CONTIGUOUS BAND MULTIPLEXER

SIMULATION AND OPTIMIZATION

OSA-84-MX-4-T

January 31, 1984

Three channel, 27 variable optimization

```
      PROGRAM MXSOS(OUTPUT,TAPE6=OUTPUT)                                    000001
                                                                            000002
C                                                                           
C     THIS PROGRAM IS THE USER DEFINED MAIN SEGMENT OF THE MXSOS PACKAGE    000003
C     FOR MULTIPLEXER SIMULATION, SENSITIVITY ANALYSIS AND OPTIMIZATION.    000004
C     THE PROGRAM SETS UP ARRAYS, INITIALIZES THE DATA AND EXECUTES SOME    000005
C     SIMPLE STEPS TO ORGANIZE THE PROBLEM AS REQUIRED BY THE PACKAGE.      000006
C     IT CONSISTS OF THREE PARTS. THE FIRST PART INITIALIZES THE DATA       000007
C     REQUIRED FOR SIMULATION, THE SECOND PART INITIALIZES ADDITIONAL       000008
C     DATA REQUIRED FOR SENSITIVITY ANALYSIS AND THE THIRD PART INITIA-     000009
C     LIZES THE DATA REQUIRED FOR THE MULTIPLEXER OPTIMIZATION PROBLEM      000010
C     OF INTEREST INCLUDING SPECIFICATIONS AND WEIGHTING FACTORS AS WELL    000011
C     AS THE DATA REQUIRED BY THE MINIMAX OPTIMIZATION PACKAGE MMLC. AT     000012
C     THIS TIME ONLY COMMON PORT RETURN LOSS AND CHANNEL INSERTION LOSS     000013
C     IN DB ARE HANDLED FOR OPTIMIZATION. IN THE CASE OF SIMULATION         000014
C     GROUP DELAY IS ESTIMATED BY DIFFERENCING THE PHASE AT A PAIR          000015
C     OF FREQUENCIES.                                                       000016
C                                                                           000017
C     THE USER MUST PROVIDE APPROPRIATE DIMENSIONS FOR THE FOLLOWING        000018
C     VARIABLES AFTER STUDYING THE COMMENTS PLACED THROUGHOUT THE MAIN       000019
C     SEGMENT MXSOS. CORRESPONDING DIMENSIONS MUST BE DECLARED IN ALL       000020
C     SUBROUTINES EXCEPT FOR THE MMLC PACKAGE.                              000021
C                                                                           000022
      REAL X(27),W(8000),B(1),C(1,1),T(3),DISP(8),QO(8)                     000023
      REAL OMEGA(47),SURL(47),SLRL(47),WURL(47),WLRL(47),                   000024
     1     SU(100,8),SL(100,8),WU(100,8),WL(100,8)                          000025
      INTEGER RLSCODE(47),SPCODE(100,8),CHBCODE(8,2)                        000026
      REAL WO(8),BW(8),CM(8,8,8),PN1(8),PN2(8),SPN1(8),SPN2(8),             000027
     1          GL(8),WGL(8),DIA(8)                                         000028
      INTEGER CEL(8,8,8)                                                    000029
      REAL FCNST(8),LAMRES(8),LAMDEL(8)                                     000030
      REAL DRL(296),FIL(8),DIL(8,296)                                       000031
      REAL ANGLE1(8),ANGLE2(8),GRDEL(8)                                     000032
      INTEGER IR(8),IRT(8),LC(8,36),KC(8,36)                                000033
      EXTERNAL FDF                                                          000034
      COMMON /BLK1/WO,BW,PN1,PN2,GL,VS,RS,PI2,WIDTH,NP1                     000035
      COMMON /BLK2/CM,WGL                                                   000036
      COMMON /BLK3/OMEGA,SURL,SLRL,WURL,WLRL,SU,SL,WU,WL,                   000037
     1            RLSCODE,SPCODE,NCOUNT,MODE,NCH,MO,NFREQ,NFRL,             000038
     2        CHBCODE,IFLAGJS,IFLAGDP,IDISPER                               000039
      COMMON /BLK4/CBR,FCUT                                                 000040
      COMMON /BLK5/DISP                                                     000041
      COMMON/BLK6/FCNST,LAMRES,LAMDEL                                       000042
      COMMON/BLK7/CEL                                                       000043
      COMMON/BLK8/IR,IRT,LC,KC                                              000044
      DATA T/10HMULTIPLEXE,10HR PROBLEM ,10HMXTST6    /                     000045
                                                                            000046
C                                                                           
C     THE MXSOS PACKAGE CAN OPERATE IN THREE MODES: SIMULATION, SENSITI-     000047
C     VITY ANALYSIS AND OPTIMIZATION. TO SELECT THE REQUIRED FUNCTION OF     000048
C     THE PACKAGE SET LMODE TO                                              000049
C     1 - IF MULTIPLEXER SIMULATION IS REQUIRED,                            000050
C     2 - IF MULTIPLEXER SENSITIVITY ANALYSIS IS REQUIRED,                  000051
C     3 - IF MULTIPLEXER OPTIMIZATION IS REQUIRED.                          000052
C                                                                           000053
C     SELECT MODE OF OPERATION OF THE PACKAGE                               000054
C                                                                           000055
      LMODE=3                                                               000056
                                                                            000057
C                                                                           
C     THIS PART OF THE MAIN SEGMENT IS USED TO DEFINE THE DATA FOR          000058
C     MULTIPLEXER SIMULATION. IT MUST ALWAYS BE DEFINED, REGARDLESS OF      000059
C     THE MODE OF OPERATION OF THE PACKAGE SELECTED.                        000060
C                                                                           000061
C     NCH     - NUMBER OF FILTER CHANNELS INCLUDING DUMMY CHANNELS          000062
C     MO      - ORDER OF FILTERS(THE SAME FOR ALL FILTERS, ODD OR EVEN)     000063
C     WO      - VECTOR OF CENTER FREQUENCIES IN MHZ, ONE PER CHANNEL        000064
C     QO      - VECTOR OF UNLOADED Q FOR THE FILTERS, ONE PER CHANNEL       000065
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C      DIA     - VECTOR OF FILTER DIAMETERS IN INCHES, ONE PER CHANNEL      000066
C      BW      - VECTOR OF CHANNEL BANDWIDTHS IN MHZ, ONE PER CHANNEL       000067
C      SPN1    - VECTOR OF INPUT TRANSFORMER RATIOS(SQUARED), ONE PER       000068
C                CHANNEL                                                    000069
C      SPN2    - VECTOR OF OUTPUT TRANSFORMER RATIOS(SQUARED), ONE PER      000070
C                CHANNEL                                                    000071
C      GL      - VECTOR OF CHANNEL TERMINATING CONDUCTANCES, ONE PER        000072
C                CHANNEL                                                    000073
C      CM      - SYMMETRICAL MATRIX OF COUPLING PARAMETERS(CHANNEL,ROW,     000074
C                COLUMN), INCLUDING NONZERO DIAGONAL ELEMENTS TO MODEL      000075
C                ASYNCHRONOUS DESIGNS                                       000076
C      CEL     - SYMMETRICAL MATRIX FOR TYPE OF COUPLING, +1 FOR SCREW,     000077
C                -1 FOR IRIS, CORRESPONDING TO CM AS ABOVE                  000078
C      WGL     - VECTOR OF WAVEGUIDE SPACINGS FOR EACH CHANNEL, MEASURED    000079
C                IN INCHES ALONG THE MANIFOLD FROM THE ADJACENT CHANNEL     000080
C                (DISTANCE FROM THE SHORT CIRCUIT FOR THE FIRST CHANNEL)    000081
C      VS      - SOURCE VOLTAGE AT THE COMMON PORT                          000082
C      RS      - SOURCE RESISTANCE AT THE COMMON PORT                       000083
C      PI2     - CONSTANT EQUAL TO TWICE PI                                 000084
C      WIDTH   - MANIFOLD WIDTH IN INCHES                                   000085
C                                                                           000086
C      DEFINE THE NUMBER OF CHANNELS AND THE ORDER OF THE FILTERS           000087
C                                                                           000088
       NCH=3                                                               000089
       MO=6                                                                000090
       NP1=NCH+1                                                           000091
C                                                                          000092
C      DEFINE CENTER FREQUENCIES IN MHZ                                    000093
C                                                                          000094
       WO(1)=12060.0                                                       000095
       WO(2)=12020.0                                                       000096
       WO(3)=11980.0                                                       000097
C                                                                          000098
C      DEFINE UNLOADED Q FACTORS OF THE FILTERS                            000099
C                                                                          000100
       DO 5 I=1,NCH                                                        000101
