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# FINAL REPORT
# ANALYSIS OF THE SURVIVABILITY OF THE SHUTTLE (ALT) FAULT-TOLERANT AVIONICS SYSTEM

APRIL 1976

APPENDICES

ultrasystems

# ANALYSIS OF THE SURVIVABILITY OF THE SHUTTLE(ALT) FAULT-TOLERANT AVIONICS SYSTEM

## FINAL REPORT

## DATA REQUIREMENTS LIST ITEM 3

## APPENDICES

prepared for

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FINAL REPORT

APPENDICES

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# APPENDIX A
# ANALYTIC MODEL PROGRAM

## A.1 PROGRAM DESCRIPTION

The analytic model program calculates the Shuttle avionics survivability for the ALT configuration. The user supplies the necessary baseline parameter data to the program as well as information on parameter variation. If time is specified as the independent variable, then survivability as a function of time is generated for each parameter variation. If time is not specified as the independent variable, then survivability as a function of parameter is generated for each parameter that is specified to be varied. The only restriction on the number and type of parameters to be varied in any one run is that they must be in the same device.

The program consists of a driver routine and six subroutines. The structure of the driver program is given on the opposite page. The routine accepts the input data and checks its validity. Next, the number of time points is set up and baseline survivabilities are calculated and printed. Following this, the varying partition is identified and its survivability is set to 1. System survivability with this partition excluded may be calculated for future use. Next, the parameters are varied and the survivabilities computed and printed. A separate path is required if time is the independent variable because of differing output formats.

The actual computation is accomplished by a subroutine. There is the GPC model computed by SURVT, the MCDS model computed by MCDSC, and the flight critical bus model computed by FLTCR. The appropriate subroutine is called for the survivability calculation for each partition. The parameters associated with that partition are included in the argument list.

The printing of results is accomplished by subroutine. There are three distinct printout formats. The baseline results are printed by SVTPRT, the parameter variation results with time as the independent variable are printed by VATPRT and the parameter variation results with the parameter as the independent variable are printed by VAPPRT.

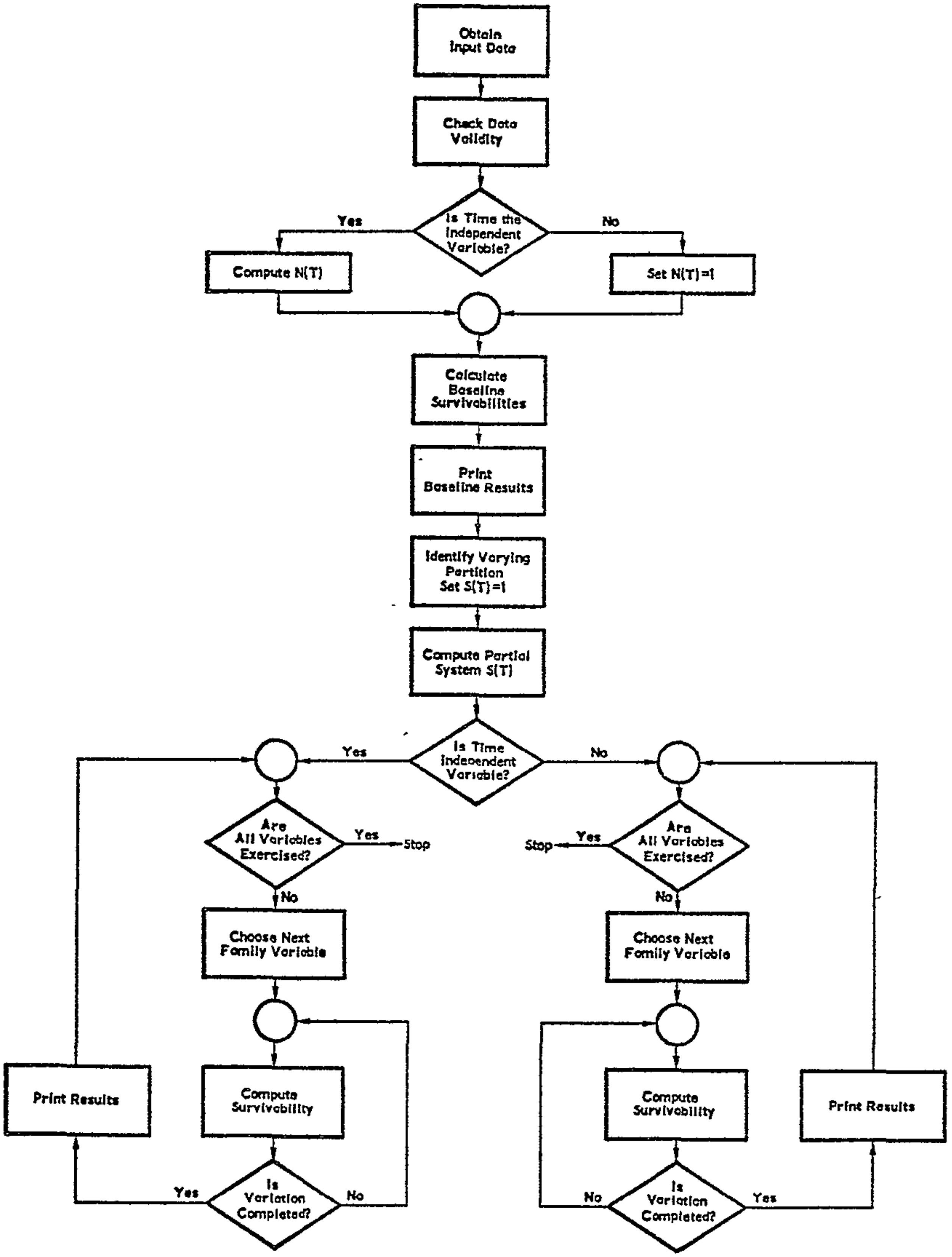

Obtain Input Data
Check Data Validity
Is Time the Independent Variable?
Yes
No
Compute N(T)
Set N(T)=1
Calculate Baseline Survivabilities
Print Baseline Results
Identify Varying Partition Set S(T)=1
Compute Partial System S(T)
Is Time Indeoendent Variable?
Yes
No
Are All Variables Exercised?
Yes
Stop
No
Choose Next Family Variable
Compute Survivability
Is Variation Completed?
Yes
No
Print Results
Are All Variables Exercised?
Yes
Stop
No
Choose Next Family Variable
Compute Survivability
Is Variation Completed?
No
Yes
Print Results

FIGURE A.1-1 OVERALL STRUCTURE OF ANALYTIC MODEL PROGRAM

## A.2. UTILIZATION PROCEDURE

### A.2.1 INTRODUCTION

Parameters are input to the program using the NAMELIST statement. This allows a relatively format free input specification and adds an identification of the parameter on the punched card. There are five namelist groups to be entered. The variables to be entered are listed in Table A.2-1, along with their group name and purpose. The variables that span several devices have an index I, while variables that apply to redundancy levels have an index K, eg. $V_2$ is detectability when 2 fault free units remain. The value of I·refers to a device as shown below

| INDEX | DEVICE NAME |
|---|---|
| 1 | MCDS DEU+DU |
| 2 | MCDS KEYBOARD |
| | THE ABOVE TWO INDICES REFER TO LAMDA AND TAU ONLY.<br>FOR U,V,W, AND LEAKGE USE INDEX 2 WITH K=1<br>1,2, AND 3 REFERRING TO DDU+DU AND 4,5 REFERRING<br>TO THE KEYBOARD |
| 3 | GPC |
| 4 | FLIGHT FORWARD MDM |
| 5 | ADIA |
| 6 | ACCELEROMETER |
| 7 | IMU |
| 8 | IACAN |
| 9 | MSBLS |
| 10 | RHC |
| 11 | RPTA |
| 12 | SBTC |
| 13 | FLIGHT AFT MDM |
| 14 | SERVO AMP |
| 15 | RATE GYRO |
| 16 | DDU |
| 17 | AVVI |
| 18 | A/MI |
| 19 | HST |
| 20 | ADI |
| 21 | PCM MASTER |
| 22 | OF MDM |
| 23 | OA MDM |
| 24 | FF MDM 4 |
| 25 | FA MDM 4 |

This index system assigns the input parameters and program control variables to the proper device. For example, U(4,3) is $U_4$ for the GPCs.

TABLE A.2-I INPUT VARIABLES AND THEIR PURPOSE

| VARIABLE | GROUP | PURPOSE |
|---|---|---|
| I | | Index number indicating a device |
| LAMDA(I) | PARAMS | Permanent Fault Rate |
| TAU(I) | PARAMS | Transient Fault Rate |
| LEAKAGE(K,I) | PARAMS | Transient Leakage |
| U(K,I) | PARAMS | Detectability |
| V(K,I) | PARAMS | Diagnosability |
| W(K,I) | PARAMS | Recoverability |
| DELT | MSNT | Time Increment |
| TMAX | MSNT | Maximum value of time |
| VARPAR | MSNT | Device number to vary parameters |
| ITER | MSNT | ITER 2 allows another run to follow |
| TIME | FLAGS | Indicates time is the independent variable |
| UFLG(K) | FLAGS | Indicates U(K,VARPAR) is to be varied |
| VFLG(K) | FLAGS | Indicates V(K,VARPAR) is to be varied |
| WFLG(K) | FLAGS | Indicates W(K,VARPAR) is to be varied |
| LKGFLG(K) | FLAGS | Indicates LEAKGE(K,VARPAR) is to be varied |
| LAMFLG | FLAGS | Indicates LAMDA(VARPAR) is to be varied |
| TAUFLG | FLAGS | Indicates TAU(VARPAR) is to be varied |
| DELU(K) | DELS | Increment in U(K,VARPAR) |
| DELV(K) | DELS | Increment in V(K,VARPAR) |
| DELW(K) | DELS | Increment in W(K,VARPAR) |
| DELLKG(K) | DELS | Increment in LEAKGE(K,VARPAR) |
| DELLAM | DELS | Increment in LAMDA(VARPAR) |
| DELTAU | DELS | Increment in TAU(VARPAR) |
| UMAX(K) | MAXS | Maximum value of U(K,VARPAR) |
| VMAX(K) | MAXS | Maximum value of V(K,VARPAR) |
| WMAX(K) | MAXS | Maximum value of W(K,VARPAR) |
| LKGMAX(K) | MAXS | Maximum value of LEAKGE(K,VARPAR) |
| LAMMAX | MAXS | Maximum value of LAMDA(VARPAR) |
| TAUMAX | MAXS | Maximum value of TAU(VARPAR) |
| TVAL | MAXS | Time when not the independent variable |

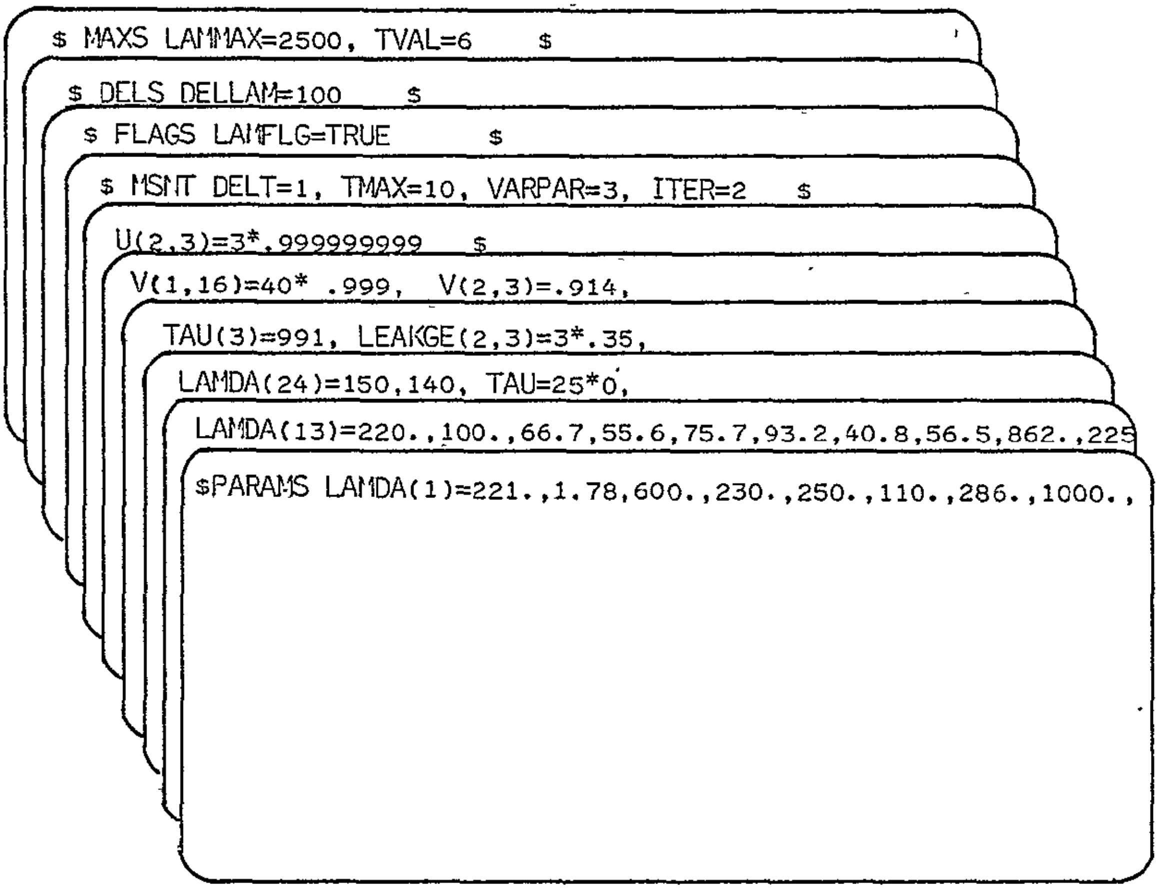
## A.2.2 INPUT DECK SETUP

Within the program, some parameters are assigned default values. That is, if a parameter is not input, it is assigned a preset value. All Us are assigned .999. All Vs and Ws are assigned 1 except V(2,I) is assigned a value of .95. LAMDAs and TAUs are 100 (per $10^6$ hours). All FLAGS are .FALSE. Leakages are zero.

A sample input deck set-up is shown in Figure A.2-1. The namelist groups are to come in the following order: PARAMS, MSNT, FLAGS, DELS, MAXS. The initial card for each group must begin with a dollar sign ($) in column 2 immediately followed by the group name with no imbedded blanks. Succeeding data items are read until a $ is encountered. Each data item is separated by commas and may be in any of two forms:

1. A variable equals a constant
2. An array with or without subscript followed by a list of constants, separated by commas.

In (2), the subscript indicates the beginning location for the assignment. No subscript implies a 1. A variable may be omitted or may have more than one assignment. A value of ITER greater than 2 allows another input deck to be run after the current one.



```
$ MAXS LAMMAX=2500, TVAL=6    $
 $ DELS DELLAM=100    $
  $ FLAGS LAMFLG=TRUE      $
   $ MSNT DELT=1, TMAX=10, VARPAR=3, ITER=2   $
    U(2,3)=3*.999999999   $
     V(1,16)=40* .999,  V(2,3)=.914,
       TAU(3)=991, LEAKGE(2,3)=3*.35,
        LAMDA(24)=150,140, TAU=25*0,
         LAMDA(13)=220.,100.,66.7,55.6,75.7,93.2,40.8,56.5,862.,225
         $PARAMS LAMDA(1)=221.,1.78,600.,230.,250.,110.,286.,1000.,
```

FIGURE A.2-1  A SAMPLE INPUT DECK SET-UP

```
      PROGRAM A(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
C
C
C           EACH UNIT OF THE ALT OP SYSTEM IS REPRESENTED BY AN INDEX.
C       THIS IS ALIST OF THESE REPRESENTATIONS.
C
C
C  INDEX    UNIT REPRESENTED
C
C     1     MCDS DEU+DU
C     2     MCDS KEYBOARD
C                  ABOVE TWO REFER TO LAMDA AND TAU  ONLY.
C                  FOR U,V,W,AND LEAKGE USE INDEX 2 WITH POSITIONS
C                  1,2, AND 3 REFERRING TO DDU+DU AND 4,5 REFERRING
C                  TO THE KEYBOARD
C     3     GPC
C     4     FLIGHT FORWARD MDM
C     5     ADTA
C     6     ACCELEROMETER
C     7     IMU
C     8     TACAN
C     9     MSBLS
C     10    RHC
C     11    RPTA
C     12    SBTC
C     13    FLIGHT AFT MDM
C     14    SERVO AMP
C     15    RATE GYRO
C     16    DDU
C     17    AVVI
C     18    A/MI
C     19    HSI
C     20    ADI
C     21    PCM MASTER
C     22    OF MDM
C     23    OA MDM
C     24    FF MDM 4
C     25    FA MDM 4
C
C
C               VARIABLE DICTIONARY
C
C       ABTFLG        ABORT FLAG, A LOGICAL VARIABLE
C       ALPHA(J,K)    COEFFICIENTS OF SURVIVABILITY EQUATION
C       B(I)          LOGICAL VARIABLE USED IN INPUT VALIDITY CHECK
C       COVRGE(K)     COVERAGE
C       DELT          TIME INCREMENT
C       DELTA(K)      PERMANENT FAULT RATE PLUS LEAKY TRANSIENT RATE
C       LAMDA         PERMANENT FAULT RATE IN FAULTS PER HOUR
C       LAMFLG        FLAG  INDICATING(IF TRUE) DESIRE TO VARY LAMDA
C       LAMMAX        MAXIMUM VALUE OF LAMDA
C       LEAKGE(K)     PERCENTAGE OF TRANSTENTS MISTAKEN FOR PERMANENT
C       LKGFLG(K)     FLAG  INDICATING(IF TRUE) DESIRE TO VARY LKGFLG(K)
C       LKGMAX        MAXIMUM VALUE OF LEAKAGE
C       M             LOOP INDEX IN SURVIVABILITY CALCULATION
```

ANALYTIC MODELING PROGRAM PRINTOUT

```
C     N            NUMBER OF COMPUTERS IN SYSTEM
C     ORGVAL       AN ARRAY USED TO STORE THE INITIAL VALUES OF U,V,W,
C                     LEAKGE,LAMDA AND TAU
C     SIGMA(K)     SUM OF PERMANENT FAULT RATE AND LEAKAGE/TRANSIENT FAULT
C                     RATE PRODUCT.
C     SIGMAT       SUM OF THE PERMANENT AND TRANSIENT FAULT RATES.  EXPRESSED
C                     IN FAULTS PER HOUR
C     SUM          TEMPORARY VARIABLE FOR ALPHA COEFFICIENT CALCULATION
C     SURVIV(M)    SURVIVABILITY OF UNIT OF INTEREST AT MTH TIME INTERVAL
C     T(M)         TIME
C     TAU          TRANSIENT FAULT RATE IN FAULTS PER HOUR
C     TAUFLG       FLAG  INDICATING(IF TRUE) DESIRE TO VARY TAU
C     TAUMAX       MAXIMUM VALUE OF TAU
C     TEMP         TEMPORARY VARIABLE IN SURVIVABILITY CALCULATION
C     TEMP1        TEMPORARY VARIABLE IN TMAX/DELT VALIDITY CHECK
C     TIME         FLAG INDICATING(IF TRUE) TIME AS THE INDEPENDENT VARIABLE
C     TMAX         MAXIMUM TIME FOR WHICH SURVIVABILITY IS CALCULATED
C     TVAL         THE VALUE OF TIME FOR WHICH COMPUTATIONS WILL BE MADE
C                     USING ANOTHER INDEPENDENT VARIABLE
C     U(K)         DETECTABILITY
C     UFLG(K)      FLAG  INDICATING(IF TRUE) DESIRE TO VARY U(K)
C     UMAX         MAXIMUM VALUE OF DETECTABILITY
C     V(K)         DIAGNOSABILITY
C     VFLG(K)      FLAG  INDICATING(IF TRUE) DESIRE TO VARY V(K)
C     VMAX         MAXIMUM VALUE OF DIAGNOSABILITY
C     W(K)         RECOVERABILITY
C     WFLG(K)      FLAG  INDICATING(IF TRUE) DESIRE TO VARY W(K)
C     WMAX         MAXIMUM VALUE OF RECOVERABILITY
C
C
      LOGICAL B(25),ABTFLG,UFLG(5),VFLG(5),WFLG(5),
     *        LKGFLG(5),LAMFLG,TAUFLG,TIME,ODUFLG(5)
      REAL       DELU(5),DELV(5),DELW(5),DELLKG(5),DELLAM,DELTAU,
     *           UMAX(5),VMAX(5),WMAX(5),LKGMAX(5),LAMMAX,TAUMAX,TVAL,
     *       PARAM(20),RESULT(20),FCBUS(20),
     *        U(5,25),V(5,25),W(5,25),LEAKGE(5,25),T(20),
     *           ORGVAL(25),LAMDA(25),TAU(25),SURVIV(20,28)
      INTEGER HFADER(6),NR(25),VARPAR,UNITN(28)
      NAMELIST/PARAMS/LAMDA,TAU,LEAKGE,U,V,W,N /MSNT/DELT,TMAX,VARPAR
     *     ,ITFR
      NAMELIST/FLAGS/UFLG,VFLG,WFLG,LKGFLG,LAMFLG,TAUFLG,TIME
      NAMELIST/DELS/DELU,DELV,DELW,DELLKG,DELLAM,DELTAU
      NAMELIST/MAXS/UMAX,VMAX,WMAX,LKGMAX,LAMMAX,TAUMAX,TVAL
      DATA UNITN/6HMCDSDU,6HMCDSKB,6HGPC   ,6HFF MDM,6HADTA  ,6HACCEL ,
     *            6HIMU   ,6HTACAN ,6HMSBLS ,6HRHC   ,6HRPTA  ,6HSBTC  ,
     *            6HFA MDM,6HASA   ,6HRGYRO ,6HDDU   ,6HAVVI  ,
     *            6HA/MI  ,6HHSI   ,6HADI   ,6HPCMMU ,6HOF MDM,6HOA MDM,
     *            6HAFT FC,6HS CRIT,6HM CRIT,6HFT DIS,6HFWD FC/
     *    , NR   /3,2,3*4,7*3,2*4,3,10*2/
     *   ,HEADER/6H ONE  ,6H TWO  ,6HTHREE ,6H FOUR ,6H FIVE ,1H  /
     *    ,LAMDA,TAU/50*100/,LEAKGE/125*0,/,U,V,W /125*.999,250*1,/
     *    ,TVAL, DELT,TMAX,UMAX,VMAX,WMAX,DELU,DELW,DELV,DELLAM,DELTAU,
     *     LAMMAX,TAUMAX/37*1.0/
      DO 5 I=1,25
    5 V(2,I) = .95
```

```
      VARPAR=0
      DELT=1
    1 ITER = 1
      DATA UFLG,VFLG,WFLG,LKGFLG,LAMFLG,TAUFLG,TIME/23*.FALSE./
      TIME=.FALSE.
      UNITN(2)=6HHCOSKB
      DO 8 I =1,25
      LAMDA(I) = LAMDA(I)/ 1.E-6
      TAU(I)  =  TAU(I)  / 1.E-6
    8 CONTINUE
      DELLAM  =  DELLAM  / 1.E-6
      DELTAU  =  DELTAU  / 1.E-6
      LAMMAX  =  LAMMAX  / 1.E-6
      TAUMAX  =  TAUMAX  / 1.E-6
      READ(05,PARAMS)
      READ(05,MSNT)
      READ(05,FLAGS)
      READ(05,DELS)
      READ(05,MAXS)
      DO 10 I=1,25
      LAMDA(I) = LAMDA(I)* 1.E-6
      TAU(I)  =  TAU(I)  * 1.E-6
   10 CONTINUE
      DELLAM  =  DELLAM  * 1.E-6
      DELTAU  =  DELTAU  * 1.E-6
      LAMMAX  =  LAMMAX  * 1.E-6
      TAUMAX  =  TAUMAX  * 1.E-6
C
C
C         INPUT VARIABLE VALIDITY CHECK
C
C     SET B(I) FALSE   AND CHECK INPUT VARIABLES
C
      ABTFLG=.FALSE.
      DO 115 J=1,25
      DO 100 I=1,25,1
         B(I)=.FALSE.
  100 CONTINUE
      DO 110 I=1,5,1
      IF (U(I,J).GT.1..OR.U(I,J).LT.0.) B(I)=.TRUE.
         IF(B(I))                 WRITE(06,101) I,U(I,J)
  101 FORMAT(1H ,10X, 2HU(,I1, 4H) = ,F10.8)
      IF (V(I,J).GT.1..OR.V(I,J).LT.0.) B(I+5)=.TRUE.
         IF(B(I+5))                 WRITE(06,102) I,V(I,J)
  102 FORMAT(1H ,10X, 2HV(,I1, 4H) = ,F10.8)
      IF (W(I,J).GT.1..OR.W(I,J).LT.0.) B(I+10)=.TRUE.
         IF(B(I+10))                 WRITE(06,103) I,W(I,J)
  103 FORMAT(1H ,10X, 2HW(,I1, 4H) = ,F10.8)
      IF (LEAKGE(I,J).GT.1..OR.LEAKGE(I,J).LT.0.) B(I+15)=.TRUE.
         IF(B(I+15))                 WRITE(06,104) I,LEAKGE(I,J)
  104 FORMAT(1H ,10X, 7HLEAKGE(,I1, 4H) = ,F10.8)
  110 CONTINUE
      TEMP1 = TMAX/DELT
      IF((TMAX/DELT).GT.20.) B(21)=.TRUE.
      IF(B(21))  WRITE(06,111) TEMP1
```

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```
      111 FORMAT(1H ,12HTMAX/DELT = ,F10.8)
    C
    C     IF ANY OF THE LOGICAL VARIABLES DETERMINED ABOVE HAVE BEEN SET,
    C        THEN ABORT THE RUN.
    C
          DO 120 I=1,25,1
             IF(B(I))              ABTFLG = .TRUE.
      120 CONTINUE
      115 CONTINUF
          IF(ABTFLG)             GO TO 999
    C
    C
    C          FIND N(T)
    C
          NT=1
          IF (.NOT.TIME) GO TO 400
          NT = INT(TMAX/DELT)
      400 CONTINUF
          IF (NT.EQ.1) DELT=TVAL
          DO 116 I=1,NT
          T(I)=I*DELT
      116 CONTINUF
    C
    C        CALCULATE BASELINE SURVIVABILITIES
    C
           DO 114 I=1,2
          U      (3+I,1)=U      (I,2)
          V      (3+I,1)=V      (I,2)
          W      (3+I,1)=W      (I,2)
          LEAKGE(3+I,1)=LEAKGE(I,2)
      114 CONTINUE
          CALL MCOSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
          DO 117 I=3,23
          CALL SURVT(LAMDA(I),TAU(I),U(1,I),V(1,I),W(1,I),LEAKGE(1,I)
         *          ,T,SURVIV(1,I),NR(I),NT)
      117 CONTINUE
          CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
         *      T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
          DO 118 I=1,28
          SURVIV(I,25)=1
          SURVIV(I,26)=1
      118 CONTINUE
    C
    C     COMPUTE SYSTEM SURVIVABILITIES
    C
          DO 119 J=1,NT
          DO 121  I=2,3
          SURVIV(J,25)=SURVIV(J,25)*SURVIV(J,I)
      121 CONTINUF
          SURVIV(J,25)=SURVIV(J,25)*SURVIV(J,24)
          DO 1210 I=27,28
          SURVIV(J,25)=SURVIV(J,25)*SURVIV(J,I)
     1210 CONTINUF
          DO 122 I=21,23
          SURVIV(J,26)=SURVIV(J,26)*SURVIV(J,I)
      122 CONTINUE
          SURVIV(J,26)=SURVIV(J,26)*SURVIV(J,25)
      119 CONTINUE
C
C             PRINT BASELINE RESULTS
C
          CALL SVTPRT(NT,LAMDA,TAU,U,V,W,T,SURVIV,NR,LEAKGE,UNITW)
C
C         PRESERVE ORIGINAL VALUES
C
          IF (VARPAR.LE.0) GO TO 998
          DO 130 I=1,5,1
               ORGVAL(I) = U(I,VARPAR)
               ORGVAL(I+5) = V(I,VARPAR)
               ORGVAL(I+10) = W(I,VARPAR)
               ORGVAL(I+15) = LEAKGE(I,VARPAR)
      130 CONTINUE
          ORGVAL(21) = LAMDA (VARPAR)
          ORGVAL(22) = TAU (VARPAR)
          DO 131 I=1,5
          U(I,2) = U(I,1)
          V(I,2) = V(I,1)
          W(I,2) = W(I,1)
          LEAKGE(I,2) = LEAKGE(I,1)
      131 CONTINUE
          NJ = NR(VARPAR)
          J = VARPAR
          IF (VARPAR.LE.2) NJ=5
          JS = VARPAR
          IF (VARPAR.EQ.1) JS=2
C
C             REMOVE VARYING PARTITION FROM S(T) FOR SYSTEM
C
          JF = JS
          IF (JS .GE. 4 .AND. JS .LE. 9) JF = 28
          IF (JS .GE. 10 .AND. JS .LE. 12) JF = 24
          IF (JS .GE. 13 .AND. JS .LE. 20) JF = 27
           DO 123 I=1,NT
          SURVIV(I,26) = SURVIV(I,26) / SURVIV(I,JF)
          IF (VARPAR .LE. 20) SURVIV(I,25) = SURVIV(I,25) / SURVIV(I,JF)
      123 CONTINUE
          IF(TIME)
C                  THEN
         *GO TO 1001
C                  ELSE
          GO TO 2000
C           SELECTION OF VARIABLE FOR WHICH FAMILY OF DATA IS TO
C                 BE COMPUTED
C CHOOSE1
     1001 DO 201 I=1,NJ
           IF (.NOT.UFLG(I)) GO TO 201
      211 CONTINUE
          IF (VARPAR.LE.2) GO TO 501
          CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
         *         ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 503
      GO TO 502
  503 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *        T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 502
  501 CONTINUE
      CALL MCOSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  502 CONTINUE
      CALL VATPRT(NR(J),LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),T,
     *  SURVIV,SURVIV(1,25),SURVIV(1,26),NT,UNITN(J),LEAKGE(1,J),JS,JF)
      U(I,VARPAR) = U(I,VARPAR) + DELU(I)
      IF (U(I,VARPAR).LE.UMAX(I))GO TO 211
      U(I,VARPAR) = ORGVAL(I)
      UFLG(I) = .FALSE.
  201 CONTINUE
      DO 202 I=1,NJ
      IF (.NOT.VFLG(I)) GOTO 202
  212 CONTINUE
      IF (VARPAR.LE.2) GO TO 511
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     *           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 513
      GO TO 512
  513 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *        T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 512
  511 CONTINUE
      CALL MCOSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  512 CONTINUE
      CALL VATPRT(NR(J),LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),T,
     *  SURVIV,SURVIV(1,25),SURVIV(1,26),NT,UNITN(J),LEAKGE(1,J),JS,JF)
      V(I,VARPAR) = V(I,VARPAR) + DELV(I)
      IF (V(I,VARPAR).LE.VMAX(I))    GO TO 212
      V(I,VARPAR) = ORGVAL(I+5)
      VFLG(I) = .FALSE.
  202 CONTINUE
      DO 203 I=1,NJ
      IF (.NOT.WFLG(I))  GOTO 203
  213 CONTINUE
      IF (VARPAR.LE.2) GO TO 521
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     *           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 523
      GO TO 522
  523 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *        T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 522
  521 CONTINUE
      CALL MCOSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  522 CONTINUE
      CALL VATPRT(NR(J),LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),T,
     *  SURVIV,SURVIV(1,25),SURVIV(1,26),NT,UNITN(J),LEAKGE(1,J),JS,JF)
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      W(I,VARPAR) = W(I,VARPAR) + DELW(I)
      IF (W(I,VARPAR).LE.WMAX(I))  GO TO 213
      W(I,VARPAR) = ORGVAL(I+10)
      WFLG(I) = .FALSE.
  213 CONTINUE
      DO 204 I=1,NJ
      IF (.NOT.LKGFLG(I)) GO TO 204
  214 CONTINUE
      IF (VARPAR.LE.2) GO TO 531
      CALL  SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     +           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 533
      GO TO 532
  533 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     +      T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 532
  531 CONTINUE
      CALL MCOSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  532 CONTINUE
      CALL VATPRT(NR(J),LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),T,
     +  SURVIV,SURVIV(1,25),SURVIV(1,26),NT,UNITM(J),LEAKGE(1,J),JS,JF)
      LEAKGE(I,VARPAR) = LEAKGE(I,VARPAR) + DELLKG(I)
      IF (LEAKGE (I,VARPAR).LE .LKGMAX(I)) GO TO 214
      LEAKGE(I,VARPAR) = ORGVAL(I+15)
      LKGFLG(I) = .FALSE.
  204 CONTINUE
      IF (.NOT.LAMFLG) GO TO 205
  215 CONTINUE
      IF (VARPAR.LE.2) GO TO 541
      CALL  SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     +           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 543
      GO TO 542
  543 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     +      T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 542
  541  CONTINUE
      CALL MCOSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  542  CONTINUE
      CALL VATPRT(NR(J),LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),T,
     +  SURVIV,SURVIV(1,25),SURVIV(1,26),NT,UNITM(J),LEAKGE(1,J),JS,JF)
      LAMDA(VARPAR) = LAMDA(VARPAR) + DELLAM
      IF (LAMDA(VARPAR).LE.LAMMAX) GO TO 215
      LAMDA(VARPAR) =  ORGVAL(21)
      LAMFLG = .FALSE.
  205 IF (.NOT.TAUFLG) GO TO 998
  216 CONTINUE
      IF (VARPAR.LE.2) GO TO 551
      CALL  SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     +           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 553
      GO TO  552
  553 CONTINUE
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```
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *      T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 552
  551  CONTINUE
      CALL MCDSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  552  CONTINUF
      CALL VATPRT(NR(J),LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),T,
     *  SURVIV,SURVIV(1,25),SURVIV(1,26),NT,UNITN(J),LEAKGE(1,J),JS,JF)
      TAU(VARPAR) = TAU(VARPAR) + DELTAU
      IF (TAU(VARPAR).LE.TAUMAX) GO TO 216
      TAU(VARPAR) = ORGVAL(22)
      TAUFLG = .FALSE.
       GO TO 998
C CHOOSE2
 2000 DO 301 I=1,NJ
      IF(.NOT.UFLG(I)) GO TO 301
      M = 0
  311 CONTINUE
      M = M + 1
      IF (VARPAR.LE.2) GO TO 505
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     *          ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 507
      GO TO 506
  507 CONTINUF
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *      T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 506
  505 CONTINUE
      CALL MCDSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  506 CONTINUE
      PARAM(M) = U(I,J)
      RESULT(M) = SURVIV(1,JS)
      FCBUS(M) = SURVIV(1,JF)
      U(I,VARPAR) = U(I,VARPAR) + DELU(I)
      IF (U(I,VARPAR).LE.UMAX(I))GO TO 311
      U(I,VARPAR) = ORGVAL(I)
      CALL VAPPRT(PARAM,RESULT,T(1),M,UNITN(J),SURVIV(1,25),SURVIV(1,26)
     *  ,HEADER(I),6HDETECT,6HABILIT,2HY ,FCBUS,JF)
      UFLG(I) = .FALSE.
  301 CONTINUF
      DO 302 I=1,NJ
      IF (.NOT.VFLG(I)) GO TO 302
      M = 0
  312 CONTINUE
      M = M + 1
      IF (VARPAR.LE.2) GO TO 515
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     *          ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 517
      GO TO 516
  517 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *      T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 516
  515 CONTINUE
      CALL MCDSC(LAMDA,TAU,U,V,H,LFAKGF,T,SURVIV(1,2),NT)
  516 CONTINUF
      PARAM(M) = V(I,J)
      RESULT(M) = SURVIV(1,JS)
      FCBUS(M) = SURVIV(1,JF)
      V(I,VARPAR) = V(I,VARPAR) + DELV(I)
      IF (V(I,VARPAR).LE.VMAX(I))  GO TO 312
      V(I,VARPAR) = ORGVAL(I+5)
      CALL VAPPRT(PARAM,RESULT,T(1),M,UNITN(J),SURVIV(1,25),SURVIV(1,26)
     *  ,HEADER(I),6HDIAGNO,6HSABILI,2HTY,FCBUS,JF)
      VFLG(I) = .FALSE.
  302 CONTINUE
      DO 303 I=1,NJ
      IF (.NOT.HFLG(I)) GO TO 303
      M = 0
  313 CONTINUE
      M = M + 1
      IF (VARPAR.LE.2) GO TO 525
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),H(1,J),LEAKGE(1,J)
     *          ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 527
      GO TO 526
  527 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),H(1,4),LEAKGE(1,4),
     *       T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 526
  525 CONTINUE
      CALL MCDSC(LAMDA,TAU,U,V,H,LEAKGE,T,SURVIV(1,2),NT)
  526 CONTINUE
      PARAM(M) = H(I,J)
      RFSULT(M) = SURVIV(1,JS)
      FCBUS(M) = SURVIV(1,JF)
      H(I,VARPAR) = H(I,VARPAR) + DELH(I)
      IF (H(I,VARPAR).LE.HMAX(I))  GO TO 313
      H(I,VARPAR) = ORGVAL(I+10)
      CALL VAPPRT(PARAM,RESULT,T(1),M,UNITN(J),SURVIV(1,25),SURVIV(1,26)
     *  ,HEADER(I),6HRECOVE,6HRABILI,2HTY,FCBUS,JF)
      HFLG(I) = .FALSE.
  303 CONTINUE
      DO 304 I=1,NJ
      IF (.NOT.LKGFLG(I)) GO TO 304
      M = 0
  314 CONTINUF
      M = M + 1
      IF (VARPAR.LE.2) GO TO 535
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),H(1,J),LEAKGE(1,J)
     *          ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAP.GE.4.AND.VARPAR.LE.20) GO TO 537
      GO TO 536
  537 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),H(1,4),LEAKGE(1,4),
     *       T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 536
  535 CONTINUE
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      CALL MCDSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  536 CONTINUF
      PARAM(M) = LEAKGE(I,J)
      RFSULT(M) = SURVIV(1,JS)
      FCBUS(M) = SURVIV(1,JF)
      LEAKGE(I,VARPAR) = LEAKGE(I,VARPAR) + DELLKG(I)
      IF (LEAKGE (I,VARPAR).LE .LKGMAX(I)) GO TO 314
      LEAKGE(I,VARPAR) = ORGVAL(I+15)
      LKGFLG(I) = .FALSE.
      CALL VAPPRT(PARAM,RESULT,T(1),M,UNITN(J),SURVIV(1,25),SURVIV(1,26)
     *  ,HEADER(I),6H   LEA,6HKAGE  ,2H  ,FCBUS,JF)
  304 CONTINUF
      IF (.NOT.LAMFLG) GO TO 305
      M = 0
  315 CONTINUE
      M = M + 1
      IF (VARPAR.LE.2) GO TO 545
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     *           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 547
      GO TO 546
  547 CONTINUE
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *       T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 546
  545 CONTINUF
      CALL MCDSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  546 CONTINUE
      PARAM(M) = LAMDA(J)
      RFSULT(M) = SURVIV(1,JS)
      FCBUS(M) = SURVIV(1,JF)
      LAMDA(VARPAR) = LAMDA(VARPAR) + DELLAM
      IF (LAMDA(VARPAR).LE.LAMMAX) GO TO 315
      LAMDA(VARPAR) =  ORGVAL(21)
      CALL VAPPRT(PARAM,RESULT,T(1),M,UNITN(J),SURVIV(1,25),SURVIV(1,26)
     *  ,HEADER(6),6H    LA,6HMBDA  ,2H  ,FCBUS,JF)
      LAMFLG = .FALSE.
  305 IF (.NOT.TAUFLG) GO TO 998
      M = 0
  316 CONTINUE
      M = M + 1
      IF (VARPAR.LE.2) GO TO 555
      CALL SURVT(LAMDA(J),TAU(J),U(1,J),V(1,J),W(1,J),LEAKGE(1,J)
     *           ,T,SURVIV(1,J),NR(J),NT)
      IF (VARPAR.GE.4.AND.VARPAR.LE.20) GO TO 557
      GO TO 556
  557 CONTINUF
      CALL FLTCR(LAMDA(4),TAU(4),U(1,4),V(1,4),W(1,4),LEAKGE(1,4),
     *       T,SURVIV(1,4),NT,NR(4),LAMDA(24),LAMDA(25))
      GO TO 556
  555 CONTINUE
      CALL MCDSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV(1,2),NT)
  556 CONTINUE
      PARAM(M) = TAU(J)
      RESULT(M) = SURVIV(1,JS)
      FCBUS(M) = SUPVIV(1,JF)
      TAU(VAPPAR) = TAU(VARPAR) + DELTAU
      IF (TAU(VARPAR).LE.TAUMAX) GO TO 316
      TAU(VARPAR) = ORGVAL(22)
      CALL VAPPRT(PARAM,RESULT,T(1),M,UNITN(J),SURVIV(1,25),SURVIV(1,26)
     *  ,HEADER(6),6H     T,6HAU    ,2H  ,FCBUS,JF)
      TAUFLG = .FALSE.
  998 ITER = ITER - 1
      IF (ITEP.GE.1)  GO TO 1
      STOP
  999 WRITE(06,113)
  113 FORMAT(1H0,45HRUN ABORTED BECAUSE OF VARIABLES OUT OF RANGE)
      STOP
      END
      SUBROUTINE SURVT(LAMDA,TAU,U,V,H,LEAKGE,T,SURVIV,N,NT)
      REAL       SIGMA(5),LEAKGE(5),COVRGE(5),U(5),V(5),H(5),DELTA(5),
     *           ALPHA(5,5),SUM,TEMP,
     *           LAMDA,TAU,
     *           T(20),SURVIV(20)
C
C         SIGMAT CALCULATION
C
      SIGMAT = LAMDA + TAU
C
C         SIGMA(K) CALCULATION
C
      DO 10 K=1,N,1
        SIGMA(K) = LAMDA + LEAKGE(K)*TAU
   10   CONTINUE
C
C         DELTA(K) CALCULATION
C
      DO 20 K=1,N,1
        DELTA(K) = U(K)*SIGMA(K) + (1.-U(K))*SIGMAT
   20   CONTINUE
C
C         COVERAGE CALCULATION
C
      DO 30 K=1,N,1
        COVRGE(K) = U(K)*V(K)*H(K)
   30   CONTINUE
C
C         ALPHA COEFFICIENT CALCULATION
C
      ALPHA(1,1) = 1.
      IF (N.LE.1) GO TO 45
      DO 40 J=2,N,1
       L = J-1
        DO 50 K=1,L,1
          ALPHA(J,K) = J*COVRGE(J)*SIGMA(J)*ALPHA(J-1,K)/((J*DELTA(J)
     *                        - K*DELTA(K))
   50     CONTINUE
        SUM = 0.0
          DO 60 I=1,L,1
            SUM = SUM + ALPHA(J,I)
   60       CONTINUE
        ALPHA(J,J) = 1. - SUM
   40   CONTINUE
   45 CONTINUE
C
C         SURVIVABILITY CALCULATION
C
      DO 80 M=1,NT
      TEMP=0.
      DO 70 I=1,N
      TEMP = TEMP + ALPHA(N,I)*EXP(-I*DELTA(I)*T(M))
   70 CONTINUE
      SURVIV(M)= TEMP
   80 CONTINUE
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                  RETURN
                  END
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      SUBROUTINE HCDSC(LAMDA,TAU,U,V,W,LEAKGE,T,SURVIV,NT)
      REAL LAMDA(2),TAU(2),U(5),V(5),W(5),LEAKGE(5),C(5),
     *   SIGDT,SIGKT,SIGD3,SIGD2,SIGD1,SIGK2,SIGK1,DLTD3,
     *   DLTD2,DLTD1,DLTK2,DLTK1,DD2D1,DK2D31,DK2D32,DK2D21,
     *   S12,S21,S22,S11,NKD,COEFA,COEFB,COEFC,COEFD,COEFE,COEFF,
     *   COEFG,COEFH,COEFI,COEFJ,COEFK,COEFL,COEFM,COEFN,COEFP,
     *   TEMP,S23,T(20),SURVIV(20),ND2,ND3,NK2
C
C     CALCULATE COVERAGE
C
      DO  10 I=1,5
      C(I)=U(I)*V(I)*W(I)
   10 CONTINUE
C
C     CALCULATE SIGMAS
C
      SIGDT  = LAMDA(1)  + TAU(1)
      SIGKT  = LAMDA(2)  + TAU(2)
      SIGD3  = LAMDA(1)  + LEAKGE(3)*TAU(1)
      SIGD2  = LAMDA(1)  + LEAKGE(2)*TAU(1)
      SIGD1  = LAMDA(1)  + LEAKGE(1)*TAU(1)
      SIGK2  = LAMDA(2)  + LEAKGE(5)*TAU(2)
      SIGK1  = LAMDA(2)  + LEAKGE(4)*TAU(2)
C
C     CALCULATE DELTAS
C
      DLTD3  = SIGD3 * U(3)  +  (1-U(3))* SIGDT
      DLTD2  = SIGD2 * U(2)  +  (1-U(2))* SIGDT
      DLTD1  = SIGD1 * U(1)  +  (1-U(1))* SIGDT
      DLTK2  = SIGK2 * U(5)  +  (1-U(5))* SIGKT
      DLTK1  = SIGK1 * U(4)  +  (1-U(4))* SIGKT
C
C     COMPUTE DENOMINATORS
C
      DD2D1  = 2*DLTD2-DLTD1
      DK2D31  =2*DLTK2+3*DLTD3-DLTK1-DLTD1
      DK2D32  =DK2D31+DLTD1-2*DLTD2
      DK2D21  =2*DLTK2+2*DLTD2-DLTK1-DLTD1
      DD3D2   =3*DLTD3-2*DLTD2
      DK2K1  = 2*DLTK2-DLTK1
C
C     COMPUTE PARTIAL NUMERATORS
C
      ND3= C(3)*SIGD3
      ND2= C(2)*SIGD2
      NK2= C(5)*SIGK2
      NKD=4*(ND2+NK2)
C
C     COMPUTE NON-TIME VARYING COEFFICIENTS
C
      COEFA  = 4*NK2*ND2/(DD2D1*DK2D31)
      COEFB  = (1-2*ND2/DD2D1)*2*NK2/DK2D32
      COEFC  = ND3*NKD/(DK2D21*DK2D31)
      COEFD  = (3-NKD/DK2D21)*ND3/DD3D2
      TEMP  = 4*ND3*NK2*ND2/(DD2D1*DK2D21)
      COEFF  = TEMP/DK2D31
      COEFG  = TEMP/DO3D2
      TEMP = (1-2*HO2/DO2D1)*2*HO3*NK2/DK2K1
      COEFH  = TEMP/DK2D32
      COEFI  = TEMP/DO3D2
      TEMP = 4*HO3*HO2*NK2/(DK2K1*DK2D21)
      COEFL  = TEMP/DK2D31
      COEFM  = TEMP/DO3D2
      TEMP = (1-2*NK2/DK2K1)*2*HO3*HO2/DO2D1
      COEFN  = TEMP/(3*DLTO3-DLTO1)
      COEFP  = TEMP/DO3D2
C
C     COMPUTE SIMPLEX SURVIVABILITIES
C
      DO 20 I=1,NT
      S23     = EXP(-(3*DLTO3+2*DLTK2)*T(I))
      S22     =  EXP(-(2*DLTO2+2*DLTK2)*T(I))
      S21     =  EXP(-(DLTO1+2*DLTK2)*T(I))
      S12     =  EXP(-(2*DLTO2+DLTK1)*T(I))
      S11     =  EXP(-(DLTO1+DLTK1)*T(I))
C
C     COMPUTE SURVIVABILITY
C
      SURVIV(I)=(COEFA+COEFC+COEFF+COEFL)*(S11-S23)+(COEFN)*(S21-S23)
     * +(COEFB+COEFH)*(S12-S23)+ S23
     * +(COEFD       -COEFG-COEFI       -COEFM-COEFP)*(S22-S23)
   20 CONTINUE
      RETURN
      END
      SUBROUTINE FLTGR(LAMDA,TAU,U,V,H,LEAKGE,T,SURVIV,NT,NR,LA,LF)
      REAL      LAMDA(17),TAU(17),U(5,17),V(5,17),H(5,17),LEAKGE(5,17),
     *          C(5,17),SURVIV(20,26),T(20),DSUR(20,17),CEQFF(4),
     *CEQFA(4),CEQD,SSUR(20,17),RSIH(20,12),S1,TEMP2,TEMP3,S3,S2,LA,LF
      INTEGER  NR(17)
      DO 10 J=1,17
      DO  5 I=1,4
    5 C(I,J) = U(I,J)*V(I,J)*H(I,J)
      I = NR(J) + 1
      CALL SURVT (LAMDA(J),TAU(J),U(1,J),V(1,J),H(1,J),LEAKGE(1,J),
     *            T,DSUR(1,J),I,NT)
   10 CONTINUE
      DO 20 J=1,12
      I = NR(J) - 2
      CALL SURVT (LAMDA(J),TAU(J),U(1,J),V(1,J),H(1,J),LEAKGE(1,J),
     *            T,SSUR(1,J),I,NT)
      I = 1
      CALL SURVT (LAMDA(J),TAU(J),U(1,J),V(1,J),H(1,J),LEAKGE(1,J),
     *            T,RSIH(1,J),I,NT)
   20 CONTINUE
      DO 60  K=1,NT
      CEQD = C(2,13)
      DO 30 I= 1,4
      CEQFF(I) = C(I,1)
      CEQFA(I) = C(I,10)
   30 CONTINUE
      S1=LAMDA(1 )
      TEMP2=EXP(-S1*T(K))
      TEMP3=1-TEMP2
      DO 70 J=2,17
      IF (J.NE.10.AND.J.NE.13) GO TO 65
      IF (J.EQ.10) GO TO 64
      S1=LAMDA(13)
      TEMP2=EXP(-S1*T(K))
      TEMP3=1-TEMP2
      GO TO 65
   64 CONTINUE
      S1=LAMDA(10)
      TEMP2=EXP(-S1*T(K))
      TEMP3=1-TEMP2
   65 C(5,J)=0
      IF (TEMP3.EQ.0) GO TO 70
      C(5,J)=(LAMDA(J)*TEMP3-S1*TEMP2*(1- EXP (-LAMDA(J)*T(K))))/
     *            ((LAMDA(J)+S1)*TEMP3)
   70 CONTINUE
      DO 80 I=14,17
      CEQD    =CEQD    *(1-C(5,I)+C(5,I)*C(2,I))
   80 CONTINUE
      DO 90 J=2,4
      DO 95 I=2,9
      CEQFF(J)=CEQFF(J)*(1-C(5,I)+C(5,I)*C(J,I))
   95 CONTINUE
      DO 97 I=11,12
      CEQFA(J)=CEQFA(J)*(1-C(5,I)+C(5,I)*C(J,I))
   97 CONTINUE
   90 CONTINUE
      S2 = 1
      TEMP2 = 1
      DO 40 I=14,17
      S2    = S2 * SURVIV(K,I)
      TEMP2 = TEMP2*DSUR(K,I)
   40 CONTINUE
      TEMP3 = EXP(-LAMDA(13)*T(K))
      SURVIV(K,24)=TEMP3*TEMP3*S2 + 2*CEQD*TEMP3*(1-TEMP3)*TEMP2
      S3 = 1
      S2 = 1
      S1 = 1
      DO 50 I=3,9
      S3 = S3*SURVIV(K,I)
      S2 = S2*DSUR(K,I)
      S1 = S1*SSUR(K,I)
   50 CONTINUE
      TEMP2 = EXP(-LAMDA(1)*T(K))
      TEMP3 = EXP(-LF*T(K))
      SURVIV(K,25)=TEMP2*TEMP2*TEMP2*S3*(TEMP3*SURVIV(K,2)+CEQFF(4)*
     *  (1-TEMP3)*DSUR(K,2))  +3*CEQFF(3)*TEMP2*TEMP2*(1-TEMP2)*(TEMP3*
     *  DSUR(K,2)+CEQFF(4)*(1-TEMP3)*SSUR(K,2))+ 3*CEQFF(3)*CEQFF(2)*
     *  TEMP2*(1-TEMP2)**2*S1*(2*TEMP3*SSUR(K,2)+CEQFF(4)*(1-TEMP3)*
     *  RSIH(K,2) )
      TEMP2 = EXP(-LAMDA(10)*T(K))
      TEMP3 = EXP(-LA*T(K))
      SURVIV(K,21) = TEMP2*TEMP2*TEMP2*DSUR(K,12)*(TEMP3*SURVIV(K,11)+
     *   3*CEQFA(4)*(1-TEMP3)*DSUR(K,11)) + 3*CEQFA(3)*TEMP2*TEMP2*
     *   DSUR(K,12)*(1-TEMP2)*(TEMP3*DSUR(K,11)+CEQFA(4)*(1-TEMP3)*
     *   SSUR(K,11)) + 3*CEQFA(3)*CEQFA(2)*TEMP2*(1-TEMP2)**2*SSUR(K,12)
     *   *(2*TEMP3 *SSUR(K,11)+CEQFA(4)*(1-TEMP3)*RSIH(K,11))
   60 CONTINUE
      RETURN
      END
      SUBROUTINE SVTPRT(N,LAMDA,TAU,U,V,W,T,SURVIV,NR,LEAKGE,UNITN)
      REAL       U(5,25),V(5,25),W(5,25),LEAKGE(5,25),LAMDA(25),
     * TAU(25),T(20), SURVIV(20,28),FT
      INTEGER N,NR(25),UNITN(28)
C
C    BASELINE RESULTS PRINT ROUTINE
C
      WRITE(06,11)
   11 FORMAT(1H1)
      WRITE(06,12)
   12 FORMAT(1H0,19X,25HCONFIGURATION PARTICULARS)
      WRITE (6,13)
   13 FORMAT(1H0,16X,4HUNIT,19X,9HPERMANENT,22X,9HTRANSIENT)
      WRITE (6,14)
   14 FORMAT(1H ,16X,6HNAME  ,19X,4HRATE,27X,4HRATE)
      WRITE (6,17)
      DO 16 I=1,23
      WRITE (6,15) UNITN(I),LAMDA(I),TAU(I)
   15 FORMAT(1H ,15X,A6,09X,E20.7,11XE20.7)
   16 CONTINUE
   17 FORMAT(1H0)
      WRITE (6,17)
      WRITE (6,18)
   18 FORMAT(1H0,28X,9HSUBSCRIPT,9X,13HDETECTABILITY,5X,
     *  14HDIAGNOSABILITY,5X,14HRECOVERABILITY,8X,7HLEAKAGE)
      WRITE (6,17)
      DO 20 J=1,23
      K = NR(J)
      DO 20 I=2,K
      WRITE(6,19)  UNITN(J),I,U(I,J),V(I,J),W(I,J),LEAKGE(I,J)
   19 FORMAT(1H ,15X,A6,10X,I1,5X,4F19.7)
   20 CONTINUE
      UNITN(2) = 6HMCDS
      IF (N.GE.2) GO TO 50
      WRITE (6,11)
      WRITE (6,37) T(1)
   37 FORMAT(1H0,21X,15HMISSION TIME IS , E14.7,6H HOURS)
      WRITE (6,21)
   21 FORMAT(1H0,23X, 4HUNIT,24X,8HBASELINE,24X, 7HFAILURE)
      WRITE (6,22)
   22 FORMAT(1H ,23X,6HNAME  ,19X,13HSURVIVABILITY,20X,11HPROBABILITY)
      WRITE (6,17)
      DO 31 I=2,28
      FT = 1-SURVIV(1,I)
      WRITE (6,30) UNITN(I),SURVIV(1,I),FT
   30 FORMAT(1H0,21X,A6,18X,F14.7,20X,E14.7)
   31 CONTINUE
      RETURN
   50 DO 60 J=2,28
      WRITE (6,11)
      WRITE (6,17)
      WRITE (6,51) UNITN(J)
   51 FORMAT(1H0,15X,16HSURVIVABILITY FOR ,A6)
      WRITE (6,53)
   53 FORMAT(1H0,19X,7HMISSION,15X,13HCONFIGURATION,14X,7HFAILURE)
```

