,NOCLS2
00710     416•            JJ2 = CLSUB(K2)
00711     417•            START2 = END2 + 1
00712     418•            END2 = START2 + JJ2 - 1
00713     419•            DO 500 N = START2,END2
00716     420•            SUBWGT(I,N) = 1.0
00717     421•            SUBWGT(N,I) = 1.0
00720     422•        500 CONTINUE
00722     423•        400 CONTINUE
00724     424•        300 CONTINUE
00726     425•        200 CONTINUE
00730     426•            RETURN
00731     427•             END                                                    SET41100

     END OF COMPILATION:        NO  DIAGNOSTICS.
SETUP4      SYMBOLIC                    20 JUN 77  01:59:42   0  03102560   14   410  (DELETED)
SETUP4  CODE  RELOCATABLE               20 JUN 77  01:59:42   1  01747210   48     1  (DELETED)
                                                              0  01747276   14   123
```

3.2.3 SOFTWARE COMPONENT NO. 3 (PRELIM)

Subprogram PRELIM sets up the separability measures for the full set of channels specified by the user. This measure is either average divergence, transformed divergence, or Bhattacharriya distance. It also computes, an option, the inter-subclass weighting factors based on number of pixels per cluster and multiplies the weights by these factors.

3.2.3.1 Linkages

Subprogram PRELIM is called by routine SELECT and calls DIVERG, AVEDIV, TRNDIV, BHTCHR, RWRITE, and ARITHMETIC routines SQRT and DEXP.

3.2.3.2 Interfaces

PRELIM interfaces with other routines through a calling sequence and common blocks INFORM, FSL, and BESTKN.

3.2.3.2 Inputs

Calling Sequence:
Subr. PRELIM (COVMTX, AVEMTX, DIVTAB, WEIGHT, S, WRKRY, WRKSIZ)

Parameter	Dimension	In/Out	Description
COVMTX	(VARSZ2,NOCLS2)	In/Out	Subclass covariance matrices (lower triangular)
AVEMTX	(NOFET2,NOCLS2)	In/Out	Subclass mean vectors
DIVTAB	(DIVSTI2)	In/Out	Double Precision Inter-subclass divergences or distances
WEIGHT	(DIVSI2)	In/Out	Inter-subclass weights

Parameter	Dimension	In/Out	Description
S	(VARSZ2,NOCLS2)	Out	"S" matrices computed if CRIKEY = 1
WRKRY	(WRKSIZ)	In/Out	Double Precision storage for feature subset covariance matrices and mean vectors
WRKSIZ	1	In	Computed as 12000 - SBASE in SELECT. SBASE = 1 if CRIKEY #1 = 2+ NOCLS2*VARSZ2 if CRIKEY=1

3.2.3.4 Outputs

N/A

3.2.3.5 Storage

Code: 671_8 Data: 1664_8

3.2.3.6 Description

The changes to subprogram PRELIM involve the computation of the weighting factors and subsequent multiplication of the weights. These factors are computed from the KPPPTS array in newly-added labeled common /BESTKN/ which holds the number of pixels per cluster.

3.2.3.7 Flowchart

N/A

3.2.3.8 Listing

```
00101           SUBROUTINE PRELIM(COVMIX,AVEMTX,DIVTAB,WEIGHT,S,
00101          *                    ARRAY,WRKSIZ)
00101     C*
00101     C*     THIS SUBROUTINE PERFORMS SOME OF THE PRELIMANARY TASKS FOR
00101     C*     FEATURE SELECTION.  THE INTERCLASS MEASURES USING ALL FEATURES
00101     C*     ARE COMPUTED AND STORED ON A SCRATCH FILE FOR LATER PRINTING.
00101     C*
00101     C*     IN ADDITION, THIS SUBROUTINE COMPUTES THE 'S' MATRICES USED IN
00101     C*     COMPUTING WEIGHTED AVERAGE DIVERGENCE IF CRIKEY=1.  IF WEIGHTS
00101     C*     ARE TO BE SET BY DEFAULT, THE SUBROUTINE ALSO PERFORMS THIS TASK.
00101     C*
00103           IMPLICIT INTEGER(A-Z)
00104           INCLUDE COMBK1,LIST
00105           COMMON/INFORM/NOCLS2,NOSUB2,NOFET2,VARSZ2,TOTVT2,NOFLD2,
00105          *              AVAR2,COVAR2,CLSID2,SUBNO2,SUBDS2,FLDSV2,JERTX2,
00105          *              FETVC2(30),SUBVC2(75),SUBPTR(75),CLSVC2(60),
00105          *              KPPTS(60),NOGRP,GRPNAM(60),GRPDEX(61),
00105          *              GRPCHK(61),GROUPS(124)
00106           END
00107           INCLUDE COMBK7,LIST
00110           COMMON/FSL/PRCKEY,CRIKEY,INCFET,INCVEC(30),ICOUNT,SETWGT,
00110          $           EVALBF(100),CFAC,TOTMSR,FETVC(30),SEPMSR
00110          *           ,NOFET4,VARSZ4,COMBAS,DTAB4,WGHSI4,BESTVC(10),DIVSIZ
00110          *     ,STATKY,ADRESD,ADRESP,ADRESF,ADRSHI,ADRSH2
00111           INTEGER ADRESD,ADRESP,ADRESF,ADRSHI,ADRSH2,STATKY
00112           DOUBLE PRECISION CFAC,TOTMSR,SEPMSR
00113           END
00114           INCLUDE CHBK17,LIST                                              *NE*
00115           COMMON/BESTKN/ KPPPTS(60),IPRIOR,KBEST,NCPASS
00116           END
00117           REAL    COVMTX(VARSZ2,NOCLS2),   AVEMTX(NOFET2,NOCLS2),
00117          *        DIVTAB(DIVSIZ), WEIGHT(DIVSIZ), S(VARSZ2,NOCLS2)
00120           R   T(30),APRWGT(780),ANUMPX                                     *NE*
00121              SLE PRECISION DIVTAB,DUM                                      **-I
00122           DOUBLE PRECISION WRKRY(1)
00123           REAL TA(60)
00124           ANUMPX = 0.                                                      *NE*
00125           DO 1 I=1,NOCLS2                                                  *NE*
00130     1     ANUMPX = ANUMPX + FLOAT(KPPPTS(I))                               *NE*
00132           K = 0                                                            *NE*
00133           NC = NOCLS2 - 1                                                  *NE*
00134           DO 2 I=1,NC                                                      *NE*
00137           IK = I + 1                                                       *NE*
00140           DO 2 II = IK,NOCLS2                                              *NE*
00143           K = K + 1                                                        *NE*
00144           APRWGT(K)=FLOAT(KPPPTS(I)*KPPPTS(II))/(ANUMPX**2)                *NE*
00145     2     APRWGT(K)=SQRT(APRWGT(K))                                        *NE*
00150           IF(IPRIOR.NE.0) WRITE(6,990)                                     *NE*
00153     990   FORMAT(1H1,'  APRIORI WEIGHT MULTIPLIERS AND TOTAL NO PIXELS')   *NE*
00154           IF(IPRIOR.NE.0) WRITE(6,1000) (APRWGT(I),I=1,DIVSIZ),ANUMPX      *NE*
00164     1000  FORMAT( )                                                        *NE*
00165           IF (SETWGT.EQ.2) GO TO 6                                         *NE*
00167           DO 5 I=1,DIVSIZ                                                  *NE*
00172     5     WEIGHT(I) = 1.0                                                  *NE*
```