       QO(I)=12000.0                                                       000102
     5 CONTINUE                                                            000103
C                                                                          000104
C      DEFINE THE DIAMETER OF THE FILTERS IN INCHES                        000105
C                                                                          000106
       DO 70 I=1,NCH                                                       000107
       DIA(I)=1.07                                                         000108
    70 CONTINUE                                                            000109
C                                                                          000110
C      DEFINE BANDWIDTHS, INPUT/OUTPUT TRANSFORMER RATIOS AND OUTPUT       000111
C      CONDUCTANCES                                                        000112
C                                                                          000113
       DO 1 I=1,NCH                                                        000114
       BW(I)=39.5                                                          000115
       SPN1(I)=0.69967                                                     000116
       SPN2(I)=1.09450                                                     000117
       PN1(I)=SQRT(SPN1(I))                                                000118
       PN2(I)=SQRT(SPN2(I))                                                000119
       GL(I)=1.0                                                           000120
     1 CONTINUE                                                            000121
C                                                                          000122
C      DEFINE THE SYMMETRICAL COUPLING MATRIX. ONLY THE UPPER PART OF THE  000123
C      CM MATRIX HAS TO BE DEFINED.                                        000124
C                                                                          000125
       DO 30 I=1,NCH                                                       000126
       DO 30 J=1,MO                                                        000127
       DO 30 KK=1,MO                                                       000128
       CM(I,J,KK)=0.0                                                      000129
    30 CONTINUE                                                            000130
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      DO 2 I=1,NCH                                                      000131
      CM(I,1,2)=0.59395                                                 000132
      CM(I,2,3)=0.53514                                                 000133
      CM(I,3,4)=0.42471                                                 000134
      CM(I,3,6)=-0.39967                                                000135
      CM(I,4,5)=0.83371                                                 000136
      CM(I,5,6)=0.76313                                                 000137
    2 CONTINUE                                                          000138
C                                                                       000139
C     DEFINE THE TYPE OF COUPLING IN THE FILTER                         000140
C           +1 >> SCREW COUPLING    -1 >> IRIS COUPLING                 000141
C                                                                       000142
C                                                                       000143
      DO 71 I=1,NCH                                                     000144
      DO 71 J=1,MO                                                      000145
      DO 71 KK=1,MO                                                     000146
      CEL(I,J,KK)=0                                                     000147
   71 CONTINUE                                                          000148
C                                                                       000149
      DO 72 I=1,NCH                                                     000150
      CEL(I,1,2)=1                                                      000151
      CEL(I,2,3)=-1                                                     000152
      CEL(I,3,4)=1                                                      000153
      CEL(I,3,6)=-1                                                     000154
      CEL(I,4,5)=-1                                                     000155
      CEL(I,5,6)=1                                                      000156
C                                                                       000157
      DO 72 J=1,MO                                                      000158
      DO 72 KK=1,J                                                      000159
      CEL(I,J,KK)=CEL(I,KK,J)                                           000160
   72 CONTINUE                                                          000161
C                                                                       000162
C     DEFINE THE SECTION LENGTHS(SPACINGS ALONG THE WAVEGUIDE MANIFOLD) 000163
C                                                                       000164
      WGL(1)=0.641                                                      000165
      WGL(2)=0.631                                                      000166
      WGL(3)=0.633                                                      000167
C                                                                       000168
C     DEFINE SOME CONSTANTS, SOURCE VOLTAGE, SOURCE RESISTANCE, TWICE PI000169
C     MANIFOLD WIDTH                                                    000170
C                                                                       000171
      VS=1.0                                                            000172
      RS=1.0                                                            000173
      PI2=8.0*ATAN(1.0)                                                 000174
      WIDTH=0.75                                                        000175
C                                                                       000176
C     THE MXSOS PACKAGE CAN EXPLOIT THREE PRACTICAL MODELS OF THE       000177
C     MULTIPLEXER AS DETERMINED BY THE PARAMETERS IFLAGJS, IFLAGDP      000178
C     AND IDISPER.                                                      000179
C                                                                       000180
C     IFLAGJS                                                           000181
C     0 - IF JUNCTIONS ARE IDEAL                                        000182
C     1 - IF JUNCTIONS ARE NONIDEAL                                     000183
C                                                                       000184
C     IFLAGDP                                                           000185
C     0 - IF FILTERS ARE LOSSLESS                                       000186
C     1 - IF FILTERS ARE LOSSY                                          000187
C                                                                       000188
C     IDISPER                                                           000189
C     0 - IF FILTERS ARE DISPERSIVE                                     000190
C     1 - IF FILTERS ARE NONDISPERSIVE                                  000191
C                                                                       000192
C     FLAG FOR JUNCTION SUSCEPTANCE (SET TO 0 OR 1)                     000193
C                                                                       000194
      IFLAGJS=1                                                         000195
      IF(IFLAGJS.NE.1)GO TO 42
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C                                                                       000196
      CALL CONST1(WIDTH)                                                000197
C                                                                       000198
   42 CONTINUE                                                          000199
C                                                                       000200
C     FLAG FOR FILTER DISSIPATION (SET TO 0 OR 1)                       000201
C                                                                       000202
      IFLAGDP=1                                                         000203
      IF(IFLAGDP.NE.1)GO TO 43                                          000204
C                                                                       000205
      CALL DISPAT(NCH,WO,BW,QO)                                         000206
C                                                                       000207
   43 CONTINUE                                                          000208
C                                                                       000209
C     FLAG FOR DISPERSIVE EFFECTS IN THE COUPLED CAVITY FILTERS         000210