```
      WRITE (6,54)
   54 FORMAT(1H ,17X,11HTIME(HOURS),13X,13HSURVIVABILITY,12X,
     * 11HPROBABILITY)
      WRITE (6,17)
      DO 60 I=1,N
      FT = 1- SURVIV(I,J)
      WRITE (6,52)   T(I),SURVIV(I,J), FT
   60 CONTINUE
   52 FORMAT(1H ,2F26.6,E26.6)
      RETURN
      END
      SUBROUTINE VATPRT(N,LAMDA,TAU,U,V,W,T,SURVIV,SAFETY,MISSON,NT,
     *     VARPAR,LEAKGE,JS,JF)
      REAL U(5), V(5), W(5), LAMDA, TAU, T(20), SURVIV(20,20)
     *     ,SAFETY(20),MISSON(20),TEMP
     *   ,LEAKGE(5),FT
      INTEGER   N,VARPAR
C
C       PRINT ROUTIN FOR PARAMETER VARIATION
C       WITH TIME AS THE INDEPENDENT VARIABLE
C
      WRITE(06,11)
   11 FORMAT(1H1)
      WRITE(06,12)      VARPAR
   12 FORMAT(1H0,19X,30HCONFIGURATION PARTICULARS FOR ,A6)
      WRITE (6,23)
      WRITE(06,14) LAMDA
   14 FORMAT(1H ,14X,20HPERMANENT FAULT RATE,E20.7)
      WRITE(06,15) TAU
   15 FORMAT(1H ,14X,20HTRANSIENT FAULT RATE,E20.7)
      WRITE(06,16)  (U(I),I=1,N)
   16 FORMAT(1H ,14X,14HDETECTABILITY ,5F14.7)
      WRITE(06,17)  (V(I),I=1,N)
   17 FORMAT(1H ,14X,14HDIAGNOSABILITY,5F14.7)
      WRITE(06,18)  (W(I),I=1,N)
   18 FORMAT(1H ,14X,14HRECOVERABILITY,5F14.7)
      WRITE  (6,27)  (LEAKGE(I),I=1,N)
   27 FORMAT(1H ,14X,7HLEAKAGE,7X,5F14.7)
      WRITE(06,19)
   19 FORMAT(1H0,19X,7HMISSION,15X,13HCONFIGURATION,15X,7HFAILURE )
      WRITE(06,21)
   21 FORMAT(1H ,17X,11HTIME(HOURS),13X,13HSURVIVABILITY,12X,
     * 11HPROBABILITY)
      WRITE(06,23)
   23 FORMAT(1H0)
      DO 60  I=1,NT
      FT  =  1- SURVIV(I,JS)
      WRITE  (6,  52)  T(I),  SURVIV(I,JS),  FT
   60 CONTINUE
   52 FORMAT(1H ,2F26.6,E26.6)
      WRITE  (6,23)
      WRITE  (6,23)
      WRITE  (6,61)
   61 FORMAT(1H0,15X,29HSAFETY CRITICAL SURVIVABILITY )
      WRITE(06,23)
      WRITE(06,19)
      WRITE(06,21)
      WRITE(06,23)
      DO 70  I=1,NT
      TEMP  =  SURVIV(I,  JF)  *  SAFETY(I)
      FT  =  1  -  TEMP
      WRITE  (6,52)    T(I),TEMP,FT
   70 CONTINUE
      WRITE  (6,23)
      WRITE  (6,23)
      WRITE  (6,71)
```

```
71 FORMAT(1H0,15X,30HMISSION CRITICAL SURVIVABILITY )
   WRITE(06,23)
   WPITE(06,19)
   WRITE(06,21)
   WRITE(06,23)
   DO 80 I=1,NT
   TEMP = SURVIV(I, JF) * MISSON(I)
   FT = 1 - TEMP
   WRITE (6,52)   T(I),TEMP,FT
80 CONTINUE
   IF (JF .LT. 24) RETURN
   WRITE (6, 23)
   WRITE (6, 23)
   WRITE (6, 81)
81 FORMAT (1H0,15X,31HOVFRALL PARTITION SURVIVABILITY)
   WRITE (6, 23)
   WRITE (6, 19)
   WRITE (6, 21)
   WRITE (6, 23)
   DO 82  I = 1, NT
   FT = 1.0 - SURVIV(I,JF)
82 WRITE (6, 52) T(I), SURVIV(I, JF), FT
   RETURN
   END
```

```
      SUBROUTINF VAPPRT(T,SURVIV,TVAL,M,VARPAR,SAFETY,MISSON,
     *   HEADER,HEADA,HEADB,HEADC,FCBUS,JF)
      REAL  T(20), SURVIV(20), TVAL, SAFETY, MISSON, FT, TEMP, FCBUS(20)
      INTEGER N,M,HEA)ER,HEADA,HEADB,HEADC,VARPAR
C
C       PRINT ROUTIN FOR PARAMETER VARIATION
C       WITH PARAMETER AS THE INDEPENDENT VARIABLE
C
      WRITE(06,11)
   11 FORMAT(1H1)
      WRITE(06,12) VARPAR
   12 FORMAT(1H0,12X,16HVARYING UNIT IS ,A6)
      WRITE(06,23)
      WRITE(06,20) TVAL
   20 FORMAT(1H0,15X,16HMISSION TIME IS ,E20.7,6H HOURS)
      WRITE(06,23)
      WRITE(06,19) HEADA,HEADB,HEADC
   19 FORMAT(1H0,16X,2A6,A2,14X,13HCONFIGURATION,19X,7HFAILURE)
      WRITE(06,21) HEADER
   21 FORMAT(1H ,20X,A6,10X,13HSURVIVABILITY,17X,11HPROBABILITY)
      WRITE(06,23)
   23 FORMAT(1H0)
      DO 25 I=1,M,1
      FT = 1- SURVIV(I)
  25  WRITE(06,24)  T(I),SURVIV(I),FT
   24 FORMAT(1H ,F26.6,15X,F14.7,15X,E14.7)
      WRITE (6,23)
      WRITE (6,23)
      WRITE (6,61)
   61 FORMAT(1H0,15X,29HSAFETY CRITICAL SURVIVABILITY )
      WRITE(06,23)
      WRITE(06,19) HEADA,HEADB,HEADC
      WRITE(06,21) HEADER
      WRITE(06,23)
      DO 30 I=1,M
      TEMP = SURVIV(I)*SAFETY
      IF (JF .GE. 24) TEMP = FCBUS(I) * SAFETY
      FT = 1 -TEMP
      WRITE (6,24) T(I), TEMP,FT
   30 CONTINUE
      WRITE (6,23)
      WRITE (6,23)
      WRITE (6,71)
   71 FORMAT(1H0,15X,30HMISSION CRITICAL SURVIVABILITY )
      WRITE(06,23)
      WRITE(06,19) HEADA,HEADB,HEADC
      WPITE(06,21) HEADER
      WRITE(06,23)
      DO 40 I=1,M
      TEMP = SURVIV(I)*MISSON
      IF (JF .GE. 24) TEMP = FCBUS(I) * MISSON
      FT = 1 -TEMP
      WRITE (6,24) T(I), TEMP,FT
   40 CONTINUE
      IF (JF .LT. 24) RETURN
```

```
            WRITE (6, 23)
            WRITE (6, 23)
            WRITE (6, 81)
         81 FORMAT (1H0,15X,31HOVERALL PARTITION SURVIVABILITY)
            WRITE (6, 23)
            WRITE (6, 19) HEADA, HEADB, HEADC
            WRITE (6, 21) HEADER
            DO 82  I = 1, N
            FT = 1.0 - FCBUS(I)
         82 WRITE (6, 24) T(I), FCBUS(I), FT
            RETURN
            END
```

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## B.1 SIMULATOR INPUT DECK SETUP

The input deck setup is dependent upon the system configuration. Since it is sometimes necssary to simulate the GPC partition without the FCB partition or vice versa, the simulator allows the combined simulation of both partitions and the separate simulation of either partition. The simulator input deck setup is dependent upon the partitions being simulated.

The first card of the simulator input deck specifies the type of simulation run being made and the seed for the random number generator. SIMTYP specifies the type of simulation. If SIMTYP=1, then the deck setup in Figure B.1-1 is used. The deck setup in Figure B.1-2 is used if SIMTYP=2. SIMTYP is specified in column 10 of the input card. SEED, the random number seed is specified in columns 11-20 of the card. It specifies the initial generative value for the random number generator. Multiple configurations can be simulated in one run. The input deck for each configuration is set up as described below. These input decks are combined into one large deck. A card with -1 in columns 9-10 is placed at the back of the deck to indicate no more configurations are to be simulated.

The input deck consists of several major groups of cards. Group 1 specifies the configuration of the GPC partition, group 2 specified the fault environment for the GPC partition, group 3 specifies the configuration of the FCB partition, and group 4 specifies the failure rates for the FCB partition. Group 2 is specified once for the CPU, once for the IOP, and once for the memory. Group 4 is specified once for permanent faults and once for transient faults. The detailed deck setup for each of these groups of cards are described in Sections B.1.1 through B.1.4.

Figure B.1-1 and Figure B.1-2 show the two possible input deck setups, which are dependent on the parameter SIMTYP. For the simulation that includes the GPC partition (SIMTYP=1), Group 3 and Group 4 will not be included if NMODU, which is specified on card of Group 1, is less than four. The FCB only simulation (SIMTYP=2) has several cards identified by "simulation descriptors." This card specifies the number of missions in columns 1-10 and the number of faults for mission in columns 11-20. As many of these cards can be used as desired, and then the deck is terminated by a card with a -1 in column 9-10.

The deck setup for the baseline configuration is listed in Section B.1.5. It consists of a total of 116 cards. Note that some of the cards are blank. In this case, the parameters that the cards specify are assumed to be zero.

| IDENTIFICATION | DESCRIPTION |
|---|---|
| HEADER | Specifies SIMTYP=1 and sets initial random seed |
| GROUP 1 | GPC configuration description |
| GROUP 3 | FCB Configuration description (only if NMODU=4) |
| GROUP 2 | Failure rates for CPU |
| GROUP 2 | Failure rates for IOP |
| GROUP 2 | Failure rates for memory |
| GROUP 4 | FCB component permanent fault rates (only if NMODU=4) |
| GROUP 4 | FCB component transient fault rates (only if NMODU=4) |

FIGURE B.1-1 DECK SETUP OF SIMTYP=1

| IDENTIFICATION | DESCRIPTION |
|---|---|
| HEADER | Specifies SIMTYP=2 and sets initial random seed |
| GROUP 3 | FCB configuration description |
| GROUP 4 | FCB component permanent fault rates |
| GROUP 4 | FCB component transient fault rates |
| Simulation Descriptor | Mission time and number of faults/mission |
| . | |
| . | |
| . | |
| Simulation Descriptor | Mission time and number of faults/mission |
| -1 | End of simulation descriptors |

FIGURE B.1-2 DECK SETUP FOR SIMTYP=2

## B.1.1 INPUT PARAMETERS - GROUP 1

| CARD 1 | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | NMIS1 | Number of missions to be simulated | INTEGER |
| | 10-20 | IDEBUG | Debugging specification | INTEGER |

NMIS1

If this number is negative, it indicates an end of file to the program and the simulation is aborted. It is better however to use SIMTYP as the end of file indicator. Thus several simulations can be run at once.

IDEBUG

The debugging option was created to deal with specific difficulties met during the programming phase. Currently, if IDEBUG=1, the cause and time of each system failure is printed and the cause and time of the first 50 state transitions is printed. IDEBUG=0 specifies that no debugging is to take place. The user by modifying the program may specify other meanings of IDEBUG.

CARD 2

| | | | |
|---|---|---|---|
| 1-10 | NBOUC | Repetition period | INTEGER |
| 11-20 | RMISTH | Mission duration (Hours) | REAL |

NBOUC

Faults (permanent and transients) are generated prior to simulation and listed sequentially in a fault table (TABLE(300,4)). However, because hundreds of thousands of faults are simulated, it is not feasible to generate all faults at once. On the other hand, it would be quite inefficient to generate them for each mission. NBOUC represents the number of missions for which faults are generated at one time. It should be chosen so that TABLE is efficiently utilized. TABLE contains at most 150 permanents and 150 transients. Thus if the whole system has a transient failure rate of 2400 per million hours, a permanent rate of 2000 per million hours and if the mission is 10 hours long, an average of 120 transients and 100 permanents are generated every 5000 missions. Thus NBOUC might be chosen as 5000. If NBOUC is too large, faults are generated which cannot be stored. A diagnostic is output and the simulation aborts.

RMISTH

The mission time is expressed in hours.

CARD 3

| | | | |
|---|---|---|---|
| 1-10 | NMODU | Number of modules | INTEGER |
| 11-20 | MODSIM | Total number of computers | INTEGER |

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|

NMODU Faults are generated for modules one thru NMODU.
MODULE 1 is the Central Processing Unit (CPU).
MODULE 2 is the Input/Output Processor (IOP).
MODULE 3 is the memory.
MODULE 4 is the Flight Critical Bus Partition (FCB).
Thus if NMODU is 3, faults are generated for only the CPU, IOP, and memory; the FCB would be ignored. If NMODU=4, the whole system is simulated.

MODSIM MODSIM indicates the total number of computers. It must be less than or equal to 5 and greater than zero.

CARD 4

| | | | |
|---|---|---|---|
| 1-10 | NSPA | Number of spare computers | INTEGER |
| 11-20 | CONDIT | Space conditioning time | REAL |

NSPA Number of spare computers (should be 0 if MODSIM <3). The IOPs should be nondedicated to the computers. For the Shuttle simulation NSPA should be set to zero.

CONDIT CONDIT represents the time in milliseconds it takes to condition a spare computer. If NSPA is zero, CONDIT is ignored.

CARD 5

| | | | |
|---|---|---|---|
| 1-10 | NONDED | Dedicated/Nondedicated IOPs | INTEGER |
| 11-20 | NIO | Number of IOPs | INTEGER |

NONDED 1: Dedicated IOPs
2: Nondedicated IOPs
For the Shuttle simulation, NONDED is 1.

NIO Number of IOPs. This parameter is significant only if NONDED is equal to 2.

CARD 6

| | | | |
|---|---|---|---|
| 1-10 | PCOM | Impact of EEM fault on computer only | REAL |
| 11-20 | PBU | Impact of EEM fault on bus only | REAL |

PCOM

PBU These two numbers represent the probability that an IOP fault impacts the computer or the bus but not both. If the IOPs are dedicated (e.g. the Shuttle DPS), the program computers PBUCO (the probability that a fault disables both the bus and computer) as 1-PCOM-PBU. Thus if PBU is zero all faults disable the associated computer. PCOM and PBU are set to zero by the program if the IOPs are nondedicated, which assumes that the computers and IOPs are fault independent.

CARD 7

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|
| 1-10 | IROLLA | Rollahead indicator | INTEGER |
| 11-20 | RECOV | Rollahead recovery duration | REAL |
| 21-30 | MININT | Rollahead recurrence interval | REAL |
| 31-40 | RACPU | Rollahead effectiveness | REAL |

IROLLA

1: Rollahead is the recovery procedure in multiplex operation
0: No rollahead.

RECOV

RECOV represents the time in milliseconds required to complete state vector transfer and continue normal operation.

MININT

Specifies a time interval in milliseconds. If a fault occurs after a rollahead and before this time interval has elapsed it is in the same location as the previous fault. It is assumed to be a reoccurrence of the previous fault. The fault is thus assumed to be permanent, and a new rollahead is not initiated.

Probability that a transient fault, which does not cause program memory damage, is recovered from because of a rollahead, without any degradation. RACPU is normally unity assuming that all necessary information is included in the state vector transfer operation.

CARD 8

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|
| 1-10 | IDLYRC | Delay reconfiguration | INTEGER |
| 11-20 | RCDUR | Recovery duration | REAL |
| 21-30 | RCCINT | Recurrence interval | REAL |
| 31-40 | DLYCPU | Effectiveness | REAL |

IDLYRC

1: This recovery technique is used instead of rollahead/rollback.
0: This recovery technique is not used.
The recovery action is delayed until the second detection of a fault. Thus transients, that do not result in any permanent damage to data or programs, do not cause system degradation.

RCDUR

RCDUR is the time in milliseconds required for this recovery procedure. It thus represents the overhead caused by the occurrence of a fault.

RCCINT RCCINT is the duration in milliseconds for which another detection of a fault in a computer will cause a system degradation. For example, if it is known that most transient faults should become inactive within two minor cycles and the minor cycle duration is 40 milliseconds, RCCINT would be 80 milliseconds.

DLYCPU The probability that a transient fault which does not cause program memory damage is corrected by this recovery procedure.

CARD 9

| | | | |
|---|---|---|---|
| 1-10 | IROLLB | Rollback indicator | INTEGER |
| 11-20 | MAXRLB | Maximum number of consecutive rollbacks | INTEGER |
| 21-30 | RBCPU | Rollback effectiveness | REAL |

IROLLB 0: No rollback.
1: Rollback. Rollback is a transient recovery procedure in which the occurrence of a fault causes the program segment in which it occurred to be re-executed. Suppose a transient fault occurs during the execution of a program and corrupts a calculation which is detected at a comparison point. The computer would then "rollback" to the previous comparison point, using the old data, and re-execute the program segment in which the fault occurred. If the fault was a transient and has disappeared then the program segment will execute properly and system operation will continue without degradation. In order to keep sync, all computers must "rollback", even the ones in which no fault occurred. The rollback duration is assumed to be equal to the inter-comparison time. If rollahead is specified, rollback is used only in duplex and simplex. If IDLYRC is one, rollahead and rollback are not used.

MAXRLB MAXRLB specifies the maximum allowed number of consecutive rollbacks. Thus if the first rollback does not succeed the computer rollbacks again if MAXRLB is greater than one.

RBCPU RBCPU is the probability that because of a rollback, a transient fault will not result in any system degradation.

CARD 10

| | | | |
|---|---|---|---|
| 1-10 | IDESCR | Memory copy indicator | INTEGER |
| 11-20 | DURMC | Memory copy duration | REAL |
| 21-30 | RMC | Memory copy recurrence interval | REAL |
| 31-40 | PSMC | Memory copy effectiveness | REAL |

IDESCR

0: No memory copy
1: Memory copy
Memory copy is used as a secondary transient recovery procedure in multiplex computer operation if the primary recovery procedure fails. The memory of the working computer is transferred to that of the "faulty" computer. Ideally this would be done on a low-priority cycle-stealing basis by ROM BCE-programs residing in the IOPs and would not significantly affect computer performance. Upon completion of the memory copy, the state vector of a working computer would be DMA-burst transferred to the faulty computers, and all computers would continue in step. Memory transients usually result in memory damage because the memory is core destructive-read-out. Thus if a transient in a memory sense-amp results in faulty data, this faulty data is written back into memory on the write-cycle. Usually this type of fault is not corrected by other recovery procedures, but is corrected by memory copy.

DURMC

DURMC is the time in milliseconds between memory copy initiation and memory copy completion. For example, if on the average one word is transferred per millisecond, then DURMC would be 65536 milliseconds for a 64K memory (slightly more than one minute). DURMC is specified in milliseconds.

RMC

RMC is the memory copy recurrence interval in milliseconds. If a fault occurs within RMC milliseconds in a computer after recovery by memory copy in the previously faulty computer, it is assumed to be a re-detection of an earlier fault and system degradation occurs.

PSMC

PSMC is the probability that a memory copy succeeds in correcting a transient fault, so the fault doesn't result in system degradation.

CARD 11

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|
| 1-10 | ISTART | System restart indicator | INTEGER |
| 11-20 | DURRES | Duration of system restart | REAL |

ISTART

0: No system restart.
1: System restart.
System restart is invoked upon the occurrence of faults in all computers, or in all computers except one. In this case, the system is re-initialized and the program memories are verified before normal operation continues. If the system restart lasts too long, the system fails.

DURRES

DURRES represents the duration in milliseconds of a system restart.

| CARD 12 | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | DELAY | Delay before transient recovery | REAL |
| | 11-20 | TC | Time between | REAL |

DELAY

In order that transient faults may become inactive before transient recovery takes place, it is sometimes adviseable to delay the recovery several milliseconds. DELAY is the time in milliseconds transient recovery is delayed after detection of a fault.

TC

TC is the time between inter-computer comparisons expressed in milliseconds.

CARD 13

| | | | | |
|---|---|---|---|---|
| | 1-10 | DIAGN | Average self-test duration | REAL |
| | 11-20 | DETMAX | Self-test efficacy | REAL |
| | 21-30 | TW2 | Isolation duration | REAL |

DIAGN

The self test program is a software routine that is run to determine if the computer is faulty. The time required to diagnose a computer as faulty varies depending on the location of the fault. IDAGN represents the average time (in milliseconds) required to detect the fault.

DETMAX

DETMAX is the probability of detecting a fault by means of the STP program.

TW2

TW2 is the time in milliseconds required for isolating a faulty computer when the system degrades from duplex to simplex.

CARD 14

| | | | | |
|---|---|---|---|---|
| | 1-10 | PDET | CPU fault detection probability | REAL |
| | 11-20 | PDM | Memory fault detection probability | REAL |
| | 21-30 | PDETIO | IOP fault detection probability | REAL |

PDET, PDM
PDETIO

These parameters represent the probability of detecting a fault in the respective units by means of BITE. (The built-in test equipment.)

CARD 15

| | | | | |
|---|---|---|---|---|
| | 1-10 | RTI | Iteration period | REAL |
| | 11-20 | MINCY | Minor cycle duration | REAL |
| | 21-30 | MACY | Number of minor cycles/major cycle | INTEGER |
| | 31-40 | DOWMAX | Maximum downtime | REAL |

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|

RTI RTI is the iteration period in milliseconds for the control loop calculations.

MINCY MINCY is the minor cycle duration in milliseconds. For example, for the Shuttle, MINCY is 40 milliseconds.

MACY MACY is the number of minor cycles per major cycle.

DOWMAX DOWMAX is the maximum allowable down time in milliseconds before a safety-critical failure occurs.

CARD 16

| | | | |
|---|---|---|---|
| 1-10 | PROMM | Relative size of minor cycle program | REAL |
| 11-20 | PSUC | Program survivability | REAL |

PROMM PROMM is the quotient size of minor cycle program over the total number of memory words. It is used for estimating the time required for detection of a fault.

PSUC PSUC represents the probability that the program survives when a memory fault occurs.

CARD 17

| | | | |
|---|---|---|---|
| 1-10 | ISYNC | Synchronous/asynchronous executive | INTEGER |
| 11-20 | RATINT | Interrupt rate | REAL |

ISYNC 0: Asynchronous scheduling
1: Synchronous scheduling

RATINT RATINT is the average number of interrupts that occur per second.

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## B.1.2 INPUT PARAMETERS - GROUP 2

| CARD 1 | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1 | DPER | Permanent distribution type | INTEGER |
| | 2 | DTRA | Transient distribution type | INTEGER |
| | 3 | DDUR | Duration distribution type | INTEGER |

DPER(I) "1" Specifies that permanent faults have an exponential interarrival time. (No other distributions are implemented).

DTRA(I) "1" Specifies that transient faults have an exponential interarrival time.
"2" Specifies that transient faults have a BURST distribution.

DDUR(I) "1" The duration of transient faults in Module-I is uniformly distributed.
"2" The duration is exponentially distributed.

CARD 2

| | | | | |
|---|---|---|---|---|
| | 1-10 | RLAMDP(I) | Permanent failure | REAL |

RLAMDP(I) This parameter is the permanent failure rate per million hours for MODULE-I.

CARD 2.1

| | | | | |
|---|---|---|---|---|
| (Only if NSPA≠0) | 1-10 | RMUP(I) | Spare dormant failure rate | REAL |

RMUP(I) This parameter specifies the dormant failure rate per hour of a spare computer. This card must be excluded from the input deck if NSPA=0.

CARD 3

| | | | | |
|---|---|---|---|---|
| If DTRA(I) =1 | 1-10 | RLAMBDT(I) | Transient failure rate | REAL |
| If DTRA(I) =2 | 1-10 | RLAMB(I) | Burst rate | REAL |
| | 11-20 | DURA(I) | Average duration of a burst | REAL |
| | 21-30 | BURST(I) | Transient fault rate during burst | REAL |

The format of this card is dependent upon the value of DTRA(I). If DTRA(I)=1, then RLAMBDT is specified. If DTRA(I)=2, then RLAMB(I), DURA(I), and BURST(I) are specified.

|  | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| RLAMDT(I) |  |  | The transient failure occurrence rate in faults per million hours. |  |
| RLAMB(I) |  |  | The transient burst rate in burst/million hours. |  |
| DURA(I) |  |  | The average duration of a transient burst in seconds. |  |
| BURST(I) |  |  | The transient fault rate during a burst. This is specified in faults/second. |  |
| CARD 4 |  |  |  |  |
| If DDUR(I) =1 | 1-10 | RMINI(I) | Minimum transient duration | REAL |
|  | 11-20 | RMAXI(I) | Minimum transient duration | REAL |
| If DDUR(I) =2 | 1-10 | AVDUR(I) | Average transient duration | REAL |
| RMINI(I) |  |  | RMINI(I) and RMAXI(I) are specified if the transient duration is modeled as being uniformally distributed. They represent the minimum and maximum durations in milliseconds of transient faults. |  |
| AVDUR(I) |  |  | AVDUR(I) is specified only if the transient duration is modeled as being exponentially distributed. In this case AVDUR(I) represents the average transient duration in milliseconds. |  |

## B.1.3 INPUT PARAMETERS - GROUP 3

| CARD 1 | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | NBTU | Number of bus terminal units | INTEGER |

NBTU

This parameter specifies the number of devices interfaced directly with the flight critical buses. For the current simulator implementation it should be specified as "10."

CARDS 2-9

| | | | | |
|---|---|---|---|---|
| I=1-8 | 1-2 | FCB(I,1) | Interface between bus -I and DDU-1 | INTEGER |
| | 3-4 | FCB(I,2) | Interface between bus -I and DDU-2 | INTEGER |
| | 5-6 | FCB(I,3) | Interface between bus -I and MDM FF-1 | INTEGER |
| | 7-8 | FCB(I,4) | Interface between bus -I and MDM FF-2 | INTEGER |
| | 9-10 | FCB(I,5) | Interface between bus -I and MDM FF-3 | INTEGER |
| | 11-12 | FCB(I,6) | Interface between bus -I and MDM FF-4 | INTEGER |
| | 13-14 | FCB(I,7) | Interface between bus -I and MDM FA-1 | INTEGER |
| | 15-16 | FCB(I,8) | Interface between bus -I and MDM FA-2 | INTEGER |
| | 17-18 | FCB(I,9) | Interface between bus -I and MDM FA-3 | INTEGER |
| | 19-20 | FCB(I,10) | Interface between bus -I and MDM FA-4 | INTEGER |

FCB

FCB is a matrix that describes the interface between the flight critical buses and the bus terminal units (MDMs and DDUs). A matrix element is defined by:

$$FCB(I,J) = \begin{cases} 0 \text{ if BUS-I is not interfaced with BTU-J} \\ 1 \text{ if BUS-I and BTU-J have an active interface} \\ 2 \text{ if BUS-I and BTU-J have a "secondary" interface} \end{cases}$$

An interface is considered to be active if the bus is connected to the BTU's primary port. An interface is.secondary if the bus is connected to the BTU's backup port. Eight cards are needed to specify the FCB matrix. The interface for bus -I is defined on card I+1.

CARD 10

| | | | |
|---|---|---|---|
| 1-2 | BTUTYP(1) | BTU -1 identifier =1 | INTEGER |
| 3-4 | BTUTYP(2) | BTU -2 identifier =1 | INTEGER |
| 5-6 | BTUTYP(3) | BTU -3 identifier =2 | INTEGER |
| 7-8 | BTUTYP(4) | BTU -4 identifier =2 | INTEGER |
| 9-10 | BTUTYP(5) | BTU -5 identifier =2 | INTEGER |
| 11-12 | BTUTYP(6) | BTU -6 identifier =2 | INTEGER |
| 13-14 | BTUTYP(7) | BTU -7 identifier =3 | INTEGER |
| 15-16 | BTUTYP(8) | BTU -8 identifier =3 | INTEGER |
| 17-18 | BTUTYP(9) | BTU -9 identifier =3 | INTEGER |
| 19-20 | BTUTYP(10) | BTU -10 identifier =3 | INTEGER |

| | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|

BTUTYP

BTUTYP is a vector that specifies whether a bus terminal unit is a DDU, a FF MDM, or a FA MDM.

$$\mathrm{BTUTYP(I)} = \begin{cases} 0 \text{ - BTU I is a DDU} \\ 1 \text{ - BTU I is a FF-MDM} \\ 2 \text{ - BTU I is a FA-MDM} \end{cases}$$

The nominal values of BTUTYP for the baseline configuration are listed along with each element description.

CARD 11

| | | | | |
|---|---|---|---|---|
| | 1-10 | NDDUDV | Number of DDU devices | INTEGER |

NDDUDV

NDDUDV is the number of devices interfaced to the GPCs by means of the DDUs. The maximum value of NDDUDV is 4.

CARDS 12-13

| | | | | |
|---|---|---|---|---|
| I=1,2 | 1-2 | DDUDV(I,1) | DDU -I device 1 interface | INTEGER |
| | 3-4 | DDUDV(I,2) | DDU -I device 2 interface | INTEGER |
| | 5-6 | DDUDV(I,3) | DDU -I device 3 interface | INTEGER |
| | 7-8 | DDUDV(I,4) | DDU -I device 4 interface | INTEGER |

DDUDV

This matrix specifies which devices are connected to the dedicated display units.

$$\mathrm{DDUDV(I,J)} = \begin{cases} 0 \text{ - DDU -I does not control device of type -J} \\ 1 \text{ - DDU -I does control device of type -J} \end{cases}$$

Two cards are required to specify DDUDV.

CARD 14

| | | | | |
|---|---|---|---|---|
| | 1-10 | NDFFDV | Number of dedicated FF-MDM devices | INTEGER |

NDFFDV

This parameter indicates the number of distinct devices dedicated to at least one of the FF MDMs. Should be less than 7.

CARDS 15-18

| | | | | |
|---|---|---|---|---|
| I=1,4 | 1-2 | DFFDV(I,1) | FF MDM I - dedicated device -1 interface | INTEGER |
| | 3-4 | DFFDV(I,2) | FF MDM I - dedicated device 2 interface | INTEGER |
| | 5-6 | DFFDV(I,3) | FF MDM I - dedicated device 3 interface | INTEGER |

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|
| 7-8 | DFFDV(I,4) | FF MDM I - dedicated device 4 interface | INTEGER+ |
| 9-10 | DFFDV(I,5) | FF MDM I - dedicated device 5 interface | INTEGER |
| 11-12 | DFFDV(I,6) | FF MDM I - dedicated device 6 interface | INTEGER |

DFFDV This array specifies the devices that are dedicated to the flight forward MDMs. Each element of the array can take on a value of zero or one (see above description of DDUDV). Four cards are required to specify DFFDV. The devices interfaced with MDM FF-I are specified on card 14+I.

CARD 19

| | | | |
|---|---|---|---|
| 1-10 | NNFADV | Number of non-dedicated FF MDM devices | INTEGER |

NNFADV This specifies the number of non-dedicated devices interfaced with the FF MDMs. A maximum value of 4 can be specified. For the baseline system there are four devices.

CARD 20

| | | | |
|---|---|---|---|
| 1-2 | NFFDVS(1) | Number of type 1 devices | INTEGER |
| 3-4 | NFFDVS(2) | Number of type 2 devices | INTEGER |
| 5-6 | NFFDVS(3) | Number of type 3 devices | INTEGER |
| 7-8 | NFFDVS(4) | Number of type 4 devices | INTEGER |

NFFADVS The non-dedicated devices are assumed to be interfaced with MDMs FF1 - FF3. NFFDVS(I) indicates the number of redundant FF-MDM devices of type -I.

CARD 21

| | | | |
|---|---|---|---|
| 1-10 | NDFADV | Number of FA MDM devices | INTEGER |

NDFADV NDFADV is the number of devices connected to each of the flight aft MDMs. A maximum of three devices can be connected to the FA-MDMs. The baseline configuration uses two.

CARDS 22-25

| | | | |
|---|---|---|---|
| 1-2 | DFADV(I,1) | MDM FA-I, device 1 connection | INTEGER |
| 3-4 | DFADV(I,2) | MDM FA-I, device 2 connection | INTEGER |
| 5-6 | DFADV(I,3) | MDM FA-I, device 3 connection | INTEGER |

| | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|

DFADV — DFADV specifies the interconnections and redundancy of the flight critical devices interfaced to the FA MDM equipment buses. Four cards are required to specify DFADV; the devices interfaced with MDM FA -Is equipment bus is specified on card 21+I.

CARD 26

| | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | BUSNM(1) | "FC - BUS 1" | CHAR* |
| | 11-20 | BUSNM(2) | "FC - BUS 2" | CHAR |
| | 21-30 | BUSNM(3) | "FC - BUS 3" | CHAR |
| | 31-40 | BUSNM(4) | "FC - BUS 4" | CHAR |
| | 41-50 | BUSNM(5) | "FC - BUS 5" | CHAR |
| | 51-60 | BUSNM(6) | "FC - BUS 6" | CHAR |
| | 61-70 | BUSNM(7) | "FC - BUS 7" | CHAR |
| | 71-80 | BUSNM(8) | "FC - BUS 8" | CHAR |

BUSNM — BUSNM is a vector of names which are listed on printouts to identify the main bus parameters and data. For the Shuttle simulator BUSNM should be set to the names listed in the parameter description area. This parameter affects only the simulator listing.

CARD 27

| | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | MDDUNM(1) | "DDU 1" | CHAR |
| | 11-20 | MDDUNM(2) | "DDU 2" | CHAR |

MDDUNM — MDDUNM contains names for the first two BTUs. They are used to identify the DDUs on the output listing.

CARD 28

| | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | MFFNM(1) | "MDM FF-1" | CHAR |
| | 11-20 | MFFNM(2) | "MDM FF-2" | CHAR |
| | 21-30 | MFFNM(3) | "MDM FF-3" | CHAR |
| | 31-40 | MFFNM(4) | "MDM FF-4" | CHAR |

MFFNM — MFFNM contains names for identifying the flight forward MDMs on the simulator listing.

CARD 29

| | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | MFANM(1) | "MDM FA-1" | CHAR |
| | 11-20 | MFANM(2) | "MDM FA-2" | CHAR |
| | 21-30 | MFANM(3) | "MDM FA-3" | CHAR |
| | 31-40 | MFANM(4) | "MDM FA-4" | CHAR |

*CHAR is short for character.

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|

NFANM This card specifies the names, to be printed on simulator listings, for the flight aft MDMs.

CARD 30

| | | | |
|---|---|---|---|
| 1-10 | DDUNM(1) | "AVVI" | CHAR |
| 11-20 | DDUNM(2) | "AMI" | CHAR |
| 21-30 | DDUNM(3) | "HSI" | CHAR |
| 31-40 | DDUNM(4) | "ADI" | CHAR |

DDUNM DDUNM is a vector of 10 character names used to identify the devices interfaced with the DDUs on simulator output listings. The parameter description above give the names used for the baseline configuration.

CARD 31

| | | | |
|---|---|---|---|
| 1-10 | DFFNM(1) | "ADTA" | CHAR |
| 11-20 | DFFNM(2) | "ACCEL" | CHAR |
| 21-30 | DFFNM(3) | "IMU" | CHAR |
| 31-40 | DFFNM(4) | "TACAN" | CHAR |
| 41-50 | DFFNM(5) | "MSBLS" | CHAR |
| 51-60 | DFFNM(6) | "RALT" | CHAR |

DFFNM DFFNM contains the identification names for the FF-MDM dedicated devices. They are used for simulator listings.

CARD 32

| | | | |
|---|---|---|---|
| 1-10 | NFFNM(1) | "MTU" | CHAR |
| 11-20 | NFFNM(2) | "RHC" | CHAR |
| 21-30 | NFFNM(3) | "RPTA" | CHAR |
| 31-40 | NFFNM(4) | "SBTC" | CHAR |

NFFNM NFFNM contains the identifications for the non-dedicated FF-MDM devices.

CARD 33

| | | | |
|---|---|---|---|
| 1-10 | DFANM(1) | "ASA" | CHAR |
| 11-20 | DFANM(2) | "RGYRO" | CHAR |

DFANM This card specifies names for identifying the devices connected to the FA-MDMs.

| CARD 34 | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | BUSTFL | Bus transient fault leakage | REAL |
| | 11-20 | BUSCOV | Bus coverage | REAL |

BUSTFL The bus transient fault leakage represents the probability that a transient fault on the bus causes unnecessary bus removal.

BUSCOV The bus coverage is the probability that a bus fault will not result in a system failure.

CARDS 35-44

| | | | |
|---|---|---|---|
| 1-10 | BTUTFL(J,1) | Transient leakage for BTU port | REAL |
| 11-20 | BTUTFL(J,2) | Transient leakage for BTU | REAL |
| 21-30 | BTUCOV(J,1) | Coverage of BTU port fault | REAL |
| 31-40 | BTUCOV(J,2) | Coverage of fault in whole BTU | REAL |

BTUTFL BTUTFL is a matrix of the transient fault leakages for the DDUs and MDMs. BTUTFL(J,1) is the probability that a transient fault causes system degradation given that it occurs in the redundant portion of BTU-J. BTUTFL(J,2) the transient leakage for the non redundant portion of BTU-J.

BTUCOV BTUCOV is a matrix of fault coverages. The first column of BTUCOV contains coverages for failures in the redundant part of an MDM or DDU (i.e. the MIA, A/D, SCI, etc.). The second column specifies the coverages for the non redundant part of a BTU. Ten cards are required to specify the leakages and coverages for all the BTUs. BTU J is specified by card 84+J.

CARD 45

| | | | |
|---|---|---|---|
| 1-10 | DDUTFL(1) | Transient fault leakage for AVVI | REAL |
| 11-20 | DDUTFL(2) | Transient fault leakage for AMI | REAL |
| 21-30 | DDUTFL(3) | Transient fault leakage for HSI | REAL |
| 31-40 | DDUTFL(4) | Transient fault leakage for ADI | REAL |

DDUTFL(I) This parameter specifies the transient fault leakage for device -I of a DDU. It should be a number between zero and one.

CARD 46

| | | | |
|---|---|---|---|
| 1-10 | DDUCOV(1) | Coverage for fault in AVVI | REAL |
| 11-20 | DDUCOV(2) | Coverage for fault in AMI | REAL |
| 21-30 | DDUCOV(3) | Coverage for fault in HSI | REAL |
| 31-40 | DDUCOV(4) | Coverage for fault in ADI | REAL |

DDUCOV DDUCOV(I) is the coverage for faults occurring in DDU device -I. The coverage represents the probability that if a fault occurs in a DDU device and its redundant counterpart if working, then the system will recover.

CARDS 47-48

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|
| 1-10 | DDUTFD(I,1) | AVVI transient fault detectability | REAL |
| 11-20 | DDUTFD(I,2) | AMI transient fault detectability | REAL |
| 21-30 | DDUTFD(I,3) | HSI transient fault detectability | REAL |
| 31-40 | DDUTFD(I,4) | ADI transient fault detectability | REAL |

DDUTFD The transient fault detectability is defined as the probability that a transient fault is detected given that it occurs. Two cards are required. The first card specifies the transient detectability of a DDU device not having a redundant counterpart (i.e. its redundant counterpart has failed). The second card specifies the transient fault detectability for a device having one redundant counterpart.

CARD 49

| | | | |
|---|---|---|---|
| 1-10 | DFFTFL(1) | ADTA transient fault leakage | REAL |
| 11-20 | DFFTFL(2) | ACCEL transient fault leakage | REAL |
| 21-30 | DFFTFL(3) | IMU transient fault leakage | REAL |
| 31-40 | DFFTFL(4) | TACAN transient fault leakage | REAL |
| 41-50 | DFFTFL(5) | MSBLS transient fault leakage | REAL |
| 51-60 | DFFTFL(6) | RALT transient fault leakage | REAL |

DFFTFL This parameter specifies the transient fault leakages for each of the FF-MDM dedicated devices.

CARDS 50-52

| | | | |
|---|---|---|---|
| 1-10 | DFFCOV(1,J) | ADTA fault coverage | REAL |
| 11-20 | DFFCOV(2,J) | ACCEL fault coverage | REAL |
| 21-30 | DFFCOV(3,J) | IMU fault coverage | REAL |
| 31-40 | DFFCOV(4,J) | TACAN fault coverage | REAL |
| 41-50 | DFFCOV(5,J) | MSBLS fault coverage | REAL |
| 51-60 | DFFCOV(6,J) | RALT fault coverage | REAL |

DFFCOV This parameter specifies the permanent fault coverages for the dedicated FF-MDM devices at each of their possible redundancy levels. Three cards are required to specify DFFCOV. Card 50 lists the coverages for a fault occurring when there are two devices; Card 51 lists the coverages when there are three redundant devices; and Card 52 lists the coverages when there are four redundant devices.

| COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|

CARDS 53-56

| | | | |
|---|---|---|---|
| 1-10 | DFFTFD(1,J) | ADTA transient fault detectability | REAL |
| 11-20 | DFFTFD(2,J) | ACCEL transient fault detectability | REAL |
| 21-30 | DFFTFD(3,J) | IMU transient fault detectability | REAL |
| 31-40 | DFFTFD(4,J) | TACAN transient fault detectability | REAL |
| 41-50 | DFFTFD(5,J) | MSBLS transient fault detectability | REAL |
| 51-60 | DFFTFD(6,J) | RALT transient fault detectability | REAL |

DFFTFD

This parameter lists the transient fault detection probabilities for faults occurring in the dedicated devices. Four cards are required to specify the DFFTFD array. Card 53 specifies the transient fault detectability for a device having no redundant counterparts left. Card 54, Card 55 and Card 56 specify the transient fault detectionwhen there are one, two or three redundant counterparts to the device left.

CARDS 57-58

| | | | |
|---|---|---|---|
| 1-10 | NFFTFL(1,J) | MTU transient fault leakage | REAL |
| 11-20 | NFFTFL(2,J) | RMC transient fault leakage | REAL |
| 21-30 | NFFTFL(3,J) | RPTA transient fault leakage | REAL |
| 31-40 | NFFTFL(4,J) | SBTC transient fault leakage | REAL |

NFFTFL

Card 57 specifies the transient fault leakages for a transient fault affecting the whole unit. Card 58 specifies the transient fault leakages for transient faults affecting the redundant portion of the non-dedicated FF-MDM devices.

CARDS 59-60

| | | | |
|---|---|---|---|
| 1-10 | NFFTFD(1,J) | Transient fault detection for MTU | REAL |
| 11-20 | NFFTFD(2,J) | Transient fault detection for RMC | REAL |
| 21-30 | NFFTFD(3,J) | Transient fault detection for RPTA | REAL |
| 31-40 | NFFTFD(4,J) | Transient fault detection for SBTC | REAL |

NFFTFD

Card 59 specifies the transient fault detection probability for faults affecting the whole unit. Card 60 specifies the transient fault detection probability for faults affecting the redundant part of each unit.

CARD 61

| | | | |
|---|---|---|---|
| 1-10 | NFFPFD(1) | Permanent fault detectability for MTU | REAL |
| 11-20 | NFFPFD(2) | Permanent fault detectability for RMC | REAL |
| 21-30 | NFFPFD(3) | Permanent fault detectability for RPTA | REAL |
| 31-40 | NFFPFD(4) | Permanent fault detectability for SBTC | REAL |

NFFPFD

This card specifies the permanent fault detection probability for faults affecting the entire device.

| CARD 62 | COLUMN | PARAMETER NAME | PARAMETER DESCRIPTION | DATA TYPE |
|---|---|---|---|---|
| | 1-10 | NFFCOV(1) | MTU fault coverage | REAL |
| | 11-20 | NFFCOV(2) | RMC fault coverage | REAL |
| | 21-30 | NFFCOV(3) | RPTA fault coverage | REAL |
| | 31-40 | NFFCOV(4) | SBTC fault coverage | REAL |

NFFCOV This card specifies the permanent fault coverage for each of the non-dedicated devices interfaced with the FF-MDMs.

CARD 63

| | | | | |
|---|---|---|---|---|
| | 1-10 | DFATFL(1) | ASA transient fault leakage | REAL |
| | 11-20 | DFATFL(2) | RGYRO transient fault leakage | REAL |

DFATFL This card specifies the transient fault leakages for the devices interfaced to the FA-MDMs.

CARD 64

| | | | | |
|---|---|---|---|---|
| | 1-10 | DFATFD(1) | ASA transient detectability | REAL |
| | 11-20 | DFATFD(2) | RGYRO transient detectability | REAL |

DFATFD DFATFD(1) and DFATFD(2) are the transient fault detection probabilities for the ASA and the RGYRO, respectively.

CARD 65

| | | | | |
|---|---|---|---|---|
| | 1-10 | DFACOV(1) | ASA fault coverage | REAL |
| | 11-20 | DFACOV(2) | RGYRO fault coverage | REAL |

DFACOV This card specifies the fault isolation-recovery coverages for faults occurring in the devices linked to the flight.

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### B.1.4 INPUT PARAMETERS - GROUP 4

This section describes the input deck for the flight critical bus partition failure rates. The units for all failure rates in this section is faults per million hours. All inputs are real F10.0 format. The same card set-up is used for both permanent and transient failure rates.

| CARD 1 | COLUMN | PARAMETER DESCRIPTION |
|---|---|---|
| | 1-10 | Flight critical bus -1 failure rate |
| | 11-20 | Flight critical bus -2 failure rate |
| | 21-30 | Flight critical bus -3 failure rate |
| | 31-40 | Flight critical bus -4 failure rate |
| | 41-50 | Flight critical bus -5 failure rate |
| | 51-60 | Flight critical bus -6 failure rate |
| | 61-70 | Flight critical bus -7 failure rate |
| | 71-80 | Flight critical bus -8 failure rate |
| CARD 2 | | |
| | 1-10 | DDU -1 failure rate (whole unit) |
| | 11-20 | DDU -2 failure rate (whole unit) |
| CARD 3 | | |
| | 1-10 | DDU -1 failure rate (redundant portion) |
| | 11-20 | DDU -2 failure rate (redundant portion) |
| CARD 4 | | |
| | 1-10 | MDM FF-1 failure rate (whole unit) |
| | 11-20 | MDM FF-2 failure rate (whole unit) |
| | 21-30 | MDM FF-3 failure rate (whole unit) |
| | 31-40 | MDM FF-4 failure rate (whole unit) |
| CARD 5 | | |
| | 1-10 | MDM FA-1 failure rate (redundant portion) |
| | 11-20 | MDM FA-2 failure rate (redundant portion) |
| | 21-30 | MDM FA-3 failure rate (redundant portion) |
| | 31-40 | MDM FA-4 failure rate (redundant portion) |
| CARD 6 | | |
| | 1-10 | MDM FA-1 failure rate (whole unit) |
| | 11-20 | MDM FA-2 failure rate (whole unit) |
| | 21-30 | MDM FA-3 failure rate (whole unit) |
| | 31-40 | MDM FA-4 failure rate (whole unit) |

| CARD 7 | COLUMN | PARAMETER DESCRIPTION |
|---|---|---|
| | 1-10 | MDM FA-1 failure rate (redundant portion) |
| | 11-20 | MDM FA-2 failure rate (redundant portion) |
| | 21-30 | MDM FA-3 failure rate (redundant portion) |
| | 31-40 | MDM FA-4 failure rate (redundant portion) |
| CARD 8 | | |
| | 1-10 | AVVI failure rate |
| | 11-20 | AMI failure rate |
| | 21-30 | HSI failure rate |
| | 31-40 | ADI failure rate |
| CARD 9 | | |
| | 1-10 | ADTA failure rate |
| | 11-20 | ACCEL failure rate |
| | 21-30 | IMU failure rate |
| | 31-40 | TACAN failure rate |
| | 41-50 | MSBLS failure rate |
| | 51-60 | RALT failure rate |
| CARD 10 | | |
| | 1-10 | MTU failure rate (whole unit) |
| | 11-20 | RMC failure rate (whole unit) |
| | 21-30 | RPTA failure rate (whole unit) |
| | 31-40 | SBTC failure rate (whole unit) |
| CARD 11 | | |
| | 1-10 | MTU failure rate (redundant portion) |
| | 11-20 | RMC failure rate (redundant portion) |
| | 21-30 | RPTA failure rate (redundant portion) |
| | 31-40 | SBTC failure rate (redundant portion) |
| CARD 12 | | |
| | 1-10 | ASA failure rate |
| | 11-20 | RGYRO failure rate |