```
00174    40•        6    IF (IPRIOR.EQ.0) GO TO 9                                          •NE•
00176    41•             DO 7 I=1,DIVSIZ                                                   •NE•
00201    42•        7    WEIGHT(I) = WEIGHT(I)*APRWGT(I)                                   •NE•
00203    43•        9    CONTINUE                                                          •NE•
00203    44•      C•     SET IPART SO PARTIALS WILL NOT BE COMPUTED.                        ••-7
00204    45•             IPART=-1
00205    46•             IFULL=1
00206    47•             GO TO(10,70,80,90),CRIKEY
00206    48•      C•
00206    49•      C•     CRITERIA - WEIGHTED AVERAGE DIVERGENCE
00206    50•      C•     --COMPUTE INTERCLASS DIVERGENCES
00206    51•      C•     --SET WEIGHTS,IF SETWGT=0
00206    52•      C•     --COMPUTE S-MATRICES
00206    53•      C•     --COMPUTE WEIGHTED AVERAGE DIVERGENCE FOR ALL FEATURES
00206    54•      C•
00207    55•         10 CALL DIVERG(COVMTX,VARSZ2,AVEMTX,DIVTAB,NOCLS2,NOFET2,
00207    56•            •                          WRKRY,WRKSIZ)
00210    57•             IF(SETWGT.NE.0)GO TO 25
00212    58•             DO 20 K=1,DIVSIZ
00215    59•             WEIGHT(K) = EXP(-DIVTAB(K)/16.)                                   •NE•
00216    60•        20    IF(IPRIOR.NE.0) WEIGHT(K) = WEIGHT(K)*APRWGT(K)                  •NE•
00216    61•      C•     COMPUTE S-MATRICES                                                 ••-1
00221    62•             CONTINUE
00222    63•             DO 30 J=1,NOCLS2
00225    64•             DO 30 I=1,VARSZ2
00230    65•         30  S(I,J)=0.0
00233    66•             NC=NOCLS2-1
00234    67•             DO 60 N=1,NOCLS2
00234    68•      C•
00234    69•      C•     SELECT ALL WEIGHTS FOR CLASS N
00234    70•      C•
00237    71•             KT=0
00240    72•             K=0
00241    73•             MN=0
00242    74•             DO 35 J=1,NC
00245    75•             IJ=J+1
00246    76•             DO 35 I=IJ,NOCLS2
00251    77•             K=K+1
00252    78•             IF(J.NE.N.AND.I.NE.N)GO TO 35
00254    79•             KT=KT+1
00255    80•             TW(KT)=WEIGHT(K)
00256    81•         35  CONTINUE
00261    82•             DO 50 M=1,NOCLS2
00264    83•             IF(M.EQ.N)GO TO 50
00266    84•             MN=MN+1
00267    85•             DO 40 I=1,NOFET2
00272    86•         40  T(I)=AVEMTX(I,N)-AVEMTX(I,M)
00274    87•             J=0
00275    88•             DO 45 I=1,NOFET2
00300    89•             DO 45 K=1,I
00303    90•             J=J+1
00304    91•         45  S(J,N)=S(J,N)+TW(MN)*(COVMTX(J,M)+T(I)*T(K))
00307    92•         50  CONTINUE
00311    93•         60  CONTINUE
00311    94•      C•     COMPUTE CFAC
00313    95•             CFAC=0
00314    96•             DO 65 I=1,DIVSIZ
00317    97•         65  CFAC = CFAC + WEIGHT(I)
```