C     (SET TO 0 OR 1)                                                   000211
C                                                                       000212
      IDISPER=1                                                         000213
      IF(IDISPER.NE.1)GO TO 44                                          000214
C                                                                       000215
      CALL DISPER(NCH,WO,BW,DIA)                                        000216
C                                                                       000217
   44 CONTINUE                                                          000218
C                                                                       000219
C     CHECK WHETHER THE SIMULATION MODE IS REQUIRED                     000220
C                                                                       000221
      IF(LMODE.NE.1)GO TO 16                                            000222
C                                                                       000223
C     SIMULATION, CORRESPONDING TO LMODE=1                              000224
C                                                                       000225
C     THIS PART OF THE MAIN SEGMENT IS USED TO GENERATE FREQUENCIES AT  000226
C     WHICH SIMULATION IS TO BE PERFORMED. A FREQUENCY STEP OF 1 MHZ IS 000227
C     ASSUMED. NONE OF THE GENERATED FREQUENCIES MUST BE SET EQUAL TO   000228
C     ANY OF THE CENTER FREQUENCIES. SUBROUTINE "SIMUL" IS CALLED AT    000229
C     EACH GENERATED FREQUENCY. IF A DIFFERENT FREQUENCY STEP IS REQUI- 000230
C     RED THE FREQUENCY POINTS FOR SIMULATION HAVE TO BE GENERATED IN A 000231
C     DIFFERENT WAY.                                                    000232
C                                                                       000233
C     FREQST - START FREQUENCY FOR SIMULATION                           000234
C     FREQ   - ACTUAL FREQUENCY AT WHICH "SIMUL" IS CALLED              000235
C     NFRSIM - NUMBER OF FREQUENCY POINTS FOR SIMULATION                000236
C                                                                       000237
      PRINT(6,199)                                                      000238
  199 FORMAT(1H1)                                                       000239
      PRINT(6,205)                                                      000240
  205 FORMAT(6X,"FREQUENCY",5X,"RETURN LOSS",5X,"INSERTION LOSS",       000241
     1        8X,"FREQUENCY FOR",7X,"GROUP DELAY")                      000242
      PRINT(6,206)                                                      000243
  206 FORMAT(8X,"MHZ",9X,"COMMON PORT",9X,"DB",17X,"GROUP DELAY",       000244
     1       9X,"NANO SECS")                                            000245
C                                                                       000246
C                                                                       000247
C     THE FOLLOWING TWO PARAMETERS MUST BE DEFINED                      000248
C                                                                       000249
      FREQST=11919.0                                                    000250
      NFRSIM=200                                                        000251
C                                                                       000252
      NCHAN=NCH                                                         000253
      MORDER=MO                                                         000254
      IREL=NCH+1                                                        000255
      DO 200 ICOUNT=1,NFRSIM                                            000256
      FREQ=FREQST+FLOAT(ICOUNT)                                         000257
      ITEST=INT(FREQ)                                                   000258
C                                                                       000259
C     THE FOLLOWING STATEMENT PRINTS DASHED LINE EVERY 20 MHZ           000260
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C                                                                       000261
      IF(MOD(ITEST,20).EQ.0)PRINT(6,208)                                000262
  208 FORMAT(90("-"))                                                   000263
      DO 210 I=1,NCH                                                    000264
      IF(ABS(FREQ-WO(I)).LT.1.E-10)FREQ=FREQ+0.001                      000265
  210 CONTINUE                                                          000266
C                                                                       000267
C     GROUP DELAY IS ESTIMATED FROM THE PHASE DIFFERENCE AT TWO         000268
C     FREQUENCIES, NAMELY, THE SELECTED FREQUENCY AND THE SELECTED      000269
C     FREQUENCY MINUS 0.5 MHZ. CONSEQUENTLY, THE EVALUATION IS A        000270
C     TRUE QUADRATIC APPROXIMATION AT THE SELECTED FREQUENCY MINUS      000271
C     0.25 MHZ. THUS, A SEPARATE COLUMN OF FREQUENCIES AND GROUP        000272
C     DELAYS IS GENERATED AND PRINTED OUT.                              000273
C                                                                       000274
C     SUBTRACT 0.5 MHZ FROM FREQ                                        000275
C                                                                       000276
      FREQ=FREQ-0.5                                                     000277
C                                                                       000278
      CALL SIMUL(FREQ,NCHAN,MORDER,ICOUNT,IFLAGJS,IFLAGDP,IDISPER,      000279
     1           FRL,FIL,ANGLE1)                                        000280
C                                                                       000281
C     RESET FREQ BY ADDING 0.5 MHZ                                      000282
C                                                                       000283
      FREQ=FREQ+0.5                                                     000284
C                                                                       000285
      CALL SIMUL(FREQ,NCHAN,MORDER,ICOUNT,IFLAGJS,IFLAGDP,IDISPER,      000286
     1           FRL,FIL,ANGLE2)                                        000287
C                                                                       000288
      DO 300 I=1,NCH                                                    000289
      DELANG=ANGLE2(I)-ANGLE1(I)                                        000290
      PI=PI2/2.0                                                        000291
      IF(DELANG.GT.PI)DELANG=DELANG-PI2                                 000292
      GRDEL(I)=-2000.0*DELANG/PI2                                       000293
  300 CONTINUE                                                          000294
C                                                                       000295
C     THE FOLLOWING STATEMENT CAUSES THE PRINTING OF INSERTION LOSS     000296
C     FUNCTION VALUES ONLY FOR THE BAND OF INTEREST.                    000297
C                                                                       000298
      IF(MOD(ITEST,40).EQ.0)IREL=IREL-1                                 000299
C                                                                       000300
C     GROUP DELAY IS ESTIMATED AT FREQ MINUS 0.25 MHZ                   000301
C                                                                       000302
      FRGROUP=FREQ-0.25                                                 000303
      PRINT(6,207)FREQ,FRL,FIL(IREL),FRGROUP,GRDEL(IREL)                000304
  207 FORMAT(6X,F7.1,9X,F5.2,12X,F5.2,17X,F8.2,10X,F8.2)                000305
  200 CONTINUE                                                          000306
      GO TO 900                                                         000307
C                                                                       000308
C     SENSITIVITY ANALYSIS, CORRESPONDING TO LMODE=2                    000309
C                                                                       000310
C     THIS PART OF THE MAIN PROGRAM IS USED TO DEFINE CODES FOR MULTI-  000311
C     PLEXER PARAMETERS W.R.T. WHICH WE WANT TO FIND THE SENSITIVITIES. 000312
C     SECTION LENGTHS(SPACINGS) ARE ASSUMED TO BE SUCH PARAMETERS AL-   000313
C     WAYS, SO NO CODES ARE REQUIRED FOR THEM. THE PARAMETER IR=0 SIG-  000314
C     NIFIES THAT SPACINGS ARE THE ONLY VARIABLES. SUBROUTINE "SIMGRD"  000315
C     IS CALLED AT EACH FREQUENCY DEFINED IN THE VECTOR OMEGA(I).       000316
C                                                                       000317
C     IR      - VECTOR CONTAINING THE NUMBER OF COUPLING PARAMETERS BE- 000318
C               ING VARIABLES FOR EACH CHANNEL                          000319
C     LC      - MATRIX CONTAINING THE ROW INDICES OF COUPLING PARAMETERS 000320
C               BEING VARIABLES FOR EACH CHANNEL                        000321