```
         1111111111?222222222233333333334444444444555555555566666666667777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890 ←— Card Column Numbers

         1    314159
    500000
      1000         6
         4         4
         0
         1
       1.0       0.0
         0
         1       1.0      1280        .5
         0         0
         0
         1      1000
         0        40
       6.5      .919       0.0
      .458      .981
        40        40        32      1000        .5
        .5        .1
         0       100
        10
 1 1 1 0 0 0 0 0 0 0
 1 1 0 1 0 0 0 0 0 0
 1 0 0 0 1 0 0 0 0 0
 0 1 0 0 0 1 0 0 0 0
 0 0 2 0 0 0 1 0 0 0
 0 0 0 2 0 0 0 1 0 0
 0 0 0 0 2 0 0 0 1 0
 0 0 0 0 0 2 0 0 0 1
 1 1 2 2 2 2 3 3 3 3
         4
 1 1 1 1
 1 1 1 1
         5
 1 1 1 1 1 1
 1 1 1 1 1 1
 1 1 1 1 1 0
 1 0 0 0 0 0
         4
 1 2 2 2
         2
 1 1
 1 1
 1 1
 1 0
FC-BUS 1  FC-BUS 2  FC-BUS 3  FC-BUS 4  FC-BUS 5  FC-BUS 6  FC-BUS 7  FC-BUS 8
   DDU 1     DDU 2
 MDM FF-1  MDM FF-2  MDM FF-3  MDM FF-4
 MDM FA-1  MDM FA-2  MDM FA-3  MDM FA-4
AVVI      AMI       HSI       ADI
ADTA      ACCEL     IMU       TACAN     MSBLS     RALT
MTU       RHC       RPTA      SBTC
ASA       RGYRO
       0.0      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
       0.0       0.0      .999      .999
```

FIGURE B.1-5 SIMULATOR INPUT DECK FOR BASELINE CONFIGURATION

```
       0.0       0.0      .999      .999
       0.0       0.0       0.0       0.0
      .999      .999      .999      .999
       .95       .95       .95       .95
      .999      .999      .999      .999
       0.0       0.0       0.0       0.0       0.0       0.0
       .95       .95       .95       .95       .95       .95
      .999      .999      .999      .999      .999      .999
      .999      .999      .999      .999      .999      .999
       .95       .95       .95       .95       .95       .95
      .999      .999      .999      .999      .999      .999
      .999      .999      .999      .999      .999      .999
      .999      .999      .999      .999      .999      .999
       0.0       0.0       0.0       0.0
       0.0       0.0       0.0       0.0
      .999      .999      .999      .999
      .999      .999      .999      .999
      .999      .999      .999      .999
      .999      .999      .999      .999
       0.0       0.0
      .999      .999
       .95       .95
112
      119.
      119.
        .1
112
      436.
      436.
        .1
112
      436.
      436.
        .1
        .1        .1        .1        .1        .1        .1        .1        .1
      55.6      55.6
       5.0       5.0
    155.95    155.95    155.95     87.25
     74.16     74.16     74.16     74.16
    144.42    144.42    144.42    125.57
     74.16     74.16     74.16     74.16
      75.7      93.2      40.0      56.5
     250.0     109.5     285.7    1000.0     500.0       0.0
       0.0        .1        .1        .1
       0.0       2.0       2.0       2.0
     100.0      66.7
        -1
         11111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890←—— Card Column Numbers
```

## B.2 SIMULATOR LISTINGS

The simulator is currently implemented as a set of fifty-eight Fortran programs designed to be compiled and run on a CDC 6600 using the extended Fortran IV compiler. Figure B.2-1 gives a short description for each of the programs. The source listings that follow this section represent the current CDC 6600 implementation of the program and will require several modifications for use in a UNIVAC 1108 computer environment.

The simulator source listings are in the same order as the subroutine names in Figure B.2-1. Some of the programs are documented by comments that describe the program, its arguments, and many of the variables that are used for the simulation. All of the listings include a comprehensive cross reference for all variables, statement labels, and subroutines. These are included in order that minor modifications to the programs can be readily made. The subroutines will be documented more thoroughly when the simulator is implemented on the UNIVAC 1108.

Several routines must be modified before the simulator can be run on the UNIVAC 1108. These routines are identified with an "*" in Figure B.2-1. PACK and UNPACK must be modified since they require non standard intrinsic functions. FCBIN, PFCBCF, and PIOSTS must be modified since they currently use a 60 bit word to represent character data. In addition, two new functions RANF and RANSET will be added for the UNIVAC 1108 implementation. These routines, which are used to generate random numbers uniformily distributed between zero and one, have already been written.

| | ROUTINE | DESCRIPTION |
|---|---|---|
| 1. | DRIVER | Main simulator program |
| 2. | ASYNC | Generate pseudo faults in case of asynchronous executive |
| 3. | BUSCHK | Simulates an IOP caused bus failure |
| 4. | BUSFLT | Simulates a bus failure |
| 5. | CLEAR | Initializes a vector to zero |
| 6. | CONFID | Generates a confidence interval for analytic model parameter estimates |
| 7. | COPY | Copies a fault into the active fault table |
| 8. | DDUFLT | Simulates faults occurring in the AVVI, AMI, HSI, and ADI |
| 9. | DETTIM | Randomly determines the detection time of a fault |
| 10. | DFAFLT | Simulates faults occurring in the ASA and RGYRO |
| 11. | DFFFLT | Simulates faults occurring in the ADTA, ACCEL, IMU, TACAN, MSBLS and RALT |
| 12. | EXDUR | Randomly generates exponential duration for transient faults |
| 13. | EXPON | Generates a table of exponentially distributed fault occurrence times |
| 14. | EXTENT | Determines if a fault causes program memory damage |
| 15. | FAUGEN | Generates faults for the simulation |
| 16. | FCBFLT | Simulates faults occurring in the flight critical bus partition |
| 17. | FCBIN | Inputs the flight critical bus partition configuration parameters |
| 18. | FCBINI | Initializes a mission for FCB simulation |
| 19. | FCBPI | Initializes the FCB partition simulator variables |
| 20. | FCBPMI | Controls simulation when SIMTYP=2 |
| 21. | FIFAU | Determines the fault location |
| 22. | GATHER | Compresses active fault table after removal of faults |
| 23. | GIORF1 | FCB failure rate input subroutine |
| 24. | GIORF2 | FCB failure rate input subroutine |
| 25. | GIORF3 | FCB failure rate input subroutine |
| 26. | GIORF4 | FCB failure rate input subroutine |
| 27. | GREATER | Randomly determines if a fault is not covered |
| 28. | INCOPY | Copies one vector to another for initialization |
| 29. | INFLTB | Routine for inputting a hand determined fault table |
| 30. | IO | Simulates faults occurring in the IOPs when they are non-dedicated |
| 31. | IRAN | Determines a random integer between 1 and X |
| 32. | ISTEPD | Chooses random integer using probability distribution vector |
| 33. | LESS | Randomly determines if a fault is covered |
| 34. | MDMFLT | Simulates the occurrence of a fault in an MDM or DDU |
| 35. | MDMPF | Simulates the removal of an MDM or DDU |
| 36. | MISCYC | Simulates the occurrence of missed iterations |
| 37. | MSTEPD | Same as ISTEPD, except row of matrix used as distribution function |
| 38. | NFFFLT | Simulates faults occurring in the MTU, RHC, RPTA, or SBTC |
| 39. | *PACK | Compresses a vector of five numbers into one number |
| 40. | *PFCBCF | Prints the FCB partition configuration definition |
| 41. | PFISO | Randomly determines where a permanent fault in the FCB partition occurs |
| 42. | PIOCNF | Prints the FCB interconnection matrices |
| 43. | *PIOSTS | Prints the FCB simulation results |
| 44. | RDIOFR | Reads FCB partition failure rates |
| 45. | SETSTS | Sets a value into the FCB status vector |
| 46. | STATE1 | Simulates normal multiplex GPC operation |
| 47. | STATE2 | Simulates a rollahead, a rollback, or delay reconfiguration in multiplex |
| 48. | STATE3 | Simulates a system restart |
| 49. | STATE4 | Simulates normal duplex GPC operation |
| 50. | STATE7 | Simulates a memory copy in multiplex |
| 51. | STATE8 | Simulates rollback or delay-reconfiguration in duplex |
| 52. | STATE9 | Simulates fault isolation in duplex |
| 53. | STATEA | Simulates simplex normal operation |
| 54. | STATEB | Simulates rollback in simplex |
| 55. | STATEC | Simulates GPC replacement by spare |
| 56. | TFISO | Randomly determines where a transient fault occurs in FCB partition |
| 57. | UNIF | Generates a uniformly distributed random number |
| 58. | *UNPACK | Undoes what PACK does |

*These routines will be modified for the UNIVAC 1108 implementation.

FIGURE B.2-1 SUMMARY OF SIMULATION ROUTINES

```
      PROGRAM DRIVER(INPUT,OUTPUT)
C                        THIS VERSION:   MARCH 1976
C ACFAU   SEC STATE1
C BUNOND  0: DEDICATED BUSSFS (TO COMPUTERS)
C         1: NON-DEDICATED BUSSFS
C COPLAS  LAST TIME THERE WAS A MEMORY COPY FOR COMPUTER I
C DELAY   DELAY BETWEEN DETECTION AND RECOVERY (MILLISECONDS)
C DOWMAX  MAXIMUM TOLERABLE DOWNTIME
C DURMC   DURATION OF A MEMORY-COPY (MILLISECONDS)
C DURRES SYSTEM RESTART DURATION
C ENDMIS  TIME AT WHICH THE CURRENT MISSION ENDS
C EXTEN   EXTENT OF THE LAST FAULT
C FOCO    FAULTY COMPUTER
C IDESCR  TMR DESCRIPTION  1 WITH MEMORY COPY
C                          ? WITHOUT MEMORY-COPY
C IDETEC  SEE STATE1
C IDIM    MAXIMUM NUMBER OF LURKING ERRORS                             SP09APR
C IFAU    NUMBER OF FAULTS
C IFULL   INDICATES AN OVERFLOW OF TABLE WHFN EQUAL TO 1
C ISIM    NO. OF TIMES IN SIMPLEX                                     SP09APR4
C ITLKP   TRANSIENTS MISTAKEN AS PERMANENTS IN DUPLEX
C LAST(I) LAST TIME THERE WAS A ROLLAHEAD FOR COMPUTER I (REAL)
C MACY    NUMBER OF MINOR CYCLE DURING A MAJOR CYCLE
C MINCY   MINOR CYCLE DURATION
C MININT  RECURRENCE INTERVAL (MILLISFCONDS)
C MISITE  MISSED ITERATIONS
C MISTAK  TRANSIENTS MISTAKEN AS PERMANENTS
C NBOUC   NUMBER OF MISSIONS FOR WHICH THE FAULT TABLE IS DETERMINED AT
C         ONE TIME
C NDIAG   NUMBER OF DIAGNOSTICS
C NEXT = NEXT STATE. 1 : NORMAL.
C                    2 : RECOVERY ATTEMPT.
C                    3 : SYSTEM RESTART.
C                    4 : N-1 UNIT SYSTEM.
C                    5 : SYSTEM FAILURE.
C                    6 : NFXT MISSION
C                    7 : MEMORY-COPY
C                    8 : ROLLBACK
C                    9 : DIAGNOSTIC AND RECOVEPY                      SP09APR4
C                   10 : SIMPLEX                                      SP09APR4
C                  11 : ROLLBACK IN SIMPLEX
C                  12 : INTRODUCTION OF A SPARE
C NFDANR  NO. SYSTEM FAILURES VIA D AND R                             SP09APR4
C NFIO    NUMBER OF FAULTS DUE TO IO FAILURFS
C NFSIM   NO. SYSTEM FAILURES VIA SIMPLEX                             SP09APR4
C NMC     NUMBER OF MFMORY-COPIES
C NMIS    CURRENT MISSION
C NMIS1   TOTAL NUMBER OF MISSIONS
C NONDED  1: DEDICATED EEM≠S
C         ?: NON-DEDICATED EEM≠S
C NOON(5) NOON(I)=1 MFANS COMPUTER I IS ON
C NWOION  NUMBER OF WORKING EEM
C NWORK   NUMBER OF WORKING COMPUTEPS
C NQUA    NUMBER OF SWITCHES TO QUADRUPLEX
C NRL     NUMBFR OF ROLLAHFADS
```

```
C NTR     NUMDER OF TRANSIENTS
C NTRI    NUMBER OF SHITCHES TO TRIPLEX
C NTR3    NO. OF TRANSIENTS RFCOVERFD FROM IN TRIPLEX                    SP08APR4
C NTR2    NO. OF TRANSIENTS RECOVERFD FROM IN DUPLEX                     SP08APR4
C NUNOI   NUMPER OF UNSUCCESSFUL DIAGNOSTICS
C N2      NUMDER OF SHITCHES TO DUPLEX
C PROMM   PROPORTION OF MEMORY ALLOCATED TO MINOR CYCLF PROGRAMMING
C PSUC    PROBABILITY OF SUCCESS OF ROLL AHEAD
C PTR     POINTER TO THE FAULT TABLE
C REASON  REASON OF THF SYSTEM FAILURE
C         1: MORF THAN 10 FAULTS SHOULD BE STORED IN ACFAU. TO AVOID
C            THIS, INCREASE THE SI7F OF ACFAU AND SET IDIM TO THIS NEW
C            SI7E
C         2: FEM FAILURE
C         3: BUS OR/AND EXTFRNAL DEVICE FAILURE
C         4: DUPLEX FAILURE (NON ISOLATED FAULTS)
C         5: SIMPLCX FAILURE
C         6: FXCESSIVC DOHNTIME
C RFCOV   DURATION OF A ROLLAHEAD
C RMC     RECURRENCE INTERVAL FOR HEMORY COPY
C RMISTH  MISSION TIME (HOURS)
C RMISTM  MISSION TIME (MILLISECONDS)
C RTI     ITERATION PFRIOD
C TABLE   SEE FAUGENE
C TC      TIMF BETHFEN COMPARISONS (MILLISECONDS)
C TIME    TIME (MILLISECONDS)
C TW2     ISOLATION DURATION
C RULES OF THF GAME: AT THE END OF THE SIMULATION OF A STATE, HE HAVE:  SP09APR4
C     TIME  = TIMF OF THE TRANSITION
C     PTR   = POINTER TO THE NFXT FAULT TO OCCUR
C
C *********************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTFN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM2/NMIS,IFULL
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/COM8/FOCO                                                   SP09APR4
      COMMON/COM9/COPLAS(5),RMC,DURMC
      COMMON/CO10/MAXRLB,DURRB
      COMMON/CO11/MTSTAK/
      COMMON/CO12/NTR,IFAU
      COMMON/CO13/ DURRES
      COMMON/CO14/RLAMDP(5),RLAMDT(5),RMINI(5),RMAXI(5),AVDUP(5)
      COMMON/CO15/NOON(5),NHORK
      COMMON/CO16/NDIAG,NUNDI
      COMMON/CO17/NTRI,NOUA
      COMMON/CO26/TW2
      COMMON/CO27/DOR,DFOR,MISTT,TISL,MI,FRTI
      COMMON/CO28/MODSIM,NSPB
      COMMON/CO29/NMC
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO33/RMUP(5)
      COMMON/CO34/ISPARE(5)
      COMMON/CO35/CONDIT
      COMMON/CO36/RMISTM
      COMMON/C037/ RMU
      COMMON/C038/IOCU(5),NONDED,NHOIO
      COMMON/C039/PDETIO
      COMMON/C040/ISHI,FSHI,NSHION,NIO
      COMMON/C041/ICATAS,I3
      COMMON/C042/MISTKI
      COMMON/C045/PSMC
      COMMON/C046/PCOM,PBU,PBUCO
      COMMON/COVER/ITLKP,IFHE                                           SP11APR4
      COMMON/CYC/LAUNMI
      COMMON/D/DIAGN
      COMMON/DEBUG/IDEBUG
      COMMON/DETF/PDET,DETMAX,PDM
      COMMON/FXEC/MINCY,RTI,TODO,OLTIS,IDLE,SEQMAX,DOWMAX,MISITE
      COMMON/FAIL02/FOC02
      COMMON/FCOUNT/NF(5),NTRF(5)
      COMMON/MM/PROMM,MACY
      COMMON/PERM/LAST(5),MININT,PSUC
      COMMON/PHILM3/NTR3,NTR2,NTR1,NTNR1
      COMMON/RAHEAD/RACPU
      COMMON/RBACK/RBCPU
      COMMON/FLTMIS/NFCV(10),NSYSF(10),PFRIO,TFRIO
      COMMON/FLTMS/IFLTCT
      INTEGER EXTEN,PTR,REASON,SEQMAX
      INTEGER SIMTYP
      LOGICAL IOSIM
      DIMENSION NFAILI(5),MISTKI(3)
      DIMENSION NMCONF(2,5)
      REAL IDLE,LAST,LAUNMI,MINCY,MININT
C *********************************************************************
C
      DATA NMCONF/5HSIMPL,2HEX,5HDUPLE,1HX,5HTRIPL,2HEX
     * ,5HQUADR,5HUPLEX,5HQUINT,5HUPLEX/
      IDIM=10
   10 CONTINUE
      READ 9802,SIMTYP,SEED
      IF(SIMTYP.LE.0) GOTO 20
      CALL RANSET(SEED)
      GOTO(1000,2000,3000),SIMTYP
 1000 CONTINUE
      READ 9801,NMIS1,IDEBUG
      IF (NMIS1.LE.0) GO TO 20
      CALL CLEAR(10,NFCV)
      CALL CLEAR(10,NSYSF)
      CALL CLEAR(5,NFAILI)
      CALL CLEAR(3,MISTKI)
      CALL CLEAR(5,NF)
      CALL CLEAR(5,NTRF)
      DOR=-1.
      DEOR=-1.
      FOCO=1.0                                                          SP02APR4
      FOC02=1.
      ICATAS=0
      IFAU=0
      IFULL=0
      IOF=0
      ISIM = 0                                                          SP09APR4
      ITLKP = 0                                                         SP11APR4
      I3=0
      IO1=1
      MISITF=0
      MISTAK=0
      NDIAG=0
      NFATL=0
      NFDANR = 0                                                        SP09APR4
      NFIO=0
      NFSIM = 0                                                         SP09APR4
      NMC=0
      NQUA=0
      NRES=0
      NPL=0
      NROBA=0
      NS=0
      NTL=0
      NTNR1=0
      NTR=0
      NTRI=0
      NTR1=0
      NTR2 = 0                                                          SP08APR4
      NTR3 = 0                                                          SP08APR4
      NUNDI=0
      N2=0
      SEQMAX=0
C
      RFAD 9802,NBOUC,RMISTH
      RCAD 9803,NMODU,MODSIM
      READ 9802.NSPA,CONDIT
      READ 9805,NONDEO,NIO
      READ 9812,PCOM,PBU
      READ 9807,IROLLA,RECOV,MININT,RACPU
      READ 9808,IDLYRC,RCDUR,RCCINT,DLYCPU
      RCAD 9809,IROLLB,MAXRLB,RBCPU
      PEAD 9810,IDESCR,DURMC,RMC,PSMC
      READ 9802,ISTART,DURRES
      READ 9812,DELAY,TC
      RFAD 9813,DIAGN,DETMAX,TH2
      RFAD 9813,PDET,PDM,PDFTIO
      READ 9814,RTI,MINCY,MACY,DOHMAX
      RCAD 9812,PROMM,PSUC
      RFAD 9815,ISYNC,RATINT
      IF(IDESCP.NE.1) IDESCR=2
      IOSIM=NMODU.GE.4
      IF(IOSIM) CALL FCBIN
      IF(IOSIM) CALL FCBPI
      NSPB=NSPA
      MOD=MODSIM-NSPA
      IF(NONDED.NE.?)NIO=MODSIM
      IDLE=RTI-MINCY
      DURPB=TC
      IF(IDLYPC.NF.1) GOTO 801
```

```
         RECOV=RCDUR
         MININT=RCCINT
         RACPU=DLYCPU
      RBCPU=DLYCPU
         DURRB=RCDUR
         MAXRLB=1
         IROLLA=1
         GOTO 805
  801 CONTINUE
      IF(IROLLB.EQ.1) GOTO 802
         MAXRLB=2
         DURRB=0.0
         GOTO 805
  802 CONTINUE
      IF(IROLLA.EQ.1) GOTO 805
      IROLLA=2
         RECOV=TC
         RACPU=RBCPU
         MININT=RTI*NACY
  805 CONTINUE
C IF THE EEM/S ARE DEDICATED,AN EEM FAULT MAY HIT THE COMPUTER. IF PBU
C IS 0, THEN A FAULT IN THE EEM ALWAYS HIT THE COMPUTER (PCOM+PBUCO=1).
C IF THE EEM/S ARE NON DEDICATED,THEN HTEY NEVER AFFECT A COMPUTER. PCOM
C AND PBUCO ARE 0.
      PBUCO=0
      IF(NONDED.EQ.1) PBUCO=1.0-PCOM-PBU
      IF(NSPA.EQ.0) PRINT 9900,(NMCONF(I,MOD),I=1,2)
      IF(NSPA.NE.0) PRINT 9901,(NMCONF(I,MOD),I=1,2),NSPA
      PRINT 9922,NMIS1
      PRINT 9923,RMISTH
      PRINT 9927
      IF(IDLYRC.NE.1) GOTO 1001
         PRINT 9902
         PRINT 9903,RECOV
         PRINT 9904,MININT
         PRINT 9905,RACPU
      GOTO 1002
 1001 CONTINUE
      IF(IROLLA.NE.1) GOTO 1002
         PRINT 9906
         PRINT 9903,RECOV
         PRINT 9904,MININT
         PRINT 9905,RACPU
 1002 CONTINUE
      IF(IDESCR.NE.1) GOTO 1003
         PRINT 9907
         PRINT 9903,DURMC
         PRINT 9904,RMC
         PRINT 9905,PSMC
 1003 CONTINUE
      IF(IROLLB.NE.1) GOTO 1004
         PRINT 9908
         PRINT 9909,MAXRLB
         PRINT 9905,RBCPU
 1004 CONTINUE
```

```
         PRINT 9910
         PRINT 9903,OURPES
      PRINT 9911    .
      PRINT 9912,PSUC
      PRINT 9913,PDET,PDM,PDETIO
      PRINT 9914,DETMAX,DIAGN
      PRINT 9915,DELAY
      PRINT 9916,TW2
      IF(NSPA.NE.0) PRINT 9917,CONDIT
      PRINT 9918,RTI,MINCY,MACY,TC,DOWMAX,PROMM
      IF(ISYNC.EQ.0) PRINT 9919,RATINT
      IF(NONDED.EQ.1) PRINT 9920
      IF(NONDED.EQ.2) PRINT 9921,NIO
      PRINT 9924
      PRINT 9925,PCOM,PBU,PBUCO
      PRINT 9926
      RMISTM=3600000.*RMISTH
      NMIS=0
      NMIS0=0
      TIGEN=NBOUC*RMISTM
C
C GENERATE FAULTS  FOR NBOUC MISSIONS
   30 CONTINUE
      CALL FAUGEN(MODSIM,TIGEN,300,NMODU)
      IF (NMIS+NSPA.NE.0) GO TO 56
C COMPUTE DORMANT FAILURE RATE OF THE COMPUTER
      RMU=RMUP(1)
      IF (NMODU.GE.3) RMU=RMU+RMUP(3)
   56 CONTINUE
   33 CONTINUE
C
C OVERFLOW TEST
      PTR=1
      IF (IFULL.EQ.0) GO TO 40
      PRINT 9601
      GO TO 10
C
C DETERMINE IN WHICH MISSION THE FAULT OCCURS AND THE END OF THE MISSION
C DETERMINE IF NEW FAULT TABLE IS NEEDED.
   40 CONTINUE
      K=INT(TABLE(PTR,1)/RMISTM)
      IF (K.GE.NBOUC) GO TO 41
      ENDMIS=K*RMISTM+RMISTM
      NMIS=NMIS0+K
      IF (NMIS.GE.NMIS1) GO TO 120
      GO TO 43
   41 CONTINUE
      NMIS0=NBOUC*(NMIS/NBOUC)+NBOUC
      NMIS=NMIS0
      IF (NMIS.GE.NMIS1) GO TO 120
      GO TO 30
C
C INITIALIZE MISSION
   43 CONTINUE
      IFLTCT=0
      LAUNMI=-10000.
      NWORK=MOD
      NWOIO=NIO
      NSPB=NSPA
      DO 140 J=1,IDIM
      ACFAU(J,3)=0.
  140 CONTINUE
      DO 285 I=1,5
      LAST(I)=-10000.
      COPLAS(I)=-10000.
      NOON(I)=0
      IF (I.LE.MOD) NOON(I)=1
      ISPARE(I)=0
      IF (I.LE.NSPA) ISPARE(I)=MOD+I
      IF (NONDED.NE.2) GO TO 285
      IOCU(I)=0
      IF (I.LE.NWOIO) IOCU(I)=1
  285 CONTINUE
      IF(IOSIM) CALL FCBINI
C
C BEGIN SIMULATION
   65 CONTINUE
      GO TO (241,91,66,66,66) MOD
   66 CONTINUE
C
C TRIPLEX (NORMAL OPERATION)                                            SP09APR4
      CALL STATE1(NEXT)
   60 CONTINUE
      IF (IDEBUG.NE.1) GO TO 103
      IF (PTR.GE.50) GO TO 103
      PRINT 962,PTR,NEXT,TIME
      DO 102 I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) GO TO 103
      PRINT 985, (ACFAU(I,J),J=1,6)
  102 CONTINUE
  103 CONTINUE
      GO TO (65,70,80,90,100,45,210,220,230,240,250,260),NEXT
   70 CONTINUE
C
C ROLLAHEAD RECOVERY                                                    SP09APR4
      IF(IROLLA.EQ.0) LAST(FOCO)=TIME
      TIME=TIME+DELAY
      NRL=NRL+1
      CALL STATE2(NEXT)
      GO TO 60
C
C SYSTEM RESTART                                                        SP10APR4
   80 CONTINUE
      IF(ISTART.EQ.1) GOTO 81
         ICATAS=ICATAS+1
         NEXT=5
         REASON=6
         GOTO 60
   81 CONTINUE
      NRES=NRES+1
      CALL STATE3(NEXT)
      GO TO 60
C
C DUPLEX (NORMAL OPERATION)                                             SP09APR4
   90 CONTINUE
      N2=N2+1
  91  CONTINUE                                                          SP03APR4
      CALL STATE4(NEXT)
      GO TO 60
C
C SYSTEM FAILURE                                                        SP09APR4
  100 CONTINUE
      NEXT=6
      IF (IDEBUG.NE.1) GO TO 101
      PRINT 988,PTR,REASON,TIME
  101 CONTINUE
      NFAIL=NFAIL+1
C SEE DEFINITION OF REASON
      GO TO (85,160,170,180,190,84),REASON                              SP29APR4
C
   85 CONTINUE
      PRINT 991,NMIS
      GO TO 50
  160 CONTINUE
      NFIO=NFIO+1
      GO TO 50
  170 CONTINUE
      NSYSF(IFLTCT)=NSYSF(IFLTCT)+1
      NFCV(IFLTCT)=NFCV(IFLTCT)+1
      IOF=IOF+1
      GO TO 50
 180  CONTINUE                                                          SP09APR4
      NFDANR = NFDANR + 1                                               SP09APR4
      GO TO 50                                                          SP09APR4
 190  CONTINUE                                                          SP09APR4
      NFSIM = NFSIM + 1                                                 SP09APR4
      GO TO 50
   84 CONTINUE
      NFAILI(NWORK)=NFAILI(NWORK)+1
      NTL=NTL+1
   50 CONTINUE
      IF (TABLE(PTR,1).GE.ENDMIS) GO TO 40
      PTR=PTR+1
      GO TO 50
C
   45 CONTINUE
      IF(IFLTCT.GE.1) NFCV(IFLTCT)=NFCV(IFLTCT)+1
      GO TO 40
C
C MEMORY COPY RECOVERY                                                  SP09APR4
  210 CONTINUE
C THE NUMBER OF ROLLAHEADS IS DECREASED SINCE A MEMORY COPY IS ALWAYS
C PRECEDED BY A DUMMY ROLLAHEAD.
      NRL=NRL-1
C IF NO MEMORY COPY IN THIS CONFINGURATION DON T DO IT                  SP09APR4
```