```
00321      98•          CFAC=1./CFAC
00321      99•     C•   COMPUTE AVERAGE WEIGHTED DIVERGENCE
00322     100•          CALL AVEDIV(TOTMSR,COVMTX,3,DUM,DUM,WRKRY,WRKSIZ,
00322     101•         •                IPART,DUM,DUM,IFULL)
00323     102•          TOTMSR=ABS(TOTMSR)
00324     103•          GO TO 85
00324     104•     C•
00324     105•     C•   CRITERIA = WEIGHTED AVERAGE TRANSFORMED DIVERGENCE
00324     106•     C•
00324     107•     C•
00325     108•        70 CALL TRNDIV(TOTMSR,COVMTX,AVEMTX,DUM,DUM,WEIGHT,DIVTAB,
00325     109•         •                WRKRY,WRKSIZ,IPART,DUM,DUM,IFULL)
00326     110•          GO TO 85
00326     111•     C•
00326     112•     C•   CRITERIA = BHATTACHARYYA DISTANCE
00326     113•     C•
00327     114•        80 CALL BHTCHR(TOTMSR,COVMTX,AVEMTX,WEIGHT,DIVTAB,DUM,DUM,
00327     115•         •                WRKRY,WRKSIZ,IPART,DUM,DUM,IFULL)
00327     116•     C•   SAVE INTERCLASS WEIGHTS ON DRUM
00330     117•        85 IQ=DIVSIZ*2
00331     118•           CALL RWRITE(ADRESD,DIVTAB,IQ,ISTAT)
00332     119•        86 IF(ISTAT.EQ.1)GO TO 86
00334     120•        90 RETURN
00335     121•           END

   END OF COMPILATION:        NO  DIAGNOSTICS.
PRELIM          SYMBOLIC                    20 JUN 77  01:57:38   0  02672142   14   104  (DELETED)
PRELIM  CODE    RELOCATABLE                 20 JUN 77  01:57:38   1  01662354   36     1  (DELETED)
                                                                   0  01662420   14    37
```



```
@ FOR,* DIVERG,DIVERG                                                    18 NOV 77          3:17:50.511
UNIVAC 1108 FORTRAN V EXEC II LEVEL 25A  -(EXECR LEVEL E12U1001GA)
THIS COMPILATION WAS DONE ON 18 NOV 77 AT 03:17:50
```

3.2.4 SOFTWARE COMPONENT NO. 4 (GTSTAT)

Subprogram GTSTAT acquires the reduced feature covariance matrices and mean vectors for each subclass.

3.2.4.1 Linkages

Subprogram GTSTAT is called by EXSRCH, WHRPLC, FINT, USERIN, EVLFET, and calls subprogram TRNSFR.

3.2.4.2 Interfaces

GTSTAT interfaces with other routines through a calling sequence and common blocks INFORM and FSL.

3.2.4.3 Inputs

Calling Sequence:

Subr GTSTAT (COVMTX, AVEMTX, S, COVMT2, AVEMT2, S2, VEC, BMAT, WRKRY, IWRKSZ)

Parameter	Dimension	In/Out	Description
COVMTX	(VARSZ2,NOCLS2)	In	Covariance matrices
AVEMTX	(NOFET2,NOCLS2)	In	Mean vectors
S	(VARSZ2,NOCLS2)	In	S matrices
COVMT2	(VARSZ4,NOCLS2)	Out	Double Precision reduced covariance matrices
AVEMT2	(NOFET4,NOCLS2)	Out	Double Precision reduced mean vectors
S2	(VARSZ4,NOCLS2)	Out	Double Precision reduced S matrices
VEC	NOFET4	In	Reduced channel set

Parameter	Dimension	In/Out	Description
BMAT	NOFET2*NOFET4	In	Double Precision B-matrix for linear combination of channels (PRICKEY = 3 or 4)
WRKRY	IWRKSZ	In/Out	Double Precision
IWRKSZ	1	In	See WKRSIZ parameter PRELIM subprogram

3.2.4.4 Outputs

N/A

3.2.4.5 Storage

Code: 456_8 Data: 104_8

3.2.4.6 Description

The change to GTSTAT consists of a transfer if PRCKEY=G to the channel reduction section. This is the same location reached for PRCKEY = 1,2, and 5.

3.2.4.7 Flowchart

N/A

3.2.4.8 Listing

```
00101     1*          SUBROUTINE GISTAT(COVMTX,AVEMTX,S,COVMT2,AVEMT2,S2,
00101     2*         *                  VEC,BMAT,WRKRY,IWRKSZ)
00101     3*    C*
00101     4*    C*    THIS SUBROUTINE SELECTS THE SUBSETS OF THE STATISTICAL
00101     5*    C*    PARAMETERS COVMTX,AVEMTX AND S DEFINED BY VEC OR BMAT AND
00101     6*    C*    STORES THE SUBSETS INTO COVMT2,AVEMT2, AND S2 RESPECTIVELY.
00101     7*    C*
00103     8*          INCLUDE COMBK1,LIST