C     KC      - MATRIX CONTAINING THE COLUMN INDICES OF COUPLING PARAME- 000322
C               TERS BEING VARIABLES FOR EACH CHANNEL                   000323
C     OMEGA   - VECTOR OF ARBITRARY FREQUENCIES (EXCEPT CENTER FREQUEN- 000324
C               CIES) AT WHICH THE SENSITIVITY ANALYSIS IS TO BE PERFOR- 000325
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C                MED.                                                    000326
C       FRSNS  - ACTUAL FREQUENCY AT WHICH THE SUBROUTINE "SIMGRD" IS    000327
C                CALLED                                                  000328
C       NV     - TOTAL NUMBER OF VARIABLES W.R.T. WHICH THE SENSITIVITIES 000329
C                ARE REQUIRED                                            000330
C       FRL    - VALUE OF THE COMMON PORT RETURN LOSS IN DB AT THE FREQU- 000331
C                ENCY FRSNS                                              000332
C       DRL    - SENSITIVITIES OF THE COMMON PORT RETURN LOSS W.R.T. ALL 000333
C                VARIABLES                                               000334
C       FIL    - VECTOR OF THE INSERTION LOSS FUNCTION IN DB FOR EACH    000335
C                CHANNEL AT THE FREQUENCY FRSNS                          000336
C       DIL    - MATRIX OF SENSITIVITIES OF THE INSERTION LOSS FUNCTION  000337
C                FOR EACH CHANNEL W.R.T. ALL VARIABLES                   000338
C                                                                        000339
C       DEFINE THE NUMBER OF COUPLING VARIABLES PER CHANNEL              000340
C                                                                        000341
   16 DO 55 I=1,NCH                                                      000342
      IR(I)=0                                                            000343
   55 CONTINUE                                                           000344
      IR(1)=12                                                           000345
      IR(3)=12                                                           000346
C                                                                        000347
C       EVALUATE THE TOTAL NUMBER OF VARIABLES ACCUMULATED AFTER         000348
C       EACH SECTION                                                     000349
C                                                                        000350
      CALL TOTAL(NCH,IR,IRT)                                             000351
C                                                                        000352
C       DEFINE CODES FOR THE VARIABLES                                   000353
C                                                                        000354
      DO 127 I=1,3,2                                                     000355
      LC(I,1)=1                                                          000356
      LC(I,2)=1                                                          000357
      LC(I,3)=2                                                          000358
      LC(I,4)=2                                                          000359
      LC(I,5)=3                                                          000360
      LC(I,6)=3                                                          000361
      LC(I,7)=3                                                          000362
      LC(I,8)=4                                                          000363
      LC(I,9)=4                                                          000364
      LC(I,10)=5                                                         000365
      LC(I,11)=5                                                         000366
      LC(I,12)=6                                                         000367
      KC(I,1)=1                                                          000368
      KC(I,2)=2                                                          000369
      KC(I,3)=2                                                          000370
      KC(I,4)=3                                                          000371
      KC(I,5)=3                                                          000372
      KC(I,6)=4                                                          000373
      KC(I,7)=6                                                          000374
      KC(I,8)=4                                                          000375
      KC(I,9)=5                                                          000376
      KC(I,10)=5                                                         000377
      KC(I,11)=6                                                         000378
      KC(I,12)=6                                                         000379
  127 CONTINUE                                                           000380
                                                                         000381
C                                                                        000382
C       CHECK WHETHER THE SIMULATION AND SENSITIVITY ANALYSIS MODE       000383
C       IS REQUIRED                                                      000384
C                                                                        000385
      IF(LMODE.NE.2) GO TO 17                                            000386
C                                                                        000387
C       GENERATE FREQUENCY POINTS IN MHZ                                 000388
C                                                                        000389
      NFREQ=1                                                            000390
      OMEGA(1)=11899.0
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      NCHAN=NCH                                                          000391
      MORDER=MO                                                          000392
      DO 18 ICOUNT=1,NFREQ                                               000393
      FRSNS=OMEGA(ICOUNT)                                                000394
C                                                                        000395
      CALL SIMGRD(FRSNS,FRL,DRL,FIL,DIL,NCHAN,MORDER,ICOUNT,IFLAGJS,     000396
     1            IFLAGDP,IDISPER)                                       000397
C                                                                        000398
   18 CONTINUE                                                           000399
      GO TO 900                                                          000400
C                                                                        000401
C     OPTIMIZATION, CORRESPONDING TO LMODE=3                             000402
C                                                                        000403
C     THIS PART OF THE MAIN SEGMENT IS USED TO DEFINE ALL VARIABLES AND  000404
C     ARRAYS FOR MULTIPLEXER OPTIMIZATION. TO SELECT THE MULTIPLEXER PA- 000405
C     RAMETERS WHICH ARE THE OPTIMIZATION VARIABLES THE MATRICES LC AND  000406
C     KC HAVE TO BE USED AS DESCRIBED IN THE SENSITIVITY ANALYSIS PART.  000407
C     SECTION LENGTHS ARE ALWAYS ASSUMED TO BE OPTIMIZATION VARIABLES,   000408
C     SO NO CODES ARE REQUIRED FOR THEM. THREE MODES OF OPTIMIZATION ARE 000409
C     ALLOWED. TO SELECT THE DESIRED MODE OF OPTIMIZATION SET PARAMETER  000410
C     MODE TO                                                            000411
C     0 - IF ONLY COMMON PORT RETURN LOSS OPTIMIZATION IS REQUIRED       000412
C     1 - IF ONLY INSERTION LOSS OPTIMIZATION IS REQUIRED                000413
C     2 - IF BOTH RETURN LOSS AND INSERTION LOSS OPTIMIZATION ARE        000414
C         REQUIRED.                                                      000415
C     IN EACH CASE A DIFFERENT HEADER FOR THE PRINTOUT OF OPTIMIZATION   000416
C     RESULTS CAN BE OBTAINED BY CALLING THE SUBROUTINE "MMXHDR" FOR     000417
C     WHICH THE ARGUMENT T CAN BE DEFINED USING THE DATA STATEMENT. VA-  000418
C     LUES OF OPTIMIZATION VARIABLES AT THE STARTING POINT MUST BE SUP-  000419
C     PLIED BY DEFINING THE X VECTOR USING EITHER THE DATA STATEMENT OR  000420
C     EXPLICITLY. THE MINIMAX FUNCTIONS ARE CREATED AT THE FREQUENCIES   000421
C     DEFINED IN THE VECTOR OMEGA(I), WHICH IS A REAL ARRAY OF LENGTH    000422
C     AT LEAST NFREQ.                                                    000423
C                                                                        000424
C     NFREQ  - NUMBER OF FREQUENCY POINTS AT WHICH THE MINIMAX FUNCTI-   000425
C              ONS ARE TO BE CREATED                                     000426
C     OMEGA  - VECTOR OF ARBITRARY FREQUENCY POINTS (EXCEPT CENTER FRE-  000427
C              QUENCIES) IN MHZ AT WHICH THE MINIMAX FUNCTIONS ARE TO    000428
C              BE CREATED                                                000429