```
      IF (IDESCR.EQ.2) COPLAS(FOCO)=TIME
      NMC=NMC+1
      CALL  STATE7(NEXT)
      GO TO 60
C
C ROLLBACK RECOVERY                                                     SP09APR4
  220 CONTINUE
      IF(MAXRLB.GE.1) NROBA=NROBA+1
      CALL STATE8(NEXT)
      IF (NEXT.EQ.4) N2=N2-1
      GO TO 60
C
C DIAGNOSTICS AND RECOVERY                                              SP09APR4
  230 CONTINUE
      NDIAG=NDIAG+1
      CALL STATE9(NEXT)                                                 SP09APR4
      GO TO 60                                                          SP09APR4
C
C SIMPLEX STATE                                                         SP08APR4
  240 CONTINUE
      ISIM = ISIM + 1                                                   SP08APR4
  241 CONTINUE
      CALL STATEA(NEXT)                                                 SP08APR4
      GO TO 60                                                          SP09APR4
C
C ROLLBACK IN SIMPLEX
  250 CONTINUE
      IF(MAXRLB.GE.1) GOTO 251
          NEXT=5
          REASON=5
          GOTO 60
  251 CONTINUE
      CALL STATEB(NEXT)
      IF (NEXT.EQ.10) ISIM=ISIM-1
      GO TO 60
C
C INTRODUCE SPARE
  260 CONTINUE
      NS=NS+1
      CALL STATEC(NEXT)
      GO TO 60
  120 CONTINUE
      PRINT 9400
      NPERM=IFAU-NTR
      PRINT 9405,NPERM,NTR,IFAU,NFAIL
      PRINT 9410
      GOTO(1105,1104,1103,1102,1101),MOD
 1101 NPERM=NF(5)-NTRF(5)
      PRINT 9411,NPERM,NTRF(5),NF(5)
 1102 NPERM=NF(4)-NTRF(4)
      PRINT 9412,NPERM,NTRF(4),NF(4)
 1103 NPERM=NF(3)-NTRF(3)
      PRINT 9413,NPERM,NTRF(3),NF(3)
 1104 NPERM=NF(2)-NTRF(2)
      PRINT 9414,NPERM,NTRF(2),NF(2)
 1105 NPERM=NF(1)-NTRF(1)
      PRINT 9415,NPERM,NTRF(1),NF(1)
      PRINT 9420
      NQUINT=0
      GOTO(1110,1109,1108,1107,1106),MOD
 1106 PRINT 9411,NFAILI(5),MISTKI(3),NQUINT
 1107 PRINT 9412,NFAILI(4),MISTKI(2),NQUA
 1108 PRINT 9413,NFAILI(3),MISTKI(1),NTRI
 1109 NDUPFL=NFAILI(2)+NFDANR
      PRINT 9414,NDUPFL,ITLKP,N2
 1110 PRINT 9415,NFSIM,NTNR1,ISIM
      PRINT 9425
      IF(IDLYRC.NE.1) GOTO 1120
         NDELAY=NROBA+NPL
         PRINT 9426,NDELAY
         GOTO 1130
 1120 CONTINUE
      IF(IROLLA.EQ.1) PRINT 9427,NRL
      IF(IROLLB.NE.1) GOTO 1130
      IF(IROLLA.NE.1) NROBA=NROBA+NPL
      PRINT 9428,NROBA
 1130 CONTINUE
      IF(IDESCR.EQ.1) PRINT 9429,NMC
      IF(ISTART.EQ.1) PRINT 9430,NRES
      PROP=MISITE/(RMISTM*NMIS1/RTI)
      PRINT 9435,PROP,SFQMAX
      IF(NSPA.NE.0) PRINT 9431,NS
      ZC=2.0
      CALL CONFID(ZC,NFAIL,NMIS1,SFP,SFPERR)
      CALL CONFID(ZC,MISTAK,NTR3+MISTAK,XLEK,XLEK1)
      CALL CONFID(ZC,ITLKP,NTR2+ITLKP,DUPLK,DUPLK1)
      CALL CONFID(ZC,NTNR1,NTNR1+NTR1,SLEK,SLEK1)
      CALL CONFID(ZC,NQUA+NTRI+N2,NQUA+NTRI+N2+ICATAS,XCOV,XCOV1)
      CALL CONFID(ZC,ISIM,ISIM+NDUPFL,DPCOV,DPCOV1)
      PRINT 9445,SFP,SFPERR
      PRINT 9450,XLEK,XLEK1,DUPLK,DUPLK1,SLEK,SLEK1
      PRINT 9455,XCOV,XCOV1,DPCOV,DPCOV1
      IF(IOSIM) CALL PIOSTS
      GOTO 10
   20 CONTINUE
      STOP
 2000 CONTINUE
      CALL FCBPM1
      GOTO 10
 3000 CONTINUE
      CALL FCBPM2
      GOTO 10
C                    ***********************************                SP02APR4
C                    *            F O R M A T S        *                SP02APR4
C                    ***********************************                SP02APR4
  962 FORMAT(6H PTR =,I3,3X,6HNEXT =,I3,3X,6HTIME =,F19.3)
  985 FORMAT(1X,6F19.3)
  988 FORMAT(6H PTR =,I3,10H  REASON =,I2,8H  TIME =,F19.3)
  991 FORMAT(25H TOO MANY FAULTS, MISSION,I6)
 9400 FORMAT(1H1,30X,42HS I M U L A T I O N   S T A T I S T I C S )
 9405 FORMAT(/1X,20HNUMBER OF PERMANENTS,5X,I10/1X,
     1 20HNUMBER OF TRANSIENTS,5X,I10/1X,
     2 22HTOTAL NUMBER OF FAULTS,3X,I10/1X,
     3 25HNUMBER OF SYSTEM FAILURES,I10)
 9410 FORMAT(//1X,33HGPC FAULT AND RECOVERY STATISTICS
     1 //3X,13HCONFIGURATION,5X,16HPERMANENT FAULTS,4X,
     2 16HTRANSIENT FAULTS,4X,12HTOTAL FAULTS)
 9411 FORMAT(5X,10HQUINTUPLEX,6X,I10,10X,I10,10X,I10)
 9412 FORMAT(5X,10HQUADRUPLEX,6X,I10,10X,I10,10X,I10)
 9413 FORMAT(5X,10HTRIPLEX   ,6X,I10,10X,I10,10X,I10)
 9414 FORMAT(5X,10HDUPLEX    ,6X,I10,10X,I10,10X,I10)
 9415 FORMAT(5X,10HSIMPLEX   ,6X,I10,10X,I10,10X,I10)
 9420 FORMAT(/21X,15HSYSTEM FAILURES,5X,20HLEAKY TRANSIENTS
     1 ,15HDEGRADATIONS TO)
 9425 FORMAT(/34H GPC RECOVERY PROCEDURE STATISTICS  )
 9426 FORMAT(3X,25HNUMBER OF DELAY-RECOVERYS,3X,I10)
 9427 FORMAT(3X,20HNUMBER OF ROLLAHEADS,8X,I10)
 9428 FORMAT(3X,19HNUMBER OF ROLLBACKS,9X,I10)
 9429 FORMAT(3X,22HNUMBER OF MEMORY COPYS,6X,I10)
 9430 FORMAT(3X,25HNUMBER OF SYSTEM RESTARTS,3X,I10)
 9431 FORMAT(3X,21HNUMBER OF SPARES USED,7X,I10)
 9435 FORMAT(/3X,31HPROPORTION OF MISSED ITERATIONS,7X,E10.3
     1 /3X,35HLONGEST SERIES OF MISSED ITERATIONS,3X,I10)
 9445 FORMAT(/28H MISSION FAILURE PROBABILITY,3X,F10.8,5H +/- ,F10.8)
 9450 FORMAT(/9H LEAKAGES/5X,9HMULTIPLEX,2X,F10.8,5H +/- ,F10.8/
     1 5X,6HDUPLEX,5X,F10.8,5H +/- ,F10.8/
     2 5X,7HSIMPLEX,4X,F10.8,5H +/- ,F10.8)
 9455 FORMAT(/10H COVERAGES/5X,9HMULTIPLEX,2X,F10.8,5H +/- ,F10.8/
     1 5X,6HDUPLEX,5X,F10.8,5H +/- ,F10.8)
 9601 FORMAT(41H SIMULATION ABORTED  FAULT TABLE OVERFLOW)
 9801 FORMAT(2I10)
 9802 FORMAT(I10,F10.0)
 9803 FORMAT(2I10)
 9804 FORMAT(I10,2F10.0)
 9805 FORMAT(2I10)
 9806 FORMAT(3F10.0)
 9807 FORMAT(I10,3F10.0)
 9808 FORMAT(I10,3F10.0)
 9809 FORMAT(2I10,F10.0)
 9810 FORMAT(I10,3F10.0)
 9812 FORMAT(2F10.0)
 9813 FORMAT(3F10.0)
 9814 FORMAT(2F10.0,I10,2F10.0)
 9815 FORMAT(I10,F10.0)
 9900 FORMAT(1H1,30X,2A5)
 9901 FORMAT(1H1,30X,2A5,2H -,I2,7H SPARES)
 9902 FORMAT(/5X,21HDELAY RECONFIGURATION)
 9903 FORMAT(8X,8HDURATION,15X,F10.2,13H MILLISECONDS)
 9904 FORMAT(8X,19HRECURRENCE INTERVAL,4X,F10.2,13H MILLISECONDS)
 9905 FORMAT(8X,13HEFFECTIVENESS,10X,F10.6)
 9906 FORMAT(/5X,9HROLLAHEAD)
 9907 FORMAT(/5X,11HMEMORY COPY)
 9908 FORMAT(/5X,8HROLLBACK)
 9909 FORMAT(8X,16HNUMBER OF RETRYS,7X,I2)
 9910 FORMAT(/5X,14HSYSTEM RESTART)
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9911 FORMAT(//1X,20HRECOVFRY  PARAMETERS)
9912 FORMAT(/5X,21HPROGRAM SURVIVABILITY,5X,F10.6)
9913 FORMAT(/5X,38HPROBABILITY OF FAULT DETECTION BY BITE
    1 /8X,17HCFNTRAL PROCESSOR,6X,F6.3
    2 /8X,6HMFMORY,17X,F6.3
    3 /8X,13HI/O PPOCESSOR,10X,F6.3)
9914 FORMAT(/5X,14HSTP EFFICIFNCY,12X,F10.6
    1 /5X,19HMEAN DIAGNOSIS TIME,7X,F10.2,13H MILLISECONDS)
9915 FORMAT(5X,21HDELAY BEFORE RFCOVFRY,5X,F10.2,13H MILLISECONDS)
9916 FORMAT(5X,18HISOLATION DURATION,8X,F10.2,13H MILLISECONDS)
9917 FORMAT(/5X,23HSPARE CONDITIONING TIME,3X,F10.2,13H MILLISECONDS)
9918 FORMAT(/1X,20HSOFTWARE PAPAMETERS
    1 /5X,26HITERATION PERIOD              ,F10.2,13H MILLISECONDS
    2 /5X,26HMINOR CYCLE DURATION          ,F10.2,13H MILLISECONDS
    3 /5X,26HMAJOR CYCLE DURATION          ,I10,11H ITERATIONS
    4 /5X,26HTIME BETWEEN COMPARISONS      ,F10.2,13H MILLISECONDS
    5 /5X,26HMAXIMUM DOWN TIME             ,F10.2,13H MILLISECONDS
    6 /5X,26HMINOR CYCLE PROGRAM SIZE      ,F10.6)
9919 FORMAT(5X,39HASYNCHRONOUS EXECUTIVE - INTERRUPT RATE,F8.1,
    1 11H PER SECOND)
9920 FORMAT(/1X,24HDFDICATED I/O PROCESSORS)
9921 FORMAT(/1X,I2,1X,28HNON-DCDICATED I/O PROCESSORS)
9922 FORMAT(/1X,18HNUMBER OF MISSIONS,I12)
9923 FORMAT(1X,16HMISSION DURATION,F14.4,1X,5HHOURS)
9924  FORMAT(10H1NOTATIONS
    1 /5X,34HMODULE 1 - CENTRAL PROCESSING UNIT
    2 /5X,24HMODULE 2 - I/O PROCFSSOR
    3 /5X,17HMODULE 3 - MEMORY
    4 /5X,27HMODULE 4 - EXTERNAL DFVICES)
9925 FORMAT(/1X,30HIMPACT OF I/O PROCESSOR FAULTS
    1 /5X,11HON COMPUTER,10X,F10.6
    2 /5X,6HON BUS,15X,F10.6
    3 /5X,19HON BUS AND COMPUTER,2X,F10.6)
9926 FORMAT(//1X,36HDESCRIPTION OF THE FAULT ENVIORNMENT)
9927 FORMAT(//1X,29HTRANSIENT RECOVERY PROCEDURES)
     END
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      SYMBOLIC REFERENCE MAP

 ENTRY POINTS      DEF LINE      REFERENCES
  4050  DRIVER          1

 VARIABLES      SN  TYPE            RELOCATION
     0  ACFAU       REAL      ARRAY    COM3        REFS       90       363       364   DEFINED       336
    24  AVDUR       REAL      ARRAY    C014        REFS       98
     0  CONDIT      REAL               C035        REFS      109       284   DEFINED       197
     0  COPLAS      REAL      ARRAY    COM9        REFS       93   DEFINED       340       441
  2265  DELAY       REAL               COM1        REFS       88       282       372   DEFINED       205
     1  DEOR        REAL               C027        REFS      103   DEFINED       160
     1  DETMAX      REAL               DETE        REFS      123       281   DEFINED       206
     0  DIAGN       REAL               D           REFS      121       281   DEFINED       206
  7031  DLYCPU      REAL                           REFS      223       224   DEFINED       201
     0  DOR         REAL               C027        REFS      103   DEFINED       159
     6  DOWMAX      REAL               EXEC        REFS      124       285   DEFINED       208
  7064  DPCOV       REAL                           REFS      529       532
  7065  DPCOV1      REAL                           REFS      529       532
  7056  DUPLK       REAL                           REFS      526       531
  7057  DUPLK1      REAL                           REFS      526       531
     6  DURMC       REAL               COM9        REFS       93       267   DEFINED       203
     1  DURRB       REAL               C010        REFS       94   DEFINED       219       225       232
     0  DURRES      REAL               C013        REFS       97       277   DEFINED       204
    74  ENOMIS      REAL               COM3        REFS       90       427   DEFINED       318
  2262  EXTEN       INTEGER            COM1        REFS       88       134
     0  FOCO        REAL               COM8        REFS       92       371       441   DEFINED       161
     0  FOCO2       REAL               FAILD2      REFS      125   DEFINED       162
     5  FRTI        REAL               C027        REFS      103
     1  FSHI        REAL               C040        REFS      114
  7036  I           INTEGER                        REFS      247       248       339       340       341     2*342       343
                                                 3*344       346     2*347       363       364   DEFINED       247       248
                                                   338       362
     0  ICATAS      INTEGER            C041        REFS      115       380       528   DEFINED       163       380
     0  IDEBUG      INTEGER            DEBUG       REFS      122       359       399   DEFINED       151
  7033  IDESCR      INTEGER                        REFS      211       265       441       518   DEFINED       203       211
  2263  IDETEC      INTEGER            COM1        REFS       88
     0  IDIM        INTEGER            COM1        REFS       88       335       362   DEFINED       144
     4  IDLE        REAL               EXEC        REFS      124       139   DEFINED       218
  7026  IDLYRC      INTEGER                        REFS      220       252       508   DEFINED       201
     1  IFAU        INTEGER            C012        REFS       96       484       485   DEFINED       164
     0  IFLTCT      INTEGER            FLTMS       REFS      133     2*413     2*414     3*432   DEFINED       330
     1  IFULL       INTEGER            COM2        REFS       89       309   DEFINED       165
     1  IFWE        INTEGER            COVER       REFS      119
     0  IOCU        INTEGER   ARRAY    C038        REFS      112   DEFINED       346       347
  7004  IOF         INTEGER                        REFS      415   DEFINED       166       415
  7001  IOSIM       LOGICAL                        REFS      136       213       214       349       533
                                                DEFINED      212
  7006  IO1       * INTEGER                     DEFINED      170
  7025  IROLLA      INTEGER                        REFS      235       259       371       513       515
                                                DEFINED      200       227       236
  7032  IROLLB      INTEGER                        REFS      230       271       514   DEFINED       202
  7005  ISIM        INTEGER                        REFS      461       474       506     2*529   DEFINED       167       461
                                                   474
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VARIABLES      SN  TYPE             RELOCATION
    J  ISPARE    INTEGER    ARRAY    C034           REFS       108   DEFINED       343       344
 7034  ISTAPT    INTEGER                            REFS       379       519   DEFINED       204
    0  ISHI      INTEGER             C040           REFS       114
    1  ISYNC     INTEGER             C031           REFS       106       286   DEFINED       210
    0  ITLKP     INTEGER             COVER          REFS       119       505     2*526   DEFINED       168
    1  I3        INTEGER             C041           REFS       115   DEFINED       169
 7042  J         INTEGER                            REFS       336       364   DEFINED       335       364
 7041  K         INTEGER                            REFS       317       318       319   DEFINED       316
    0  LAST      REAL       ARRAY    PERM           REFS       128       139   DEFINED       339       371
    0  LAUNMI    REAL                CYC            REFS       120       139   DEFINED       331
    1  MACY      INTEGER             MM             REFS       127       239       285   DEFINED       208
    0  MAXRLB    INTEGER             C010           REFS        94       273       448       468   DEFINED       202       226
                                                     231
   75  MEMSIZ    INTEGER             COM3           REFS        90
    4  MI        INTEGER             C027           REFS       103
    0  MINCY     REAL                EXEC           REFS       124       139       218       285   DEFINED       208
    5  MININT    REAL                PERM           REFS       128       139       255       262   DEFINED       200       222
                                                     239
    2  MISIT     INTEGER             C027           REFS       103
    7  MISITE    INTEGER             EXEC           REFS       124       520   DEFINED       171
    0  MISTAK    INTEGER             C011           REFS        95     2*525   DEFINED       172
    0  MISTKI    INTEGER    ARRAY    C042           REFS       116       137       156       501       502       503
 7035  MOD       INTEGER                            REFS       247       248       332       342       344       353       487
                                                     500   DEFINED       216
    0  MODSIM    INTEGER             C028           REFS       104       216       217       299   DEFINED       196
 7021  NBOUC     INTEGER                            REFS       295       317     3*323   DEFINED       195
 7047  NDELAY    INTEGER                            REFS       510   DEFINED       509
    0  NDIAG     INTEGER             C016           REFS       100       455   DEFINED       173       455
 7046  NDUPFL    INTEGER                            REFS       505       529   DEFINED       504
 7043  NEXT      INTEGER                            REFS       357       361       367       374       386       393       443
                                                     449       450       456       463       473       474       480
                                                 DEFINED       381       398       469
    0  NF        INTEGER    ARRAY    FCOUNT         REFS       126       157       488       489       490       491       492
                                                     493       494       495       496       497
 7007  NFAIL     INTEGER                            REFS       402       485       524   DEFINED       174       402
 7066  NFAILI    INTEGER    ARRAY                   REFS       137       155       424       501       502       503       504
                                                 DEFINED       424
    0  NFCV      INTEGER    ARRAY    FLTMIS         REFS       132       153       414       432   DEFINED       414       432
 7010  NFDANR    INTEGER                            REFS       418       504   DEFINED       175       418
 7011  NFIO      INTEGER                            REFS       410   DEFINED       176       410
 7012  NFSIM     INTEGER                            REFS       421       506   DEFINED       177       421
    3  NIO       INTEGER             C040           REFS       114       288       333   DEFINED       198       217
    0  NMC       INTEGER             C029           REFS       105       442       518   DEFINED       178       442
 7073  NMCONF    INTEGER    ARRAY                   REFS       138       247       248   DEFINED       142
    0  NMIS      INTEGER             COM2           REFS        89       300       320       323       325       407
                                                 DEFINED       293       319       324
 7037  NMIS0     INTEGER                            REFS       319       324   DEFINED       294       323
 7003  NMIS1     INTEGER                            REFS       152       249       320       325       520       524
                                                 DEFINED       151
 7023  NMODU     INTEGER                            REFS       212       299       303   DEFINED       196
    5  NONDFD    INTEGER             C038           REFS       112       217       246       287       288       345
                                                 DEFINED       198
    0  NOON      INTEGER    ARRAY    C015           REFS        99   DEFINED       341       342
 7044  NPERM     INTEGER                            REFS       485       489       491       493       495       497
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      PROGRAM    DRIVER                                    CDC 6600 FTN V3.0-P355 OPT=1  04/09/76  15.29.55.      PAGE     1

VARIABLES      SN  TYPE          RELOCATION
                                               DEFINED       484       488       490       492       494       496
     1  NOUA      INTEGER            C017         REFS       101       502     2*528   DEFINED       179
  7045  NOUINT    INTEGER                         REFS       501   DEFINED       499
  7013  NRES      INTEGER                         REFS       385       519   DEFINED       180       385
  7014  NRL       INTEGER                         REFS       373       439       509       513       515
                                               DEFINED       181       373       439
  7015  NROBA     INTEGER                         REFS       448       509       515       516   DEFINED       182       448
                                                   515
  7016  NS        INTEGER                         REFS       479       522   DEFINED       183       479
  7024  NSPA      INTEGER                         REFS       215       216       247     2*248       284       300       334
                                                   344       522   DEFINED       197
     1  NSPB      INTEGER            C028         REFS       104   DEFINED       215       334
     2  NSHION    INTEGER            C040         REFS       114
    12  NSYSF     INTEGER   ARRAY    FLTMIS       REFS       132       154       413   DEFINED       413
  7017  NTL       INTEGER                         REFS       425   DEFINED       184       425
     3  NTNR1     INTEGER            PHILM3       REFS       129       506     2*527   DEFINED       185
     0  NTR       INTEGER            C012         REFS        96       484       485   DEFINED       186
     5  NTRF      INTEGER   ARRAY    FCOUNT       REFS       126       158       488       489       490       491       492
                                                   493       494       495       496       497
     0  NTRI      INTEGER            C017         REFS       101       503     2*528   DEFINED       187
     2  NTR1      INTEGER            PHILM3       REFS       129       527   DEFINED       188
     1  NTR2      INTEGER            PHILM3       REFS       129       526   DEFINED       189
     0  NTR3      INTEGER            PHILM3       REFS       129       525   DEFINED       190
     1  NUNDI     INTEGER            C016         REFS       100   DEFINED       191
     6  NWOIO     INTEGER            C038         REFS       112       347   DEFINED       333
     5  NWORK     INTEGER            C015         REFS        99     2*424   DEFINED       332
  7020  N2        INTEGER                         REFS       391       450       505     2*528   DEFINED       192       391
                                                   450
     3  OLTIS     REAL               EXEC         REFS       124
     1  PBU       REAL               C046         REFS       118       246       290   DEFINED       199
     2  PBUCO     REAL               C046         REFS       118       290   DEFINED       245       246
     0  PCOM      REAL               C046         REFS       118       246       290   DEFINED       199
     0  PDET      REAL               DETE         REFS       123       280   DEFINED       207
     0  PDETIO    REAL               C039         REFS       113       280   DEFINED       207
     2  PDM       REAL               DETE         REFS       123       280   DEFINED       207
    24  PFRIO     REAL               FLTMIS       REFS       132
     0  PROMM     REAL               MM           REFS       127       285   DEFINED       209
  7050  PROP      REAL                            REFS       521   DEFINED       520
     0  PSMC      REAL               C045         REFS       117       269   DEFINED       203
     6  PSUC      REAL               PERM         REFS       128       279   DEFINED       209
  2261  PTR       INTEGER            COM1         REFS        88       134       316       360       361       400       427
                                                   428   DEFINED       308       428
     0  RACPU     REAL               RAHEAD       REFS       130       256       263   DEFINED       200       223       236
     0  RATINT    REAL               C031         REFS       106       286   DEFINED       210
     0  RBCPU     REAL               RBACK        REFS       131       238       274   DEFINED       202       224
  7030  RCCINT    REAL                            REFS       222   DEFINED       201
  7027  RCDUR     REAL                            REFS       221       225   DEFINED       201
     0  REASON    INTEGER            COM7         REFS        91       134       400       404   DEFINED       382       470
  2264  RECOV     REAL               COM1         REFS        88       254       261   DEFINED       200       221       237
     0  RLAMDP    REAL      ARRAY    C014         REFS        98
     5  RLAMDT    REAL      ARRAY    C014         REFS        98
    17  RMAXI     REAL      ARRAY    C014         REFS        98
     5  RMC       REAL               COM9         REFS        93       268   DEFINED       203
    12  RMINI     REAL      ARRAY    C014         REFS        98
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR.

```
VARIABLES      SN  TYPE           RELOCATION
 7022  RMISTH    REAL                               REFS       250       292   DEFINED      195
    0  RMISTM    REAL                 C036          REFS       110       295       316    2*318       520
                                                 DEFINED       292
    0  RMU       REAL                 C037          REFS       111       303   DEFINED      302       303
    0  RMUP      REAL       ARRAY     C033          REFS       107       302       303
    1  RTI       REAL                 EXEC          REFS       124       218       239      285       520
                                                 DEFINED       208
 7002  SEED      REAL                               REFS       148   DEFINED       146
    5  SEQMAX    INTEGER              EXEC          REFS       124       134       521  DEFINED       193
 7052  SFP       REAL                               REFS       524       530
 7053  SFPERR    REAL                               REFS       524       530
 7000  SIMTYP    INTEGER                            REFS       135       147       149  DEFINED       146
 7060  SLEK      REAL                               REFS       527       531
 7061  SLEK1     REAL                               REFS       527       531
    1  TABLE     REAL       ARRAY     COM1          REFS        88       316       427
   76  TC        REAL                 COM3          REFS        90       219       237      285   DEFINED      205
   25  TFRIO     REAL                 FLTMIS        REFS       132
 7040  TIGEN     REAL                               REFS       299   DEFINED       295
 2266  TIME      REAL                 COM1          REFS        88       361       371      372       400      441
                                                 DEFINED       372
    3  TISL      REAL                 C027          REFS       103
    2  TODO      REAL                 EXEC          REFS       124
    0  TW2       REAL                 C026          REFS       102       283   DEFINED      206
 7062  XCOV      REAL                               REFS       528       532
 7063  XCOV1     REAL                               REFS       528       532
 7054  XLEK      REAL                               REFS       525       531
 7055  XLEK1     REAL                               REFS       525       531
 7051  ZC        REAL                               REFS       524       525       526      527       528      529
                                                 DEFINED       523

FILE NAMES         MODE
    0  INPUT        FMT                READS      146       151       195       196      197       198      199      200
                                         201      202       203       204       205      206       207      208      209
                                         210
 2022  OUTPUT       FMT               WRITES      247       248       249       250      251       253      254      255
                                         256      260       261       262       263      266       267      268      269
                                         272      273       274       276       277      278       279      280      281
                                         282      283       284       285       286      287       288      289      290
                                         291      310       361       364       400      407       483      485      486
                                         489      491       493       495       497      498       501      502      503
                                         505      506       507       510       513      516       518      519      521
                                         522      530       531       532

EXTERNALS           TYPE    ARGS        REFERENCES
       CLFAP                  2              153      154       155       156      157       158
       CONFID                 5              524      525       526       527      528       529
       FAUGEN                 4              299
       FCBIN                  0              213
       FCBINI                 0              349
       FCBPI                  0              214
       FCBPM1                 0              538
       FCBPM2                 0              541
       PIOSTS                 0              533
       RANSET                 1              148
```

```
EXTERNALS          TYPE   ARGS        REFERENCES
       STATEA                1           463
       STATEB                1           473
       STATEC                1           480
       STATE1                1           357
       STATE2                1           374
       STATE3                1           386
       STATE4                1           393
       STATE7                1           443
       STATE8                1           449
       STATE9                1           456

INLINE FUNCTIONS   TYPE   ARGS          DEF LINE  REFERENCES
       INT       INTEGER    1  INTRIN                 316

STATEMENT LABELS                DEF LINE    REFERENCES
 4052  10                         145         311       534       539       542
 6030  20                         535         147       152
 4775  30                         298         326
    0  33          INACTIVE       305
 5020  40                         315         309       427       433
 5034  41                         322         317
 5043  43                         329         321
 5320  45                         431         367
 5313  50                         426         408       411       416       419       422       429
 5010  56                         304         300
 5122  60                         358         375       383       387       394       444       451       457       464       471
                                              475       481
 5107  65                         352         367
 5120  66                         354        3*353
 5203  70                         368         367
 5216  80                         378         367
 5225  81                         384         379
 5310  84                         423         404
 5267  85                         406         404
 5231  90                         390         367
 5233  91                         392         353
 5236  100                        397         367
 5253  101                        401         399
    0  102                        365         362
 5163  103                        366         359       360       363
 5405  120                        482         320       325
    0  140                        337         335
 5275  160                        409         404
 5277  170                        412         404
 5304  180                        417         404
 5306  190                        420         404
 5326  210                        436         367
 5341  220                        447         367
 5354  230                        454         367
 5360  240                        460         367
 5362  241                        462         353
 5365  250                        467         367
 5372  251                        472         468
 5401  260                        478         367
```

```
STATEMENT LABELS                DEF LINE    REFERENCES
  5102  285                       348         338       345
  4414  801                       279         220
  4421  802                       234         230
  4432  805                       240         228       233       235
  6142  962      FMT              546         361
  6150  985      FMT              547         364
  6152  988      FMT              548         400
  6160  991      FMT              549         407
  4074  1000                      150         149
  4530  1001                      258         252
  4555  1002                      264         257       259
  4602  1003                      270         265
  4622  1004                      275         271
  5441  1101                      488         487
  5454  1102                      490         487
  5467  1103                      492         487
  5502  1104                      494         487
  5515  1105                      496         487
  5545  1106                      501         500
  5556  1107                      502         500
  5567  1108                      503         500
  5600  1109                      504         500
  5613  1110                      506         500
  5642  1120                      512         508
  5666  1130                      517         511       514
  6032  2000                      537         149
  6035  3000                      540         149
  6165  9400     FMT              550         483
  6174  9405     FMT              551         485
  6213  9410     FMT              555         486
  6231  9411     FMT              558         489       501
  6236  9412     FMT              559         491       502
  6243  9413     FMT              560         493       503
  6250  9414     FMT              561         495       505
  6255  9415     FMT              562         497       506
  6262  9420     FMT              563         498
  6272  9425     FMT              565         507
  6277  9426     FMT              566         510
  6304  9427     FMT              567         513
  6311  9428     FMT              568         516
  6316  9429     FMT              569         518
  6323  9430     FMT              570         519
  6330  9431     FMT              571         522
  6335  9435     FMT              572         521
  6350  9445     FMT              574         530
  6357  9450     FMT              575         531
  6374  9455     FMT              578         532
  6406  9601     FMT              580         310
  6414  9801     FMT              581         151
  6416  9802     FMT              582         146       195       197       204
  6421  9803     FMT              583         196
  6423  9804     FMT  NO REFS     584
  6426  9805     FMT              585         198
  6430  9806     FMT  NO REFS     586
```

```
STATEMENT LABELS               DEF LINE    REFERENCES
 6432  9807    FMT                587        200
 6435  9808    FMT                588        201
 6440  9809    FMT                589        202
 6443  9810    FMT                590        203
 6446  9812    FMT                591        199        205        209
 6450  9813    FMT                592        206        207
 6452  9814    FMT                593        208
 6455  9815    FMT                594        210
 6460  9900    FMT                595        247
 6463  9901    FMT                596        248
 6467  9902    FMT                597        253
 6473  9903    FMT                598        254        261        267        277
 6500  9904    FMT                599        255        262        268
 6506  9905    FMT                600        256        263        269        274
 6512  9906    FMT                601        260
 6515  9907    FMT                602        266
 6520  9908    FMT                603        272
 6523  9909    FMT                604        273
 6527  9910    FMT                605        276
 6533  9911    FMT                606        278
 6537  9912    FMT                607        279
 6544  9913    FMT                608        280
 6561  9914    FMT                612        281
 6572  9915    FMT                614        282
 6601  9916    FMT                615        283
 6607  9917    FMT                616        284
 6616  9918    FMT                617        285
 6661  9919    FMT                624        286
 6671  9920    FMT                626        287
 6676  9921    FMT                627        288
 6704  9922    FMT                628        249
 6710  9923    FMT                629        250
 6715  9924    FMT                630        289
 6735  9925    FMT                635        290
 6752  9926    FMT                639        291
 6760  9927    FMT                640        251

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
 5054  140        J          335 337       28       INSTACK
 5063  285      * I          338 348      228          OPT
 5142  102      * I          362 365      218                     EXT REFS    EXITS   NOT INNER
 5150           * J          364           78                     EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1      1207                0 IOIM    (1)              1 TABLE  (1200)            1201 PTR     (1)
                                  1202 EXTEN   (1)           1203 IDETEC (1)               1204 RECOV   (1)
                                  1205 DELAY   (1)           1206 TIME   (1)
       COM2         2                0 MMIS    (1)              1 IFULL  (1)
       COM3        63                0 ACFAU   (60)            60 ENDMIS (1)                 61 MEMSIZ (1)
                                    62 TC      (1)
       COM7         1                0 REASON  (1)
       COM8         1                0 FOCO    (1)
       COM9         7                0 COPLAS  (5)              5 RMC    (1)                  6 DURMC   (1)
       CO10         2                0 MAXRLB  (1)              1 DURRB  (1)
```

```
COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       C011         1              0 MISTAK (1)
       C012         2              0 NTR    (1)                  1 IFAU   (1)
       C013         1              0 DURRES (1)
       C014        25              0 RLAMDP (5)                  5 RLAMDT (5)                10 RMINI  (5)
                                  15 RMAXI  (5)                 20 AVDUR  (5)
       C015         6              0 NOON   (5)                  5 NWORK  (1)
       C016         2              0 NDIAG  (1)                  1 NUNDI  (1)
       C017         2              0 NTPI   (1)                  1 NQUA   (1)
       C026         1              0 TH2    (1)
       C027         6              0 DOR    (1)                  1 DEOR   (1)                 2 MISIT  (1)
                                   3 TISL   (1)                  4 MI     (1)                 5 FRTI   (1)
       C028         2              0 MODSIM (1)                  1 NSPB   (1)
       C029         1              0 NMC    (1)
       C031         2              0 RATINT (1)                  1 ISYNC  (1)
       C033         5              0 RMUP   (5)
       C034         5              0 ISPARE (5)
       C035         1              0 CONDIT (1)
       C036         1              0 RMISTM (1)
       C037         1              0 RMU    (1)
       C038         7              0 IOCU   (5)                  5 NONDED (1)                 6 NWOIO  (1)
       C039         1              0 PDETIO (1)
       C040         4              0 ISWI   (1)                  1 FSWI   (1)                 2 NSWION (1)
                                   3 NIO    (1)
       C041         2              0 TCATAS (1)                  1 I3     (1)
       C042         3              0 MISTKI (3)
       C045         1              0 PSMC   (1)
       C046         3              0 PCOM   (1)                  1 PBU    (1)                 2 PBUCO  (1)
       COVER        2              0 TTLKP  (1)                  1 IFWE   (1)
       CYC          1              0 LAUNMI (1)
       D            1              0 DIAGN  (1)
       DEBUG        1              0 IDEBUG (1)
       DETE         3              0 PDET   (1)                  1 DETMAX (1)                 2 PDM    (1)
       EXEC         8              0 MINCY  (1)                  1 RTI    (1)                 2 TODO   (1)
                                   3 OLTIS  (1)                  4 IDLE   (1)                 5 SEQMAX (1)
                                   6 DOWMAX (1)                  7 MISITE (1)
       FAILD2       1              0 FOCO2  (1)
       FCOUNT      10              0 NF     (5)                  5 NTRF   (5)
       MM           2              0 PROMM  (1)                  1 MACY   (1)
       PERM         7              0 LAST   (5)                  5 MININT (1)                 6 PSUC   (1)
       PHILM3       4              0 NTP3   (1)                  1 NTR2   (1)                 2 NTR1   (1)
                                   3 NTNR1  (1)
       RAHEAD       1              0 RACPU  (1)
       RBACK        1              0 RBCPU  (1)
       FLTMIS      22              0 NFCV   (10)                10 NSYSF  (10)               20 PFRIO  (1)
                                  21 TFRIO  (1)
       FLTMS        1              0 IFLTCT (1)

STATISTICS
  PROGRAM LENGTH   3043B    1571
   BUFFER LENGTH   4044B    2084
   COMMON LENGTH   2631B    1433
```

```
      SUBROUTINE ASYNC(TIME,FINPR,NEXT)
C                                         THIS VERSION: 29 AUGUST 1974
C ASYNC GENERATES SEVERAL FAULTS IN ACFAU DEPENDING ON THE NUMBER OF
C INTERRUPTS RECEIVED BETWEEN OCCURRENCE AND DETECTION OF THE FAULT
C IN CASE OF AN ASYNCHRONOUS EXECUTIVE, THIS SUBROUTINE CREATES PSEUDO-
C FAULTS CORRESPONDING TO THE FACT THAT A FAULT MAY BE DETECTED MORE
C THAN ONCE
C FINPR   LAST DETECTION (COMPUTED BY DETTIME)
C TIME    OCCURRENCE TIME OF THE FAULT
C NEXT    SET TO 5 IF MORE FAULTS ARE GFNERATED THAN CAN BE ACCOMODATED
C         BY ACFAU  (IF IT HAPPENS, INCREASE IDIM AND SIZE OF ACFAU.
C
C ************************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,T
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/CO31/RATINT,ISYNC
      COMMON/EXEC/MINCY,RTI,TODO,OLTIS,IDLE,SEQMAX,DOMMAX,MISITE
      INTEGER EXTEN,PTR,REASON
      REAL MINCY,IDLE
C ************************************************************************
C
      IF (RANF(0.).LT.MINCY/RTI) RETURN
      IF (RATINT.EQ.0.)RETURN
C TEST IF AN INTERRUPT COMES BEFORE FINPR
      U=0.
   10 CONTINUE
      Y=RANF(0.)
      IF (Y.EQ.0.) GO TO 10
      U=U+(-1000./RATINT)*ALOG(Y)
      IF (U.GT.FINPR-TIME) RETURN
C
C AN INTERRUPT COMES CREATE A NEW FAULT
      DO 20 I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) GO TO 30
   20 CONTINUE
C THE ACFAU TABLE IS FULL
      NEXT=5
      REASON=1
      RETURN
C COPY NEWLY CREATED FAULT
   30 CONTINUE
      ACFAU(I,2)=TABLE(PTR,1)+TABLE(PTR,2)
      ACFAU(I,3)=1.
      ACFAU(I,4)=TABLE(PTR,4)
      ACFAU(I,5)=0.
      CALL DETTIM(DETEC,TIME+U,1.0)
      ACFAU(I,6)=DETEC
      IF (DETEC.LT.FINPR)FINPR=DETEC
      GO TO 10
      END
```

```
       SUBROUTINE  ASYNC                              CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.       PAGE      2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
     2 ASYNC          1        23        24        31        40

VARIABLES     SN  TYPE           RELOCATION
     0 ACFAU     REAL       ARRAY    COM3         REFS        15        35   DEFINED        43        44        45        46
                                                    48
  2265 DELAY     REAL                COM1         REFS        14
   106 DETEC     REAL                             REFS        47        48      2*49
     6 DOWMAX    REAL                EXEC         REFS        18
    74 ENDHIS    REAL                COM3         REFS        15
  2262 EXTEN     INTEGER             COM1         REFS        14        19
     0 FINPR     REAL                 F.P.        REFS        31        49   DEFINED         1        49
   105 I         INTEGER                          REFS        35        43        44        45        46        48
                                                DEFINED       34
  2263 IDETEC    INTEGER             COM1         REFS        14
     0 IDIM      INTEGER             COM1         REFS        14        34
     4 IDLE      REAL                EXEC         REFS        18        20
     1 ISYNC     INTEGER             CO31         REFS        17
    75 MEMSIZ    INTEGER             COM3         REFS        15
     0 MINCY     REAL                EXEC         REFS        18        20        23
     7 MISITE    INTEGER             EXEC         REFS        18
     0 NEXT      INTEGER              F.P.      DEFINED        1        38
     3 OLTIS     REAL                EXEC         REFS        18
  2261 PTR       INTEGER             COM1         REFS        14        19      2*43        45
     0 RATINT    REAL                CO31         REFS        17        24        30
     0 REASON    INTEGER             COM7         REFS        16        19   DEFINED        39
  2264 RECOV     REAL                COM1         REFS        14
     1 RTI       REAL                EXEC         REFS        18        23
     5 SEQMAX    REAL                EXEC         REFS        18
  2266 T         REAL                COM1         REFS        14
     1 TABLE     REAL       ARRAY    COM1         REFS        14      2*43        45
    76 TC        REAL                COM3         REFS        15
     0 TIME      REAL                 F.P.        REFS        31        47   DEFINED         1
     2 TODO      REAL                EXEC         REFS        18
   103 U         REAL                             REFS        30        31        47   DEFINED        26        30
   104 Y         REAL                             REFS        29        30   DEFINED        28

EXTERNALS          TYPE   ARGS       REFERENCES
       ALOG      REAL       1 LIBRARY     30
       DETTIM               3             47
       RANF      REAL       1             23        28

STATEMENT LABELS             DEF LINE   REFERENCES
    17 10                         27         29        50
     0 20                         36         34
    51 30                         42         35

LOOPS  LABEL    INDEX      FROM-TO    LENGTH     PROPERTIES
    41 20     * I            34 36        48      INSTACK    EXITS
```

```
COMMON BLOCKS   LENGTH.    MEMBERS - BIAS NAME(LENGTH)
      COM1        1207              0 IDIM    (1)                1 TABLE  (1200)            1201 PTR     (1)
                                 1202 EXTEN   (1)             1203 IDETEC (1)               1204 RECOV   (1)
                                 1205 DELAY   (1)             1206 T      (1)
      COM3          63              0 ACFAU   (60)              60 ENDMIS (1)                 61 MEMSIZ  (1)
                                   62 TC      (1)
      COM7           1              0 REASON  (1)
      CO31           2              0 RATINT  (1)                1 ISYNC  (1)
      EXEC           8              0 MINCY   (1)                1 RTI    (1)                  2 TODO    (1)
                                    3 OLTIS   (1)                4 IDLE   (1)                  5 SEQMAX  (1)
                                    6 DOWMAX  (1)                7 MISITE (1)

STATISTICS
  PROGRAM LENGTH    107B     71
   COMMON LENGTH   2401B   1281
```

```
          SUBROUTINE BUSCHK(NEXT,NUNIT)
C                             THIS VERSION:   MARCH 1976
          COMMON/FAULT/FLTTYP
          COMMON/COM7/REASON
          COMMON/FCBCNT/FCBSF,FALFCB(50)
          COMMON/STATUS/STS(20)
          INTEGER FLTTYP,REASON,FCBSF,FALFCB,STS
 •        IBUS=IRAN(1,8)
          CALL BUSFLT(IBUS)
          IF(STS(1).EQ.0) RETURN
          REASON=7
          NEXT=5
          FCBSF=FCBSF+1
          K=STS(2)
          FALFCB(K)=FALFCB(K)+1
          RETURN
          END
```

```
      SYMBOLIC REFERENCE MAP

ENTRY POINTS      DEF LINE      REFERENCES
    2  BUSCHK          1         10          16

VARIABLES      SN  TYPE            RELOCATION
     1  FALFCB     INTEGER    ARRAY    FCBCNT        REFS          5         7         15    DEFINED        15
     0  FCBSF      INTEGER             FCBCNT        REFS          5         7         13    DEFINED        13
     0  FLTTYP     INTEGER             FAULT         REFS          3         7
    32  IBUS       INTEGER                           REFS          9    DEFINED          8
    33  K          INTEGER                           REFS       2*15    DEFINED         14
     0  NEXT       INTEGER               F.P.     DEFINED          1        12
     0  NUNIT      INTEGER   *UNUSED     F.P.     DEFINED          1
     0  REASON     INTEGER             COM7          REFS          4         7    DEFINED         11
     0  STS        INTEGER    ARRAY    STATUS        REFS          6         7         10         14

EXTERNALS          TYPE     ARGS        REFERENCES
       BUSFLT                 1              9
       IRAN       INTEGER     2              8

COMMON BLOCKS    LENGTH      MEMBERS - BIAS NAME(LENGTH)
       FAULT        1                0 FLTTYP (1)
       COM7         1                0 REASON (1)
       FCBCNT      51                0 FCBSF  (1)                1 FALFCB (50)
       STATUS      20                0 STS    (20)

STATISTICS
  PROGRAM LENGTH     34B      28
   COMMON LENGTH    111B      73
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR.