00104     8*          COMMON/INFORM/NOCLS2,NOSUB2,NOFET2,VARSZ2,TOTVT2,NOFLD2,
00104     8*         *              AVAR2,COVAR2,CLSID2,SUBNO2,SUBDS2,FLDSV2,VERTX2,
00104     8*         *              FETVC2(30),SUBVC2(75),SUBPTR(75),CLSVC2(60),
00104     8*         *              NEPPTS(60),NUGRP,GRPNAM(60),GRPDEF(61),
00104     8*         *              GRPCHK(61),GROUPS(1024)
00105     6*          END
00106     9*          INCLUDE COMBK7,LIST
00107     9*          COMMON/FSL/PRCKEY,CRIKEY,INCFET,INCVEC(30),ICOUNT,SETNGT,
00107     9*         $            EVALBF(100),CFAC,TOTMSR,FETVC4(30),SEPMSR
00107     9*         *             ,NOFET4,VARSZ4,CURBKS,DTAB4,NGHS14,BESTVC(10),DIVSIZ
00107     9*         *    ,STATKY,ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2
00110     9*          INTEGER ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2,STATKY
00111     9*          DOUBLE PRECISION CFAC,TOTMSR,SEPMSR
00112     9*          END
00113    10*          INTEGER PRCKEY,CRIKEY,VEC,VARSZ2,VARSZ4
00114    11*          DOUBLE PRECISION COVMT2,AVEMT2,S2,BMAT,WRKRY(1),SUM
00115    12*          DIMENSION  COVMTX(VARSZ2,NOCLS2),  COVMT2(VARSZ4,NOCLS2),
00115    13*         *           AVEMTX(NOFET2,NOCLS2),  AVEMT2(NOFET4,NOCLS2),
00115    14*         *           S(VARSZ2,NOCLS2),S2(VARSZ4,NOCLS2),VEC(1),
00115    15*         *           BMAT(NOFET4,NOFET2)
00115    16*    C*
00115    17*    C*    IF WITHOUT REPLACEMENT OR EX. SEARCH PROCEDURE, SELECT ELEMENTS
00115    18*    C*    DETERMINED BY 'VEC'.
00116    19*          GO TO (5,5,20,20,5,5),PRCKEY                                    *NEW
00117    20*        5 CONTINUE                                                        **-1
00120    21*          DO 10 I=1,NOCLS2
00123    22*          IK=0
00124    23*          DO 10 J=1,NOFET4
00127    24*          K=VEC(J)
00130    25*          LOC=K*(K-1)/2
00131    26*          AVEMT2(J,I)=AVEMTX(K,I)
00132    27*          DO 10 L=1,J
00135    28*          IK=IK+1
00136    29*          IW=VEC(L)+LOC
00137    30*          COVMT2(IK,I)=COVMTX(IW,I)
00140    31*          IF(CRIKEY.NE.1)GO TO 10
00142    32*          S2(IK,I)=S(IW,I)
00143    33*       10 CONTINUE
00147    34*          RETURN
00147    35*    C*
00147    36*    C*    DAVIDON OR USER INPUT PROCEDURE, MULTIPLY B-MATRIX
00147    37*    C*
00150    38*       20 CONTINUE
00151    39*          IW1=1
00152    40*          ITEST= IW1 + NOFET2*NOFET4
00153    41*          IF(IWRKSZ/2.GE.ITEST)GO TO 30
00155    42*          WRITE(6,100)IWRKSZ
00160    43*          CALL CMERR
00161    44*       30 CONTINUE
00162    45*          DO 80 I=1,NOCLS2
00165    46*          DO 60 J=1,NOFET4
00170    47*          SUM=0.0
00171    48*          DO 50 K=1,NOFET2
00174    49*       50 SUM=SUM+AVEMTX(K,I)*BMAT(J,K)
00176    50*       60 AVEMT2(J,I)=SUM
00200    51*       80 CONTINUE
00202    52*          CALL TRNSFR(COVMTX,COVMT2,WRKRY(IW1),BMAT)
00203    53*          IF(CRIKEY.EQ.1)CALL TRNSFR(S,SZ,WRKRY(IW1),BMAT)

00205    54*          RETURN
00206    55*      100 FORMAT(' NOT ENOUGH WORK AREA IN GISTAT -- IWRKSZ=',,5)
00207    56*          END
```

3.2.5 SOFTWARE COMPONENT NO. 5 (GENRPT)

Subprogram GENRPT handles the reporting of results through printer output.

3.2.5.1 Linkages

GENRPT is called by routine SELECT, and calls UNIVAC RANDIO routine RREAD.

3.2.5.2 Interfaces

GENRPT interfaces with other routines through a calling sequence and common blocks GLOBAL, FSL, and INFORM.

3.2.5.3 Inputs

Calling Sequences

Subr. GENRPT (CLSNAM, WEIGHT, PIVTAB, WRKRY, IWRKSZ, FEJVEC)

Parameter	Dimension	In/Out	Description
CLSNAM	(NOCLSZ)	In	Class names
WEIGHT	(DIVISZ)	In	inter-subclass weights
DIVTAB	(DIVSIZ)	In	Double Precision inter-subclass separabilities
WRKRY	IWRKSZ	In	Double Precision separabilities for full feature set
IWRKSZ	1	In	See WRKSIZ parameter of routine PRELIM
FETVEC	30	In	Selected features

3.2.5.4 Outputs

Printed reports are outputted.

3.2.5.5 Storage

Code: 1116_8 Data: 523_8

3.2.5.6 Description

The changes to GENRPT consist of privisions for extra printout if PRCKEY=6.

3.2.5.7 Flowchart

N/A

3.2.5.8 Listings