C     NFRL   - NUMBER OF MINIMAX FUNCTIONS CREATED DUE TO RETURN LOSS    000430
C              SPECIFICATIONS                                            000431
C                                                                        000432
C     ARRAYS AND CODES FOR COMMON PORT RETURN LOSS OPTIMIZATION          000433
C                                                                        000434
C     RLSCODE- INTEGER ARRAY OF LENGTH AT LEAST NFREQ. EACH ELEMENT MUST 000435
C              BE SET TO THE FOLLOWING SPECIFICATION CODE VALUE AT EACH  000436
C              FREQUENCY :                                               000437
C              0 - NO SPECIFICATION REQUIRED                             000438
C             -1 - ONLY LOWER SPECIFICATION REQUIRED                     000439
C              1 - ONLY UPPER SPECIFICATION REQUIRED                     000440
C              2 - BOTH UPPER AND LOWER SPECIFICATIONS REQUIRED          000441
C     SURL   - REAL ARRAY OF LENGTH AT LEAST NFREQ. IT MUST CONTAIN THE  000442
C              UPPER SPECIFICATIONS APPLICABLE AT EACH FREQUENCY          000443
C     SLRL   - REAL ARRAY OF LENGTH AT LEAST NFREQ. IT MUST CONTAIN THE  000444
C              LOWER SPECIFICATIONS APPLICABLE AT EACH FREQUENCY          000445
C     WURL   - REAL ARRAY OF LENGTH AT LEAST NFREQ. IT MUST CONTAIN THE  000446
C              WEIGHTING FACTORS CORRESPONDING TO UPPER SPECIFICATIONS    000447
C     WLRL   - REAL ARRAY OF LENGTH AT LEAST NFREQ. IT MUST CONTAIN THE  000448
C              WEIGHTING FACTORS CORRESPONDING TO LOWER SPECIFICATIONS    000449
C                                                                        000450
C     ARRAYS AND CODES FOR INSERTION LOSS OPTIMIZATION                   000451
C                                                                        000452
C     CHBCODE- INTEGER ARRAY OF DIMENSIONS AT LEAST NCH BY 2. EACH ROW   000453
C              MUST CONTAIN THE RANGE OF FREQUENCIES OVER WHICH SPECI-    000454
C              FICATIONS FOR THE CORRESPONDING CHANNEL ARE GIVEN. THE    000455
```

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C               FIRST ELEMENT OF A ROW INDICATES THE LOWER FREQUENCY      000456
C               EDGE OF INTEREST, THE SECOND THE UPPER FREQUENCY EDGE.    000457
C     SPCODE -  INTEGER ARRAY OF DIMENSIONS AT LEAST NSPMAX BY NCH.       000458
C               NSPMAX IS THE MAXIMUM NUMBER OF FREQUENCY POINTS CONSI-   000459
C               DERED FOR ANY OF THE CHANNELS.                            000460
C               EACH COLUMN MUST CONTAIN THE SPECIFICATION CODE AT EACH   000461
C               FREQUENCY FOR THE CORRESPONDING CHANNEL. EACH ELEMENT     000462
C               OF A COLUMN MUST BE SET TO ONE OF THE FOLLOWING VALUES:   000463
C               0 - NO SPECIFICATION REQUIRED                             000464
C              -1 - ONLY LOWER SPECIFICATION REQUIRED                     000465
C               1 - ONLY UPPER SPECIFICATION REQUIRED                     000466
C               2 - BOTH UPPER AND LOWER SPECIFICATIONS REQUIRED           000467
C     SU        - REAL ARRAY OF DIMENSIONS AT LEAST NSPMAX BY NCH. IT     000468
C               MUST CONTAIN THE UPPER SPECIFICATIONS FOR EACH CHANNEL     000469
C               ORDERED CONSECUTIVELY W.R.T. FREQUENCY INDEX IMPLIED      000470
C               BY THE CHBCODE MATRIX IN THE FORM (FREQUENCY INDEX,       000471
C               CHANNEL).                                                 000472
C     SL        - REAL ARRAY OF DIMENSIONS AT LEAST NSPMAX BY NCH. IT     000473
C               MUST CONTAIN THE LOWER SPECIFICATIONS FOR EACH CHANNEL     000474
C               ORDERED CONSECUTIVELY W.R.T. FREQUENCY INDEX IMPLIED      000475
C               BY THE CHBCODE MATRIX IN THE FORM (FREQUENCY INDEX,       000476
C               CHANNEL).                                                 000477
C     WU        - REAL ARRAY OF DIMENSIONS AT LEAST NSPMAX BY NCH. IT     000478
C               MUST CONTAIN THE WEIGHTING FACTORS FOR UPPER SPECIFI-      000479
C               CATIONS. IT IS ARRANGED TO CORRESPOND TO SU.              000480
C     WL        - REAL ARRAY OF DIMENSIONS AT LEAST NSPMAX BY NCH. IT     000481
C               MUST CONTAIN THE WEIGHTING FACTORS FOR LOWER SPECIFI-      000482
C               CATIONS. IT IS ARRANGED TO CORRESPOND TO SL.              000483
C                                                                         000484
C                                                                         000485
   17 CALL MMXHDR(3,T)                                                    000486
C                                                                         000487
C     SELECT THE DESIRED MODE OF OPTIMIZATION                             000488
C                                                                         000489
      MODE=2                                                              000490
C                                                                         000491
C     THE STARTING POINT MUST BE INITIALIZED BY SETTING CONSECUTIVELY     000492
C     NUMBERED X VALUES                                                   000493
C                                                                         000494
      X(1)=CM(1,1,1)                                                      000495
      X(2)=CM(1,1,2)                                                      000496
      X(3)=CM(1,2,2)                                                      000497
      X(4)=CM(1,2,3)                                                      000498
      X(5)=CM(1,3,3)                                                      000499
      X(6)=CM(1,3,4)                                                      000500
      X(7)=CM(1,3,6)                                                      000501
      X(8)=CM(1,4,4)                                                      000502
      X(9)=CM(1,4,5)                                                      000503
      X(10)=CM(1,5,5)                                                     000504
      X(11)=CM(1,5,6)                                                     000505
      X(12)=CM(1,6,6)                                                     000506
      X(13)=WGL(1)                                                        000507
      X(14)=WGL(2)                                                        000508
      DO 128 I=1,12                                                       000509
      II=I+14                                                             000510
      X(II)=X(I)                                                          000511
  128 CONTINUE                                                            000512
      X(27)=WGL(3)                                                        000513
C                                                                         000514
C     GENERATE FREQUENCY POINTS IN MHZ                                    000515
C                                                                         000516
      NFREQ=47                                                            000517
      OMEGA(1)=11962.0                                                    000518
      OMEGA(2)=11964.0                                                    000519
      OMEGA(3)=11966.0                                                    000520
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      OMEGA(4)=11968.0                                                  000521
      OMEGA(5)=11970.0                                                  000522
      OMEGA(6)=11972.0                                                  000523
      OMEGA(7)=11976.0                                                  000524
      OMEGA(8)=11980.0001                                               000525
      OMEGA(9)=11984.0                                                  000526
      OMEGA(10)=11988.0                                                 000527
      OMEGA(11)=11990.0                                                 000528
      OMEGA(12)=11992.0                                                 000529
      OMEGA(13)=11994.0                                                 000530
      OMEGA(14)=11996.0                                                 000531
      OMEGA(15)=11998.0                                                 000532
      DO 10 I=16,45                                                     000533
      OMEGA(I)=OMEGA(I-15)+40.0                                         000534
   10 CONTINUE                                                          000535
      OMEGA(46)=12000.0                                                 000536
      OMEGA(47)=12040.0                                                 000537