```
      SUBROUTINE BUSFLT(BUS)
C
C THIS SUBROUTINE DETERMINES THE EFFECT OF A BUS FAULT ON THE FLIGHT
C CRITICAL BUS EQUIPMENT GROUP.
C
C BUS    IDENTIFIES THE FAULTY BUS
C
C************************************************************
      COMMON/FCB1/BUSSTS(8),FCB(8,10),BTUSTS(10)
      COMMON/FCB2/NBTU,BTUTYP(10),BTUCON(10,4),BTUNO(10)
      COMMON/FCB3/BUSTFL,BUSCOV
      COMMON/FCB4/NBUSTF,NBUSPF,NBUSTR
      COMMON/CO12/NTR,IFAU
      COMMON/FAULT/FLTTYP
      COMMON/STATUS/STS(20)
      COMMON/FCBUC/FCBUCF(6)
      COMMON/FLAGS/FLG(5)
      LOGICAL FLG
      LOGICAL GREATR
      INTEGER FCBUCF
      INTEGER BTUNO,BUSSTS,FCB,BTUSTS
      INTEGER  NBTU,BTUTYP,BTUCON,FLTTYP,STS
      INTEGER  BUS,BSTS
C
C                 ...IGNORE THE FAULT IF THE BUS IS ALREADY DISABLED
      BSTS = BUSSTS(BUS)
      IF(BSTS.EQ.0) RETURN
      FLG(1)=.TRUE.
C                 ...JUMP TO TRANSIENT OR PERMANENT FAULT ROUTINE
      GOTO(100,200,205),FLTTYP
C
C TRANSIENT FAULT HAS OCCURED
C
  100 CONTINUE
C                 ...INCREMENT FAULT COUNTERS
      IFAU = IFAU+1
      NTR = NTR+1
      NBUSTF = NBUSTF+1
C                 ...IF TRANSIENT RECOVERY FAILS, GOTO PERMANENT RECOV
      IF(GREATR(BUSTFL)) RETURN
      NBUSTR = NBUSTR+1
      GOTO 205
C
C PERMANENT FAULT RECOVERY
C
  200 CONTINUE
      IFAU = IFAU+1
      NBUSPF = NBUSPF+1
C                 ...ENTER LEAKY TRANSIENTS
  205 CONTINUE
      DO 300 J=1,NBTU
        ITYP=FCB(BUS,J)+1
        GOTO(300,400,500),ITYP
  300 CONTINUE
      BUSSTS(BUS)=0
      IF(STS(1).NE.0) CALL SETSTS(24)
      RFTURN
C
C                 ...AN ACTIVE BTU PORT FAILS
  400 CONTINUE
      MDM=J
      FCB(BUS,MDM)=0
C                 ...IF THE BTU IS DISABLED, GOTO 450
      NL = BTUSTS(MDM)-1
      BTUSTS(MDM) = NL
      IF( NL.EQ.0) GOTO  450
C                 ...GOTO 300, IF IT HAS A DDU PORT THAT FAILED
      IF(BTUTYP(MDM).EQ.1) GOTO 300
C                 ...IF THE BUS SWITCHING CAUSES A SYSTEM FAILURE, 900
      IF(GREATR(BUSCOV)) GOTO 900
C                 ...ELSE, SWITCH TO BACKUP PORT
      DO 420 I=1,2
        IBUS=BTUCON(MDM,I)
        IF(FCB(IBUS,MDM).EQ.2)GOTO 425
  420 CONTINUE
C                 ...IF CONTROL FALLS THROUGH, SOMETHING IS WRONG.
      PRINT 1000,BTUCON
 1000 FORMAT(/12H ***ERROR***/1X,4(10I5/)/)
      CALL PIOCNF
C
C                 ...INDICATE THAT BACKUP PORT IS NOW ACTIVE
  425 FCB(IBUS,MDM)=1
      GOTO 300
C
C                 ...AN MDM IS DISABLED
  450 CONTINUE
      CALL MDMPF(MDM)
      GOTO 300
C
C                 ...AN INACTIVE PORT HAS FAILED
  500 CONTINUE
      FCB(BUS,J) = 0
      BTUSTS(J)=BTUSTS(J)-1
      GOTO 300
  900 CONTINUE
      CALL SETSTS(FCBUCF(1))
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  BUSFLT          1        27        40        57        97

VARIABLES     SN  TYPE           RELOCATION
  173  BSTS      INTEGER                          REFS        23        27   DEFINED        26
   13  BTUCON    INTEGER    ARRAY    FCB2         REFS        10        22        73        77
   63  BTUNO     INTEGER    ARRAY    FCB2         REFS        10        21
  130  BTUSTS    INTEGER    ARRAY    FCB1         REFS         9        21        64        93   DEFINED        65        93
    1  BTUTYP    INTEGER    ARRAY    FCB2         REFS        10        22        68
    0  BUS       INTEGER              F.P.        REFS        23        26        52        55        62        92
                                                DEFINED        1
    1  BUSCOV    REAL                FCB3         REFS        11        70
    0  BUSSTS    INTEGER    ARRAY    FCB1         REFS         9        21        26   DEFINED        55
    0  BUSTFL    REAL                FCB3         REFS        11        40
   10  FCB       INTEGER    ARRAY    FCB1         REFS         9        21        52        74   DEFINED        62        82
                                                    92
    0  FCBUCF    INTEGER    ARRAY    FCBUC        REFS        16        20        96
    0  FLG       LOGICAL    ARRAY    FLAGS        REFS        17        18   DEFINED        28
    0  FLTTYP    INTEGER             FAULT        REFS        14        22        30
  200  I         INTEGER                          REFS        73   DEFINED        72
  201  IBUS      INTEGER                          REFS        74        82   DEFINED        73
    1  IFAU      INTEGER             C012         REFS        13        36        47   DEFINED        36        47
  175  ITYP      INTEGER                          REFS        53   DEFINED        52
  174  J         INTEGER                          REFS        52        61        92      2*93   DEFINED        51
  176  MDM       INTEGER                          REFS        62        64        65        68        73        74        82
                                                    87    DEFINED       61
    0  NBTU      INTEGER             FCB2         REFS        10        22        51
    1  NBUSPF    INTEGER             FCB4         REFS        12        48   DEFINED        48
    0  NBUSTF    INTEGER             FCB4         REFS        12        38   DEFINED        38
    2  NBUSTR    INTEGER             FCB4         REFS        12        41   DEFINED        41
  177  NL        INTEGER                          REFS        65        66   DEFINED        64
    0  NTR       INTEGER             C012         REFS        13        37   DEFINED        37
    0  STS       INTEGER    ARRAY    STATUS       REFS        15        22        56

FILE NAMES        MODE
       OUTPUT      FMT                 WRITES       77

EXTERNALS          TYPE   ARGS       REFERENCES
       GREATR    LOGICAL    1             19        40        70
       MDMPF                1             87
       PIOCNF               0             79
       SETSTS               1             56        96

STATEMENT LABELS             DEF LINE   REFERENCES
   33  100                      34        30
   44  200                      46        30
   47  205                      50        30        42
   62  300                      54        51        53        68        83        88        94
   74  400                      60        53
    0  420                      75        72
  133  425                      82        74
  136  450                      86        66
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

```
       SUBPOUTINE  BUSFLT                                  CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      4

STATEMENT LABELS             DEF LINE   REFFPENCES
  141  500                      91        53
  146  900                      95        70
  164  1000    FMT              78        77

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   50  300    * J           51 54      15B                    ENTRIES    EXITS
  116  420    * I           72 75       6B      INSTACK        EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCB1         98                 0 BUSSTS (8)                   8 FCO    (80)                  88 BTUSTS (10)
       FCB2         61                 0 NBTU   (1)                   1 BTUTYP (10)                  11 BTUCON (40)
                                      51 BTUNO  (10)
       FCB3          2                 0 BUSTFL (1)                   1 BUSCOV (1)
       FCB4          3                 0 NBUSTF.(1)                   1 NBUSPF (1)                    2 NBUSTR (1)
       CO12          2                 0 NTR    (1)                   1 IFAU   (1)
       FAULT         1                 0 FLTTYP (1)
       STATUS       20                 0 STS    (20)
       FCBUC         6                 0 FCBUCF (6)
       FLAGS         5                 0 FLG    (5)

STATISTICS
  PROGRAM LENGTH    204B     132
   COMMON LENGTH    306B     198
```

```
      SUBROUTINE CONFID(ZC,NS,N,PM,PI)
      PM=-1.0
      PI=-1.0
      IF(N.EQ.0) RETURN
      XN=FLOAT(N)
      P=NS/XN
      DENOM=2.0*(XN+ZC**2)
      PM=(2.0*XN*P+ZC**2)/DENOM
      PI=(ZC*SQRT(4.0*N*P*(1-P)+ZC**2))/DENOM
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  CONFID          1         4        10

VARIABLES     SN  TYPE           RELOCATION
   41  DENOM     REAL                             REFS         8         9    DEFINED        7
    0  N         INTEGER              F.P.        REFS         4         5         9    DEFINED        1
    0  NS        INTEGER              F.P.        REFS         6    DEFINED        1
   40  P         REAL                             REFS         8        2*9   DEFINED        6
    0  PI        REAL                 F.P.      DEFINED        1         3         9
    0  PM        REAL                 F.P.      DEFINED        1         2         8
   37  XN        REAL                             REFS         6         7         8    DEFINED        5
    0  ZC        REAL                 F.P.        PEFS         7         8        2*9   DEFINED        1

EXTERNALS          TYPE   ARGS       REFERENCES
       SQRT      REAL       1 LIBRARY      9

INLINF FUNCTIONS   TYPE   ARGS        DEF LINE  REFERENCES
       FLOAT     REAL       1  INTRIN                5

STATISTICS
  PROGRAM LENGTH     42B      34
```

```
      SUBROUTINE CLEAR(NC,IVEC)
      DIMENSION IVEC(NC)
      DO 10 I=1,NC
        IVEC(I)=0
   10  CONTINUE
      END
```

```
       SYMBOLIC RFFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  CLEAR            1          6

VARIABLES     SN  TYPE           RELOCATION
   22  I         INTEGER                          PEFS          4   DEFINED         3
    0  IVEC      INTEGER    ARPAY     F.P.        REFS          2   DEFINED         1         4
    0  NC        INTEGER              F.P.        REFS          2         3   DEFINED         1

STATEMENT LABELS             DEF LINE   REFEPENCFS
    0  10                         5          3

LOOPS  LABEL     INDFX     FROM-TO    LENGTH     PROPERTIES
   16  10        I            3 5         2B      INSTACK

STATISTICS
  PROGRAM LENGTH     30B      24
```

```
      SUBROUTINE COPY(TIME,DETEC,REASON,NEXT)
C                        THIS VERSION:   MARCH 1976
C IT COPIES THE NEW FAULT IN ACFAU. IF THERE IS TOO MANY FAULTS, REASON
C IS SET TO 1 AND NEXT TO  5
C
C ************************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,T
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/CO12/NTR,IFAU
      COMMON/CO15/NOOM(5),NWORK
      COMMON/CO41/ICATAS,I3 .
      COMMON/CO60/LSTFLT
      COMMON/FCOUNT/NF(5),NTRF(5)
      INTEGER EXTEN,PTR,REASON
C********** ********* ********* ********** ********* ********* ********
C
      IFAU=IFAU+1
      IF (TABLE(PTR,2).LT.ENDMIS) NTR=NTR+1
      IF (NWORK.GE.3)  I3=I3+1
      DO 4 I=1,IDIM
      IF (ACFAU(I,3).NE.0.)GO TO 4
      LSTFLT=I
      ACFAU(I,1)=TIME
      ACFAU(I,2)=TIME+TABLE(PTR,2)
C         HERE WE COUNT OUR TRANSIENTS                                  SP12APR
      ACFAU(I,3)=TABLE(PTR,3)
      ACFAU(I,4)=TABLE(PTR,4)
      ACFAU(I,5)=EXTEN
      ACFAU(I,6)=DETEC
      RETURN
C
C THERE ARE MORE THAN 5 FAULTS.
    4 CONTINUE
      RCASON=1
      NEXT=5
      END
```

```
       SUBROUTINE  COPY                                   CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE       2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  COPY             1           30        36

VARIABLES     SN TYPE            RELOCATION
    0  ACFAU     REAL       ARRAY    COM3         REFS         8        21   DEFINED        23        24        26        27
                                                    28        29
 2265  DELAY     REAL                COM1         REFS         7
    0  DETEC     REAL                 F.P.        REFS        29   DEFINED         1
   74  ENDMIS    REAL                COM3         REFS         8        18
 2262  EXTEN     INTEGER             COM1         REFS         7        14        28
   56  I         INTEGER                          REFS        21        22        23        24        26        27        28
                                                    29   DEFINED        20
    0  ICATAS    INTEGER             C041         REFS        11
 2263  IDETFC    INTEGER             COM1         REFS         7
    0  IDIM      INTEGER             COM1         REFS         7        20
    1  IFAU      INTEGER             C012         REFS         9        17   DEFINED        17
    1  I3        INTEGER             C041         REFS        11        19   DEFINED        19
    0  LSTFLT    INTEGER             C060         REFS        12   DEFINED        22
   75  MEMSIZ    INTEGER             COM3         REFS         8
    0  NEXT      INTEGER              F.P.     DEFINED         1        35
    0  NF        INTEGER    ARRAY    FCOUNT       REFS        13
    0  NOON      INTEGER    ARRAY    C015         REFS        10
    0  NTR       INTEGER             C012         REFS         9        18   DEFINED        18
    5  NTRF      INTEGER    ARRAY    FCOUNT       REFS        13
    5  NWORK     INTEGER             C015         REFS        10        19
 2261  PTR       INTEGER             COM1         REFS         7        14        18        24        26        27
    0  REASON    INTEGER              F.P.        REFS        14   DEFINED         1        34
 2264  RECOV     REAL                COM1         REFS         7
 2266  T         REAL                COM1         REFS         7
    1  TABLE     REAL       ARRAY    COM1         REFS         7        18        24        26        27
   76  TC        REAL                COM3         REFS         8
    0  TIME      REAL                 F.P.        REFS        23        24   DEFINED         1

STATEMENT LABELS             DEF LINE   REFERENCES
   47  4                         33        20        21

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   34  4      * I           20 33       150        OPT     EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1         1207              0 IDIM   (1)                 1 TABLE  (1200)          1201 PTR    (1)
                                   1202 EXTEN  (1)              1203 IDETEC (1)             1204 RECOV  (1)
                                   1205 DELAY  (1)              1206 T      (1)
       COM3           63              0 ACFAU  (60)               60 ENDMIS (1)                 61 MEMSIZ (1)
                                     62 TC     (1)
       C012            2              0 NTR    (1)                 1 IFAU   (1)
       C015            6              0 NOON   (5)                 5 NWORK  (1)
       C041            2              0 ICATAS (1)                 1 I3     (1)
       C060            1              0 LSTFLT (1)
       FCOUNT         10              0 NF     (5)                 5 NTRF   (5)
```

```
STATISTICS
  PROGRAM LENGTH      67B       55
   COMMON LENGTH    2413B     1291
```

```
      SUBROUTINE  DDUFLT(DDUNO,DEV)
C
C DETERMINES THE EFFECT OF A DDU DEVICE FAILURE ON THE DPS SUBSYSTEM
C
C DDUNO  THE DDU THAT CONTROLS THE DEVICE WHERE THE FAULT OCCURS
C DEV    THE DEVICE WHERE THE FAULT OCCURS
C
C*********************************************************************
      INTEGER DDUNO,DEV
      COMMON/FCB7/NDDUDV,DDUDVS(4),DDUDV(2,4),DDUDVN(4)
      COMMON/FCB11/NDDUTF(4),NDDUPF(4),NDDUTR(4)
      COMMON/FCB12/DDUCOV(4),DDUTFL(4),DDUTFD(4)
      COMMON/FAULT/FLTTYP
      COMMON/CO12/NTR,IFAU
      COMMON/STATUS/STS(20)
      COMMON/FCBUC/FCBUCF(6)
      COMMON/FLAGS/FLG(5)
      LOGICAL FLG
      INTEGER FCBUCF
      LOGICAL GREATR
      INTEGER DDUDVS,DDUDV,DDUDVN,FLTTYP,STS
      LOGICAL LESS
C                 ...RETURN IF THE DFVICE HAS ALREADY FAILED
      IF(DDUDV(DDUNO,DEV).EQ.0) RETURN
      FLG(2)=.TRUE.
      IFAU = IFAU+1
      GOTO(100,200),FLTTYP
C
C                 ...THE FAULT IS TRANSIENT
  100 CONTINUE
      NTR=NTR+1
      NDDUTF(DEV)=NDDUTF(DEV)+1
      NL=DDUDVS(DEV)
      IF(GREATR(DDUTFD(DEV))) GOTO 240
      IF(GREATR(DDUTFL(DEV))) RETURN
      NDDUTR(DEV)=NDDUTR(DEV)+1
      GOTO 205
C
C                 ...THE FAULT IS PERMANENT
  200 CONTINUE
      NDDUPF(DEV)=NDDUPF(DEV)+1
C                 ...ENTER LEAKY TRANSIENTS
  205 CONTINUE
      DDUDV(DDUNO,DEV)=0
      NL=DDUDVS(DEV)-1
      DDUDVS(DEV)=NL
      IF(NL.EQ.0) GOTO 250
      IF(LESS(DDUCOV(DEV))) RETURN
  240 CONTINUE
C                 ...AN UNCOVERED FAILURE
      CALL SETSTS(FCBUCF(3))
      RETURN
C
C                 ...SYSTEM  FAILURE
  250 CONTINUF
```

```
      CALL SETSTS(DDUOVN(DEV))
      RETURN
      END
      SYMBOLIC REFEPENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  DDUFLT          1          24         35         48         52         57

VARIABLES      SN  TYPE           RELOCATION
    0  DDUCOV     REAL       ARRAY    FCB12        REFS        12         48
    5  DDUDV      INTEGER    ARRAY    FCB7         REFS        10         21         24    DEFINED        44
   15  DDUDVN     INTEGER    ARRAY    FCB7         REFS        10         21         56
    1  DDUDVS     INTEGER    ARRAY    FCB7         REFS        10         21         33         45    DEFINED        46
    0  DDUNO      INTEGER              F.P.        REFS         9         24         44    DEFINED         1
   10  DDUTFD     REAL       ARRAY    FCB12        REFS        12         34
    4  DDUTFL     REAL       ARRAY    FCB12        REFS        12         35
    0  DEV        INTEGER              F.P.        REFS         9         24       2*32         33         34         35       2*36
                                                   2*41        44         45         46         48         56
                                                DEFINED         1
    0  FCBUCF     INTEGER    ARRAY    FCBUC        REFS        16         19         51
    0  FLG        LOGICAL    ARRAY    FLAGS        REFS        17         18    DEFINED         25
    0  FLTTYP     INTEGER             FAULT        REFS        13         21         27
    1  IFAU       INTEGER             CO12         REFS        14         26    DEFINED         26
    0  NDDUDV     INTEGER             FCB7         REFS        10
    4  NDDUPF     INTEGER    ARRAY    FCB11        REFS        11         41    DEFINED         41
    0  NDDUTF     INTEGER    ARRAY    FCB11        REFS        11         32    DEFINED         32
   10  NDDUTR     INTEGER    ARRAY    FCB11        REFS        11         36    DEFINED         36
  101  NL         INTEGER                          REFS        46         47    DEFINED         33         45
    0  NTR        INTEGER             CO12         REFS        14         31    DEFINED         31
    0  STS        INTEGER    ARRAY    STATUS       REFS        15         21

EXTERNALS          TYPE    ARGS        REFERENCES
       GREATR     LOGICAL     1              20         34         35
       LESS       LOGICAL     1              22         48
       SETSTS                 1              51         56

STATEMENT LABELS                DEF LINE    REFERENCES
    23  100                           30         27
    44  200                           40         27
    46  205                           43         37
    62  240                           49         34
    66  250                           55         47

COMMON BLOCKS    LENGTH      MEMBERS - BIAS NAME(LENGTH)
       FCB7          17              0 NDDUDV (1)      -      1 DDUDVS (4)                 5 DDUDV   (8)
                                    13 DDUDVN (4)
       FCB11         12              0 NDDUTF (4)             4 NDDUPF (4)                 8 NDDUTR (4)
       FCB12         12              0 DDUCOV (4)             4 DDUTFL (4)                 8 DDUTFD (4)
       FAULT          1              0 FLTTYP (1)
       CO12           2              0 NTR    (1)             1 IFAU   (1)
       STATUS        20              0 STS    (20)
       FCBUC          6              0 FCBUCF (6)
       FLAGS          5              0 FLG    (5)

STATISTICS
  PROGRAM LENGTH     102B       66
   COMMON LENGTH     113B       75
```

Q2

```
      SUBROUTINE DETTIM(DETEC,TIME,PLACE)
C                          THIS VERSION:   MARCH 1976
C THIS SUBROUTINE DETFRMINES THE  DETECTION TIME OF THE FAULT DESCRIBED
C BY TIME AND PLACE: TIME IS THE PSFUDO-OCCURRFNCETIME, PLACE THE PSEUDO
C MODULE. THE TIME OF THE COMPARISON FOLLOWING OCCURRENCE OF THE FAULT
C IS FIRST DETERMINED. MEMORY FAULT MAY BE DETECTED LATER.
C DETEC   DETECTION TIME COMPUTED BY DETTIME
C TIME    OCCURRENCE TIME OF THE FAULT
C PLACE   MODULE WHERE THE FAULT OCCURS
C
C********** ********* ********* ********** ********* ********* ********
      COMMON/COM3/ACFAU(10,6),ENDHIS,MEMSIZ,TC
      COMMON/CO31/RATINT,ISYNC
      COMMON/DETE/PDET,DETMAX,PDM
      COMMON/FXEC/MINCY,RTI,TODO,OLTIS,IDLE,SEQMAX,DOWMAX,MISITE
      COMMON/MH/PROMM,MACY
C ********************************************************************
C
      IF (ISYNC.EQ.0) GO TO 130
C
C SYNCHRONOUS SCHEDULING
      DETEC=TC*AINT(TIME/TC)+TC
      IF ((PLACE.NE.3.).OR.(RANF(0.).LT.PDM)) RETURN
      IF (RANF(0.).GT.PROMM)GO TO 110
      NCOM=RTI/TC
      GO TO 120
  110 CONTINUE
      NCOM=(MACY*RTI)/TC
  120 CONTINUE
      N=IRAN(1,NCOM)
      DETEC=DFTEC+(N-1)*TC
      RETURN
C
C ASYNCHRONOUS SCHEDULING
  130 CONTINUE
      U=RANF(0.)
      IF ((PLACE.EQ.3.).AND.(U.GT.PDM)) GO TO 135
      DETEC=TIME+TC*2.*RANF(0.)
      RETURN
  135 CONTINUE
      IF (RANF(0.).GT.PROMM) GO TO 140
      DET=RTI
      GO TO 150
  140 CONTINUE
      DET=RTI*MACY
  150 CONTINUE
      DETEC=TIME+DET*2.*RANF(0.)
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  DETTIM          1        23        32        39        48

VARIABLES     SN  TYPE           RELOCATION
    0  ACFAU     REAL       ARRAY    COM3         REFS        12
  116  DET       REAL                             REFS        47    DEFINED       42        45
    0  DETEC     REAL                 F.P.        REFS        31    DEFINED        1        22        31        38        47
    1  DETMAX    REAL                DETE         REFS        14
    6  DOWMAX    REAL                EXEC         REFS        15
   74  ENDMIS    REAL                COM3         REFS        12
    4  IDLE      INTEGER             EXEC         REFS        15
    1  ISYNC     INTEGER             C031         REFS        13        19
    1  MACY      INTEGER             MM           REFS        16        28        45
   75  MEMSIZ    INTEGER             COM3         REFS        12
    0  MINCY     INTEGER             EXEC         REFS        15
    7  MISITE    INTEGER             EXEC         REFS        15
  114  N         INTEGER                          REFS        31    DEFINED       30
  113  NCOM      INTEGER                          REFS        30    DEFINED       25        28
    3  OLTIS     REAL                EXEC         REFS        15
    0  PDET      REAL                DETE         REFS        14
    2  PDM       REAL                DETE         REFS        14        23        37
    0  PLACE     REAL                 F.P.        REFS        23        37    DEFINED        1
    0  PROMM     REAL                MM           REFS        16        24        41
    0  RATINT    REAL                C031         REFS        13
    1  RTI       REAL                EXEC         REFS        15        25        28        42        45
    5  SEQMAX    REAL                EXEC         REFS        15
   76  TC        REAL                COM3         REFS        12       3*22       25        28        31        38
    0  TIME      REAL                 F.P.        REFS        22        38        47    DEFINED        1
    2  TODO      REAL                EXEC         REFS        15
  115  U         REAL                             REFS        37    DEFINED       36

EXTERNALS          TYPE   ARGS       REFERENCES
       IRAN      INTEGER    2             30
       RANF      REAL       1             23        24        36        38        41        47

INLINE FUNCTIONS   TYPE   ARGS       DEF LINE  REFERENCES
       AINT      REAL       1  INTRIN             22

STATEMENT LABELS             DEF LINE   REFERENCES
   31  110                      27        24
   35  120                      29        26
   44  130                      35        19
   62  135                      40        37
   70  140                      44        41
   73  150                      46        43

COMMON-BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM3        63               0 ACFAU  (60)                60 ENDMIS (1)                   61 MEMSIZ (1)
                                   62 TC     (1)
       C031         2               0 RATINT (1)                  1 ISYNC  (1)
       DETE         3               0 PDET   (1)                  1 DETMAX (1)                    2 PDM    (1)
       EXEC         8               0 MINCY  (1)                  1 RTI    (1)                    2 TODO   (1)
       SUBROUTINE  DETTIM                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      3

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
                                    3 OLTIS  (1)                  4 IDLE   (1)                  5 SEQMAX (1)
                                    6 DOWMAX (1)                  7 MISITE (1)
       MM            2              0 PROMM  (1)                  1 MACY   (1)

STATISTICS
  PROGRAM LENGTH    117B      79
   COMMON LENGTH    116B      78
```

```
      SUBROUTINF DFAFLT(MDM,DEV)
C
C THIS ROUTINE DETERMINES THE EFFECT OF A FAULT IN ONE OF THE DEVICES
C INTEPFACED TO THE FLIGHT-AFT MDMS.
C
C MDM    IDENTIFIES THE FA-MDM INTERFACED TO THE BAD DEVICE
C DEV    IDENTIFIES THE DEVICE
C
C**********************************************************************
      COMMON/FAULT/FLTTYP
      COMMON/CO12/NTR,IFAU
      COMMON/STATUS/STS(20)
      COMMON/FCB10/NDFADV,DFADVS(3),DFADV(4,3),DFADVN(3)
      COMMON/FCB17/NDFATF(3),NDFAPF(3),NDFATR(3)
      COMMON/FCB18/DFATFD(3),DFATFL(3),DFACOV(3)
      COMMON/FLAGS/FLG(5)
      COMMON/FCBUC/FCBUCF(6)
      LOGICAL FLG
      INTEGER FCBUCF
      LOGICAL GREATR
      INTEGER DEV,FLTTYP,STS,DFADVS,DFADV,DFADVN
      LOGICAL LESS
C                 ...RETURN IF UNIT HAS ALREADY FAILED
      IF(DFADV(MDM,DEV).EQ.0) RETURN
      FLG(5)=.TRUE.
      IFAU=IFAU+1
      GOTO(100,200),FLTTYP
C
C                 ...A TRANSIENT HAS OCCURRED
  100 CONTINUE
      NTR=NTR+1
      NDFATF(DEV)=NDFATF(DEV)+1
      NL=DFADVS(DEV)
      IF((DEV.EQ.1).AND.(NL.LE.2)) GOTO 250
      IF(GREATR(DFATFD(DEV)).AND.(NL.EQ.1)) GOTO 800
      IF(GREATR(DFATFL(DEV))) RETURN
      NDFATR(DEV)=NDFATR(DEV)+1
      GOTO 205
C
C                 ...ITS A PERMANENT FAULT
  200 CONTINUE
      NDFAPF(DEV)=NDFAPF(DEV)+1
C                 ...ENTER LEAKY TRANSIENTS---RECONFIGURATION
  205 CONTINUF
      DFADV(MDM,DEV)=0
      NL=DFADVS(DEV)-1
      DFADVS(DEV)=NL
      IF(NL.EQ.0) GOTO 250
      IF(NL.GT.1) RETURN
      IF(LESS(DFACOV(DEV)))RETURN
C
C                 ...A SET OF DEVICES IS NO LONGER FUNCTIONAL
  250 CONTINUE
      CALL SETSTS(DFADVN(DFV))
      RETURN
```

```
C                ...AN UNCOVERED(CATESTROPHIC) FAULT OCCURRED
  800 CONTINUE
      CALL SETSTS(FCBUCF(6))
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  DFAFLT          1        24        36        49        50        55        59

VARIABLES     SN  TYPE           RELOCATION
    0  DEV       INTEGER                F.P.        REFS        21        24       2*32       33        34        35        36
                                                     2*37      2*42        45        46        47        50        54
                                                  DEFINED        1
    6  DFACOV    REAL        ARRAY     FCB18        REFS        15        50
    4  DFADV     INTFGER     ARPAY     FCB10        REFS        13        21        24     DEFINED       45
   20  DFADVN    INTEGER     ARRAY     FCB10        REFS        13        21        54
    1  DFADVS    INTEGER     ARRAY     FCB10        REFS        13        21        33        46     DEFINED       47
    0  DFATFD    REAL        ARRAY     FCB18        REFS        15        35
    3  DFATFL    REAL        ARRAY     FCB18        REFS        15        36
    0  FCBUCF    INTEGER     ARRAY     FCBUC        REFS        17        19        58
    0  FLG       LOGICAL     ARRAY     FLAGS        REFS        16        18    DEFINED        25
    0  FLTTYP    INTEGER               FAULT        REFS        10        21        27
    1  IFAU      INTEGER               C012         REFS        11        26    DEFINED        26
    0  MDM       INTEGER                F.P.        REFS        24        45    DEFINED         1
    0  NOFADV    INTEGER               FCB10        REFS        13
    3  NDFAPF    INTEGER     ARPAY     FCB17        REFS        14        42    DEFINED        42
    0  NDFATF    INTEGER     ARRAY     FCB17        REFS        14        32    DEFINED        32
    6  NDFATR    INTEGER     ARRAY     FCB17        REFS        14        37    DEFINED        37
  115  NL        INTEGER                            REFS        34        35        47        48        49
                                                  DEFINED       33        46
    0  NTR       INTEGER               C012         REFS        11        31    DEFINED        31
    0  STS       INTEGER     ARRAY     STATUS       REFS        12        21

EXTERNALS          TYPE   ARGS       REFERENCES
       GREATR    LOGICAL    1             20        35        36
       LESS      LOGICAL    1             22        50
       SETSTS               1             54        58

STATEMENT LABELS             DEF LINE   REFERENCES
   23  100                      30        27
   53  200                      41        27
   55  205                      44        38
   76  250                      53        34        48
  104  800                      57        35

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FAULT         1                0 FLTTYP (1)
       C012          2                0 NTR    (1)                 1 IFAU   (1)
       STATUS       20                0 STS    (20)
       FCB10        19                0 NOFADV (1)                 1 DFADVS (3)                 4 DFADV  (12)
                                     16 DFADVN (3)
       FCB17         9                0 NDFATF (3)                 3 NDFAPF (3)                 6 NDFATR (3)
       FCB18         9                0 DFATFD (3)                 3 DFATFL (3)                 6 DFACOV (3)
       FLAGS         5                0 FLG    (5)
       FCBUC         6                0 FCBUCF (6)
```

```
STATISTICS
  PROGRAM LENGTH    116B      78
   COMMON LENGTH    107B      71
```

```
      SUBROUTINE  DFFFLT(MDMNO,DEV)
C
C     DETERMINES THE EFFECT OF A FLIGHT FORWARD MDM DEDICATED DEVICE
C     FAULT.
C
C MDMNO  IDENTIFIES THE FF-MDM THAT IS INTERFACED WITH THE BAD DEVICE
C DEV    IDENTIFIES THE TYPE OF DEVICC THAT FAILED
C
C**********************************************************************
      COMMON/FCB8/NDFFDV,DFFDVS(6),DFFOV(4,6),DFFDVN(6)
      COMMON/FCB13/NDFFTF(6),NDFFPF(6),NDFFTR(6)
      COMMON/FCB14/DFFTFD(6,4),DFFTFL(6),DFFCOV(6,3)
      COMMON/FAULT/FLTTYP
      COMMON/CO12/NTR,IFAU
      COMMON/STATUS/STS(20)
      COMMON/FCBUC/FCBUCF(6)
      COMMON/FLAGS/FLG(5)
      LOGICAL FLG
      LOGICAL GREATR
      INTEGER FCBUCF
      INTEGER DEV,DFFDVS,DFFDV,DFFDVN,FLTTYP,STS
      LOGICAL LESS
C
C                  ...RETURN IF UNIT HAS ALREADY FAILED
      IF(DFFDV(MDMNO,DEV).EQ.0) RETURN
      IFAU=IFAU+1
      FLG(3)=.TRUE.
      GOTO(100,200),FLTTYP
C
C                  ...A TRANSIENT HAS OCCURRED
  100 CONTINUE
      NTR=NTR+1
      NDFFTF(DEV)=NDFFTF(DEV)+1
C                  ...IS THE FAULT DETECTED
      NL=DFFDVS(DEV)
      IF(GREATR(DFFTFD(DEV,NL))) GOTO 800
C                  ...IS TRANSIENT RECOVERY SUCCESSFUL
      IF(GREATR(DFFTFL(DEV))) RETURN
      NDFFTR(DEV) = NDFFTR(DEV)+1
      GOTO 205
C
C                  ...A PERMANENT FAULT HAS OCCURED
  200 CONTINUC
      NDFFPF(DEV)=NDFFPF(DEV)+1
      NL=DFFDVS(DEV)
C                  ...ENTER  LEAKY TRANSIENTS
  205 CONTINUF
      DFFDV(MDMNO,DEV)=0
      NL=DFFDVS(DEV)-1
      DFFDVS(DEV)=NL
      IF(NL.EQ.0) GOTO 250
      IF(LESS(DFFCOV(DEV,NL))) RETURN
C                  ...THE DEVICE GROUP IS NO LONGER FUNCTIONAL
  250 CONTINUE
      CALL SETSTS(DFFDVN(DEV))
```

```
                RETURN
          C
          C                   ...THE FAULT WAS UNDETECTED
            800 CONTINUE
                CALL SETSTS(FCBUCF(4))
                RETURN
                END
```

```
        SYMBOLIC REFERENCE MAP

ENTRY POINTS      DEF LINE      REFERENCES
    2  DFFFLT          1          25          38          52          56          61

VARIABLES      SN  TYPE            RELOCATION
    0  DEV         INTEGER                  F.P.        REFS        21          25        2*33        35          36          38        2*39
                                                         2*44        45          48          49          50          52          55
                                                      DEFINED         1
   36  DFFCOV      REAL        ARRAY      FCB14         REFS        12          52
    7  DFFDV       INTEGER     ARRAY      FCB8          REFS        10          21          25      DEFINED         48
   37  DFFDVN      INTEGER     ARRAY      FCB8          REFS        10          21          55
    1  DFFDVS      INTEGER     ARRAY      FCB8          REFS        10          21          35          45          49
                                                      DEFINED        50
    0  DFFTFD      REAL        ARRAY      FCB14         REFS        12          36
   30  DFFTFL      REAL        ARRAY      FCB14         REFS        12          38
    0  FCBUCF      INTEGER     ARRAY      FCBUC         REFS        16          20          60
    0  FLG         LOGICAL     ARRAY      FLAGS         REFS        17          18      DEFINED         27
    0  FLTTYP      INTEGER                FAULT         REFS        13          21          28
    1  IFAU        INTEGER                CO12          REFS        14          26      DEFINED         26
    0  MDMNO       INTEGER                 F.P.         REFS        25          48      DEFINED          1
    0  NDFFDV      INTEGER                FCB8          REFS        10
    6  NDFFPF      INTEGER     ARRAY      FCB13         REFS        11          44      DEFINED         44
    0  NDFFTF      INTEGER     ARRAY      FCB13         REFS        11          33      DEFINED         33
   14  NDFFTR      INTEGER     ARRAY      FCB13         REFS        11          39      DEFINED         39
  105  NL          INTEGER                              REFS        36          50          51          52      DEFINED         35          45
                                                           49
    0  NTR         INTEGER                CO12          REFS        14          32      DEFINED         32
    0  STS         INTEGER     ARRAY      STATUS        REFS        15          21

EXTERNALS            TYPE    ARGS         REFERENCES
        GREATR     LOGICAL     1              19          36          38
        LESS       LOGICAL     1              22          52
        SETSTS                 1              55          60

STATEMENT LABELS              DEF LINE    REFERENCES
   23  100                        31          28
   44  200                        43          28
   50  205                        47          40
   66  250                        54          51
   74  800                        59          36

COMMON BLOCKS     LENGTH      MEMBERS - BIAS NAME(LENGTH)
        FCB8          37              0 NDFFDV (1)                 1 DFFDVS (6)                  7 DFFDV  (24)
                                     31 DFFDVN (6)
        FCB13         18              0 NDFFTF (6)                 6 NDFFPF (6)                 12 NDFFTR (6)
        FCB14         48              0 DFFTFD (24)               24 DFFTFL (6)                 30 DFFCOV (18)
        FAULT          1              0 FLTTYP (1)
        CO12           2              0 NTR    (1)                 1 IFAU   (1)
        STATUS        20              0 STS    (20)
        FCBUC          6              0 FCBUCF (6)
        FLAGS          5              0 FLG    (5)
```

```
STATISTICS
  PROGRAM LENGTH    106B       70
   COMMON LENGTH    211B      137
```

```
      SUBROUTINE EXDUR(FAU,N,DUR)
C                                     THIS VERSION! 25 FEBRUARY 1974
C  IT GENERATES N EXPONENTIAL DURATIONS
C FAU     ARRAY WHERE DURATIONS ARE STORED
C N       DIMENSION OF FAU
C DUR     MEAN DURATION
C
C********** ********* ********* ********** ********* ********* ********
      DIMENSION FAU(N)
C **********************************************************************
C
      DO 40 K=1,N
   41 U=RANF(0.)
      IF (U.EQ.0.)GO TO 41
      FAU(K)=-DUR*ALOG(U)
   40 CONTINUE
      RETURN
      END
      SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  EXDUR           1          17

VARIABLES     SN  TYPE            RELOCATION
    0  DUR          REAL                F.P.        REFS          15    DEFINED         1
    0  FAU          REAL        ARRAY   F.P.        REFS           9    DEFINED         1         15
   34  K            INTEGER                         REFS          15    DEFINED        12
    0  N            INTEGER             F.P.        REFS           9         12   DEFINED         1
   35  U            REAL                            REFS          14         15   DEFINED        13

EXTERNALS           TYPE    ARGS        REFERENCES
       ALOG         REAL       1 LIBRARY      15
       RANF         REAL       1              13

STATEMENT LABELS              DEF LINE   REFERENCES
    0  40                        16          12
   15  41                        13          14

LOOPS  LABEL    INDEX      FROM-TO     LENGTH    PROPERTIES
   15  40      * K           12 16       13B                EXT REFS

STATISTICS
  PROGRAM LENGTH     44B      36
```

```
      SUBROUTINE EXPON(FAU,N,RTIME,NACTIV,RLAMDA)
C                             THIS VERSION:   MARCH 1976
C IT GFNERATES N OR LESS POISSON ARRIVAL TIMES. GENERATION STOPS WHEN
C RTIME IS REACHED.
C FAU      ARRAY OF ARRIVAL TIMES
C N        DIMENSION OF FAU
C RTIME    UPPER LIMIT ON ARRIVAL TIME
C NACTIVE NUMBER OF UNITS RECEIVING FAULTS AT RATE RLAMBDA
C RLAMBDA FAULT RATE IN EACH UNIT
C
C********** ********* ********* ********** ********* ********* ********
      DIMENSION FAU(N)
C *******************************************************************
C
      TIME=0.
      RLAMBD=NACTIV*RLAMDA/3.6E6
      IF (RLAMBD.EQ.0.) GO TO 19
      DO 17 K=1,N
  170 CONTINUE
      U=RANF(0.)
      IF (U.EQ.0.) GO TO 170
      Y=(-1./RLAMBD)*ALOG(U)
      TIME=Y+TIME
      FAU(K)=TIME
      IF(TIME.GT.RTIME)GOTO 18
   17 CONTINUE
   20 CONTINUE
      FAU(N)=RTIME
      RETURN
   18 CONTINUE
      N=K
      RETURN
   19 CONTINUF
      N=1
      GO TO 20
      END
```

```
       SUBROUTINE  EXPON                                  CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE       2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  EXPON          1        29        32

VARIABLES     SN  TYPE           RELOCATION
    0  FAU       REAL       ARRAY     F.P.        REFS        12    DEFINED        1        24        28
   63  K         INTEGER                          REFS        24        31    DEFINED       18
    0  N         INTEGER              F.P.        REFS        12        18        28    DEFINED        1        31        34
    0  NACTIV    INTEGER              F.P.        REFS        16    DEFINED        1
   62  RLAMBD    REAL                             REFS        17        22    DEFINED       16
    0  RLAMDA    REAL                 F.P.        REFS        16    DEFINED        1
    0  RTIME     REAL                 F.P.        REFS        25        28    DEFINED        1
   61  TIME      REAL                             REFS        23        24        25    DEFINED       15        23
   64  U         REAL                             REFS        21        22    DEFINED       20
   65  Y         REAL                             REFS        23    DEFINED       22

EXTERNALS          TYPE   ARGS       REFERENCES
       ALOG      REAL       1 LIBRARY     22
       RANF      REAL       1             20

STATEMENT LABELS             DEF LINE   REFERENCES
    0  17                      26        18
   46  18                      30        25
   51  19                      33        17
   42  20                      27        35
   23  170                     19        21

LOOPS  LABEL   INDEX     FROM-TO    LENGTH    PROPERTIES
   23  17     * K          18 26       170               EXT REFS    EXITS

STATISTICS
  PROGRAM LENGTH    101B      65
```

```
      SUBROUTINE EXTENT(EXT,DUR,MOD)
C                                            THIS VERSION: 18 JULY 1974
C THIS SUBROUTINES COMPUTES THE EXTENT OF A FAULT WHOSE DURATION IS DUR.
C DUR     UNUSED
C EXT     FAULT EXTENT: 0 NO MEMORY DAMAGE;1 MEMORY DAMAGE
C MOD     LOCATION OF THE FAULT
C
C **********************************************************************
      COMMON/PERM/LAST(5),MININT,PSUC
      INTEGER EXT
      REAL MOD
C********** ********* ********* ********** ********* ********* ********
C
      EXT=0
      IF (MOD.NE.3.)RETURN
      IF (RANF(0.) .GT.PSUC) EXT=1
      END
```

```
       SUBROUTINE  EXTENT                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  EXTENT          1        15        17

VARIABLES     SN  TYPE           RELOCATION
    0  DUR        REAL      *UNUSED    F.P.      DEFINED        1
    0  EXT        INTEGER              F.P.        REFS        10     DEFINED        1        14        16
    0  LAST       INTEGER    ARRAY    PERM         REFS         9
    5  MININT     INTEGER             PFRM         PEFS         9
    0  MOD        REAL                 F.P.        REFS        11        15    DEFINED        1
    6  PSUC       REAL                PCRM         REFS         9        16

EXTERNALS          TYPE   ARGS       REFERENCES
       RANF       REAL      1            16

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       PERM          7               0 LAST   (5)                5 MININT (1)                   6 PSUC    (1)

STATISTICS
  PROGRAM LENGTH     24B      20
   COMMON LENGTH      7B       7
```

```
      SUBROUTINE FAUGEN(NAC,RTIME,NFAUT,NMODU)
C                           THIS VERSION:   MARCH 1976
C FAUGENE GENERATES UP TO 300 FAULTS (NFAUT IS LESS THAN 300)
C THERE ARE UP TO 5 COMPUTERS(NACTIVC) WITH UP TO  5 MODULES (NMODU).
C THE 5 COMPUTERS ARE IDENTICA. FOR EACH MODULE, THE COMPUTER IS
C RANDOMLY DETERMINED. NO MORE THAN 300 FAULTS PER MODULE.
C NO MORE THAN 150 PERMANENTS AND 150 TRANSIENTS.
C IN CASE OF BURST DISTRIBUTION, ONE HAS TO BE CAREFUL THAT THERE WILL
C NOT OF MORE THAN 10 FAULTS AT ANY TIME IN ACFAU. IF THIS SHOULD
C HAPPEN, INCREASE IDIM AND THE SIZE OF ACFAU.
C AVDUR(I) = AVERAGE DURATION OF THE TRANSIENTS (EXPONENTIAL DISTRIB.)
C BURST  = FAULT RATE DURING THE BURST
C DDUR(I) = 1 : UNIFORM DISTRIBUTION FOR DURATION
C DDUR(I) = 2 : EXPONENTIAL DISTRIBUTION FOR DURATION
C DPER(I) = 1 : POISSON DISTRIBUTION FOR ARRIVALS OF PERMANENTS
C DTRA(I) = 1 : POISSON DISTRIBUTION FOR ARRIVALS OF TRANSIENTS
C DTRA(I) = 2 : BURST DISTRIBUTION FOR ARRIVALS OF TRANSIENTS
C DURA    = DURATION OF THE BURST
C NAC     = NUMBER OF COMPUTERS
C NFAUT.  = TOTAL NUMBER OF FAULTS
C RLAMB  = BURST OCCURRENCE RATE
C RMAXI(I) = MAXIMUM DURATION OF THE TRANSIENTS (UNIFORM DISTRIBUTION)
C RMINI(I) = MINIMUM DURATION OF THE TRANSIENTS (UNIFORM DISTRIBUTION)
C NMODU  = NUMBER OF DIFFERENT UNITS IN A COMPUTER
C RTIME  = MISSION TIME
C TABLE(I,1) = OCCURRENCE TIME
C TABLE(I,2) = DURATION (= RTIME IF PERMANENT)
C TABLE(I,3) = MODULE
C TABLE(I,4) = COMPUTER
C
C ****************************************************************
C
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM2/MIS,IFULL
      COMMON/CO14/RLAMDP(5),RLAMDT(5),RMINI(5),RMAXI(5),AVDUR(5)
      COMMON/CO28/MODSIM,NSPA
      COMMON/CO33/RMUP(5)
      COMMON/CO40/IIII,FFFF,NNNN,NIO
      COMMON/FLTMIS/NFCV(10),NSYSF(10),PFRIO,IFRIO
      INTEGER DPER(5),DTRA(5),DDUR(5)
      DIMENSION NERG1(5),NERG2(5)
      DIMENSION NA(5)
      DIMENSION RLAMB(5),DURA(5),BURST(5)
      DIMENSION DEBDU(300)
      DIMENSION FAULTT(150,5,3),FAULTP(150,5),FAULT(150)
C ****************************************************************
C
C NMIS IS SET TO 1 WHEN MIS=0 SO THAT THE INPUT TEST WORKS
      NMIS=MIS+1
      DO 2 I=1,NMODU
      NPER=150
      NTRA=150
C SET NACTIVE TO THE NUMBER OF MODULES OF EACH KIND
      GO TO (5,5,5,16,5),I
    5 CONTINUE
```

```
      NACTIV=NAC
      GO TO 17
    8 CONTINUE
      NACTIV=NTO
      GO TO 17
   16 CONTINUE
      IF(NMIS.NE.1) GOTO 2016
      CALL RDIOFR(PFRIO,TFRIO)
      CALL PFCBCF
      PFRIO=PFRIO/1E6
      TFRIO=TFRIO/1E6
 2016 CONTINUE
      CALL EXPON(FAULT,NPER,RTIME,1,PFRIO)
      IF(NPER.LT.150) GOTO 2010
         IFULL=1
         RETURN
 2010 CONTINUE
      DO 2020 J=1,NPER
         FAULTP(J,I)=FAULT(J)
 2020 CONTINUE
      CALL EXPON(FAULT,NTRA,RTIME,1,TFRIO)
      IF(NTRA.LT.150) GOTO 2030
         IFULL=1
         RETURN
 2030 CONTINUE
      IF(NTRA.GT.1) GOTO 2035
         FAULTT(1,I,1)=FAULT(1)
         GOTO 2
 2035 CONTINUE
      DO 2040 J=1,NTRA
         FAULTT(J,I,1)=FAULT(J)
         CALL TFISO(IUNIT,1)
         FAULTT(J,I,3)=IUNIT
         FAULTT(J,I,2)=0.0
 2040 CONTINUE
      GOTO 2
   17 CONTINUE
      NA(I)=NACTIV
      IF (NMIS.NE.1) GO TO 1
      READ 3,DPER(I),DTRA(I),DDUR(I)
    1 CONTINUE
      K=DPER(I)
      GO TO (4,6),K
    6 CONTINUE
      K=DTRA(I)
      GO TO (7,31,9),K
    9 CONTINUE
      K=DDUR(I)
      GO TO (10,30,2),K
C
C GENERATION OF THE PERMANENTS (POISSON)
    4 CONTINUE
      IF (NMIS.NE.1) GO TO 44
      READ 105,RLAMOP(I)
      RLAMOP(I)=RLAMOP(I)/1E6
      PRINT 990,I,RLAMDP(I)
      IF (NSPA.EQ.0) GO TO 44
      READ 105,RMUP(I)
      PRINT 997,RMUP(I)
   44 CALL EXPON(FAULT,NPER,RTIME,NACTIV,RLAMDP(I))
      IF (NPER.LT.150) GO TO 14
      IFULL=1
      RETURN
   14 CONTINUE
      DO 11 J=1,NPER
      FAULTP(J,I)=FAULT(J)
   11 CONTINUE
      GO TO 6
C
C GENERATION OF THE TRANSIENTS (POISSON)
    7 CONTINUF
      IF (NMIS.NF.1) GO TO 77
      RCAD 105,RLAMDT(I)
      RLAMDT(I)=RLAMDT(I)/1E6
      PRINT 980,RLAMDT(I)
   77 CALL EXPON(FAULT,NTRA,RTIMF,NACTIV,RLAMDT(I))
      IF (NTRA.LT.150) GO TO 12
      IFULL=1
      RETURN
   12 CONTINUF
      DO 13 J=1,NTRA
      FAULTT(J,I,1)=FAULT(J)
C CHOOSE THE FAULTY COMPUTER
      FAULTT(J,I,3)=IRAN(1,NACTIV)
   13 CONTINUE
      GOTO 9
C
C GENERATION OF THE BURSTS
   31 CONTINUF
      IF (NMIS.NE.1) GO TO 32
      PEAD 999,RLAMB(I),DURA(I),BURST(I)
      RLAMB(I)=PLAMB(I)/1E6
      PRINT 998,RLAMB(I),DURA(I),BURST(I)
   32 CONTINUE
      NTRC=150
      CALL EXPON(DEBBU,NTRC,RTIME,NACTIV,RLAMB(I))
      L=1
      DO 35 J=1,NTRC
      IF (DEBBU(J).GT.RTIME) GO TO 38
   36 CONTINUE
      U=RANF(0.)
      IF (U.EQ.0.) GO TO 36
      U=-DURA(I)*ALOG(U)*1000.
C WE AVOID A BURST COMING UPON A PREVIOUS BURST
      U=AMIN1(U,DEBBU(J+1)-DEBBU(J))
     .NTRB=150
      CALL EXPON(FAULT,NTRB,U,1,BUPST(I)*3600.)
      M=IRAN(1,NACTIV)
      DO 37 K=1,NTRB
      IF (FAULT(K).GT.U) GO TO 35
```

```
            FAULTT(L,I,1)=DEBRU(J)+FAULT(K)
            FAULTT(L,I,3)=M
            L=L+1
            IF (L.GE.300) GO TO 38
         37 CONTINUE
         35 CONTINUE
         38 CONTINUE
            FAULTT(L,I,1)=10.*RTIME
            NTRA=L
            IF (L.LT.150) GO TO 9
            IFULL=1
            RETURN
      C
      C GENERATION OF THE TRANSIENT DURATIONS (UNIFORM)
         10 CONTINUE
            IF (NMIS.NE.1) GO TO 1010
            READ 19,RMINI(I),RMAXI(I)
            AVER=(RMAXI(I)+RMINI(I))/2
            PRINT 950,AVER
       1010 CONTINUE
      C IF NO TRANSIENT GO TO 2
            IF (NTRA.LE.1) GO TO 2
            CALL UNIF(FAULT,NTRA,RMINI(I),RMAXI(I))
            GO TO 1011
      C
      C GENERATION OF THE TRANSIENT DURATIONS (EXPONENTIAL)
         30 CONTINUE
            IF (NMIS.NE.1) GO TO 3030
            READ 105,AVDUR(I)
            PRINT 949,AVDUR(I)
       3030 CONTINUE
      C IF NO TRANSIENT GO TO 2
            IF (NTRA.LE.1) GO TO 2
            CALL EXDUR(FAULT,NTRA,AVDUR(I))
      C
      C COPY DURATION
       1011 CONTINUE
            DO 15 J=1,NTRA
            FAULTT(J,I,2)=FAULT(J)
         15 CONTINUE
          2 CONTINUE
      C
      C SO AT HIS POINT, SPORTSFANS, WE HAVE CREATED TWO SEPERATE FAULT       SP03APR4
      C TABLES, ONE FOR PERMANENTS AND ONE FOR TRANSIENTS -- NOW IS THE EVER  SP03APR4
      C PRESENT TIME TO MAKE THINGS PERFECTLY CLEAR BY MERGING THE TWO TABLES SP03APR4
      C INTO ONE GRANDIOUS TIME-ORDERED FAULT TABLE.                          SP03APR4
            DO 21 I=1,NMODU
            MERG1(I)=1
            MERG2(I)=1
         21 CONTINUE
            DO 29 J=1,NFAUT
            RMINP=RTIME
            RMINT=RTIME
      C THE FOLLOWING LOOPS FINDS THE JTH FAULT
            DO 22 I=1,NMODU
      IMERG1=MERG1(I)
      IF(FAULTP(IMERG1,I).GT.RMINP) GO TO 23
      RMINP=FAULTP(IMFRG1,I)
      MP=I
   23 CONTINUF
      IMERG2=MERG2(I)
      IF(FAULTT(IMERG2,I,1).GT.RMINT) GOTO 22
      RMINT=FAULTT(IMFPG2,I,1)
      MT=I
   22 CONTINUE
      TABLE(J,1)=AMIN1(RMINP,RMINT)
C IF NO MORE FAULT RETUPN
      IF ((TABLE(J,1).GE.RTIME).AND.(J.LT.NFAUT)) RETURN
      IF (J.LT.NFAUT) GO TO 28
      IFULL=1
      RETURN
   28 CONTINUE
      IF (RMINP.GE.RMINT)GO TO 25
      IF(MP.EQ.4) CALL PFISO(IUNIT,1)
      IF(MP.NE.4) IUNIT=IRAN(1,NA(MP))
      TABLE(J,4)=IUNIT
      TABLE(J,2)=36.E12
      TABLE(J,3)=MP
      MFRG1(MP)=MERG1(MP)+1
      GO TO 26
   25 CONTINUC
      IMERG2=MFRG2(MT)
      TABLE(J,2)=FAULTT(IMERG2,MT,2)
      TABLE(J,3)=MT
      TABLE(J,4)=FAULTT(IMERG2,MT,3)
      MERG2(MT)=MERG2(MT)+1
   26 CONTINUE
   29 CONTINUF
      RETURN
C                     *********************************                  SP02APR4
C                     *          F O R M A T S          *                  SP02APR4
C                     *********************************                  SP02APR4
    3 FORMAT (3I1)
   19 FORMAT(2E10.3)
  105 FORMAT (E10.3)
  949 FORMAT(17X,18HTPANSIENT DURATION,3X,E9.2,
     1 27H MILLISECONDS (EXPONENTIAL))
  950 FORMAT(28H AVFRAGF TRANSIFNT DURATION ,F7.0,
     1 23H MILLISECONDS (UNIFORM))
  980 FORMAT(17X,14HTPANSIENT RATF,7X,E9.2,9H PER HOUR)
  990 FORMAT(5X,6HMODULE,I3,17H : PFRMANENT RATE,7X,E9.2,9H PER HOUR)
  997 FORMAT(17X,12HDORMANT RATE,9X,E9.2,9H PER HOUR)
  998 FORMAT(17X,21HBURST OCCURPENCF RATE,E9.2,9H PER HOUR/
     1 17X,14HBURST DURATION,3X,F8.1,22H SECONDS (EXPONENTIAL)/
     2 17X,16HBURST FAULT RATE,5X,E9.2,11H PER SFCOND)
  999 FORMAT(3E10.3)
      FND
```