```
00101      1•            SUBROUTINE GENRPT(CLSNAM,WEIGHT,DIVTAB,WRKRY,I#RKSZ,FETVEC)
00103      2•            DIMENSION CLSNAM(NOCLS2),DIVTAB(1),WRKRY(1),WEIGHT(1)
00104      3•            INCLUDE COMBK6,LIST
00105      3•            COMMON/GLOBAL/HEAD(42),MAPTAP,DATAPE,SAVTAP,BMFILE,BMKEY,
00105      3•           •              HISFIL,HISKEY,TRFORM,ERIPTP,EMPKEY,MAPUNT,NOFILE,
00105      3•           •    DRUMAD,DRMADS,PAGSIZ,DATFIL,STAFIL,ASAV,ASAVFL
00105      3•           •  ,NHSTUN,NHSTFI,SCTRUN,MAPFIL
00105      3•           •   ,DOTUNT,DOTFIL
00106      3•            END
00107      4•            DOUBLE PRECISION RATIO
00110      5•            DOUBLE PRECISION WRKRY,DIVTAB
00111      6•            DIMENSION FETVEC(30)
00112      7•            INCLUDE COMBK1,LIST
00113      7•            COMMON/INFORM/NOCLS2,NOSUB2,NOFET2,VARSZ2,TOTVT2,NOFLD2,
00113      7•           •              AVAR2,COVAR2,CLSID2,SUBNO2,SUBDS2,FLDSV2,VENTX2,
00113      7•           •              FETVC2(30),SUBVC2(75),SUBPTR(75),CLSVC2(60),
00113      7•           •              KEPPTS(60),NOGRP,GRPNAM(60),GRPDEX(61),
00113      7•           •              GRPCHK(61),GROUPS(124)
00114      7•            END
00115      8•            INCLUDE COMBK7,LIST
00116      8•            COMMON/FSL/PRCKEY,CRIKEY,INCFET,INCVEC(30),ICOUNT,SETWGT,
00116      8•           $            EVALBF(100),CFAC,TOTMSR,FETVC4(30),SEPMSR
00116      8•           •              ,NOFET4,VARSZ4,CORBAS,DTAB4,WGHS14,BESTVC(10),DIVSIZ
00116      8•           •    ,STATKY,ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2
00117      8•            INTEGER ADRESD,ADRESP,ADRESF,ADRSH1,ADRSH2,STATKY
00120      8•            DOUBLE PRECISION CFAC,TOTMSR,SEPMSR
00121      8•            END
00122      9•            INTEGER CRIKEY,PRCKEY
00123     10•            DIMENSION PRC(4,6),CRI(9,4)                                    •NE•
00124     11•            DATA PRC/'EXHAUSTIVE SEARCH       ',                           •••I
00124     12•           •         'WITHOUT REPLACEMENT    ',
00124     13•           •         'DAVIDON-FLETCHER-POWELL',
00124     14•           •         'EVAL. B-MATRIX REQUEST ',
```


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```
00124          *     'EVAL. FEATURES REQUEST  ',                              *NE*
00124          *     'BEST  K   OF   N  PASSES'/                              *NE*
00126         DATA CRI/'WEIGHTED AVERAGE DIVERGENCE              ',           **-1
00126          *       'WEIGHTED AV. TRANSFORMED DIVERGENCE       ',
00126          *       'WEIGHTED AV. BHATTACHARYYA DISTANCE       ',
00126          *       'PROBABILITY OF MISCLASSIFICATION OF TRAINING DATA'/
00130         INTEGER DIVSIZ,PAGSIZ
00131         INTEGER FETVC4
00132         IPCNT=27
00133         WRITE(6,HEAD)
00135         WRITE(6,100)(PRC(I,PRCKEY),I=1,4),(CRI(I,CRIKEY),I=1,9)
00147         IB=1
00150         IE=15
00151       5 IF(IE.GT.NOFET2)IE=NOFET2
00153         WRITE(6,105)(FETVC2(I),I=IB,IE)
00161         IF(IE.EQ.NOFET2)GO TO 10
00163         IB=IE+1
00164         IE=IE+15
00165         GO TO 5
00166      10 CONTINUE
00167         WRITE(6,125)
00171         IF(PRCKEY.EQ.3.OR.PRCKEY.EQ.4)WRITE(6,110)NOFET4
00175         IF(PRCKEY.EQ.3.OR.PRCKEY.EQ.4)GO TO 18
00177         IB=1
00200         IE=16
00201      12 IF(IE.GT.NOFET4)IE=NOFET4
00203         IF(PRCKEY.LT.3)WRITE(6,120)(FETVC4(I),I=IB,IE)
00212         IF (PRCKEY.GE.5) WRITE(6,115) (FETVEC(I), I=IB,IE)          *NE*
00221         IF(IE.EQ.NOFET4)GO TO 18                                    **-1
00223         IB=IE+1
00224         IE=IE+16
00225         GO TO 12
00226      18 CONTINUE
00227         IF(CRIKEY.EQ.1)SEPMSR=ABS(SEPMSR)
00231         IF(PRCKEY .EQ.3)WRITE(6,130)SEPMSR
00235         IF(PRCKEY .EQ.4)WRITE(6,130)SEPMSR
00241         IF (PRCKEY.GE.5) WRITE(6,145) SEPMSR                        *NE*
00245         IF(PRCKEY.LT.3)WRITE(6,140)SEPMSR                           **-1
00251         IF(CRIKEY.EQ.1)RATIO=SEPMSR/TOTMSR
00253         IF(CRIKEY.NE.1)RATIO=TOTMSR/SEPMSR
00255         IF(CRIKEY.NE.1)WRITE(6,150)TOTMSR,RATIO