C                                                                       000538
C     DEFINE THE NUMBER OF MINIMAX FUNCTIONS RESULTING FROM THE         000539
C     SPECIFICATIONS ON RETURN LOSS                                     000540
C                                                                       000541
      NFRL=2                                                            000542
C                                                                       000543
C     DEFINE CODES AND ARRAYS REQUIRED FOR RETURN LOSS OPTIMIZATION     000544
C                                                                       000545
      DO 150 I=1,45                                                     000546
      RLSCODE(I)=0                                                      000547
  150 CONTINUE                                                          000548
      RLSCODE(46)=-1                                                    000549
      RLSCODE(47)=-1                                                    000550
      SLRL(46)=20.0                                                     000551
      SLRL(47)=20.0                                                     000552
      WLRL(46)=1.0                                                      000553
      WLRL(47)=1.0                                                      000554
C                                                                       000555
C     DEFINE CHANNEL BAND CODE (CHANNEL, FREQUENCY EDGE INDEX), WHERE   000556
C     THE FIRST CHANNEL IS CLOSEST TO THE SHORT CIRCUIT AND CORRESPONDS 000557
C     TO THE HIGHEST CENTER FREQUENCY, AND THE FREQUENCY EDGES ARE 1    000558
C     FOR LOWER EDGE AND 2 FOR UPPER EDGE. THE VALUE OF CHBCODE CORRES- 000559
C     PONDS TO THE FREQUENCY POINT INDEX USED AS ARGUMENT OF OMEGA(I).  000560
C     IF THERE IS NO SPECIFICATION FOR A PARTICULAR CHANNEL, THE VALUE  000561
C     OF CHBCODE MUST BE SET TO 0.                                      000562
C                                                                       000563
      CHBCODE(1,1)=31                                                   000564
      CHBCODE(1,2)=45                                                   000565
      CHBCODE(2,1)=16                                                   000566
      CHBCODE(2,2)=30                                                   000567
      CHBCODE(3,1)=1                                                    000568
      CHBCODE(3,2)=15                                                   000569
C                                                                       000570
C     DEFINE THE SPECIFICATION CODE FOR INSERTION LOSS OPTIMIZATION     000571
C     (FREQUENCY INDEX, CHANNEL)                                        000572
C                                                                       000573
      DO 20 I=1,15                                                      000574
      DO 20 J=1,3                                                       000575
      SPCODE(I,J)=1                                                     000576
   20 CONTINUE                                                          000577
C                                                                       000578
C     DEFINE VALUES FOR THE SPECIFICATIONS (FREQUENCY INDEX, CHANNEL)   000579
C                                                                       000580
      DO 25 I=1,3                                                       000581
      SU(1,I)=2.79                                                      000582
      SU(2,I)=1.77                                                      000583
      SU(3,I)=1.41                                                      000584
      SU(4,I)=1.24                                                      000585
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      DO 33 J=5,11                                                      000586
      SU(J,I)=1.12                                                      000587
   33 CONTINUE                                                          000588
      SU(12,I)=1.24                                                     000589
      SU(13,I)=1.41                                                     000590
      SU(14,I)=1.77                                                     000591
      SU(15,I)=2.79                                                     000592
   25 CONTINUE                                                          000593
C                                                                       000594
C     DEFINE WEIGHTING FACTORS CORRESPONDING TO THE SPECIFICATIONS      000595
C                                                                       000596
      DO 35 I=1,15                                                      000597
      DO 35 J=1,3                                                       000598
      WU(I,J)=1.0                                                       000599
   35 CONTINUE                                                          000600
C                                                                       000601
C     ARGUMENTS OF THE MINIMAX OPTIMIZATION(MMLC) CALL STATEMENT        000602
C                                                                       000603
C     FDF     - NAME OF A SUBROUTINE CALCULATING MINIMAX FUNCTIONS AND  000604
C               THEIR DERIVATIVES AT THE POINT DEFINED BY THE X VECTOR. 000605
C               THE NAME FDF IS ARBITRARY AND MUST APPEAR IN THE EXTER- 000606
C               NAL STATEMENT IN THE SEGMENT CALLING MMLC1A.            000607
C     NV      - INTEGER ARGUMENT WHICH MUST BE SET TO THE NUMBER OF OP- 000608
C               TIMIZATION VARIABLES. ITS VALUE MUST BE POSITIVE AND IS 000609
C               NOT CHANGED BY THE PACKAGE.                             000610
C     MF      - INTEGER ARGUMENT WHICH MUST BE SET TO THE NUMBER OF RE- 000611
C               SIDUAL FUNCTIONS DEFINING THE MINIMAX OBJECTIVE FUNCTION. 000612
C               ITS VALUE MUST BE POSITIVE AND IS NOT CHANGED BY THE PA- 000613
C               CKAGE.                                                  000614
C     L       - INTEGER ARGUMENT WHICH MUST BE SET TO THE TOTAL NUMBER  000615
C               OF EQUALITY AND INEQUALITY CONSTRAINTS. ITS VALUE MUST  000616
C               BE POSITIVE OR ZERO AND IT IS NOT CHANGED BY THE PACKA- 000617
C               GE.                                                     000618
C     LEQ     - INTEGER ARGUMENT WHICH MUST BE SET TO THE NUMBER OF EQ- 000619
C               UALITY CONSTRAINTS. ITS VALUE MUST BE POSITIVE OR ZERO  000620
C               AND NOT GREATER THAN NV, AND NOT GREATER THAN L. ITS    000621
C               VALUE IS NOT CHANGED BY THE PACKAGE.                    000622
C     B       - REAL ARRAY OF LENGTH IIC > L. THE ELEMENTS OF B MUST BE 000623
C               SET TO THE CONSTANT TERMS IN THE LINEAR CONSTRAINTS.    000624
C               THE CONTENTS OF B ARE NOT CHANGED BY THE PACKAGE.       000625
C     C       - REAL MATRIX OF DIMENSIONS (IIC,NV). THE FIRST L ROWS OF 000626
C               C MUST BE SET TO THE COEFFICIENTS OF X IN THE LINEAR    000627
C               CONSTRAINTS.                                            000628
C     IIC     - INTEGER ARGUMENT WHICH MUST BE SET TO THE LENGTH OF THE 000629
C               ARRAY B AND TO NUMBER OF ROWS OF THE MATRIX C. ITS VA-  000630
C               LUE MUST NOT BE LESS THAN L, AND IT IS NOT CHANGED BY   000631
C               THE PACKAGE.                                            000632
C     X       - REAL ARRAY OF LENGTH AT LEAST NV WHICH, ON ENTRY, MUST  000633
C               BE SET TO THE INITIAL APPROXIMATION OF THE SOLUTION.    000634
C               ON EXIT X CONTAINS THE BEST SOLUTION FOUND BY THE PACK- 000635
C               AGE.                                                    000636
C     DX      - REAL VARIABLE WHICH CONTROLS THE STEP LENGTH OF THE ITER- 000637
C               ATIVE ALGORITHM. ON ENTRY IT MUST BE SET TO AN INITIAL  000638
C               VALUE APPROXIMATELY EQUAL TO 0.1* X. THE VALUE OF DX    000639
C               MUST BE POSITIVE. ON EXIT DX CONTAINS THE LAST VALUE OF 000640
C               THE STEPSIZE. FOR EXTENSIVE DETAILS PLEASE REFER TO     000641
C               REPORT SOS-82-5-U2, AUGUST 1983.                        000642
C     EPS     - REAL VARIABLE WHICH ON ENTRY MUST BE SET TO THE REQUIRED 000643
C               ACCURACY OF THE SOLUTION. ON EXIT EPS CONTAINS THE LENGTH 000644
C               OF THE LAST STEP TAKEN IN THE ITERATION.                000645
C     MAXF    - INTEGER VARIABLE WHICH MUST BE SET TO AN UPPER BOUND ON 000646
C               THE NUMBER OF CALLS OF FDF. ON EXIT MAXF CONTAINS THE   000647
C               NUMBER OF CALLS OF FDF THAT HAVE BEEN PERFORMED BY THE  000648