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       SUBROUTINE  FAUGEN                                 CDC 6600 FTN V3.0-P355 OPT=1  04/09/76  15.00.05.      PAGE        6

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
.    2  FAUGFN         1          71        79       118       134       177       233       236       254

VARIABLES     SN  TYPE           RELOCATION
   24  AVDUR     REAL       ARRAY    C014          REFS        35       195       199   DEFINED       194
 1056  AVER      REAL                               RFFS       184   DEFINED       183
 1135  BURST     REAL       ARRAY                   REFS        43       148       162   DEFINED       146
 1077  DDUR      INTEGER    ARRAY                   REFS        40       103   DEFINED        95
 1147  DEBBU     REAL       ARRAY                   RFFS        44       151       154     2*160       166
 2265  DFLAY     REAL                COM1           REFS        33
 1065  DPER      INTFGER    ARRAY                   REFS        40        97   DEFINED        95
 1072  DTRA      INTEGER    ARRAY                   REFS        40       100   DEFINED        95
 1130  DURA      REAL       ARRAY                   RFFS        43       148       158   DEFINED       146
 2262  EXTEN     REAL                COM1           REFS        33
 7506  FAULT     REAL       ARRAY                   RFFS        45        68        74        76        82        86       115
                                                     121       131       137       162       165       166       188       199
                                                     204
 6130  FAULTP    REAL       ARRAY                   REFS        45       222       223   DEFINED        74       121
 1616  FAULTT    REAL       ARRAY                   RFFS        45       227       228       248       250
                                                 DEFINED        82        86        88        89       137       139       166
                                                     167       173       204
    1  FFFF      REAL                C040           REFS        38
 1042  I         INTEGER                            REFS        54        74        82        86        88        89        93
                                                    3*95        97       100       103       109     2*110     2*111       113
                                                     114       115       121       128     2*129       130       131       137
                                                     139     3*146     2*147     3*148       151       158       162       166
                                                     167       173     2*182     2*183     2*188       194       195       199
                                                     204       213       214       221       222       223       224       226
                                                     227       228       229   DEFINED        50       212       220
 2263  IDETEC    INTEGER             COM1           REFS        33
    0  IDIM      INTFGER             COM1           REFS        33
    1  IFULL     INTFGER             COM2           REFS        34   DEFINED        70        78       117       133       176
                                                     235
.   0  IIII      INTEGER             C040           REFS        38
 1061  IMERG1    INTFGER                            REFS       222       223   DEFINED       221
 1063  IMFRG2    INTFGER                            PEFS       227       228       248       250   DEFINED       226       247
 1047  IUNIT     INTEGER                            PEFS        87        88       239       241   DEFINED       240
 1046  J         INTEGER                            PFFS      2*74      2*86        88        89     2*121     2*137       139
                                                     154     2*160       166     2*204       231     2*233       234       241
                                                     242       243       248       249       250   DEFINED        73        85
                                                     120       136       153       203       216
 1050  K         INTEGER                            REFS        98       101       104       165       166
                                                 DEFINED        97       100       103       164
 1052  L         INTFGFR                            PEFS       166       167       168       169       173       174       175
                                                 DEFINED       152       168
 1055  M         INTFGER                            PFFS       167   DEFINED       163
 1104  MERG1     INTEGEP    ARRAY                   REFS        41       221       244   DEFINED       213       244
 1111  MERG2     INTEGER    ARRAY                   REFS        41       226       247       251   DEFINED       214       251
    0  MIS       INTEGER             COM2           PFFS        34        49
    0  MODSIM    INTFGER             C028           PEFS        36
 1062  MP        INTEGER                            PEFS       239     2*240       243     2*244   DEFINFD       224
 1064  MT        INTEGER                            PFFS       247       248       249       250     2*251
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       SUBROUTINE  FAUGEN                                 CDC 6600 FTN V3.0-P355 OPT=1  04/09/76  15.00.05.      PAGE       7

VARIABLES     SN  TYPE           RELOCATION
                                                DEFINED      229
 1116  NA        INTEGER    ARRAY                 REFS        42       240   DEFINED        93
    0  NAC       INTEGER              F.P.        REFS        56   DEFINED         1
 1045  NACTIV    INTEGER                          REFS        93       115       131       139       151       163
                                                DEFINED       56        59
    0  NFAUT     INTEGER              F.P.        REFS       216       233       234   DEFINED         1
    0  NFCV      INTEGER    ARRAY    FLTMIS       REFS        39
    3  NIO       INTEGER             C040         REFS        38        59
 1041  NMIS      INTEGER                          REFS        62        94       108       127       145       181       193
                                                DEFINED       49
    0  NMODU     INTEGER              F.P.        REFS        50       212       220   DEFINED         1
    2  NNNN      INTEGER             C040         REFS        38
 1043  NPER      INTEGER                          REFS        68        69        73       115       116       120
                                                DEFINED       51
    1  NSPA      INTEGER             C028         REFS        36       112
   12  NSYSF     INTEGER    ARRAY    FLTMIS       REFS        39
 1044  NTRA      INTEGER                          REFS        76        77        81        85       131       132       136
                                                   187       188       198       199       203   DEFINED        52       174
 1054  NTRB      INTEGER                          REFS       162       164   DEFINED       161
 1051  NTRC      INTEGER                          REFS       151       153   DEFINED       150
   24  PFRIO     REAL                FLTMIS       REFS        39        63        65        68   DEFINED        65
 2261  PTR       REAL                COM1         REFS        33
 2264  PECOV     REAL                COM1         REFS        33
 1123  RLAMB     REAL       ARRAY                 REFS        43       147       148       151   DEFINED       146       147
    0  PLAMDP    REAL       ARRAY    C014         REFS        35       110       111       115   DEFINED       109       110
    5  RLAMDT    REAL       ARRAY    C014         REFS        35       129       130       131   DEFINED       128       129
   17  RMAXI     REAL       ARRAY    C014         REFS        35       183       188   DEFINED       182
   12  RMINI     REAL       ARRAY    C014         REFS        35       183       188   DEFINED       182
 1057  RMINP     REAL                             REFS       222       231       238   DEFINED       217       223
 1060  RMINT     REAL                             REFS       227       231       238   DEFINED       218       228
    0  RMUP      REAL       ARRAY    C033         REFS        37       114   DEFINED       113
    0  RTIME     REAL                 F.P.        REFS        68        76       115       131       151       154       173
                                                   217       218       233   DEFINED         1
    1  TABLE     REAL       ARRAY    COM1         REFS        33       233   DEFINED       231       241       242       243
                                                   248       249       250
   25  TFRIO     REAL                FLTMIS       REFS        39        63        66        76   DEFINED        66
 2266  TIME      REAL                COM1         REFS        33
 1053  U         REAL                             REFS       157       158       160       162       165
                                                DEFINED      156       158       160

FILE NAMES        MODE
       INPUT       FMT                  READS       95       109       113       128       146       182       194
       OUTPUT      FMT                 WRITES      111       114       130       148       184       195

EXTERNALS          TYPE   ARGS       REFERENCES
       ALOG      REAL       1 LIBRARY    158
       EXDUR                3            199
       EXPON                5             68        76       115       131       151       162
       IRAN      INTEGER    2            139       163       240
       PFCBCF               0             64
       PFISO                2            239
       RANF      REAL       1            156
       RDIOFR               2             63
       TFISO                2             87
```

```
EXTERNALS           TYPE    ARGS       REFERENCES
      UNIF                    4           188

INLINE FUNCTIONS    TYPE    ARGS         DEF LINE  REFERENCES
      AMIN1      REAL        0  INTRIN              160        231

STATEMENT LABELS              DEF LINE    REFERENCES
  140  1                         96         94
  522  2                        206         50        83        91        104        187        198
  740  3        FMT             258         95
  172  4                        107         98
   32  5                         55         3*54
  150  6                         99         98       123
  250  7                        126        101
   34  8                         58         54
  161  9                        102        101       141       175
  435  10                       180        104
    0  11                       122        120
  277  12                       135        112
    0  13                       140        136
  240  14                       119        116
    0  15                       205        203
   36  16                        61         54
  122  17                        92         57        60
  742  19       FMT             259        182
    0  21                       215        212
  564  22                       230        220       227
  553  23                       225        222
  630  25                       246        238
  640  26                       252        245
  603  28                       237        234
    0  29                       253        216
  470  30                       192        104
  314  31                       144        101
  343  32                       149        145
  421  35                       171        153       165
  354  36                       155        157
    0  37                       170        164
  424  38                       172        154       169
  230  44                       115        108       112
  267  77                       131        127
  744  105      FMT             260        109       113       128       194
  746  949      FMT             261        195
  756  950      FMT             263        184
  766  980      FMT             265        130
  773  990      FMT             266        111
 1002  997      FMT             267        114
 1007  998      FMT             268        148
 1027  999      FMT             271        146
  460  1010                     185        181
  513  1011                     202        189
   57  2010                      72         69
   50  2016                      67         62
    0  2020                      75         73
   75  2030                      80         77
```

```
STATEMENT LABELS              DEF LINE   REFERENCES
  103  2035                      84         81
    0  2040                      90         85
  505  3030                     196        193

LOOPS  LABEL     INDEX      FROM-TO    LENGTH     PROPERTIES
   17  2       * I            50 206     506B                  EXT REFS    EXITS   NOT INNER
   64  2020      J            73 75       2B       INSTACK
  104  2040    * J            85 90      15B                   EXT REFS
  245  11        J           120 122      2B       INSTACK
  300  13      * J           136 140     14B                   EXT REFS
  351  35      * J           153 171     53B                   EXT REFS    EXITS   NOT INNER
  405  37      * K           164 170     14B          OPT        EXITS
  520  15        J           203 205      2B       INSTACK
  530  21        I           212 215      2B       INSTACK
  533  29      * J           216 253    110B                   EXT REFS    EXITS   NOT INNER
  542  22      * I           220 230     24B          OPT

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
      COM1       1207                 0 IDIM    (1)                1 TABLE  (1200)           1201 PTR     (1)
                                   1202 EXTEN   (1)             1203 IDETEC (1)              1204 RECOV   (1)
                                   1205 DELAY   (1)             1206 TIME   (1)
      COM2          2                 0 MIS     (1)                1 IFULL  (1)
      CO14         25                 0 RLAMDP  (5)                5 RLAMDT (5)                10 RMINI   (5)
                                     15 RMAXI   (5)               20 AVDUR  (5)
      CO28          2                 0 MODSIM  (1)                1 NSPA   (1)
      CO33          5                 0 RMUP    (5)
      CO40          4                 0 IIII    (1)                1 FFFF   (1)                 2 NNNN    (1)
                                      3 NIO     (1)
      FLTMIS       22                 0 NFCV    (10)              10 NSYSF  (10)               20 PFRIO   (1)
                                     21 TFRIO   (1)

STATISTICS
  PROGRAM LENGTH   7757B    4079
   COMMON LENGTH   2363B    1267
```

```
      SUBROUTINE FCBFLT(TIME,PLACE,DUR,NEXT)
C
C THIS SUBROUTINE IS INVOKED BY FIFAU UPON THE OCCURRENCE OF A FAULT
C IN THE FLIGHT CRITAL BUS PARTITION.  THE APPROPRIATE SUBROUTINE
C IS INVOKED TO SIMULATE THE SYSTEMS RESPONSE TO THE FAULT.  FCBFLT
C THEN CHECKS THE RESULTING SYSTEM STATUS.  IF A FLIGHT CRITAL FAILURE
C OCCURRED, THE APPROPRIATE COUNTER IS INCREMENTED, AND NEXT IS SET TO
C ≠5≠ TO INDICATE SYSTEM FAILURE.  CONTROL RETURNS TO FIFAU.
C
C***********************************************************************
      INTEGER REASON
      INTEGER PLACE,STS,FLTTYP,GROUP
      INTEGER FCBSF,FALFCB
      COMMON/FCBCNT/FCBSF,FALFCB(50)
      COMMON/FAULT/FLTTYP
      COMMON/DEBUG/IDEBUG
      COMMON/STATUS/STS(20)
      COMMON/COM7/REASON
      COMMON/CO36/RMISTM
      DIMENSION PLACE(5)
C
C
      GROUP=PLACE(2)
      FLTTYP=1
      IF(DUR.GE.RMISTM) FLTTYP=2
      GOTO(10,20,30,40,50,60),GROUP
C            ...BUS FAULT
   10 CONTINUE
      CALL BUSFLT(PLACE(3))
      GOTO 200
C            ...MDM FAULT
   20 CONTINUE
      CALL MDMFLT(PLACE(3),PLACE(4))
      GOTO 200
C            ...DDU FAULT
   30 CONTINUE
      CALL DDUFLT(PLACE(3),PLACE(4))
      GOTO 200
C            ...DEDICATED DEVICE FAILURE...FF-MDM
   40 CONTINUE
      CALL DFFFLT(PLACE(3),PLACE(4))
      GOTO 200
C            ...NON-DEDICATED DEVICE   FF-MDM
   50 CONTINUE
      CALL NFFFLT(PLACE(3),PLACE(4),PLACE(5))
      GOTO 200
C            ...DEDICATED DEVICE   FA-MDM
   60 CONTINUE
      CALL DFAFLT(PLACE(3),PLACE(4))
      GOTO 200
C
C
  200 CONTINUE
      IF(STS(1).EQ.0) RETURN
      REASON=3
      NEXT=5
      FCBSF=FCBSF+1
      N=STS(1)+1
      K=STS(N)
      FALFCB(K)=FALFCB(K)+1
      RETURN
      END
```

```
       SUBROUTINE  FCBFLT                                 CDC 6600 FTN V3.0-P355 OPT=1  04/09/76  20.09.38.      PAGE       3

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  FCBFLT          1         54         61

VARIABLES     SN  TYPE           RELOCATION
    0  DUR       REAL                 F.P.        REFS        25    DEFINED        1
    1  FALFCB    INTEGER    ARRAY    FCBCNT      REFS        13        14        60    DEFINED       60
    0  FCBSF     INTEGER             FCBCNT      REFS        13        14        57    DEFINED       57
    0  FLTTYP    INTEGER             FAULT       REFS        12        15    DEFINED       24        25
  104  GROUP     INTEGER                         REFS        12        26    DEFINED       23
    0  IDEBUG    INTEGER             DEBUG       REFS        16
  106  K         INTEGER                         REFS       2*60   DEFINED        59
  105  N         INTEGER                         REFS        59    DEFINED        58
    0  NEXT      INTEGER              F.P.      DEFINED       1         56
    0  PLACE     INTEGER    ARRAY     F.P.        REFS        12        20        23        29       2*33      2*37      2*41
                                                   3*45      2*49   DEFINED        1
    0  REASON    INTEGER             COM7        REFS        11        18    DEFINED       55
    0  RMISTM    REAL                C036        REFS        19        25
    0  STS       INTEGER    ARRAY    STATUS      REFS        12        17        54        58        59
    0  TIME      REAL      *UNUSED    F.P.      DEFINED       1

EXTERNALS          TYPE   ARGS        REFERENCES
       BUSFLT               1             29
       ODUFLT               2             37
       DFAFLT               2             49
       OFFFLT               2             41
       MDMFLT               2             33
       NFFFLT               3             45

STATEMENT LABELS             DEF LINE   REFERENCES
   34  10                       28         26
   37  20                       32         26
   42  30                       35         26
   45  40                       40         26
   50  50                       44         26
   53  60                       48         26
   55  200                      53         30        34        38        42        46        50

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCBCNT       51              0 FCBSF   (1)                1 FALFCB (50)
       FAULT         1              0 FLTTYP  (1)
       DEBUG         1              0 IDEBUG  (1)
       STATUS       20              0 STS     (20)
       COM7          1              0 REASON  (1)
       C036          1              0 RMISTM  (1)

STATISTICS
  PROGRAM LENGTH    125B       85
   COMMON LENGTH    113B       75
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```
      SUBROUTINE FCBIN
      COMMON/IFCB1/BUSSTS(8),FCB(8,10),BTUSTS(10)
      COMMON/FCB2/NBTU,BTUTYP(10),BTUCON(10,4),BTUNO(10)
      COMMON/FCB3/BUSTFL,BUSCOV
      COMMON/FCB5/BTUCOV(10,2),BTUTFL(10,2)
      COMMON/IFCB7/NDDUDV,DDUDVS(4),DDUDV(2,4)
      COMMON/IFCB8/NDFFDV,DFFDVS(6),DFFDV(4,6)
      COMMON/IFCB9/NNFFDV,NFFDVS(2,4),NFFDV(3,2,4)
      COMMON/IFCB10/NDFADV,DFADVS(3),DFADV(4,3)
      COMMON/FCB12/DDUCOV(4),DDUTFL(4),DDUTFD(4,2)
      COMMON/FCB14/DFFTFD(6,4),DFFTFL(6),DFFCOV(6,3)
      COMMON/FCB16/NFFTFD(4,2),NFFTFL(4,2),NFFCOV(4),NFFPFD(4,2)
      COMMON/FCB18/DFATFD(3),DFATFL(3),DFACOV(3)
      COMMON/FCBNM/DDUNM(4),DFFNM(6),NFFNM(4),DFANM(3)
      COMMON/FCBNM1/BUSNM(8),MDDUNM(2),MFFNM(4),MFANM(4)
      INTEGER BUSNM
      DIMENSION ICNT(3),IRFC(6)
      INTEGER DDUNM,DFFNM,NFFNM,DFANM
      REAL NFFTFD,NFFTFL,NFFCOV,NFFPFD
      INTEGER BUSSTS,FCB,BTUSTS,BTUTYP,BTUCON,BTUNO
      INTEGER DDUDVS,DDUDV,DFFDVS,DFFDV,DFADVS,DFADV
      DATA BUSSTS/8*1/
      NTYPS=3
      READ 2001,NBTU
      DO 10 I=1,8
        READ 2002,(FCB(I,J),J=1,NBTU)
   10 CONTINUE
      READ 2002,(BTUTYP(I),I=1,NBTU)
      DO 20 I=1,NTYPS
        ICNT(I)=0
   20 CONTINUE
      DO 50 J=1,NBTU
        ITYP=BTUTYP(J)
        IF(ITYP.GT.NTYPS) STOP 1021
        ICNT(ITYP)=ICNT(ITYP)+1
        BTUNO(J)=ICNT(ITYP)
        ISUM=0
        DO 40 I=1,8
          IPRT=FCB(I,J)
          IF(IPRT.EQ.0) GOTO 40
      IF(IPRT.LT.0.OR.IPRT.GT.2) STOP 1022
          ISUM=ISUM+1
          BTUCON(J,ISUM)=I
   40   CONTINUE
        BTUSTS(J)=ISUM
   50 CONTINUE
      READ 2001,NDDUDV
      IF((NDDUDV.LT.0).OR.(NDDUDV.GT.4)) STOP 1023
      DO 60 I=1,2
        READ 2002,(DDUDV(I,J),J=1,NDDUDV)
   60  CONTINUE
      DO 80 J=1,NDDUDV
        ISUM=0
        DO 70 I=1,2
          IF(DDUDV(I,J).NE.0)ISUM=ISUM+1
```

```
 70   CONTINUE
      DDUDVS(J)=ISUM
 80 CONTINUE
    READ 2001,NDFFDV
    IF(NDFFDV.LT.0.OR.NDFFDV.GT.6) STOP 1024
    DO 90 I=1,4
      READ 2002,(DFFDV(I,J),J=1,NOFFDV)
 90 CONTINUE
    DO 110 J=1,NOFFDV
      ISUM=0
      DO 100 I=1,4
        IF(OFFDV(I,J).NE.0) ISUM=ISUM+1
100   CONTINUE
      OFFOVS(J)=ISUM
110 CONTINUE
    READ 2001,NNFFDV
    IF(NNFFDV.LT.0.OR.NNFFDV.GT.4) STOP 1025
    READ 2002,(IREC(I),I=1,NNFFDV)
    DO 130 J=1,NNFFDV
      DO 120 I=1,?
      I1=0
      I2=0
        IF(IREC(J).LE.0)GOTO 115
          IREC(J)=IREC(J)-1
          I1=3
          I2=1
115     CONTINUE
        NFFDVS(I,J)=I1
        DO 120 K=1,3
          NFFDV(K,I,J)=I2
120   CONTINUE
130 CONTINUE
    READ 2001,NDFADV
    IF((NDFADV.LE.0).OR.(NDFADV.GT.3)) STOP 1026
    DO 140 I=1,4
      READ 2002,(DFADV(I,J),J=1,NDFADV)
140 CONTINUF
    DO 150 J=1,NDFADV
      ISUM=0
      DO 145 I=1,4
        IF(DFADV(I,J).NE.0) ISUM=ISUM+1
145   CONTINUE
      DFADVS(J)=ISUM
150 CONTINUE
    RFAD 2004,(BUSNM(I),I=1,8)
    READ 2004,(MDDUNM(I),I=1,2)
    READ 2004,(MFFNM(I),I=1,4)
    READ 2004,(MFANM(I),I=1,4)
    READ 2004,(DDUNM(I),I=1,NDDUDV)
    READ 2004,(OFFNM(I),I=1,NDFFDV)
    READ 2004,(NFFNM(I),I=1,NNFFDV)
    READ 2004,(DFANM(I),I=1,NDFADV)
    READ 2003,BUSTFL,BUSCOV
    DO 160 J=1,NBTU
      READ 2003,BTUTFL(J,1),BTUTFL(J,2),BTUCOV(J,1),BTUCOV(J,2)
```

```
  160 CONTINUE
      READ 2003,(DDUTFL(I),I=1,NDDUDV)
      READ 2003,(DDUCOV(I),I=1,NDDUDV)
      READ 2003,(DDUTFD(I,1),I=1,NDDUDV)
      READ 2003,(DDUTFD(I,2),I=1,NDDUDV)
      READ 2003,(DFFTFL(I),I=1,NDFFDV)
      DO 170 J=1,3
        READ 2003,(DFFCOV(I,J),I=1,NDFFDV)
  170 CONTINUE
      DO 180 J=1,4
        READ 2003,(DFFTFD(I,J),I=1,NDFFDV)
  180 CONTINUE
      READ 2003,(NFFTFL(I,1),I=1,NNFFDV)
      READ 2003,(NFFTFL(I,2),I=1,NNFFDV)
      READ 2003,(NFFTFD(I,1),I=1,NNFFDV)
      READ 2003,(NFFTFD(I,2),I=1,NNFFDV)
      READ 2003,(NFFPFD(I,1),I=1,NNFFDV)
      READ 2003,(NFFCOV(I),I=1,NNFFDV)
      READ 2003,(DFATFL(I),I=1,NDFADV)
      READ 2003,(DFATFD(I),I=1,NDFADV)
      READ 2003,(DFACOV(I),I=1,NDFADV)
      RETURN
 2001 FORMAT(8I10)
 2002 FORMAT(20I2)
 2003 FORMAT(8F10.0)
 2004 FORMAT(8A10)
      END
      SYMBOLIC REFFRENCE MAP