00262         IF(CRIKEY.EQ.1)WRITE(6,155)TOTMSR,RATIO
00267         WRITE(6,160)
00271         IF(CRIKEY.EQ.1)WRITE(6,170)
00274         IF(CRIKEY.EQ.2)WRITE(6,175)
00277         IF(CRIKEY.EQ.3)WRITE(6,180)
00302         IF(PRCKEY.LE.2)WRITE(6,190)
00305         IF(PRCKEY.EQ.3)WRITE(6,200)
00310         IF(PRCKEY.EQ.4)WRITE(6,200)
00313         IF (PRCKEY.GE.5) WRITE(6,205)                               *NE*
00316         WRITE(6,125)                                                **-1
00316       C*
00316       C*    READ INTERCLASS MEASURE FOR ALL FEATURES - COMPUTED AND SAVED IN
00316       C*    PRELIM.
00316       C*
00320         NW=DIVSIZ*2
00321         CALL RREAD(ADRESD,WRKKY,NW,ISTAT)
00322      19 IF(ISTAT.EQ.1)GO TO 19
```

```
00324      73•            NC=NOCLS2-1
00325      74•            IK=0
00326      75•            DO 20 I=1,NC
00331      76•            K=I+1
00332      77•            DO 20 J=K,NOCLS2
00335      78•            IK=IK+1
00336      79•            IF(CRIKEY.EQ.1)RATIO=DIVTAB(IK)/#RKRY(IK)
00340      80•            IF(CRIKEY.NE.1)RATIO=#RKRY(IK)/DIVTAB(IK)
00342      81•            #RITE(6,210)CLSNAM(I),CLSNAM(J),
00342      82•           •                #EIGHT(IK),DIVTAB(IK),#RKRY(IK),RATIO
00352      83•            IPCNT=IPCNT+1
00353      84•            IF(IPCNT.LT.PAGSIZ)GO TO 20
00355      85•            IPCNT=17
00356      86•            IF(IK.EQ.DIVSIZ)GO TO 20
00360      87•            #RITE(6,HEAD)
00362      88•            #RITE(6,160)
00364      89•            IF(CRIKEY.EQ.1)#RITE(6,170)
00367      90•            IF(CRIKEY.EQ.2)#RITE(6,175)
00372      91•            IF(CRIKEY.EQ.3)#RITE(6,180)
00375      92•            IF(PRCKEY.LE.2)#RITE(6,190)
00400      93•            IF(PRCKEY.EQ.3)#RITE(6,200)
00403      94•            IF(PRCKEY.EQ.4)#RITE(6,200)
00406      95•            IF (PRCKEY.GE.5) #RITE(6,205)                                    •NE•
00411      96•            #RITE(6,125)                                                     •••-1
00413      97•         20 CONTINUE
00416      98•            IF(CRIKEY.NE.2)RETURN
00416      99•      C•
00416     100•      C•    GET DIVERGENCE BACK FOR PLOTS
00416     101•      C•
00420     102•            DO 30 I=1,DIVSIZ
00423     103•            #RKRY(I)=-16.••DLOG(#RKRY(I))
00424     104•            DIVTAB(I)=-16.••DLOG(DIVTAB(I))
00425     105•         30 CONTINUE
00427     106•        100 FORMAT(1X,T35,'RESULTS FOR CHANNEL SELECTION ACTIVITY USING:'/
00427     107•           •       1X,T40,'OPTIMIZATION PROCEDURE = ',4A6/
00427     108•           •       1X,T40,'SEPARABILITY MEASURE   = ',9A6)
00430     109•        105 FORMAT(1X,T40,'CHANNELS CONSIDERED    = ',15(I2,','))
00437     110•        110 FORMAT(1X,T35,'NO. OF LINEAR COMBINATIONS                  = ',I3)
00442     111•        115 FORMAT(1X,T35,'CHANNELS EVALUATED                          = '
00443     112•           • 16(I2,','))
00453     113•        120 FORMAT(1X,T35,'CHANNELS SELECTED                           = ',
00454     114•           •  I2,15(',',I2))
00434     115•        125 FORMAT(/)
00435     116•        130 FORMAT(1X,T35,'SEPARABILITY MEASURE FOR LINEAR COMB.       = ',
00435     117•           •  E14.8)
00436     118•        140 FORMAT(1X,T35,'SEPARABILITY MEASURE FOR SELECTED CHANNELS = ',
00436     119•           •  E14.8)
00437     120•        145 FORMAT(1X,T35,'SEPARABILITY MEASURE FOR EVALUATE REQUEST  = ',
00437     121•           • E14.8)
00440     122•        150 FORMAT(1X,T35,'MINIMUM SEP•MEASURE (USING ALL CHANNELS)    = ',
00440     123•           • E14.8/1X,T35,'RATIO',T78,'= ',E14.8)
00441     124•        155 FORMAT(1X,T35,'MAXIMUM SEP•MEASURE (USING ALL CHANNELS)    = ',
00441     125•           •E14.8/1X,T35,'RATIO',T78,'= ',E14.8)
00442     126•        160 FORMAT(////    1X,T50,'INTERCLASS SEPARABILITY TABLE' //)
00443     127•        170 FORMAT(1X,T73,'INTERCLASS DIVERGENCE')
00444     128•        175 FORMAT(1X,T65,'INTERCLASS TRANSFORMED DIVERGENCE')
00445     129•        180 FORMAT(1X,T65,'INTERCLASS BHATTACHARYYA DISTANCE')
00446     130•        190 FORMAT(1X,T22,'SUBCLASS PAIR',T41,'#EIGHT',T58,'SELECTED CHANNELS'
```