C               PACKAGE.                                                000649
C     KEQS    - INTEGER VARIABLE WHICH MUST BE SET TO THE NUMBER OF SUC- 000650
```

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C               CESSIVE ITERATIONS WITH IDENTICAL SETS OF ACTIVE RESIDUAL  000651
C               FUNCTIONS AND ACTIVE CONSTRAINTS THAT IS REQUIRED BEFORE   000652
C               A SWITCH TO STAGE 2 IS MADE. ON EXIT KEQS CONTAINS THE     000653
C               NUMBER OF SWITCHES TO STAGE 2 THAT HAVE TAKEN PLACE.       000654
C     W       - REAL ARRAY WHICH IS USED FOR WORKING SPACE. ITS LENGTH     000655
C               IS GIVEN BY IW. ON EXIT THE FIRST MF ELEMENTS OF W CON-    000656
C               TAIN THE RESIDUAL FUNCTION VALUES AT THE SOLUTION.         000657
C     IW      - INTEGER ARGUMENT WHICH MUST BE SET TO THE LENGTH OF W.     000658
C               ITS VALUE MUST BE AT LEAST                                 000659
C                                                                          000660
C                    IWR=2*MF*NV+5*NV*NV+4*MF+8*NV+4*IIC+3                 000661
C                                                                          000662
C     ICH     - INTEGER ARGUMENT WHICH MUST BE SET TO THE UNIT NUMBER       000663
C               THAT IS TO BE USED FOR THE PRINTED OUTPUT GENERATED BY     000664
C               THE PACKAGE. IF ICH IS LESS THAN OR EQUAL TO ZERO, NO      000665
C               PRINTED OUTPUT WILL BE GENERATED BY THE PACKAGE.           000666
C     IPR     - INTEGER ARGUMENT WHICH CONTROLS THE PRINTED OUTPUT GE-      000667
C               NERATED BY THE PACKAGE. FOR EXTENSIVE DETAILS PLEASE       000668
C               REFER TO REPORT SOS-82-5-U2, AUGUST 1983.                  000669
C     IFALL   - INTEGER VARIABLE WHICH ON EXIT CONTAINS INFORMATION        000670
C               ABOUT THE SOLUTION:                                        000671
C               IFALL=-2 FEASIBLE REGION IS EMPTY,                         000672
C               IFALL=-1 INCORRECT INPUT DATA,                             000673
C               IFALL= 0 REGULAR SOLUTION; REQUIRED ACCURACY OBTAINED,     000674
C               IFALL= 1 SINGULAR SOLUTION; REQUIRED ACCURACY OBTAINED,    000675
C               IFALL= 2 MACHINE ACCURACY REACHED,                         000676
C               IFALL= 3 MAXIMUM NUMBER OF FUNCTION EVALUATIONS REACHED,   000677
C               IFALL= 4 ITERATION TERMINATED BY THE USER.                 000678
C                                                                          000679
C     DEFINE PARAMETERS FOR THE MMLC PACKAGE                               000680
C                                                                          000681
      NV=27                                                                000682
      MF=47                                                                000683
      L=0                                                                  000684
      LEQ=0                                                                000685
      IIC=1                                                                000686
      DX=0.05                                                              000687
      EPS=1.E-6                                                            000688
      MAXF=75                                                              000689
      KEQS=3                                                               000690
      IW=8000                                                              000691
      ICH=6                                                                000692
      IPR=10                                                               000693
      NCOUNT=1                                                             000694
C                                                                          000695
      CALL MMLC1A(FDF,NV,MF,L,LEQ,B,C,IIC,X,DX,EPS,MAXF,KEQS,W,IW,ICH,     000696
     1            IPR,IFALL)                                               000697
C                                                                          000698
  900 STOP                                                                 000699
      END                                                                  000700
C                                                                          000701
```

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C                                                                       000702
      SUBROUTINE FDF(NV,MF,X,DF,F)                                      000703
      REAL X(NV),F(MF),DF(MF,NV)                                        000704
      REAL OMEGA(47),SURL(47),SLRL(47),WURL(47),WLRL(47),               000705
     1     SU(100,8),SL(100,8),WU(100,8),WL(100,8)                      000706
      INTEGER RLSCODE(47),SPCODE(100,8),CHBCODE(8,2)                    000707
      REAL CM(8,8,8),WGL(8),DRL(296),FIL(8),DIL(8,296)                  000708
      INTEGER IR(8),IRT(8),LC(8,36),KC(8,36)                            000709
      COMMON /BLK2/CM,WGL                                               000710
      COMMON /BLK3/OMEGA,SURL,SLRL,WURL,WLRL,SU,SL,WU,WL,               000711
     1             RLSCODE,SPCODE,NCOUNT,MODE,NCH,MO,                   000712
     2             NFREQ,NFRL,CHBCODE,IFLAGJS,IFLAGDP,IDISPER           000713
      COMMON/BLK8/IR,IRT,LC,KC                                          000714
C                                                                       000715
C     UPDATE OPTIMIZATION VARIABLES                                     000716
C                                                                       000717
      IF(IR(1).EQ.0)GO TO 20                                            000718
      IR1=IR(1)                                                         000719
      DO 10 IV=1,IR1                                                    000720
      CM(1,LC(1,IV),KC(1,IV))=X(IV)                                     000721
   10 CONTINUE                                                          000722
   20 DO 40 I=2,NCH                                                     000723
      IX=IRT(I-1)                                                       000724
      IF(IR(I).EQ.0) GO TO 40                                           000725
      IRI=IR(I)                                                         000726
      DO 30 IP=1,IRI                                                    000727
      IXX=IX+IP                                                         000728
      CM(I,LC(I,IP),KC(I,IP))=X(IXX)                                    000729
   30 CONTINUE                                                          000730
   40 CONTINUE                                                          000731
      DO 50 I=1,NCH                                                     000732
      WGL(I)=X(IRT(I))                                                  000733
   50 CONTINUE                                                          000734
C                                                                       000735
C     DEFINE MINIMAX FUNCTIONS AND THEIR GRADIENTS                      000736
C                                                                       000737
      NCHAN=NCH                                                         000738
      MORDER=MO                                                         000739
      KFRL=0                                                            000740
      KFUN=NFRL                                                         000741
      DO 100 I=1,NFREQ                                                  000742
      FREQ=OMEGA(I)                                                     000743
C                                                                       000744
      CALL SIMGRD(FREQ,FRL,DRL,FIL,DIL,NCHAN,MORDER,I,IFLAGJS,          000745
     1            IFLAGDP,IDISPER)                                      000746
C                                                                       000747
      IF(MODE.EQ.1)GO TO 199                                            000748
      IF(RLSCODE(I).EQ.0)GO TO 199                                      000749
      IF(RLSCODE(I).EQ.-1)GO TO 70                                      000750
      IF(RLSCODE(I).EQ.1)GO TO 75                                       000751
      KFRL=KFRL+1                                                       000752
      F(KFRL)=WURL(I)*(FRL-SURL(I))                                     000753
      DO 80 K1=1,NV                                                     000754
      DF(KFRL,K1)=WURL(I)*DRL(K1)                                       000755
   80 CONTINUE                                                          000756