ENTRY POINTS      DEF LINE      REFERENCES
    1  FCBIN           1         132

VARIABLES      SN  TYPE           RELOCATION
    13  BTUCON   INTEGER    ARRAY    FCB2            REFS         3        20   DEFINED        43
     0  BTUCOV   REAL       ARPAY    FCB5            REFS         5   DEFINED     2*110
    63  BTUNO    INTEGER    ARRAY    FCB2            REFS         3        20   DEFINED        36
   130  BTUSTS   INTEGER    ARRAY    IFCB1           REFS         2        20   DEFINED        45
    24  BTUTFL   RFAL       ARRAY    FCB5            REFS         5   DEFINED     2*110
     1  BTUTYP   INTFGER    ARRAY    FCB2            REFS         3        20        33   DEFINED        28
     1  BUSCOV   REAL                FCB3            REFS         4   DEFINED       108
     0  BUSNM    INTEGER    ARRAY    FCBNM1          REFS        15        16   DEFINED       100
     0  BUSSTS   INTEGER    ARRAY    IFCB1           REFS         2        20   DEFINED        22
     0  BUSTFL   RFAL                FCB3            REFS         4   DEFINED       108
     0  DDUCOV   REAL       ARRAY    FCB12           REFS        10   DEFINED       113
     5  DDUDV    INTEGER    ARRAY    IFCB7           REFS         6        21        55   DEFINED        50
     1  DDUDVS   INTEGER    ARRAY    IFCB7           REFS         6        21   DEFINED        57
     0  DDUNM    INTEGER    ARRAY    FCBNM           REFS        14        18   DEFINED       104
    10  DDUTFD   REAL       ARRAY    FCB12           REFS        10   DEFINED       114       115
     4  DDUTFL   REAL       ARRAY    FCB12           REFS        10   DEFINED       112
     6  DFACOV   REAL       ARRAY    FCB18           REFS        13   DEFINED       131
     4  DFADV    INTEGER    ARRAY    IFCB10          REFS         9        21        96   DEFINED        91
     1  DFADVS   INTEGER    ARRAY    IFCB10          REFS         9        21   DEFINED        98
    16  DFANM    INTEGER    ARRAY    FCBNM           REFS        14        18   DEFINED       107
     0  DFATFD   REAL       ARRAY    FCB18           REFS        13   DEFINED       130
     3  DFATFL   REAL       ARRAY    FCB18           REFS        13   DEFINED       129
    36  DFFCOV   REAL       ARRAY    FCB14           REFS        11   DEFINED       118
     7  DFFDV    INTEGER    ARRAY    IFCB8           REFS         7        21        67   DEFINED        62
     1  DFFDVS   INTEGER    ARRAY    IFCB8           REFS         7        21   DEFINED        69
     4  DFFNM    INTEGER    ARRAY    FCBNM           REFS        14        18   DEFINED       105
     0  DFFTFD   REAL       ARRAY    FCB14           REFS        11   DEFINED       121
    30  DFFTFL   REAL       ARRAY    FCB14           REFS        11   DEFINED       116
    10  FCB      INTEGER    ARRAY    IFCB1           REFS         2        20        39   DEFINED        26
   572  I        INTEGER                             REFS        26        28        30        39        43        50        55
                                                       62        67        73        83        85        91        96       100
                                                      101       102       103       104       105       106       107       112
                                                      113       114       115       116       118       121       123       124
                                                      125       126       127       128       129       130       131
                                                  DEFINED        25        28        29        38        49        54        61
                                                       66        73        75        90        95       100       101       102
                                                      103       104       105       106       107       112       113       114
                                                      115       116       118       121       123       124       125       126
                                                      127       128       129       130       131
   602  ICNT     INTEGER    ARRAY                    REFS        17        35        36   DEFINED        30        35
   576  IPRT     INTEGER                             REFS        40      2*41   DEFINED        39
   605  IREC     INTEGER    ARRAY                    REFS        17        78        79   DEFINED        73        79
   575  ISUM     INTEGER                             REFS        42        43        45        55        57        67        69
                                                       96        98   DEFINED        37        42        53        55        65
                                                       67        94        96
   574  ITYP     INTEGER                             REFS        34      2*35        36   DEFINED        33
   577  I1       INTFGER                             REFS        83   DEFINED        76        80
   600  I2       INTEGER                             REFS        85   DEFINED        77        81
```

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       SUBROUTINE  FCBTN                                  CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      5

VARIABLES     SN  TYPE          RELOCATION
  573  J         INTEGER                          REFS        26        33        36        39        43        45        50
                                                    55        57        62        67        69        78      2*79        83
                                                    85        91        96        98     4*110       118       121
                                               DEFINED        26        32        50        52        62        64        74
                                                    91        93       109       117       120
  601  K         INTEGFR                          REFS        85   DEFINED        84
   10  MDDUNM    INTEGER    ARRAY    FCBNM1       REFS        15   DEFINED       101
   16  MFANM     INTEGER    ARRAY    FCBNM1       REFS        15   DEFINED       103
   12  MFFNM     INTEGER    ARRAY    FCBNM1       REFS        15   DEFINED       102
    0  NBTU      INTEGER             FCB2         REFS         3        26        28        32       109
                                               DEFINED        24
    0  NDDUDV    INTEGER             IFCB7        REFS         6      2*48        50        52       104       112       113
                                                   114       115   DEFINED        47
    0  NDFADV    INTEGER             IFCB10       REFS         9      2*89        91        93       107       129       130
                                                   131   DEFINED        88
    0  NOFFDV    INTEGER             IFCB8        REFS         7      2*60        62        64       105       116       118
                                                   121   DEFINED        59
   20  NFFCOV    REAL       ARRAY    FCB16        REFS        12        19   DEFINED       128
   11  NFFDV     INTFGER    ARRAY    IFCB9        REFS         8   DEFINED        85
    1  NFFDVS    INTEGER    ARRAY    IFCB9        REFS         8   DEFINED        83
   12  NFFNM     INTEGER    ARRAY    FCBNM        REFS        14        18   DEFINED       106
   24  NFFPFD    REAL       ARRAY    FCB16        REFS        12        19   DEFINED       127
    0  NFFTFD    REAL       ARRAY    FCB16        REFS        12        19   DEFINED       125       126
   10  NFFTFL    REAL       ARRAY    FCB16        REFS        12        19   DEFINED       123       124
    0  NNFFDV    INTEGER             IFCB9        REFS         8      2*72        73        74       106       123       124
                                                   125       126       127       128   DEFINED        71
  571  NTYPS     INTEGER                          REFS        29        34   DEFINED        23

FILE NAMES        MODE
       INPUT      FMT                   READS        24        26        28        47        50        59        62        71
                                           73        88        91       100       101       102       103       104       105
                                          106       107       108       110       112       113       114       115       116
                                          118       121       123       124       125       126       127       128       129
                                          130       131

STATEMENT LABELS             DEF LINE   REFEPENCES
    0  10                       27        25
    0  20                       31        29
   72  40                       44        38        40
    0  50                       46        32
    0  60                       51        49
    0  70                       56        54
    0  80                       58        52
    0  90                       63        61
    0  100                      68        66
    0  110                      70        64
  244  115                      82        78
    0  120                      86        75        84
    0  130                      87        74
    0  140                      92        90
    0  145                      97        95
    0  150                      99        93
    0  160                     111       109
    0  170                     119       117
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ORIGINAL PAGE IS POOR.

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STATEMENT LABELS             DEF LINE   REFERENCES
    0  180                      122       120
  561  2001     FMT             133        24        47        59        71        88
  563  2002     FMT             134        26        28        50        62        73        91
  565  2003     FMT             135       108       110       112       113       114       115       116       118       121
                                          123       124       125       126       127       128       129       130       131
  567  2004     FMT             136       100       101       102       103       104       105       106       107

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   11  10     * I           25 27       15B                EXT REFS  NOT INNER
   14         * J           26           6B                EXT REFS
   35  20       I           29 31        2B     INSTACK
   40  50     * J           32 46       41B                EXT REFS  NOT INNER
   53  40     * I           38 44       22B                EXT REFS
  114  60     * I           49 51       15B                EXT REFS  NOT INNER
  117         * J           50           6B                EXT REFS
  132  80     * J           52 58       14B                NOT INNER
  136  70       I           54 56        4B     INSTACK
  161  90     * I           61 63       15B                EXT REFS  NOT INNER
  164         * J           62           6B                EXT REFS
  177  110    * J           64 70       14B                NOT INNER
  203  100      I           66 68        4B     INSTACK
  233  130    * J           74 87       27B                NOT INNER
  234  120    * I           75 86       23B                NOT INNER
  253  120      K           84 86        2B     INSTACK
  276  140    * I           90 92       15B                EXT REFS  NOT INNER
  301         * J           91           6B                EXT REFS
  314  150    * J           93 99       14B                NOT INNER
  320  145      I           95 97        4B     INSTACK
  410  160    * J          109 111      16B                EXT REFS
  460  170    * J          117 119      11B                EXT REFS
  472  180    * J          120 122      11B                EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LFNGTH)
       IFCB1        98               0 BUSSTS (8)                  8 FCB    (80)                  88 BTUSTS (10)
       FCB2         61               0 NBTU   (1)                  1 BTUTYP (10)                  11 BTUCON (40)
                                    51 BTUNO  (10)
       FCB3          2               0 BUSTFL (1)                  1 BUSCOV (1)
       FCB5         40               0 BTUCOV (20)                20 BTUTFL (20)
       IFCB7        13               0 NDDUDV (1)                  1 DDUDVS (4)                    5 DDUDV  (8)
       IFCB8        31               0 NDFFDV (1)                  1 DFFDVS (6)                    7 DFFDV  (24)
       IFCB9        33               0 NNFFDV (1)                  1 NFFDVS (8)                    9 NFFDV  (24)
       IFCB10       16               0 NDFADV (1)                  1 DFADVS (3)                    4 DFADV  (12)
       FCB12        16               0 DDUCOV (4)                  4 DDUTFL (4)                    8 DDUTFD (8)
       FCB14        48               0 DFFTFD (24)                24 DFFTFL (6)                   30 DFFCOV (18)
       FCB16        28               0 NFFTFD (8)                  8 NFFTFL (8)                   16 NFFCOV (4)
                                    20 NFFPFD (8)
       FCB18         9               0 DFATFD (3)                  3 DFATFL (3)                    6 DFACOV (3)
       FCBNM        17               0 DDUNM  (4)                  4 DFFNM  (6)                   10 NFFNM  (4)
                                    14 DFANM  (3)
       FCBNM1       18               0 BUSNM  (8)                  8 MDDUNM (2)                   10 MFFNM  (4)
                                    14 MFANM  (4)
```

```
STATISTICS
  PROGRAM LENGTH    627B      407
   COMMON LENGTH    656B      430
```

```
      SUBROUTINE FCBINI
      COMMON/FCB1/FCB1A(98)/IFCB1/FCB1B(98)
      COMMON/FCB7/FCB7A(17)/IFCB7/FCB7B(13)
      COMMON/FCB8/FCB8A(37)/IFCB8/FCB8B(31)
      COMMON/FCB9/FCB9A(37)/IFCB9/FCB9B(33)
      COMMON/FCB10/FCB10A(19)/IFCB10/FCB10B(16)
      COMMON/FLAGS/IFLG1,IFLG2,IFLG3,IFLG4,IFLG5
      COMMON/STATUS/STS(20)
      INTEGER FCB1A,FCB1B,FCB7A,FCB7B,FCB8A,FCB8B
      INTEGER FCB9A,FCB9B,FCB10A,FCB10B
      LOGICAL IFLG1,IFLG2,IFLG3,IFLG4,IFLG5
      IF(IFLG1) CALL  INCOPY(98,FCB1A,FCB1B)
      IF(IFLG2) CALL  INCOPY(13,FCB7A,FCB7B)
      IF(IFLG3) CALL  INCOPY(31,FCB8A,FCB8B)
      IF(IFLG4) CALL  INCOPY(33,FCB9A,FCB9B)
      IF(IFLG5) CALL  INCOPY(16,FCB10A,FCB10B)
      IFLG1 = .FALSE.
      IFLG2 = .FALSE.
      IFLG3 = .FALSE.
      IFLG4 = .FALSE.
      IFLG5 = .FALSE.
      STS(1)=0
      RETURN
      END
```

```
         SYMBOLIC REFERENCE MAP

 ENTRY POINTS     DEF LINE     REFERENCES
     1  FCBINI          1        23

 VARIABLES      SN  TYPE           RELOCATION
     0  FCB1A      INTEGER    ARPAY    FCB1          REFS           2         9         12
     0  FCB1B      INTEGER    ARPAY    IFCB1         REFS           2         9         12
     0  FCB10A     INTEGER    ARRAY    FCB10         REFS           6        10         16
     0  FCB10B     INTEGER    ARRAY    IFCB10        REFS           6        10         16
     0  FCB7A      INTEGEP    ARRAY    FCB7          RFFS           3         9         13
     0  FCB7B      INTEGER    ARPAY    IFCB7         REFS           3         9         13
     0  FCB8A      INTEGER    ARRAY    FCB8          REFS           4         9         14
     0  FCB8B      INTEGER    ARRAY    IFCB8         REFS           4         9         14
     0  FCB9A      INTEGER    ARRAY    FCB9          REFS           5        10         15
     0  FCB9B      INTEGER    ARRAY    IFCB9         REFS           5        10         15
     0  IFLG1      LOGICAL             FLAGS         REFS           7        11         12   DEFINED        17
     1  IFLG2      LOGICAL             FLAGS         REFS           7        11         13   DEFINED        18
     2  IFLG3      LOGICAL             FLAGS         REFS           7        11         14   DEFINED        19
     3  IFLG4      LOGICAL             FLAGS         REFS           7        11         15   DEFINED        20
     4  IFLG5      LOGICAL             FLAGS         PEFS           7        11         16   DEFINED        21
     0  STS        REAL       ARRAY    STATUS        REFS           8    DEFINED        22

 FXTERNALS          TYPE    ARGS       REFERENCES
        INCOPY                3             12         13         14         15         16

 COMMON BLOCKS    LENGTH      MEMBERS - BIAS NAME(LENGTH)
        FCB1         98                  0 FCB1A  (98)
        IFCB1        98                  0 FCB1B  (98)
        FCB7         17                  0 FCB7A  (17)
        IFCB7        13                  0 FCB7B  (13)
        FCB8         37                  0 FCB8A  (37)
        IFCB8        31                  0 FCB8B  (31)
        FCB9         37                  0 FCB9A  (37)
        IFCB9        33                  0 FCB9B  (33)
        FCB10        19                  0 FCB10A (19)
        IFCB10       16                  0 FCB10B (16)
        FLAGS         5                  0 IFLG1  (1)               1 IFLG2  (1)                2 IFLG3  (1)
                                         3 IFLG4  (1)               4 IFLG5  (1)
        STATUS       20                  0 STS    (20)

 STATISTICS
   PROGRAM LENGTH     56B     46
    COMMON LENGTH    650B    424
```

```
      SUBROUTINE FCBPI
      COMMON/FCB4/ICNT4(3)
      COMMON/FCB6/ICNT6(60)
      COMMON/FCB11/ICNT11(12)
      COMMON/FCB13/ICNT13(18)
      COMMON/FCB15/ICNT15(24)
      COMMON/FCB17/ICNT17(9)
      COMMON/FCBCNT/IFCBCN(51)
      COMMON/FLAGS/IFLG(5)
      LOGICAL IFLG
      DO 10 I=1,5
        IFLG(I)=.TRUE.
   10 CONTINUE
      CALL FCBINI
      CALL CLEAR(3,ICNT4)
      CALL CLEAR(60,ICNT6)
      CALL CLFAR(12,ICNT11)
      CALL CLEAR(18,ICNT13)
      CALL CLEAR(24,ICNT15)
      CALL CLEAR(9,ICNT17)
      CALL CLEAR(51,IFCBCN)
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    1  FCBPI          1         22

VARIABLES     SN  TYPE           RELOCATION
   64  I          INTEGER                         .REFS        12    DEFINED       11
    0  ICNT11     INTEGER    ARRAY    FCB11        REFS         4        17
    0  ICNT13     INTEGER    ARRAY    FCB13        REFS         5        18
    0  ICNT15     INTEGER    ARRAY    FCB15        REFS         6        19
    0  ICNT17     INTEGER    ARRAY    FCB17        REFS         7        20
    0, ICNT4      INTEGER    ARPAY    FCB4         REFS         2        15
    0  ICNT6      INTFGER    ARRAY    FCB6         REFS         3        16
    0  IFCBCN     INTEGER    ARRAY    FCBCNT       REFS         8        21
    0  IFLG       LOGICAL    ARRAY    FLAGS        REFS         9        10    DEFINED       12

EXTFRNALS,         TYPE   ARGS        REFERENCES
      'CLEAR                2             15        16        17        18        19        20        21
       FCBINI               0             14

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                       13         11

LOOPS  LABEL    INDEX     FROM-TO    LENGTH     PROPERTIES
    4  10       I           11 13        2B      INSTACK

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCB4          3              0 ICNT4   (3)
       FCB6         60              0 ICNT6   (60)
       FCB11        12              0 ICNT11  (12)
       FCB13        18              0 ICNT13  (18)
       FCB15        24              0 ICNT15  (24)
       FCB17         9              0 ICNT17  (9)
       FCBCNT       51              0 IFCBCN  (51)
       FLAGS         5              0 IFLG    (5)

STATISTICS
  PROGRAM LENGTH    65B       53
   COMMON LENGTH    266B     182
```

```
      SUBROUTINE FCBPM1
      COMMON/FCB7/NDDUDV,DDUDVS(4),DDUDV(2,4),DDUDVN(4)
      COMMON/FCB8/NDFFDV,DFFDVS(6),DFFDV(4,6),DFFDVN(6)
      COMMON/FCB9/NNFFDV,NFFDVS(2,4),NFFDV(3,2,4),NFFDVN(4)
      COMMON/FCB10/NDFADV,DFADVS(3),DFADV(4,3),DFADVN(3)
      COMMON/FCBUC/FCBUCF(6)
      COMMON/CO36/RMISTM
      COMMON/FLTHIS/NFCV(10),NSYSF(10),PFRIO,TFRIO
      DIMENSION NAMEF(2)
      DIMENSION IPLACE(5)
      DATA TIME/10000.0/
      DATA RMISTM/100000.0/
      DATA DFADVN/21,22,23/
      DATA NFFDVN/17,18,19,20/
      DATA DFFDVN/11,12,13,14,15,16/
      DATA DDUDVN/7,8,9,10/
      DATA NAMEF/10HTRANSIENT ,10HPERMANENT /
      DATA FCBUCF/1,2,3,4,5,6/
      CALL FCBIN
      CALL RDIOFR(PFRIO,TFRIO)
      CALL PFCBCF
    5 CONTINUE
      READ 3001,NOMIS,NOFLT,IDEBUG
      IF(NOMIS.LE.0) RETURN
      CALL FCBPI
      DO 10 I=1,10
         NFCV(I)=0
         NSYSF(I)=0
   10 CONTINUE
      DO 100 K=1,NOMIS
         NEXT=0
         DUR=RMISTM
         CALL FCBINI
         DO 50 J=1,NOFLT
      CALL PFISO(IP,2)
      CALL UNPACK(IP,IPLACE)
            CALL FCBFLT(TIME,IPLACE,DUR,NEXT)
         NFCV(J)=NFCV(J)+1
            IF(NEXT.EQ.5) GOTO 60
   50    CONTINUE
         GO TO 100
   60    CONTINUE
         NSYSF(J)=NSYSF(J)+1
  100 CONTINUE
      CALL PIOSTS
      GOTO 5
 2000 FORMAT(1H1,10X,10HMISSION - ,I3/11X,12H------------/)
 2001 FORMAT(1X,F10.2,3H...,A10,4X,4I3/)
 2002 FORMAT(/16H  SYSTEM FAILURE/)
 3000 FORMAT(I1,I9,F10.0)
 3001 FORMAT(3I10)
      END
```

```
       SUBROUTINE  FCBPM1                                  CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.       PAGE      2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    1  FCBPM1         1          24

VARIABLES     SN  TYPE             RELOCATION
    5  DDUDV      REAL        ARRAY    FCB7         REFS          2
   15  DDUDVN     REAL        ARRAY    FCB7         REFS          2    DEFINED        16
    1  DDUDVS     REAL        ARRAY    FCB7         REFS          2
    4  DFADV      REAL        ARRAY    FCB10        REFS          5
   20  DFADVN     REAL        ARRAY    FCB10        REFS          5    DEFINED        13
    1  DFADVS     REAL        ARRAY    FCB10        REFS          5
    7  DFFDV      REAL        ARRAY    FCB8         REFS          3
   37  DFFDVN     REAL        ARRAY    FCB8         REFS          3    DEFINED        15
    1  DFFDVS     REAL        ARRAY    FCB8         REFS          3
  137  DUR        REAL                              REFS         37    DEFINED        32
    0  FCBUCF     REAL        ARRAY    FCBUC        REFS          6    DEFINED        18
  134  I          INTEGER                           REFS         27         28   DEFINED        26
  133  IDEBUG   * INTEGER                         DEFINED        23
  141  IP         INTEGER                           REFS         35         36
  144  IPLACE     INTEGER     ARRAY                 REFS         10         36        37
  140  J          INTEGER                           REFS       2*38       2*43   DEFINED        34
  135  K        * INTEGER                         DEFINED        30
  142  NAMEF      INTEGER     ARRAY                 REFS          9    DEFINED        17
    0  NDDUDV     INTEGER              FCB7         REFS          2
    0  NDFADV     INTEGER              FCB10        REFS          5
    0  NDFFDV     INTEGER              FCB8         REFS          3
  136  NEXT       INTEGER                           REFS         37         39   DEFINED        31
    0  NFCV       INTEGER     ARRAY    FLTMIS       REFS          8         38   DEFINED        27         38
   11  NFFDV      INTEGER     ARRAY    FCB9         REFS          4
   41  NFFDVN     INTEGER     ARRAY    FCB9         REFS          4    DEFINED        14
    1  NFFDVS     INTEGER     ARRAY    FCB9         REFS          4
    0  NNFFDV     INTEGER              FCB9         REFS          4
  132  NOFLT      INTEGER                           REFS         34    DEFINED        23
  131  NOMIS      INTEGER                           REFS         24         30   DEFINED        23
   12  NSYSF      INTEGER     ARRAY    FLTMIS       REFS          8         43   DEFINED        28         43
   24  PFRIO      REAL                 FLTMIS       REFS          8         20
    0  RMISTM     REAL                 C036         REFS          7         32   DEFINED        12
   25  TFRIO      REAL                 FLTMIS       REFS          8         20
  103  TIME       REAL                              REFS         37    DEFINED        11

FILE NAMES        MODE
       INPUT      FMT                    READS        23

EXTERNALS          TYPE   ARGS        REFERENCES
       FCBFLT               4             37
       FCBIN                0             19
       FCBINI               0             33
       FCBPI                0             25
       PFCBCF               0             21
       PFISO                2             35
       PIOSTS               0             45
       RDIOFR               2             20
       UNPACK               2             36
```

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ORIGINAL PAGE IS POOR

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STATEMENT LABELS              DEF LINE   REFERENCES
   10  5                         22         46
    0  10                        29         26
    0  50                        40         34
   56  60                        42         39
   60  100                       44         30        41
  104  2000    FMT  NO REFS      47
  112  2001    FMT  NO REFS      48
  116  2002    FMT  NO REFS      49
  122  3000    FMT  NO REFS      50
  125  3001    FMT               51         23

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   30  10       I           26 29       2B      INSTACK
   33  100    * K           30 44      30B                EXT REFS  NOT INNER
   40  50     * J           34 40      15B                EXT REFS    EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCB7        17               0 NDOUDV (1)                 1 DDUDVS (4)                  5 DDUDV   (8)
                                   13 DDUDVN (4)
       FCB8        37               0 NDFFDV (1)                 1 DFFDVS (6)                  7 DFFDV   (24)
                                   31 DFFDVN (6)
       FCB9        37               0 NNFFDV (1)                 1 NFFDVS (8)                  9 NFFDV   (24)
                                   33 NFFDVN (4)
       FCB10       19               0 NDFADV (1)                 1 DFADVS (3)                  4 DFADV   (12)
                                   16 DFADVN (3)
       FCBUC        6               0 FCBUCF (6)
       CO36         1               0 RMISTM (1)
       FLTMIS      22               0 NFCV   (10)               10 NSYSF  (10)                20 PFRIO   (1)
                                   21 TFRIO  (1)

STATISTICS
  PROGRAM LENGTH    151B     105
   COMMON LENGTH    213B     139
```

```
      SUBROUTINE FIFAU(IN,NEXT,ISYNC)
C                  .    THIS VERSION:   MARCH 1976
C THIS SUBROUTINE LOOKS IF A FAULT IS IN THE ON-UNITS
C IN      0: THE FAULT IS TAKEN CARE OF BY FIFAU.(UNIT NOT ON OR BUS)
C         1: THE FAULT IS IN A COMPUTER OR EEM
C
C **********************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/CO12/NTR,IFAU
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO38/IOCU(5),NONDED,NWOIO
      COMMON/CO43/IO1
      COMMON/CO46/PCOM,PBU,PBUCO
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSZ,TC
      COMMON/FLTMS/IFLTCT
      INTEGER BUNOND
      INTEGER EXTEN,PTR
      COMMON/COM7/REASON
      INTEGER REASON
      COMMON/FCOUNT/NF(5),NTRF(5)
      DIMENSION IPLACE(5)
C **********************************************************************
C
      TIME=TABLE(PTR,1)
      DUR=TABLE(PTR,2)
      XMOD=TABLE(PTR,3)
      NUNIT=TABLE(PTR,4)
      MOD=XMOD
      GOTO(1000,2000,1000,3000,1000),MOD
 1000 CONTINUE
      IF(NOON(NUNIT).EQ.1) GOTO 1500
         IN=0
         PTR=PTR+1
         RETURN
 1500 CONTINUE
         CALL EXTENT(EXTEN,DUR,XMOD)
         CALL DETTIM(DETEC,TIME,XMOD)
      CALL COPY(TIME,DETEC,REASON,NEXT)
         NF(NWORK)=NF(NWORK)+1
         IF(DUR.LT.ENDMIS) NTRF(NWORK)=NTRF(NWORK)+1
         IF(ISYNC.EQ.0) CALL ASYNC(TIME,DETEC,NEXT)
         PTR=PTR+1
               IN=1
         RETURN
 2000 CONTINUF
      IF(NONDED.EQ.2) GOTO 2500
         IF(NOON(NUNIT).EQ.1) GOTO 2100
 2050 CONTINUE
         IN=0
         PTR=PTP+1
         RETURN
 2100    CONTINUE
         U=RANF(0.0)
      IF(U.LT.PCOM) GOTO 2110
            IF(DUR.LT.TC) GOTO 2200
```

```
                CALL BUSCHK(NEXT,NUNIT)
                IF(NEXT.EQ.5) GOTO 2050
 2110       CONTINUE
                IF(U.LT.PDU) GOTO 2050
 2200       CONTINUE
                TABLE(PTR,3)=1
                GOTO 1500
 2500  CONTINUE
            CALL IO(NEXT)
            IN=0
            RETURN
 3000  CONTINUE
       IFLTCT=IFLTCT+1
       CALL UNPACK(NUNIT,IPLACE)
       CALL FCOFLT(TIME,IPLACE,DUR,NEXT)
       IN=0
       PTR=PTR+1
       RETURN
       END
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  FIFAU           1         34        44        51        66        73

VARIABLES     SN  TYPE           RELOCATION
    0  ACFAU     REAL       ARPAY    COM3         REFS         14
  173  BUNOND  * INTEGER   *UNDEF                 REFS         16
 2265  DELAY     REAL                COM1         REFS          8
  200  DETEC     REAL                             REFS         37        38        41
  174  DUR       REAL                             REFS         36        40        55        70   DEFINED        25
   74  ENDMIS    REAL                COM3         REFS         14        40
 2262  EXTEN     INTEGER             COM1         REFS          8        17        36
 2263  IDETEC    INTEGER             COM1         REFS          8
    0  IDIM      INTEGER             COM1         REFS          8
    1  IFAU      INTEGER             C012         REFS          9
    0  IFLTCT    INTEGFR             FLTMS        REFS         15        68   DEFINED        68
    0  IN        INTEGER              F.P.      DEFINED         1        32        43        49        65        71
    0  IOCU      INTEGFR   ARRAY    C038         REFS         11
    0  IO1       INTEGER             C043         REFS         12
  202  IPLACE    INTEGER   ARRAY                  REFS         21        69        70
    0  ISYNC     INTEGER              F.P.        REFS         41   DEFINED         1
   75  MEMSZ     INTEGFR             COM3         REFS         14
  177  MOD       INTEGER                          REFS         29   DEFINED        28
    0  NEXT      INTEGER              F.P.        REFS         38        41        56        57        64        70
                                                DEFINED         1
    0  NF        INTEGER   ARRAY    FCOUNT       REFS         20        39   DEFINED        39
    5  NONDED    INTEGER             C038         REFS         11        46
    0  NOON      INTEGER   ARRAY    C015         REFS         10        31        47
    0  NTR       INTEGER             C012         REFS          9
    5  NTRF      INTEGER   ARRAY    FCOUNT       REFS         20        40   DEFINED        40
  176  NUNIT     INTEGER                          REFS         31        47        56        69   DEFINED        27
    6  NWOIO     INTEGER             C038         REFS         11
    5  NWORK     INTEGER             C015         REFS         10      2*39      2*40
    1  PBU       REAL                C046         REFS         13        59
    2  PBUCO     REAL                C046         REFS         13
    0  PCOM      REAL                C046         REFS         13        54
 2261  PTR       INTEGER             COM1         REFS          8        17        24        25        26        27        33
                                                    42        50        61        72   DEFINED        33        42        50
                                                    72
    0  REASON    INTEGER             COM7         REFS         18        19        38
 2264  RECOV     REAL                COM1         REFS          8
    1  TABLE     REAL       ARRAY    COM1         REFS          8        24        25        26        27
                                                DEFINED        61
   76  TC        REAL                COM3         REFS         14        55
 2266  TIME      REAL                COM1         REFS          8        37        38        41        70
                                                DEFINED        24
  201  U         REAL                             REFS         54        59   DEFINED        53
  175  XMOD      REAL                             REFS         28        36        37   DEFINED        26

EXTERNALS          TYPE   ARGS       REFERENCES
       ASYNC                3              41
       BUSCHK               2              56
       COPY                 4              38
       SUBROUTINE   FIFAU                                   CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE       4

EXTFRNALS           TYPE   ARGS       REFERENCES
       DETTIM                3             37
       EXTENT                3             36
       FCBFLT                4             70
       IO                    1             64
       RANF      REAL        1             53
       UNPACK                2             69

STATEMENT LABELS              DEF LINE   REFEPENCES
   24  1000                      30        3*29
   33  1500                      35         31         62
   62  2000                      45         29
   70  2050                      48         57         59
   74  2100                      52         47
  110  2110                      58         54
  112  2200                      60         55
  115  2500                      63         46
  122  3000                      67         29

COMMON BLOCKS   LENGTH      MEMBERS - BIAS NAME(LFNGTH)
       COM1        1207              0 IDIM   (1)                   1 TABLE  (1200)             1201 PTR    (1)
                                  1202 EXTEN  (1)                1203 IDETEC (1)                1204 RECOV  (1)
                                  1205 DELAY  (1)                1206 TIME   (1)
       CO12           2              0 NTR    (1)                   1 IFAU   (1)
       CO15           6              0 NOON   (5)                   5 NWORK  (1)
       CO38           7              0 IOCU   (5)                   5 NONDED (1)                   6 NHOIO  (1)
       CO43           1              0 IO1    (1)
       CO46           3              0 PCOM   (1)                   1 PBU    (1)                   2 PBUCO  (1)
       COM3          63              0 ACFAU  (60)                 60 ENDMIS (1)                  61 MEMSZ  (1)
                                    62 TC     (1)
       FLTHS          1              0 IFLTCT (1)
       COM7           1              0 REASON (1)
       FCOUNT        10              0 NF     (5)                   5 NTRF   (5)

STATISTICS
  PROGRAM LENGTH     207B      135
   COMMON LENGTH    2425B     1301
```

```
      SUBROUTINE GATHER
C                                     THIS VERSION: 10 APRIL 1974
C THIS SUBROUTINE GATHERS ALL FAULTS ON TOP OF ACFAU
C WE KEEP ALL FAULTS ON TOP OF ACFAU
C REALLY A DELETE AND SQUEEZE THE LIVE/ACTIVE FAULT RECORDS TO THE TOP  SP08APR4
C OF THE ACFAU TABLE.                                                   SP08APR4
C IDIM IS THE MAXIMUM NUMBER OF LURKING FAULTS                          SP08APR4
C
C********** ********* ********* ********** ********* ********* ********
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
C **********************************************************************
C
   81 CONTINUE
      DO 110 J=1,IDIM
C         FIND ONE THATS NOT ZERO                                       SP08APR4
      IF (ACFAU(J,3).NE.0. )GO TO 110
C         IF ITS AT THE END OF THE TABLE YOU VE DONE YOUR BEST ANYWAY   SP08APR4
      IF (J.EQ.IDIM) RETURN
      K=J+1
C
      DO 120 L=K,IDIM
      IF (ACFAU(L,3).EQ.0.) GO TO 120
C         SO YOU VE GOT A LIVE ONE                                      SP08APR4
      DO 130 I=1,6
C         TRANSFER IT UP TO THE BLANK RECORD                            SP08APR4
      ACFAU(J,I)=ACFAU(L,I)
  130 CONTINUE
C
C         BLANK OUT THE ONE YOU TRANSFERED UP                           SP08APR4
      ACFAU(L,3)=0.
      GO TO 81
  120 CONTINUE
      RETURN
  110 CONTINUE
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCFS
    1  GATHER          1        19        34        36

VARIABLES     SN  TYPE           RELOCATION
    0  ACFAU     REAL       ARPAY    COM3         REFS        11        17        23        27    DEFINED      27        31
 2265  DELAY     REAL                COM1         REFS        10
   74  ENDMIS    REAL                COM3         REFS        11
 2262  EXTEN     REAL                COM1         REFS        10
   40  I         INTEGER                          REFS       2*27   DEFINED        25
 2263  IDETEC    INTEGER             COM1         REFS        10
    0  IDIM      INTEGER             COM1         REFS        10        15        19        22
   35  J         INTEGER                          REFS        17        19        20        27    DEFINED      15
   36  K         INTEGER                          REFS        22   DEFINED        20
   37  L         INTEGER                          PEFS        23        27        31   DEFINED       22
   75  MEMSIZ    INTEGER             COM3         REFS        11
 2261  PTR       REAL                COM1         REFS        10
 2264  RECOV     REAL                COM1         REFS        10
    1  TABLE     REAL       ARRAY    COM1         REFS        10
   76  TC        REAL                COM3         REFS        11
 2266  TIME      REAL                COM1         REFS        10

STATEMENT LABELS             DEF LINE   REFERENCES
    2  81                       14        32
   32  110                      35        15        17
   27  120                      33        22        23
    0  130                      28        25

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
    3  110     * J        15 35      32B               EXITS   NOT INNER
   15  120     * L        22 33      15B               EXITS   NOT INNER
   23  130       I        25 28       2B    INSTACK

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207          0 IDIM   (1)                  1 TABLE  (1200)          1201 PTR    (1)
                             1202 EXTEN  (1)               1203 IDETEC (1)             1204 RECOV  (1)
                             1205 DELAY  (1)               1206 TIME   (1)
       COM3         63          0 ACFAU  (60)                60 ENDMIS (1)               61 MEMSIZ (1)
                               62 TC     (1)

STATISTICS
  PROGRAM LENGTH      41B      33
   COMMON LENGTH   2366B    1270
```

```
      SUBROUTINE GIORF1(TOTAL,VEC,BUS)
      DIMENSION BUS(8)
      DIMENSION VEC(8)
      READ 1000,BUS
      VEC(1)=BUS(1)
      DO 10 I=2,8
         VEC(I)=BUS(I)+VEC(I-1)
   10 CONTINUE
      TOTAL=VEC(8)
      IF(TOTAL.EQ.0) RETURN
      DO 20 I=1,8
        VEC(I)=VEC(I)/TOTAL
   20 CONTINUE
      RETURN
 1000 FORMAT(8F10.5)
      END
```

```
       SUBROUTINE  GIORF1                                     CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      2

       SYMBOLIC REFERENCE MAP

FNTRY POINTS     DFF LINF     REFERENCES
    2  GIORF1          1        10         14

VARIABLFS      SN  TYPE           RELOCATION
    0  BUS          REAL       ARRAY      F.P.        REFS         2         5         7    DEFINED        1         4
   50  I            INTEGER                           REFS        3*7      2*12   DEFINED        6        11
    0  TOTAL        REAL                  F.P.        REFS        10        12    DEFINED        1         9
    0  VEC          REAL       ARRAY      F.P.        REFS         3         7         9        12   DEFINED        1         5
                                                         7        12

FILE NAMES        MODE
       INPUT       FMT                     READS         4

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                         8          6
    0  20                        13         11
   45  1000    FMT               15          4

LOOPS  LABEL    INDEX     FROM-TO    LENGTH     PROPERTIES
   25  10       I           6 8          3B      INSTACK
   37  20       I          11 13         2B      INSTACK

STATISTICS
  PROGRAM LENGTH      70B      56
```

```
      SUBROUTINE GIORF2(TOTAL,VEC,XM,ISTS,BTUFR)
      DIMENSION VEC(10),ISTS(10),XM(10,4),BTU(10),BTUL(10)
      DIMENSION BTUFR(10,2)
      READ 1000,(BTU(I),I=1,2)
      READ 1000,(BTUL(I),I=1,2)
      READ 1000,(BTU(I),I=3,6)
      READ 1000,(BTUL(I),I=3,6)
      READ 1000,(BTU(I),I=7,10)
      READ 1000,(BTUL(I),I=7,10)
      DO 50 I=1,10
        BTUFR(I,1)=BTU(I)
        BTUFR(I,2)=BTUL(I)
        NO=ISTS(I)+1
        XM(I,1)=BTU(I)
        DO 30 J=2,NO
          XM(I,J)=XM(I,J-1)+BTUL(I)
   30   CONTINUE
        VEC(I)=XM(I,NO)
      IF(VEC(I).EQ.0)GOTO 50
        DO 40 J=1,NO
          XM(I,J)=XM(I,J)/VEC(I)
   40   CONTINUE
   50 CONTINUE
      DO 60 I=2,10
        VEC(I)=VEC(I)+VEC(I-1)
   60 CONTINUE
      TOTAL=VEC(10)
      IF(TOTAL.EQ.0)  RETURN
      DO 70 I=1,10
        VEC(I)=VEC(I)/TOTAL
   70 CONTINUE
      RETURN
 1000 FORMAT(8F10.5)
      END
```

```
       SUBROUTINE  GIORF2                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      2

       SYMBOLIC REFERENCE MAP

FNTRY POINTS     DEF LINE     REFERENCES
    2  GIORF2          1        28        32

VARIABLES     SN  TYPE           RELOCATION
  135  BTU       REAL       ARRAY                 REFS         2        11        14   DEFINED         4         6         8
    0  BTUFR     REAL       ARRAY     F.P.        REFS         3   DEFINED         1        11        12
  147  BTUL      REAL       ARRAY                 REFS         2        12        16   DEFINED         5         7         9
  132  I         INTEGER                          REFS         4         5         6         7         8         9      2*11
                                                  2*12        13      2*14      3*16      2*18        19      3*21      3*25
                                                  2*30   DEFINED         4         5         6         7         8         9
                                                    10        24        29
    0  ISTS      INTEGER    ARRAY     F.P.        REFS         2        13   DEFINED         1
  134  J         INTEGER                          REFS      2*16      2*21   DEFINED        15        20
  133  NO        INTEGER                          REFS        15        18        20   DEFINED        13
    0  TOTAL     REAL                 F.P.        REFS        28        30   DEFINED         1        27
    0  VEC       REAL       ARRAY     F.P.        REFS         2        19        21      2*25        27        30
                                               DEFINED         1        18        25        30
    0  XM        REAL       ARRAY     F.P.        REFS         2        16        18        21   DEFINED         1        14
                                                    16        21

FILE NAMFS        MODE
       INPUT      FMT                 READS        4         5         6         7         8         9

STATFMENT LABELS             DEF LINE   REFERENCES
    0  30                       17        15
    0  40                       22        20
  103  50                       23        10        19
    0  60                       26        24
    0  70                       31        29
  127  1000   FMT               33         4         5         6         7         8         9

LOOPS  LABEL    INDEX     FROM-TO    LENGTH     PROPERTIES
   53  50     * I          10 23       33B              NOT INNER
   64  30       J          15 17        2B      INSTACK
  101  40       J          20 22        2B      INSTACK
  107  60       I          24 26        2B      INSTACK
  121  70       I          29 31        2B      INSTACK

STATISTICS
  PROGRAM LENGTH    210B      136
```

```
      SUBROUTINE GIORF3(TOTAL,VEC,XM,IDEV,IDIM,JDIM,DEV)
      DIMENSION VEC(IDIM),XM(IDIM,JDIM),IDEV(IDIM,JDIM),DEV(JDIM)
      READ 1000,DEV
      DO 30 I=1,IDIM
         XP=0
         DO 10 J=1,JDIM
            XN=XP
            IF(IDEV(I,J).NE.0) XN=XN+DEV(J)
            XP=XN
            XM(I,J)=XN
   10    CONTINUE
         VEC(I)=XN
      IF(XN.EQ.0)GOTO 30
         DO 20 J=1,JDIM
            XM(I,J)=XM(I,J)/XN
   20    CONTINUE
   30 CONTINUE
      DO 40 I=2,IDIM
         VEC(I)=VEC(I)+VEC(I-1)
   40 CONTINUE
      TOTAL=VFC(IDIM)
      IF(TOTAL.EQ.0)RETURN
      DO 50 I=1,IDIM
         VEC(I)=VEC(I)/TOTAL
   50 CONTINUE
      RETURN
 1000 FORMAT(8F10.5)
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  GIORF3          1          22           26

VARIABLES     SN  TYPE           RELOCATION
    0  DEV       REAL       ARRAY      F.P.        REFS          2         8    DEFINED         1         3
  111  I         INTEGER                           REFS          8        10        12     2*15      3*19      2*24
                                                DEFINED        4        18        23
    0  IDEV      INTEGER    ARRAY      F.P.        REFS          2         8    DEFINED         1
    0  IDIM      INTEGER               F.P.        REFS         3*2        4        18        21        23
                                                DEFINED        1
  113  J         INTEGEP                           REFS         2*8       10      2*15   DEFINED        6        14
    0  JDIM      INTEGER               F.P.        REFS         3*2        6        14    DEFINED         1
    0  TOTAL     REAL                  F.P.        REFS         22        24    DEFINED         1        21
    0  VEC       REAL       ARRAY      F.P.        REFS          2      2*19        21        24    DEFINED         1        12
                                                    19        24
    0  XM        REAL       ARRAY      F.P.        REFS          2        15    DEFINED         1        10        15
  114  XN        REAL                              REFS          8         9        10        12        13        15
                                                DEFINED        7         8
  112  XP        REAL                              REFS          7    DEFINED          5         9

FILE NAMES        MODE
       INPUT       FMT                     READS         3

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                       11         6
    0  20                       16        14
   56  30                       17         4         13
    0  40                       20        18
    0  50                       25        23
  106  1000    FMT              27         3

LOOPS  LABEL    INDFX     FROM-TO    LENGTH    PROPERTIES
   25  30     * I            4 17       34B              NOT INNER
   33  10       J            6 11        7B     INSTACK
   54  20       J           14 16        2B     INSTACK
   63  40       I           18 20        2B     INSTACK
   77  50       I           23 25        2B     INSTACK

STATISTICS
  PROGRAM LENGTH    145B      101
```

```
      SUBROUTINE GIORF4(TOTAL,VEC,XM1,XM2,ISTS,DEVS)
      DIMENSION DEVS(4,2)
      DIMENSION VEC(4),XM1(4,4),XM2(4,2),ISTS(2,4),DEV(4),DEVL(4)
      READ 1000,DEV
      READ 1000,DEVL
      DO 20 I=1,4
         DEVS(I,1)=DEV(I)
         DEVS(I,2)=DEVL(I)
         XM1(I,1)=DEV(I)
         DO 10 J=2,4
            XM1(I,J)=XM1(I,J-1)+DEVL(I)
   10    CONTINUE
         IF(ISTS(1,I).EQ.0) XM2(I,1)=0
         IF(ISTS(1,I).NE.0) XM2(I,1)=XM1(I,4)
         IF(ISTS(2,I).EQ.0) XM2(I,2)=XM2(I,1)
         IF(ISTS(2,I).NE.0) XM?(I,2)=XM1(I,4)+XM2(I,1)
         VEC(I)=XM2(I,2)
      IF(XM1(I,4).EQ.0) GOTO 15
      DO 11 J=1,4
      XM1(I,J)=XM1(I,J)/XM1(I,4)
   11 CONTINUF
   15 CONTINUE
      IF(XM2(I,2).EQ.0)GOTO 20
      XM2(I,1)=XM2(I,1)/XM2(I,2)
      XM2(I,2)=1.0
   20 CONTINUE
      DO 30 I=2,4
         VEC(I)=VEC(I)+VEC(I-1)
   30 CONTINUF
      TOTAL=VEC(4)
      IF(TOTAL.EQ.0)RETURN
      DO 40 I=1,4
         VEC(I)=VEC(I)/TOTAL
   40 CONTINUE
      RETURN
 1000 FORMAT(8F10.5)
      END
```

```
       SUBROUTINE  GIORF4                                      CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE        2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  GIORF4          1        31         35

VARIABLES     SN  TYPE            RELOCATION
  140  DEV       REAL       ARRAY                 REFS          3         7         9   DEFINED         4
  144  DEVL      REAL       ARRAY                 REFS          3         8        11   DEFINED         5
    0  DEVS      REAL       ARRAY     F.P.        REFS          2   DEFINED         1         7         8
  136  I         INTEGER                          REFS        2*7       2*8       2*9      3*11      2*13      3*14      3*15
                                                   4*16      2*17        18      3*20        23      3*24        25      3*28
                                                   2*33   DEFINED         6        27        32
    0  ISTS      INTEGER    ARRAY     F.P.        REFS          3        13        14        15        16
                                                DEFINED         1
  137  J         INTEGER                          REFS       2*11      2*20   DEFINED        10        19
    0  TOTAL     REAL                 F.P.        REFS         31        33   DEFINED         1        30
    0  VEC       RFAL       ARRAY     F.P.        REFS          3      2*28        30        33   DEFINED         1        17
                                                     28        33
    0  XM1       REAL       ARRAY     F.P.        REFS          3        11        14        16        18      2*20
                                                DEFINED         1         9        11        20
    0  XM2       REAL       ARRAY     F.P.        REFS          3        15        16        17        23      2*24
                                                DEFINED         1        13        14        15        16        24        25

FILE NAMES         MODE
       INPUT        FMT                  READS                  5

STATEMENT LABELS                DEF LINE   REFERENCES
    0  10                           12          10
    0  11                           21          19
   77  15                           22          18
  106  20                           26           6          23
    0  30                           29          27
    0  40                           34          32
  132  1000    FMT                  36           4           5

LOOPS  LABEL    INDEX      FROM-TO    LENGTH     PROPERTIES
   27  20     * I           6 26       62B                 NOT INNER
   35  10       J          10 12        2B        INSTACK
   75  11       J          19 21        2B        INSTACK
  112  30       I          27 29        2B        INSTACK
  124  40       I          32 34        2B        INSTACK

STATISTICS
  PROGRAM LENGTH     220B      144
```

```
      LOGICAL FUNCTION GREATR(VAL)
      GREATR=RANF(0.).GT.VAL
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  GREATR         1          3

VARIABLES     SN  TYPE           RELOCATION
   14  GPEATR     LOGICAL                       DEFINED        2
    0  VAL        REAL                 F.P.       PEFS         2    DEFINED        1

EXTFRNALS          TYPE   ARGS       REFERENCES
       RANF       RFAL      1              2

STATISTICS
  PROGRAM LENGTH     158      13
```

```
      SUBROUTINE INCOPY(NC,FIELDA,FIELDB)
      INTEGER FIELDA,FIELDB
      DIMENSION FIELDA(NC),FIELDB(NC)
      DO 10 I=1,NC
        FIELDA(I)=FIELDB(I)
   10 CONTINUE
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFFRENCES
    2  INCOPY          1          7

VARIABLFS     SN  TYPE            RELOCATION
    0  FIELDA    INTEGER    ARRAY     F.P.        REFS         2         3    DEFINED        1         5
    0  FIELOB    INTEGER    ARRAY     F.P.        REFS         2         3         5    DEFINED         1
   24  I         INTEGER                          REFS        2*5   DEFINED         4
    0  NC        INTEGER              F.P.        REFS        2*3        4    DEFINED        1

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                         6          4

LOOPS  LABFL    INDEX     FROM-TO    LENGTH    PROPERTIFS
   17  10       I            4 6         28     INSTACK

STATISTICS
  PROGRAM LENGTH     34B      28
```

```
      SUBROUTINE INFLTR
      COMMON/TAB/TABLE(100)
      DIMENSION IPLACE(5)
      INTEGER TRANS,PERM,TABLE
      DATA TRANS/1HT/,PERM/1HP/
      DATA NW/1HN/
      J=1
   20 CONTINUE
      KJ=0
      READ 2000,ITYP,(IPLACE(M),M=2,5)
      IF(ITYP.EQ.TRANS) KJ=1
      IF(ITYP.EQ.PERM) KJ=2
      IPLACE(1)=KJ
      PRINT 2001,IPLACE
      CALL PACK(IPLACE,LOC)
      TABLE(J)=LOC
      J=J+1
      IF((ITYP.EQ.NW).OR.(KJ.NE.0)) GOTO 20
      TABLE(J)=-1
 2000 FORMAT(A1,4X,4I5)
 2001 FORMAT(1X,5I5)
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    1  INFLTB          1         22

VARIABLES     SN  TYPE           RELOCATION
   64  IPLACE    INTEGER    ARRAY                 REFS         3        14        15   DEFINED        10        13
   61  ITYP      INTEGER                          REFS        11        12        18   DEFINED        10
   57  J         INTEGER                          REFS        16        17        19   DEFINED         7        17
   60  KJ        INTEGER                          REFS        13        18   DEFINED         9        11        12
   63  LOC       INTEGER                          REFS        15        16
   62  M         INTEGER                          REFS        10   DEFINED        10
   52  NW        INTEGER                          REFS        18   DEFINED         6
   51  PERM      INTEGER                          REFS         4        12   DEFINED         5
    0  TABLE     INTEGER    ARRAY    TAB          REFS         2         4   DEFINED        16        19
   50  TRANS     INTEGER                          REFS         4        11   DEFINED         5

FILE NAMES        MODE
       INPUT       FMT                  READS        10
       OUTPUT      FMT                 WRITES        14

EXTERNALS          TYPE   ARGS       REFERENCES
       PACK                 2            15

STATEMENT LABELS             DEF LINE   REFERENCES
    3  20                        8         18
   53  2000    FMT              20         10
   55  2001    FMT              21         14

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       TAB         100              0 TABLE  (100)

STATISTICS
  PROGRAM LENGTH     71B      57
   COMMON LENGTH    144B     100
```

```
      SUBROUTINE IO(NEXT)
C                                          THIS VERSION: 12 JULY 1974
C THIS SUBROUTINE  RETURNS NEXT=5 IF ALL EEMS  ARE LOST.
C
C ***********************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/A(10,6),ENDHIS,M,TC
      COMMON/COM7/REASON
      COMMON/CO12/NTR,IFAU
      COMMON/CO16/NDIAG,NUNDI
      COMMON/CO36/RMISTM
      COMMON/CO38/IOCU(5),NONDEO,NWOIO
      COMMON/CO39/PDETIO
      COMMON/CO40/ISWI,FSWI,NSWION,NIO
      INTEGER PTR,EXTEN,REASON
C ***********************************************************************
C
      I=TABLE(PTR,4)
      PTR=PTR+1
C COUNTING
      IFAU=IFAU+1
      GO TO (4,2,3,3,3),NWOIO
    4 CONTINUE
      REASON=2
      NEXT=5
      RETURN
C LOOK IF WE CAN ISOLATE FAULT.
    2 CONTINUE
      IF (RANF(0.).GT.PDETIO) GO TO 4
    3 CONTINUE                                                          L1588IO
      IF (TABLE(PTR-1,2).LT.TC) GO TO 1
      NWOIO=NWOIO-1
      IOCU(I)=0
    1 CONTINUE
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCFS
    2  IO              1        26        35

VARIABLES     SN  TYPE           RELOCATION
    0  A         REAL       ARRAY    COM3         REFS          7
 2265  DELAY     REAL                COM1         REFS          6
   74  ENDMIS    REAL                COM3         REFS          7
 2262  EXTEN     INTEGER             COM1         REFS          6         15
    1  FSHI      REAL                C040         REFS         14
   43  I         INTEGER                          REFS         33    DEFINED       18
 2263  IDETEC    INTEGER             COM1         REFS          6
    0  IDIM      INTEGER             COM1         REFS          6
    1  IFAU      INTEGER             C012         REFS          9         21    DEFINED       21
    0  IOCU      INTEGER    ARRAY    C038         REFS         12    DEFINED       33
    0  ISWI      INTEGER             C040         REFS         14
   75  M         INTEGER             COM3         REFS          7
    0  NDIAG     INTEGER             C016         REFS         10
    0  NEXT      INTEGER              F.P.      DEFINED         1         25
    3  NIO       INTEGER             C040         REFS         14
    5  NONDED    INTEGER             C030         REFS         12
    2  NSWION    INTEGER             C040         REFS         14
    0  NTR       INTEGER             C012         REFS          9
    1  NUNDI     INTEGER             C016         REFS         10
    6  NWOIO     INTEGER             C038         REFS         12         22        32    DEFINED       32
    0  POETIO    REAL                C039         REFS         13         29
 2261  PTR       INTEGER             COM1         REFS          6         15        18        19        31
                                                DEFINED        19
    0  REASON    INTEGER             COM7         REFS          8         15    DEFINED       24
 2264  RECOV     REAL                COM1         REFS          6
    0  RMISTM    REAL                C036         REFS         11
    1  TABLE     REAL       ARRAY    COM1         REFS          6         18        31
   76  TC        REAL                COM3         REFS          7         31
 2266  TIME      REAL                COM1         REFS          6

EXTERNALS          TYPE   ARGS       REFERENCES
       RANF      REAL       1             29

STATEMENT LABELS             DEF LINE   REFERENCES
   36  1                        34        31
   25  2                        28        22
   31  3                        30       3*22
   21  4                        23        22        29