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```
00446     131•          •  , T80,'ALL CHANNELS',T99,'RATIO')
00447     132•      200 FORMAT(1X,T22,'SUBCLASS PAIR',T41,'WEIGHT',T58,'LINEAR COMBINATION
00447     133•         •', T80,'ALL CHANNELS',T99,'RATIO')
00450     134•      205 FORMAT(1X,T24,'SUBCLASS PAIR',T41,'WEIGHT',T58,'EVALUATED CHANNELS
00450     135•         •', T80,'ALL CHANNELS',T99,'RATIO')
00451     136•      210 FORMAT(18X,A6,5X,A6,4X,E8.3,T60,D14.8,T78,D14.8,T96,D14.8)
00452     137•          RETURN
00453     138•          END

     END OF COMPILATION:        NO  DIAGNOSTICS.
GENRPT               SYMBOLIC                    20 JUN 77  01:54:51   0  02929190    14   137  (DELETED)
GENRPT  CODE         RELOCATABLE                 20 JUN 77  01:54:51   1  01557470    36     1  (DELETED)
                                                                        0  01557534    14    87
```



```
@ FOR,* REDDAT,REDDAT
UNIVAC 1108 FORTRAN V EXEC II LEVEL 25A  -(EXEC8 LEVEL E12010010A)
THIS COMPILATION WAS DONE ON 18 NOV 77 AT 03:18:50
```

18 NOV 77 3:18:49.203

3.2.6 SOFTWARE COMPONENT NO. 6 (REDDAT)

Subprogram REDDAT is one of a set of utility routines involved with reading statistics files.

3.2.6.1 Linkages

REDDAT is called by REDSAV.

3.2.6.2 Interfaces

REDDAT interfaces with other routines through a calling sequence and common blocks INFORM, GLOBAL and BESTKN.

3.2.6.3 Inputs

Calling Sequence:

```
Subr. REDDAT (COVAR, AVAR, CLSDES, SUBNO, SUBDES, FLDSAV, VERTEX,
              COV, AVEN, CLSDS, SUBNOS, SUBDS, FLDSV, VERTX,
              NOFEAT, VARSIZ, NOCLS, NOFLD, NOSVB, FETVEC)
```

These parameters are all associated with statistics file (SAVTAP) information.

3.2.6.4 Outputs

N/A

3.2.6.5 Storage

Code: 1014_8 Data: 212_8

3.2.6.6 Description

The additions to REDDAT involve the storage of the number of points per subclass (after grouping) into array KPPPTS of the newly-added common block BESTKN.

3.2.6.7 Flowchart

N/A

3.2.6.8 Listing

```
00100      1*      C
00100      2*      C
00100      3*      C
00101      4*            SUBROUTINE REDDAT(COVAR,AVAR,CLSDES,SUBNU,SUBDES,FLDSAV,VERTEX,
00101      5*           *                  COV,AVEN,CLSDS,SUBNOS,SUBDS,FLDSV,VERTX,
00101      6*           *                  NOFEAT,VARSIZ,NOCLS,NOFLD,NOSUB,FETVEC)
00103      7*            DIMENSION FETVEC(30)
00103      8*      C
00103      9*      C
00103     10*      C     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
00103     11*      C
00103     12*      C     READS COVARIANCES AND MEANS FROM FILE AND REDUCES STATS
00103     13*      C
00103     14*      C     * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
00103     15*      C
00104     16*            IMPLICIT INTEGER (A-Z)
00104     17*      C
00105     18*            INCLUDE COMBK1,LIST
00105     19*      C
00106     19*            COMMON/INFORM/NOCLS2,NOSUB2,NOFET2,VARSZ2,TOTVT2,NOFLD2,
00106     19*           *              AVAR2,COVAR2,CLSID2,SUBNO2,SUBDS2,FLDSV2,VERTX2,
00106     19*           *              FETVC2(30),SUBVC2(75),SUBPTR(75),CLSVC2(60),
00106     19*           *              KEYPTS(60),NOGRP,GRPNAM(60),GRPDEX(61),
00106     19*           *              GRPCHK(61),GROUPS(124)
00107     19*            END
00110     20*            INCLUDE COMBK6,LIST
00111     20*            COMMON/GLOBAL/HEAD(42),MAPTAP,DATAPE,SAVTAP,BMFILE,BMKEY,
00111     20*           *             HISFIL,HISKEY,TKFORM,ERIPTP,ERPKEY,MAPUNT,NOFILE,
00111     20*           *    DRUMAD,DRMBDS,PAGSIZ,DATFIL,STAFIL,ASAV,ASAVFL
00111     20*           *  ,NHSTUN,NHSTFI,SCTRUN,MAPFIL
00111     20*           *   ,DOTUNT,DOTFIL
00112     20*            END
00113     21*            INCLUDE CMBK17,LIST                                          *KE*
00114     21*            COMMON/BESTKN/ KPPPTS(60),IPRIOR,KBEST,NCPASS
00115     21*            END
00116     22*            REAL COVAR(VARSZ2,NOSUB2),AVAR(NOFEAT,NOSUB),COV(VARSIZ),
00116     23*           *     AVEN(NOFET2,NOSUB2),X
00117     24*            DIMENSION CLSDES(NOCLS),SUBNO(NOCLS),SUBDES(NOSUB),CLSDS(NOCLS2),
00117     25*           *     SUBNOS(NOCLS2),SUBDS(NOSUB2),FLDSV(4,NOFLD2),
00117     26*           *     VERTX(2,TOTVT2),FLDSAV(4,NOFLD),VERTEX(2,TOTVT2)
00117     27*           *    ,DUMVEC(30)
00117     28*      C
00117     29*      C     REDUCE CLASS DESCRIPTION AND ARRAY CONTAINING NO OF SUBCLASSES
00117     30*      C
00120     31*            DO 150  I=1,NOCLS2
```