      KFRL=KFRL+1                                                       000757
      F(KFRL)=-WLRL(I)*(FRL-SLRL(I))                                    000758
      DO 85 K2=1,NV                                                     000759
      DF(KFRL,K2)=-WLRL(I)*DRL(K2)                                      000760
   85 CONTINUE                                                          000761
      GO TO 199                                                         000762
   70 KFRL=KFRL+1                                                       000763
      F(KFRL)=-WLRL(I)*(FRL-SLRL(I))                                    000764
      DO 90 K3=1,NV                                                     000765
      DF(KFRL,K3)=-WLRL(I)*DRL(K3)                                      000766
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```
 90 CONTINUE                                                                    000767
    GO TO 199                                                                   000768
 75 KFRL=KFRL+1                                                                 000769
    F(KFRL)=WURL(I)*(FRL-SURL(I))                                               000770
    DO 95 K4=1,NV                                                               000771
    DF(KFRL,K4)=WURL(I)*DRL(K4)                                                 000772
 95 CONTINUE                                                                    000773
199 CONTINUE                                                                    000774
    IF(MODE.EQ.0)GO TO 100                                                      000775
    DO 105 J=1,NCH                                                              000776
    NCHECK=0                                                                    000777
    IF(I.GE.CHBCODE(J,1).AND.I.LE.CHBCODE(J,2))NCHECK=1                         000778
    IF(NCHECK.EQ.0)GO TO 105                                                    000779
    K=I-CHBCODE(J,1)+1                                                          000780
    IF(SPCODE(K,J).EQ.0)GO TO 105                                               000781
    IF(SPCODE(K,J).EQ.-1)GO TO 110                                              000782
    IF(SPCODE(K,J).EQ.1)GO TO 115                                               000783
    KFUN=KFUN+1                                                                 000784
    F(KFUN)=WU(K,J)*(FIL(J)-SU(K,J))                                            000785
    DO 120 I1=1,NV                                                              000786
    DF(KFUN,I1)=WU(K,J)*DIL(J,I1)                                               000787
120 CONTINUE                                                                    000788
    KFUN=KFUN+1                                                                 000789
    F(KFUN)=-WL(K,J)*(FIL(J)-SL(K,J))                                           000790
    DO 125 I2=1,NV                                                              000791
    DF(KFUN,I2)=-WL(K,J)*DIL(J,I2)                                              000792
125 CONTINUE                                                                    000793
    GO TO 105                                                                   000794
110 KFUN=KFUN+1                                                                 000795
    F(KFUN)=-WL(K,J)*(FIL(J)-SL(K,J))                                           000796
    DO 130 I3=1,NV                                                              000797
    DF(KFUN,I3)=-WL(K,J)*DIL(J,I3)                                              000798
130 CONTINUE                                                                    000799
    GO TO 105                                                                   000800
115 KFUN=KFUN+1                                                                 000801
    F(KFUN)=WU(K,J)*(FIL(J)-SU(K,J))                                            000802
    DO 135 I4=1,NV                                                              000803
    DF(KFUN,I4)=WU(K,J)*DIL(J,I4)                                               000804
135 CONTINUE                                                                    000805
105 CONTINUE                                                                    000806
100 CONTINUE                                                                    000807
    NCOUNT=NCOUNT+1                                                             000808
    RETURN                                                                      000809
    END                                                                         000810
```

DATE : 84/01/31. TIME : 11.29.55. PAGE : 1
LINEARLY CONSTRAINED MINIMAX OPTIMIZATION (MMLC PACKAGE) (V:82.04)

MULTIPLEXER PROBLEM MXTST6

INPUT DATA

NUMBER OF VARIABLES (N) 27
NUMBER OF FUNCTIONS (MDC 47
TOTAL NUMBER OF LINEAR CONSTRAINTS (L) 0
NUMBER OF EQUALITY CONSTRAINTS (LEQ) 0
STEP LENGTH (DX) 5.000E-02
ACCURACY (EPS) 1.000E-06
MAX NUMBER OF FUNCTION EVALUATIONS (MAXF) 75
NUMBER OF SUCCESSIVE ITERATIONS (KEQS) 3
WORKING SPACE (IW) 8000
PRINTOUT CONTROL (IPR) 10

STARTING POINT :

	VARIABLES		FUNCTION VALUES
1	0.	1	5.881726899296E-01
2	5.939500000000E-01	2	5.606073452421E+00
3	0.	3	3.397343518583E-01
4	5.351400000000E-01	4	4.272216573252E-01
5	0.	5	2.547630170446E-01
6	4.247100000000E-01	6	2.088061948320E-01
7	-3.996700000000E-01	7	2.171340363827E-01
8	0.	8	9.014140138119E-02
9	8.337100000000E-01	9	-1.459429271873E-01
10	0.	10	-1.840639900810E-01
11	7.631300000000E-01	11	-1.722974051960E-01
12	0.	12	-1.668893351765E-01
13	6.410000000000E-01	13	-1.130228510226E-01
14	6.310000000000E-01	14	-1.273117826421E-01
15	0.	15	-1.326792957479E-01
16	5.939500000000E-01	16	-2.116054575533E-01
17	0.	17	-5.411054170164E-01
18	5.351400000000E-01	18	-1.280821750845E-01
19	0.	19	-7.401366925222E-02
20	4.247100000000E-01	20	-6.622988776045E-02
21	-3.996700000000E-01	21	-6.449319252491E-02
22	0.	22	-5.698638585295E-02
23	8.337100000000E-01	23	-1.450000956344E-01
24	0.	24	-2.378459752295E-01
25	7.631300000000E-01	25	-2.557855803587E-01
26	0.	26	-2.432559645821E-01
27	6.330000000000E-01	27	-1.535450722065E-01
		28	-8.290883706865E-02
		29	-1.117050256841E-01
		30	-1.204251798056E-01

DATE : 84/01/31. TIME : 11.29.55. PAGE : 2
LINEARLY CONSTRAINED MINIMAX OPTIMIZATION (MMLC PACKAGE) (V:82.04)

MULTIPLEXER PROBLEM MXTST6

31	-1.527941620359E-01
32	-4.575620274459E-01
33	-2.520671425147E-02
34	-2.745971306157E-02
35	-6.062636513491E-03
36	-1.005897550820E-02
37	-3.099806085189E-02
38	-1.275063411426E-01
39	-1.557719685368E-01
40	-1.569355189001E-01
41	-1.439201763664E-01
42	8.470500807513E-02
43	2.194009772458E-01
44	2.125154002832E-01
45	2.481392931055E-01
46	4.141733127239E-01
47	3.340379043190E-01

SOLUTION

	VARIABLES		FUNCTION VALUES
1	-1.835739844319E-02	1	-6.910441775187E-02
2	6.417176496817E-01	2	-8.079585361975E-02
3	-2.423271760186E-02	3	-2.829997924271E-01
4	5.368211712300E-01	4	-8.087144334808E-02
5	-2.366762036668E-02	5	-1.329190843834E-01
6	3.405171151420E-01	6	-1.176561114683E-01
7	-5.818397013861E-01	7	-8.087253947649E-02
8	-6.145980172849E-02	8	-1.519825923170E-01
9	9.151858806980E-01	9	-1.754603705853E-01
10	7.414486463879E-03	10	-8.087187265347E-02
11	6.415135398576E-01	11	-1.047605974425E-01
12	-2.220342037606E-02	12	-1.454474069162E-01
13	6.367895770849E-01	13	-8.155732025440E-02
14	6.335029964943E-01	14	-8.085526224878E-02
15	1.303498762872E-01	15	-8.617672904876E-02
16	6.332270498868E-01	16	-1.478082189043E-01
17	2.578746989860E-02	17	-3.068096118852E-01
18	5.237099205089E-01	18	-4.146449690693E-01
19	-3.454949013256E-03	19	-1.446793844646E-01
20	4.267930095111E-01	20	-1.132197293204E-01
21	-4.262271112930E-01	21	-1.070040508616E-01
22	3.432949318695E-02	22	-8.087290276863E-02
23	8.553003304111E-01	23	-1.508572403899E-01
24	7.979952045823E-03	24	-2.426479792947E-01
25	7.658198344032E-01	25	-2.668511512847E-01
26	2.196442955008E-02	26	-2.397208953432E-01
27	6.564619503318E-01	27	-1.483581503288E-01
		28	-8.087350856258E-02
		29	-1.052748693193E-01
		30	-1.004670071697E-01
		31	-1.225383156654E-01
		32	-4.548761151290E-01
		33	-8.087261051234E-02
		34	-1.298226963910E-01

DATE : 84/01/31. TIME : 11.29.55. PAGE : 3
LINEARLY CONSTRAINED MINIMAX OPTIMIZATION (MMLC PACKAGE) (V:82.04)

MULTIPLEXER PROBLEM MXTST6

35	-8.087327937570E-02
36	-8.173976899224E-02
37	-8.087338143842E-02
38	-1.335672712195E-01
39	-8.325385300316E-02
40	-8.087265407679E-02
41	-1.959719607059E-01
42	-1.718728943760E-01
43	-8.087302311235E-02
44	-8.913194654387E-02
45	-9.649344484077E-02
46	-8.086828962196E-02
47	-3.281119582671E-01

TYPE OF SOLUTION (IFALL) 3

NUMBER OF FUNCTION EVALUATIONS 75

NUMBER OF SHIFTS TO STAGE-2 6

EXECUTION TIME (IN SECONDS) 294.900