```
00123     32•          CLSDS(I) = CLSDES(I)
00124     33•        150 SUBNOS(I) = SUBNO(I)
00124     34•      C
00124     35•      C     REDUCE SUBCLASS DESCRIPTIONS
00124     36•      C
00126     37•          DO 160  I=1,NOSUB2
00131     38•        160 SUBDS(I) = SUBDES(I)
00131     39•      C
00131     40•      C     REDUCE FIELD INFORMATION
00131     41•      C
00133     42•          DO 170  I=1,NOFLD2
00136     43•           DO 170 J=1,4
00141     44•        170  FLDSV(J,I) = FLDSAV(J,I)
00141     45•      C
00141     46•      C     REDUCE VERTICES
00144     47•          DO 180 I=1,TOTVT2
00147     48•           DO 180 J=1,2
00152     49•        180  VERTX(J,I) = VERTEX(J,I)
00152     50•      C
00152     51•      C     ZERO OUT JUST PORTION OF COVAR THAT WILL CONTAIN SUBCLASSES
00152     52•      C     THAT HAVE BEEN GROUPED
00152     53•      C
00155     54•          DO 200  J=1,NOGRP
00160     55•          KB = GRPDEX(J) + 1                                          •NE#
00161     56•          KE = KB + GROUPS(KB-1) - 1                                  ••-1
00162     57•          IF (KB .GE. KE)  GO TO 200
00164     58•          KK = SUBPTR(KB)
00165     59•          DO 195  LL = 1,VARSZ2
00170     60•        195  COVAR(LL,KK) = 0.0
00172     61•        200  CONTINUE
00172     62•      C
00172     63•      C     CHECK CLASSIFICATION CHANNELS AGAINST TRAINING CHANNELS
00172     64•      C
00174     65•          DO 220   J=1,NOFET2
00177     66•          DO 210   L=1,NOFEAT
00202     67•        210 IF ( FETVC2(J) .EQ. FETVEC(L)) GO TO 220
00205     68•          WRITE(6,230) FETVC2(J),(FETVEC(K),K=1,NOFEAT)
00214     69•        230  FORMAT(' ** CHANNEL NO. ',I2,' IS NOT A TRAINING CHANNEL **'/
00214     70•       •     40X,'TRAINING CHANNELS ARE - '/ 10X,30(I2,1X))
00215     71•          CALL EXIT
00216     72•        220  DUMVEC(J) = L
00220     73•          DO 100  JJ=1,NOSUB
00220     74•      C     IS THIS SUBCLASS A MEMBER OF SELECTED SUBCLASSES
00223     75•          IF (SUBPTR(JJ) .LE. 0) READ(SAVTAP) DUMMY
00227     76•          IF (SUBPTR(JJ) .LE. 0) GO TO 100
00231     77•          READ(SAVTAP)KEPPTS(JJ),COV,(AVAR(I,JJ),I=1,NOFEAT)
00231     78•      C
00231     79•      C     REDUCE BY CHANNELS
00231     80•      C
00244     81•          NE#SUB = SUBPTR(JJ)
00245     82•          KK= 0
00246     83•          DO 20  J=1,NOFET2
00251     84•          K = DUMVEC(J)
00252     85•          LOC = K*(K-1)/2
00253     86•           DO 40 L=1,J
00256     87•           KK = KK + 1
00257     88•          #AT = LOC + DUMVEC(L)
00260     89•         40  COV(KK) = COV(#AT)
```

```
00262     90•        20 AVAR(J,JJ)   =   AVAR(K,JJ)
00262     91•     C
00262     92•     C     GROUP SUBCLASSES
00262     93•     C
00264     94•           IF (GRPCHK(JJ) .LE. 0) GO TO 60
00266     95•            KK = 0
00267     96•           DO 50  J1=1,NOFET2
00272     97•            DO 50 J2=1,J1
00275     98•            KK = KK + 1
00276     99•            R  = COVAR(KK,NEWSUB)
00277    100•            COVAR(KK,NEWSUB) = R + (COV(KK)*(KEPPTS(JJ)-1)) +
00277    101•         *                         (AVAR(J1,JJ)*AVAR(J2,JJ)*KEPPTS(JJ))
00300    102•        50 CONTINUE
00303    103•           GO TO 100
00304    104•        60 DO 70 I=1,VARSZ2
00307    105•        70 COVAR(I,NEWSUB) = COV(I)
00311    106•       100 CONTINUE
00311    107•     C
00311    108•     C     GROUP MEANS
00311    109•     C
00313    110•           DO 125   I=1,NOGRP
00316    111•           KB = GRPDEX(I) + 1
00317    112•           KE = KB + GROUPS(KB-1) - 1
00320    113•           KB1 = GROUPS(KB)
00321    114•           IF (KB .GE. KE) GO TO 130
00323    115•            DO 120  J=1,NOFET2
00326    116•            R = 0.0
00327    117•            KPTS = 0
00330    118•             DO 110  K=KB,KE
00333    119•             KB2 = GROUPS(K)
00334    120•             KPTS = KPTS + KEPPTS(KB2)
00335    121•       110   R = R + AVAR(J,KB2) * KEPPTS(KB2)
00337    122•       120  AVAR(J,KB1) = R / KPTS
00341    123•           KEPPTS(KB1) = KPTS                                    *NE*
00342    124•           JJ = 0
00343    125•           NEWSUB = SUBPTR(KB1)
00344    126•           DO 123   J1=1,NOFET2
00347    127•           DO 123   J2=1,J1
00352    128•           JJ = JJ + 1
00353    129•       123 COVAR(JJ,NEWSUB) = (COVAR(JJ,NEWSUB) - (AVAR(J1,KB1)*
00353    130•         *                       AVAR(J2,KB1))*KPTS) / (KPTS-1)
00356    131•       125 CONTINUE
00356    132•     C     REDUCE MEANS
00360    133•       130 DO 149   K=1,NOSUB2
00363    134•           II = SUBVC2(K)
00364    135•           KPPPTS(K) = KEPPTS(II)                                *NE*
00365    136•             DO 145 J=1,NOFET2
00370    137•       140   AVEN(J,K) = AVAR(J,II)
00370    138•     C
00370    139•     C
00373    140•           RETURN
00373    141•     C
00374    142•           END

   END OF COMPILATION:        NO  DIAGNOSTICS.
REDDAT          SYMBOLIC                          16 JUL 77  13:03:59   0  03406650    14   139  (DELETED)
REDDAT  CODE    RELOCATABLE                       16 JUL 77  13:03:59   1  02060666    36     1  (DELETED)
```

4. OPERATION

For the duration of the UNIVAC 1108 EXEC 2 system implementation, these options are included in the EOD-LARSYS system by means of PCF tapes X23778 and X14135. One of these tapes should be referenced as unit Z in run setups.

These options are also included in the EOD-LARSYS implementation on the Purdue-LARS 370/148 system. Detailed instructions on the usage of this system will be provided at a later date.