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207             0 IDIM   (1)                  1 TABLE  (1200)            1201 PTR     (1)
                                1202 EXTEN  (1)               1203 IDETEC (1)               1204 RECOV   (1)
                                1205 DELAY  (1)               1206 TIME   (1)
       COM3         63             0 A      (60)                60 ENDMIS (1)                 61 M       (1)
                                  62 TC     (1)
       COM7          1             0 REASON (1)
       C012          2             0 NTR    (1)                  1 IFAU   (1)
       C016          2             0 NDIAG  (1)                  1 NUNDI  (1)
```

```
COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       C036         1               0 RMISTM (1)
       C038         7               0 IOCU   (5)                5 NONDED (1)                  6 NWOIO  (1)
       C039         1               0 PDETIO (1)
       C040         4               0 ISHI   (1)                1 FSHI   (1)                  2 NSHION (1)
                                    3 NIO    (1)

STATISTICS
  PROGRAM LENGTH     44B      36
   COMMON LENGTH   2410B    1288
```

```
      FUNCTION IRAN(MIN,MAX)
C                                        THIS VERSION: 25 FEBRUARY 1974
C IT RETURNS A RANDOM INTEGER BETWEEN MIN AND MAX(INCLUDED)
C********** ********* ********* ********** ********* ********* ********
C
      IRAN=INT((MAX-MIN+1)*RANF(0.))+MIN
      END
```

```
       SYMBOLIC REFEPENCE MAP

ENTRY POINTS   . DEF LINE     REFERENCES
    2  IRAN           1          7

VARIABLES     SN  TYPE           RELOCATION
   17  IRAN      INTEGER                       DEFINED         6
    0  MAX       INTEGER              F.P.       REFS          6   DEFINED         1
    0  MIN       INTEGER              F.P.       REFS        2*6   DEFINED         1

EXTERNALS          TYPE   ARGS       REFERENCES
       PANF      REAL       1              6

INLINE FUNCTIONS   TYPE   ARGS        DEF LINE  REFERENCES
       INT       INTEGER    1  INTRIN                 6

STATISTICS
  PROGRAM LENGTH     20B      16
```

```
      FUNCTION ISTEPD(N,VEC)
      DIMENSION VEC(N)
      U=RANF(0.0)
      DO 10 J=1,N
        IF(U.LE.VEC(J)) GOTO 20
   10 CONTINUE
      STOP 4005
   20 CONTINUE
      ISTEPD=J
      RETURN
      END
```

```
       FUNCTION    ISTEPD                                CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE        2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  ISTEPD          1        10

VARIABLES     SN  TYPE           RELOCATION
   40  ISTEPD    INTEGER                        DEFINED        9
   42  J         INTEGER                          REFS         5         9   DEFINED         4
    0  N         INTEGER              F.P.        REFS         2         4   DEFINED         1
   41  U         REAL                             REFS         5   DEFINED         3
    0  VEC       REAL       ARRAY     F.P.        REFS         2         5   DEFINED         1

EXTERNALS          TYPE   ARGS       REFERENCES
       RANF      REAL       1              3

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                        6         4
   31  20                        8         5

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   23  10     * J            4 6         4B     INSTACK    EXITS

STATISTICS
  PROGRAM LENGTH     52B      42
```

```
      LOGICAL FUNCTION LESS(VAL)
C
C THIS PROGRAM GENERATES A UNIFORM PANDOM NUMBER BETWEEN ZERO AND ONE,
C AND THEN DETERMINES IF IT IS LESS THAN A GIVEN VALUE.  IF IT IS,
C .TRUE. IS RETURNED; ELSE .FALSE. IS RETURNED.  THIS FUNCTION IS USED
C TO DETERMINE THE SUCCESS OF FAULT RECOVERY
C
C VAL    THE GIVEN VALUE.----SUCH AS A TRANSIENTE LEAKAGE
C
C**********************************************************************
C
      U=RANF(0.)
      LESS = U.LE.VAL
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  LESS            1         14

VARIABLES     SN  TYPE           RELOCATION
   15  LESS         LOGICAL                        DEFINED       13
   16  U            REAL                             REFS        13    DEFINED       12
    0  VAL          REAL                 F.P.        REFS        13    DEFINED        1

EXTERNALS          TYPE   ARGS       REFERENCES
       RANF     REAL        1             12

STATISTICS
  PROGRAM LENGTH     17B      15
```

```
      SUBROUTINF  MDMFLT(MDM,PRT)
C
C THIS ROUTINE IS INVOKED WHEN A FAULT OCCURS IN A BUS TERMINAL UNIT
C (AN MDM OR DDU).  IT DETERMINFS THE EFFECT OF THIS FAULT ON THE
C FLIGHT CRITICAL BUS EQUIPMENT GPOUP.
C
C MDM    IDENTIFIES THE FAULTY MDM
C PRT    IF NONZERO, INDICATES: ONLY A PORT FAILED AND IDENTIFIES IT
C
C*******************************************************************
      COMMON/FCB1/BUSSTS(8),FCB(8,10),BTUSTS(10)
      COMMON/FCB2/NBTU,BTUTYP(10),BTUCON(10,4),BTUNO(10)
      COMMON/FCB5/BTUCOV(10,2),BTUTFL(10,2)
      COMMON/FCB6/NBTUTF(10,2),NBTUPF(10,2),NBTUTR(10,2)
      COMMON/CO12/NTR,IFAU
      COMMON/STATUS/STS(20)
      COMMON/FAULT/FLTTYP
      COMMON/FCBUC/FCBUCF(6)
      INTEGER BTYP,BUS,BUSSTS,FCB,BTUSTS
      COMMON/FLAGS/FLG(5)
      LOGICAL FLG
      INTEGER FCBUCF
      LOGICAL GREATR
      INTEGER BTUTYP,BTUCON,BTUNO,STS,FLTTYP
      INTEGER PRT
C
      IF(BTUSTS(MDM).EQ.0) RETURN
      FLG(1)=.TRUE.
      BTYP = BTUTYP(MDM)
      IF(PRT.EQ.0) GOTO 500
C
C                   ...THE FAULT OCCURED IN ONE OF THE BTU PORTS
      BUS=BTUCON(MDM,PRT)
      IF(BUS.EQ.0)STOP 1002
      ITYP=FCB(BUS,MDM)
      IF(ITYP.EQ.0) RETURN
C                   ...INCREMENT FAULT COUNTER AND JUMP ON FAULT TYPE
      IFAU = IFAU+1
      GOTO(100,200),FLTTYP
C
C                   ...ITS A TRANSIENT
  100 CONTINUE
      NTR = NTR+1
      NBTUTF(BTYP,1)=NBTUTF(BTYP,1)+1
C                   ...IF TRANSIENT PECOVERY FAILS, GOTO PERMANENT RECOV
      IF(ITYP.EQ.2)RETURN
      IF(GREATR(BTUTFL(MDM,1))) RETURN
      NBTUTR(BTYP,1)=NBTUTR(BTYP,1)+1
      GOTO 205
C
C                   ...ITS A PERMANENT
  200 CONTINUE
      NBTUPF(BTYP,1) = NBTUPF(BTYP,1) + 1
C                   ...ENTER---LEAKY TRANSIENT
  205 CONTINUE
```

```
      GOTO (300,400),ITYP
C
C                   ...AN ACTIVE PORT HAS FAILED
  300 CONTINUF
      FCB(BUS,MDM)=0
      NL=BTUSTS(MDM)-1
      BTUSTS(MDM)=NL
      IF(NL.EQ.0) GOTO 350
      IF(BTUTYP(MDM).EQ.1) RETURN
C                   ...IF FAULT COVERED, FIND BACKUP PORT
      IF(GREATR(BTUCOV(MDM,1))) GOTO 900
      DO  330 I=1,2
        IBUS=BTUCON(MDM,I)
        IF(FCB(IBUS,MDM).EQ.2) GOTO 335
  330 CONTINUE
C                   ...SOMETHINGS WRONG WITH FCB.
      PRINT 1000,BTUCON
 1000 FORMAT(/12H ***ERROR***/1X,4(10I5/)/)
      CALL PIOCNF
C                   ...FOUND THE BACKUP PORT
  335 FCB(IBUS,MDM)=1
      RETURN
C
C                   ...NO BACKUP PORTS ARE LEFT
  350 CONTINUE
      CALL MDMPF(MDM)
      IF(STS(1).NE.0) CALL SETSTS(24+BTUTYP(MDM))
      RETURN
C
C                   ...THE BACKUP PORT FAILED
  400 CONTINUE
      FCB(BUS,MDM)=0
      BTUSTS(MDM)=BTUSTS(MDM)-1
      RETURN
C
C                   ...THE WHOLE BTU FAILED
  500 CONTINUE
      IFAU = IFAU+1
      GOTO(600,700),FLTTYP
C
C                   ...ITS ONLY A TRANSIENT
  600 CONTINUE
      NTR=NTR+1
      NBTUTF(BTYP,2) = NBTUTF(BTYP,2)+1
C                   ...IS TRANSIFNT RECOVERY SUCCESSFUL
      IF(GREATR(BTUTFL(MDM,2))) RETURN
      NBTUTR(BTYP,2) = NBTUTR(BTYP,2)+1
      GOTO 705
C
C                   ...THE FAULT IS PERMANENT
  700 CONTINUE
      NBTUPF(BTYP,2)=NBTUPF(BTYP,2)+1
C                   ...ENTER LEAKY TRANSIENTS
  705 CONTINUF
      IF(GREATR(BTUCOV(MDM,2))) GOTO 900
```

```
C                 ...REMOVE MDM FROM SYSTEM
        DO 710 I=1,3
          IBUS=BTUCON(MDM,I)
        IF(IBUS.EQ.0) GOTO 750
          FCB(IBUS,MDM)=0
  710   CONTINUE
C
C                 ...DETERMINE EFFECT OF FAULT
  750 CONTINUE
      BTUSTS(MDM)=0
      CALL  MDMPF(MDM)
      IF(STS(1).NE.0) CALL SETSTS(24+BTUTYP(MDM))
      RETURN
C
C                 ...AN UNCOVERED FAULT OCCURED
  900 CONTINUE
      CALL SETSTS(FCBUCF(2))
      RETURN
      END
```

```
       SUBROUTINE  MOMFLT                                 CDC 6600 FTN V3.0-P355 OPT=1   04/08/76  17.50.49.       PAGE      4

       SYMBOLIC PEFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCFS
    2  MDMFLT          1        27        36        46        47        64        77        83        89       101       123
                               128

VARIABLES     SN  TYPE           RELOCATION
   13  BTUCON    INTEGER    ARRAY    FCB2         REFS        12        24        33        68        72       113
    0  BTUCOV    REAL       ARRAY    FCB5         REFS        13        66       110
   63  BTUNO     INTEGER    ARRAY    FCB2         REFS        12        24
  130  BTUSTS    INTEGER    ARRAY    FCB1         REFS        11        19        27        61        88
                                               DEFINED        62        88       120
   24  BTUTFL    REAL       ARRAY    FCB5         REFS        13        47       101
    1  BTUTYP    INTEGER    ARRAY    FCB2         REFS        12        24        29        64        82       122
  276  BTYP      INTEGER                          REFS        19      2*44      2*48      2*53      2*99     2*102     2*107
                                               DEFINED        29
  277  RUS       INTEGER                          REFS        19        34        35        60        87
                                               DEFINED        33
    0  BUSSTS    INTEGER    ARRAY    FCB1         REFS        11        19
   10  FCB       INTEGER    ARRAY    FCB1         RFFS        11        19        35        69   DEFINED        60        76
                                                    87       115
    0  FCBUCF    INTEGER    ARRAY    FCRUC        REFS        18        22       127
    0  FLG       LOGICAL    ARRAY    FLAGS        REFS        20        21   DEFINED        28
    0  FLTTYP    INTEGER             FAULT        REFS        17        24        39        94
  302  I         INTEGER                          REFS        68       113   DEFINED        67       112
  303  IBUS      INTEGER                          REFS        69        76       114       115   DEFINED        68       113
    1  IFAU      INTEGER             C012         REFS        15        38        93   DEFINED        38        93
  300  ITYP      INTEGER                          REFS        36        46        56   DEFINED        35
    0  MDM       INTEGER              F.P.        REFS        27        29        33        35        47        60        61
                                                    62        64        66        68        69        76        81        82
                                                    87      2*68       101       110       113       115       120       121
                                                   122   DEFINED         1
    0  NBTU      INTEGER             FCB2         REFS        12
   24  NBTUPF    INTEGER    ARRAY    FCB6         REFS        14        53       107   DEFINED        53       107
    0  NBTUTF    INTEGER    ARRAY    FCB6         REFS        14        44        99   DEFINED        44        99
   50  NBTUTR    INTEGER    ARRAY    FCB6         REFS        14        48       102   DEFINED        48       102
  301  NL        INTEGER                          REFS        62        63   DEFINED        61
    0  NTR       INTEGER             C012         REFS        15        43        98   DEFINED        43        98
    0  PRT       INTEGER              F.P.        REFS        25        30        33   DEFINED         1
    0  STS       INTEGER    ARRAY    STATUS       REFS        16        24        82       122

FILE NAMES        MODE
       OUTPUT      FMT                WRITES       72

EXTERNALS          TYPE   ARGS       REFERENCES
       GREATR    LOGICAL    1             23        47        66       101       110
       MDMPF                1             81       121
       PIOCNF               0             74
       SETSTS               1             82       122       127

STATEMENT LABELS             DEF LINE   REFERENCES
   55  100                      42        39
   74  200                      52        39
   76  205                      55        49
```

```
STATEMENT LABELS           DEF LINE   REFERENCES
  104  300                     59         56
    0  330                     70         67
  145  335                     76         69
  151  350                     80         63
  165  400                     86         56
  172  500                     92         30
  202  600                     97         94
  215  700                    106         94
  217  705                    109        103
    0  710                    116        112
  237  750                    119        114
  254  900                    126         66         110
  270  1000    FMT             73         72

LOOPS  LABEL    INDEX      FROM-TO     LENGTH    PROPERTIES
  130  330    * I           67 70          6B     INSTACK     EXITS
  230  710    * I          112 116         7B     INSTACK     EXITS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCB1          98              0 BUSSTS (8)                  8 FCB    (80)                88 BTUSTS (10)
       FCB2          61              0 NBTU   (1)                  1 BTUTYP (10)                11 BTUCON (40)
                                    51 BTUNO  (10)
       FCB5          40              0 BTUCOV (20)                20 BTUTFL (20)
       FCB6          60              0 NBTUTF (20)                20 NBTUPF (20)                40 NBTUTR (20)
       CO12           2              0 NTR    (1)                  1 IFAU   (1)
       STATUS        20              0 STS    (20)
       FAULT          1              0 FLTTYP (1)
       FCBUC          6              0 FCBUCF (6)
       FLAGS          5              0 FLG    (5)

STATISTICS
  PROGRAM LENGTH    313B      203
   COMMON LENGTH    445B      293
```

```
      SUBROUTINE MDMPF(IIMDM)
C
C THIS ROUTINF DETERMINS THE EFFECT OF THE LOSS OF AN MDM OR DDU
C FAULT ON THE FLIGT CRITICAL DEVICES.  IT IS INVOKED BY BUSFLT
C OR MDMFLT.
C
C MDM    IDENTIFIES THE FAULTY MDM OR DDU.
C
C**********************************************************************
      COMMON/FCB2/NBTU,BTUTYP(10),BTUCON(10,4),BTUNO(10)
      COMMON/FCB7/NDDUDV,DDUDVS(4),DDUDV(2,4),DDUDVN(4)
      COMMON/FCB8/NDFFDV,DFFDVS(6),DFFDV(4,6),DFFDVN(6)
      COMMON/FCB9/NNFFDV,NFFDVS(2,4),NFFDV(3,2,4),NFFDVN(4)
      COMMON/FCB10/NDFADV,DFADVS(3),DFADV(4,3),DFADVN(3)
      COMMON/STATUS/STS(20)
      COMMON/FLAGS/FLG(5)
      LOGICAL FLG
      INTEGER BTUTYP,BTUCON,BTUNO,DDUDVS,DDUDV,DDUDVN
      INTEGER DFFDVS,DFFDV,DFFDVN,DFADVS,DFADV,DFADVN,STS,DDUNO
      MDM=IIMDM
C
C                 ...IS THE BTU A DDU, AN FF MDM, OR A FA MDM.
      MDMTYP = BTUTYP(MDM)
      GOTO(100,200,300),MDMTYP
C
C                 ...A DDU HAS FAILED
  100 CONTINUF
      FLG(2)=.TRUE.
      DDUNO = BTUNO(MDM)
      DO 120 I=1,NDDUDV
        IF(DDUDV(DDUNO,I).EQ.0)GOTO 120
        DDUDV(DDUNO,I)=0
        NL=DDUDVS(I)-1
        DDUDVS(I)=NL
        IF(NL.NE.0)GOTO 120
C                 ...A FUNCTION IS NO LONGER AVAILABLE
        CALL SETSTS(DDUDVN(I))
  120 CONTINUE
C                 ...THE CORRESPONDING PILOT CONTROLS ARE ALSO DISABLED
      FLG(4)=.TRUE.
      DO 130 I=2,NNFFDV
        IF(NFFDVS(DDUNO,I).EQ.0) GOTO 130
        NFFDVS(DDUNO,I)=0
      IF(NFFDVS(3-DDUNO,I).NF.0) GOTO 130
C                 ...A PILOT CONTROL FUNCTION HAS FAILED
        CALL SETSTS(NFFDVN(I))
  130 CONTINUE
      RETURN
C
C                 ...A FAULT OCCURS IN THE FLIGHT FORWARD MDMS
  200 CONTINUE
      FLG(3)=.TRUE.
      FLG(4)=.TRUE.
      MDM=BTUNO(MDM)
      DO 220 I=1,NDFFDV
```

```
        IF(DFFDV(MDM,I).EQ.0)GOTO 220
        DFFDV(MDM,I)=0
        NL=DFFDVS(I)-1
        DFFDVS(I)=NL
        IF(NL.NE.0) GOTO 220
C                     ...A FUNCTION IS NO LONGER AVAILABLE
        CALL SETSTS(DFFDVN(I))
  220 CONTINUF
C                ...CHECK THE NON-DEDICATED DEVICES
      IF(MDM.GE.4) RETURN
      DO 250 I=1,2
        DO 230 J=1,NNFFDV
          IF( NFFDVS(I,J).EQ.0) GOTO 230
          IF(NFFDV(MDM,I,J).EQ.0) GOTO 230
          NFFDV(MDM,I,J)=0
          NL=NFFDVS(I,J)-1
          NFFDVS(I,J)=NL
          IF(NL.NE.0) GOTO 230
C                ...CHECK TO SEE THAT THE CORRESPONDING DEVICE IS OK
      IF(NFFDVS(3-I,J).NE.0) GOTO 230
          CALL SETSTS(NFFDVN(J))
  230   CONTINUE
  250 CONTINUE
      RETURN
C
C                ...AN FA-MDM HAS FAILED
  300 CONTINUE
      FLG(5)=.TRUE.
      MDM=BTUNO(MDM)
      DO 320 I=1,NOFADV
        IF(DFADV(MDM,I).EQ.0) GOTO 320
        DFADV(MDM,I)=0
        NL=DFADVS(I)-1
        DFADVS(I)=NL
        IF(NL.GT.1) GOTO 320
        IF((NL.NE.0).AND.(I.NE.1)) GOTO 320
        DFADVS(I)=0
        CALL SETSTS(DFADVN(I))
  320 CONTINUE
      RETURN
      END
```

```
       SUBROUTINE  MDMPF                                  CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      3

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     RFFERENCES
    2  MDMPF           1        48        65        79        95

VARIABLES     SN  TYPE           RELOCATION
   13  BTUCON    INTEGER    ARRAY    FCB2         REFS        10        18
   63  BTUNO     INTEGER    ARRAY    FCB2         REFS        10        18        29        54        84
    1  BTUTYP    INTEGER    ARRAY    FCB2         REFS        10        18        23
    5  DDUDV     INTEGER    ARRAY    FCB7         REFS        11        18        31   DEFINED        32
   15  DDUDVN    INTEGER    ARRAY    FCB7         REFS        11        18        37
    1  DDUDVS    INTEGER    ARRAY    FCB7         REFS        11        18        33   DEFINED        34
  221  DDUNO     INTEGER                          REFS        19        31        32        42        43        44
                                                DEFINED       29
    4  DFADV     INTEGER    ARRAY    FCB10        REFS        14        19        86   DEFINED        87
   20  DFADVN    INTEGER    ARRAY    FCB10        REFS        14        19        93
    1  DFADVS    INTEGER    ARRAY    FCB10        REFS        14        19        88   DEFINED        89        92
    7  DFFDV     INTEGER    ARRAY    FCB8         REFS        12        19        56   DEFINED        57
   37  DFFDVN    INTEGER    ARRAY    FCB8         REFS        12        19        62
    1  DFFDVS    INTEGER    ARRAY    FCB8         REFS        12        19        58   DEFINED        59
    0  FLG       LOGICAL    ARRAY    FLAGS        REFS        16        17   DEFINED        28        40        52        53
                                                    83
  224  I         INTEGER                          REFS        31        32        33        34        37        42        43
                                                    44        46        56        57        58        59        62        68
                                                    69        70        71        72        75        86        87        88
                                                    89        91        92        93   DEFINED        30        41        55
                                                    66        85
    0  IIMDM     INTEGER                F.P.      REFS        20   DEFINED         1
  226  J         INTEGER                          REFS        68        69        70        71        72        75        76
                                                DEFINED       67
  222  MDM       INTEGER                          REFS        23        29        54        56        57        65        69
                                                    70        84        86        87   DEFINED        20        54        84
  223  MDMTYP    INTEGER                          REFS        24   DEFINED        23
    0  NBTU      INTEGER             FCB2         REFS        10
    0  NODUDV    INTEGER             FCB7         REFS        11        30
    0  NDFADV    INTEGER             FCB10        REFS        14        85
    0  NDFFDV    INTEGER             FCB8         REFS        12        55
   11  NFFDV     INTEGER    ARRAY    FCB9         REFS        13        69   DEFINED        70
   41  NFFDVN    INTEGER    ARRAY    FCB9         REFS        13        46        76
    1  NFFDVS    INTEGER    ARRAY    FCB9         REFS        13        42        44        68        71        75
                                                DEFINED       43        72
  225  NL        INTEGER                          REFS        34        35        59        60        72        73        89
                                                    90        91   DEFINED        33        58        71        88
    0  NNFFDV    INTEGER             FCB9         REFS        13        41        67
    0  STS       INTEGER    ARRAY    STATUS       REFS        15        19

EXTERNALS          TYPE   ARGS       REFERENCES
       SETSTS               1         37        46        62        76        93

STATEMENT LABELS             DEF LINE   REFFRENCES
   16  100                        27        24
   37  120                        38        30        31        35
   62  130                        47        41        42        44
   66  200                        51        24
```

```
STATEMENT LABELS                   DEF LINE   REFERENCES
  110  220                             63         55         56         60
  154  230                             77         67         68         69         73         75
    0  250                             78         66
  163  300                             82         24
  212  320                             94         85         86         90         91

LOOPS  LABEL     INDEX       FROM-TO    LENGTH    PROPERTIES
   22  120     * I            30 38       20B               EXT REFS
   44  130     * I            41 47       21B               EXT REFS
   73  220     * I            55 63       20B               EXT REFS
  120  250     * I            66 78       41B               EXT REFS  NOT INNER
  121  230     * J            67 77       36B               EXT REFS
  167  320     * I            85 94       26B               EXT REFS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCB2          61                0 NBTU    (1)                1 BTUTYP (10)                11 BTUCON (40)
                                      51 BTUNO   (10)
       FCB7          17                0 NDDUDV  (1)                1 DDUDVS (4)                  5 DDUDV  (8)
                                      13 DDUDVN  (4)
       FCB8          37                0 NDFFDV  (1)                1 DFFDVS (6)                  7 DFFDV  (24)
                                      31 DFFDVN  (6)
       FCB9          37                0 NNFFDV  (1)                1 NFFDVS (8)                  9 NFFDV  (24)
                                      33 NFFDVN  (4)
       FCB10         19                0 NDFADV  (1)                1 DFADVS (3)                  4 DFADV  (12)
                                      16 DFADVN  (3)
       STATUS        20                0 STS     (20)
       FLAGS          5                0 FLG     (5)

STATISTICS
  PROGRAM LENGTH      227B       151
   COMMON LENGTH      304B       196
```

```
      SUBROUTINE MISCYC(BEG,END,NEXT)
C                                                THIS VERSION: 3 JULY 1974
C THE PURPOSE OF THIS SUBROUTINE IS TO DETERMINE IF A MINOR
C CYCLE           IS MISSED BECAUSE OF A RECOVERY PROCEDURE.
C BEG     BEGINNING OF THE RECOVERY PROCEDURE
C END     END OF RECOVERY PROCEDURE
C NEXT    5 IF THE RECOVERY IS TOO LONG
C BOR, DOR, EOR, DEOR HELP  IN DETERMINING IF WE ALREADY LOST TIME IN
C PREVIOUS ITERATION.
C
C **********************************************************************
      COMMON/CO27/DOR,DEOR,MISIT,TISL,MI,FRTI
      COMMON/CO31/RATINT,ISYNC
      COMMON/CYC/LAUNMI
      COMMON/EXEC/MINCY,RTI,TODO,OLTIS,IDLE,SEQMAX,DOWMAX,MISITE
      INTEGER SEQ
      INTEGER SEQMAX
      REAL MINCY,IDLE
      REAL LAUNMI
      REAL LASUMI
C **********************************************************************
C
C DETERMINE BEGINNING OF TIME SLOT AND KIND OF CYCLE (MINOR : MI=0)
      BOR=BEG
      EOR=END
      IF (ISYNC.EQ.0) GO TO 200
C SYNCHRONOUS CASE
      SEQ=0
      IF (BOR.NE.DEOR) GO TO 5
      BOR=DOR
      MISITE=MISITE-MISIT
      GO TO 60
    5 CONTINUE
      IF (BOR.NE.DOR) GO TO 6
      MISITE=MISITE-MISIT
      GO TO 60
    6 CONTINUE
      DOR=BOR
      TISL=AINT(BOR/RTI)*RTI
      IF (TISL.EQ.BOR) TISL=TISL-RTI
C NEW RTI
      FRTI=TISL+RTI
      IF (BOR-TISL-MINCY) 10,10,20
   10 MI=0
      IF (LAUNMI.LT.TISL-RTI)LASUMI=TISL-RTI
      GO TO 60
   20 CONTINUE
      IF ((OLTIS.EQ. TISL).AND.(BOR.LT.TISL+MINCY+(IDLE-TODO)))GO TO 10
      MI=1
      TISL=TISL+MINCY
   50 IF (LAUNMI.LT.TISL-MINCY)LASUMI=TISL-MINCY
   60 CONTINUE
      DEOR=EOR
      MISIT=0
C DETERMINE WHAT IS LEFT TO BE DONE IN THIS MINOR CYCLE
```

```
      IF (MI.EQ.1) GO TO 75
      IF (TISL.NE.OLTIS) TODO=IDLE-(END-BEG)
      IF (TISL.EQ.OLTIS) TODO=TODO- (END-BEG)
   75 CONTINUF
C DETERMINE IF RECOVERY LASTS AFTER NEW RTI (NO# GO TO 80)
      IF (EOR.LE. FRTI) GO TO 80
      MISIT=1+ INT((EOR-FRTI)/RTI)
      IF ((EOR-FRTI)/RTI.EQ.AINT((EOR-FRTI)/RTI)) MISIT =MISIT -1
      MISITE=MISITE+MISIT
  100 CONTINUE
      SEQ=MAX0( INT((EOR-LASUMI-RTI)/RTI),MISIT)
      IA=INT(DOWMAX/RTI)
      IF (SEQ.LE.IA) GO TO 70
      MISITE=MISITE-SEQ+IA+1
      SEQ=IA +1
   70 CONTINUE
      IF(SEQ.GT.SEQMAX) SEQMAX=SEQ
      OLTIS=RTI*AINT(EOR/RTI)
      IF (OLTIS.EQ.EOR) OLTIS=OLTIS-RTI
      TODO=IDLE
      LAUNMI=OLTIS
      GO TO 110
   80 CONTINUE
C IN CASE OF MINOR  DETERMINE IF RECOVERY LASTS OVER TIME SLOT
      IF (MI.EQ.1) RETURN
      IF (TODO.GE.0.) GO TO 95
      MISITE=MISITE+1
      MISIT=1
      GO TO 100
   95 CONTINUE
      OLTIS=TISL
  110 CONTINUF
      IF (RTI*SEQ.GT.DOWMAX)NFXT=5
      RETURN
C
C ASYNCHRONOUS CASE
  200 CONTINUC
      IF (BOR.EQ.DOR) GO TO 210
C WAS THERE AN INTERRUPT SINCE LAST RECOVERY
      Y=DEOR+RTI*2.*RANF(0.)
      IF (Y.GE.BOR) GO TO 210
      Y=BOR
      MISIT=0
  209 CONTINUE
      Y=Y+RTI*2.*RANF(0.)
  210 CONTINUE
      IF (Y.GT.EOR) GO TO 240
      MISITE=MISITE+1
      MISIT=MISIT+1
      GO TO 209
  240 CONTINUE
      IF (MISIT.GT.SEQMAX) SEQMAX=MISIT
      IF (MISIT.GT. INT(DOWMAX/RTI)) NEXT=5
      DEOR=EOR
      DOR=BOR
```

```
                END
```

```
       SUBROUTINE  MISCYC                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      4

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  MISCYC          1        80        89       111

VARIABLES     SN  TYPE           RELOCATION
    0  BEG       REAL                 F.P.        REFS        24        57        58   DEFINED         1
  257  BOR       REAL                             REFS        29        34        38        39        40        43        48
                                                    93        96        97       110   DEFINED        24        38
    1  DEOR      REAL                C027         REFS        12        29        95   DEFINED        53       109
    0  DOR       REAL                C027         REFS        12        30        34        93   DEFINED        38       110
    6  DOHMAX    REAL                EXEC         REFS        15        67        88       108
    0  END       REAL                 F.P.        REFS        25        57        58   DEFINED         1
  260  EOR       REAL                             REFS        53        61        62      2*63        66        73        74
                                                   102       109   DEFINED        25
    5  FRTI      REAL                C027         REFS        12        61        62      2*63   DEFINED        42
  261  IA        INTEGER                          REFS        68        69        70   DEFINED        67
    4  IDLE      REAL                EXEC         REFS        15        18        48        57        75
    1  ISYNC     INTEGER             C031         REFS        13        26
  256  LASUMI    REAL                             REFS        20        66   DEFINED        45        51
    0  LAUNMI    REAL                CYC          REFS        14        19        45        51   DEFINED        76
    4  MI        INTEGER             C027         REFS        12        56        80   DEFINED        44        49
    0  MINCY     REAL                EXEC         REFS        15        18        43        48        50      2*51
    2  MISIT     INTEGER             C027         REFS        12        31        35        63        64        66       104
                                                 2*107       108   DEFINED        54        62        63        83        98
                                                   104
    7  MISITE    INTEGER             EXEC         REFS        15        31        35        64        69        82       103
                                               DEFINED        31        35        64        69        82       103
    0  NEXT      INTEGER              F.P.     DEFINED         1        88       108
    3  OLTIS     REAL                EXEC         REFS        15        48        57        58      2*74        76
                                               DEFINED        73        74        86
    0  RATINT    REAL                C031         REFS        13
    1  RTI       REAL                EXEC         REFS        15      2*39        40        42      2*45        62      2*63
                                                  2*66        67      2*73        74        88        95       100       108
  255  SEQ       INTEGER                          PEFS        16        68        69      2*72        88
                                               DEFINED        28        66        70
    5  SEQMAX    INTEGER             EXEC         REFS        15        17        72       107   DEFINED        72       107
    3  TISL      REAL                C027         REFS        12      2*40        42        43      2*45      2*48        50
                                                  2*51        57        58        86   DEFINED        39        40        50
    2  TODO      REAL                EXEC         REFS        15        48        58        81   DEFINED        57        58
                                                    75
  262  Y         REAL                             REFS        96       100       102   DEFINED        95        97       100

EXTERNALS          TYPE   ARGS          REFERENCES
       RANF      REAL       1                  95       100

INLINE FUNCTIONS   TYPE   ARGS           DEF LINE  REFERENCES
       AINT      REAL       1  INTRIN                   39        63        73
       INT       INTEGER    1  INTRIN                   62        66        67       108
       MAX0      INTEGER    0  INTRIN                   66

STATEMENT LABELS             DEF LINE    PEFERFNCES
   21  5                         33         29
   26  6                         37         34
```

```
STATEMENT LABELS             DEF LINE   REFERENCES
   43  10                       44      2*43       48
   52  20                       47        43
    0  50          INACTIVE     51
   70  60                       52        32       36        46
  144  70                       71        68
  111  75                       59        56
  162  80                       78        61
  174  95                       85        81
  126  100                      65        84
  176  110                      87        77
  205  200                      92        26
  221  209                      99       105
  226  210                     101        93       96
  233  240                     106       102

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       C027         6             0 DOR     (1)                  1 DEOR    (1)                  2 MISIT  (1)
                                  3 TISL    (1)                  4 MI      (1)                  5 FRTI   (1)
       C031         2             0 RATINT  (1)                  1 ISYNC   (1)
       CYC          1             0 LAUNMI  (1)
       EXEC         8             0 MINCY   (1)                  1 RTI     (1)                  2 TODO   (1)
                                  3 OLTIS   (1)                  4 IDLE    (1)                  5 SEQMAX (1)
                                  6 DOWMAX  (1)                  7 MISITE  (1)

STATISTICS
  PROGRAM LENGTH    263B     179
   COMMON LENGTH     21B      17
```

```
      FUNCTION MSTEPD(I,XMAT,IDIM,JDIM)
      DIMENSION XMAT(IDIM,JDIM)
      U=RANF(0.0)
      DO 10 J=1,JDIM
        IF(U.LE.XMAT(I,J)) GOTO 20
   10 CONTINUE
      STOP 4006
   20 CONTINUE
      MSTEPD=J
      RETURN
      FND
```

```
       FUNCTION    MSTEPD                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE       2

       SYMBOLIC REFEPENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  MSTEPD          1        10

VARIABLES     SN  TYPE            RELOCATION
    0  I         INTEGER               F.P.        REFS         5    DEFINED        1
    0  IDIM      INTEGER               F.P.        REFS         2    DEFINED        1
   53  J         INTEGER                           REFS         5         9   DEFINED        4
    0  JDIM      INTEGER               F.P.        REFS         2         4   DEFINED        1
   51  MSTEPD    INTEGER                         DEFINED        9
   52  U         REAL                              REFS         5    DEFINED        3
    0  XMAT      REAL        ARRAY     F.P.        REFS         2         5   DEFINED        1

EXTFRNALS          TYPE   ARGS       REFERENCES
       RANF      RFAL        1              3

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                        6          4
   40  20                        8          5

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   32  10     * J            4 6         40     INSTACK    EXITS

STATISTICS
  PROGRAM LENGTH     67B      55
```

```
      SUBROUTINE  NFFFLT(MDMNO,STANO,DEV)
C
C THIS ROUTINE DETERMINES THE EFFECT OF A NONDEDICATED DEVICE FAILURE
C UPON THE FLIGHT CRITICAL BUS EQUIPMENT GROUP
C
C MDMNO  IDENTIFIES MDM
C STANO  IDENTIFIES THE PILOT STATION
C DEV    IDENTIFIES THE DEVICE
C
C**********************************************************************
      COMMON/FAULT/FLTTYP
      COMMON/CO12/NTR,IFAU
      COMMON/STATUS/STS(20)
      COMMON/FCB9/NNFFDV,NFFDVS(2,4),NFFDV(3,2,4),NFFDVN(4)
      COMMON/FCB15/NNFFTF(4,2),NNFFPF(4,2),NNFFTR(4,2)
      COMMON/FCB16/NFFTFD(4,2),NFFTFL(4,2),NFFCOV(4),NFFPFD(4,2)
      COMMON/FCBUC/FCBUCF(6)
      COMMON/FLAGS/FLG(5)
      LOGICAL FLG
      INTEGER FCBUCF
      LOGICAL GREATR
      INTEGER DFV,STANO,FLTTYP,STS
      REAL NFFPFD,NFFTFD,NFFTFL
C
      NL=NFFDVS(STANO,DEV)
      IF(NL.EQ.0) RETURN
      FLG(4)=.TRUE.
      IF(MDMNO.NE.0) GOTO 400
      IFAU=IFAU+1
      GOTO(100,200),FLTTYP
C
C                 ...A TRANSIENT AFFECTING THE WHOLE UNIT
  100 CONTINUE
      NTR=NTR+1
      NNFFTF(DEV,1)=1+NNFFTF(DEV,1)
C                 ...IS THE FAULT DETECTED AND RECOVERED FROM
      IF(GREATR(NFFTFD(DEV,1))) GOTO 800
      IF(GREATR(NFFTFL(DEV,1))) RETURN
      NNFFTR(DEV,1)=1+NNFFTR(DEV,1)
      GOTO 205
C
C                 ...A PERMANENT FAULT OCCURS
  200 CONTINUE
      NNFFPF(DEV,1)=1+NNFFPF(DEV,1)
      IF(GREATR(NFFPFD(DEV,1))) GOTO 800
C                 ...ENTER  LEAKY  TRANSIENTS
  205 CONTINUE
      NFFDVS(STANO,DEV)=0
      IF(NFFDVS(3-STANO,DEV).NE.0) RETURN
C                 ...THE SYSTEM HAS FAILED
      CALL SETSTS(NFFDVN(DEV))
      RETURN
C
C                 ...THE DEVICES INTFRFACE TO ONE OF THC MDMS FAILS
  400 CONTINUE
```

```
      IF(NFFDV(MDMNO,STANO,DEV).EQ.0)RETURN
      IFAU=IFAU+1
      GOTO(500,600),FLTTYP
C
C                    ...TRANSIENT FAULT
  500 CONTINUE
      NTR=NTR+1
      NNFFTF(DEV,2)=NNFFTF(DEV,2)+1
      IF((NL.EQ.1).AND.(GREATR(NFFTFD(DEV,2)))) GOTO 800
      IF(GREATR(NFFTFL(DEV,2))) RETURN
      NNFFTR(DEV,2)=NNFFTR(DEV,2)+1
      GOTO 605
C
C                    ...PERMANENT  FAULT
  600 CONTINUE
      NNFFPF(DEV,2)=NNFFPF(DEV,2)+1
  605 CONTINUE
      NFFDV(MDMNO,STANO,DEV)=0
      NFFDVS(STANO,DEV)=NL-1
      IF(NL.EQ.1) GOTO 205
      IF(NL.GE.3) RETURN
      IF(GREATR(NFFCOV(DEV))) GOTO 800
      RETURN
C
C                    ...UNCOVERED OR UNDETECTED FAULT
  800 CONTINUE
      CALL SETSTS(FCBUCF(5))
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  NFFFLT          1        26        38        49        52        56        65        76        78        83

VARIABLES     SN  TYPE           RELOCATION
    0  DEV       INTEGER             F.P.         REFS        22        25      2*35        37        38      2*39      2*44
                                                    45        48        49        51        56      2*63        64        65
                                                  2*66      2*71        73        74        77   DEFINED         1
    0  FCBUCF    INTEGER    ARRAY   FCBUC         REFS        17        28        82
    0  FLG       LOGICAL    ARRAY   FLAGS         REFS        18        19   DEFINED        27
    0  FLTTYP    INTEGER            FAULT         REFS        11        22        30        58
    1  IFAU      INTEGER            CO12          REFS        12        29        57   DEFINED        29        57
    0  MDMNO     INTEGER             F.P.         REFS        28        56        73   DEFINED         1
   20  NFFCOV    INTEGER    ARRAY   FCB16         REFS        16        77
   11  NFFDV     INTEGER    ARRAY   FCB9          REFS        14        56   DEFINED        73
   41  NFFDVN    INTEGER    ARRAY   FCB9          REFS        14        51
    1  NFFDVS    INTEGER    ARRAY   FCB9          REFS        14        25        49   DEFINED        48        74
   24  NFFPFD    REAL       ARRAY   FCB16         REFS        16        23        45
    0  NFFTFD    REAL       ARRAY   FCB16         REFS        16        23        37        64
   10  NFFTFL    REAL       ARRAY   FCB16         REFS        16        23        38        65
  172  NL        INTEGER                          REFS        26        64        74        75        76
                                               DEFINED        25
    0  NNFFDV    INTEGER            FCB9          PEFS        14
   10  NNFFPF    INTEGER    ARRAY   FCB15         REFS        15        44        71   DEFINED        44        71
    0  NNFFTF    INTEGER    ARRAY   FCB15         REFS        15        35        63   DEFINED        35        63
   20  NNFFTR    INTEGER    ARRAY   FCB15         REFS        15        39        66   DEFINED        39        66
    0  NTR       INTEGER            CO12          REFS        12        34        62   DEFINED        34        62
    0  STANO     INTEGER             F.P.         REFS        22        25        48        49        56        73        74
                                               DEFINED         1
    0  STS       INTEGER    ARRAY   STATUS        REFS        13        22

EXTERNALS          TYPE   ARGS        REFERENCES
       GREATR    LOGICAL    1              21        37        38        45        64        65        77
       SETSTS               1              51        82

STATEMENT LABELS             DEF LINE   REFERENCES
   26  100                       33        30
   45  200                       43        30
   53  205                       47        40        75
   72  400                       55        28
  112  500                       61        58
  134  600                       70        58
  136  605                       72        67
  161  800                       81        37        45        64        77

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FAULT         1              0 FLTTYP (1)
       CO12          2              0 NTR    (1)                  1 IFAU   (1)
       STATUS       20              0 STS    (20)
       FCB9         37              0 NNFFDV (1)                  1 NFFDVS (8)                    9 NFFDV  (24)
                                   33 NFFDVN (4)
       FCB15        24              0 NNFFTF (8)                  8 NNFFPF (8)                   16 NNFFTR (8)
       FCB16        28              0 NFFTFD (8)                  8 NFFTFL (8)                   16 NFFCOV (4)
```

```
COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
                                   20 NFFPFD (8)
       FCBUC         6              0 FCBUCF (6)
       FLAGS         5              0 FLG    (5)

STATISTICS
  PROGRAM LENGTH    173B     123
   COMMON LENGTH    173B     123
```

```
      SUBROUTINE PACK(PLACE,LOC)
      INTEGER PLACE
      DIMENSION PLACE(5)
      LOC=PLACE(5)
      IF(LOC.LE.0) LOC=0
      DO 10 I=1,4
        J=5-I
        IF(PLACE(J).LE.0)PLACE(J)=0
        LOC=OR(SHIFT(LOC,6),PLACE(J))
   10 CONTINUF
      RETURN
      END
```

```
       SUBROUTINE  PACK                                   CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE      2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  PACK           1         11

VARIABLES     SN  TYPE            RELOCATION
   41  I          INTEGER                           REFS         7    DEFINED         6
   42  J          INTEGER                           REFS       2*8        9    DEFINED         7
    0  LOC        INTEGER              F.P.         REFS         5        9    DEFINED         1         4         5         9
    8  PLACE      INTEGER     ARRAY    F.P.         REFS         2        3         4         8         9
                                                  DEFINED        1        8

INLINE FUNCTIONS   TYPE   ARGS        DEF LINE  REFERENCES
       OR         NO TYPE     2  INTRIN                9
       SHIFT      NO TYPE     2  INTRIN                9

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                        10         6

LOOPS  LABEL    INDEX     FROM-TO    LENGTH     PROPERTIES
   26  10     * I            6 10        11B        OPT

STATISTICS
  PROGRAM LENGTH     52B      42
```

```
     SUBROUTINE PFCBCF
     COMMON/FLTHIS/NFCV(10),NSYSF(10),PFRIO,TFRIO
     COMMON/FCBPF/PFRBUS(8),PFRBTU(10,2),PFRDDU(4),PFRDFF(6),
    1 PFRNFF(4,2),PFRDFA(2)
     COMMON/FCBTF/TFRBUS(8),TFRBTU(10,2),TFRDDU(4),TFRDFF(6),
    1 TFRNFF(4,2),TFRDFA(2)
     COMMON/FCB3/BUSTFL,BUSCOV
     COMMON/FCB5/BTUCOV(10,2),BTUTFL(10,2)
     COMMON/FCB12/DDUCOV(4),DDUTFL(4),DDUTFD(4,2)
     COMMON/FCB14/DFFTFD(6,4),DFFTFL(6),DFFCOV(6,3)
     COMMON/FCB16/NFFTFD(4,2),NFFTFL(4,2),NFFCOV(4),NFFPFD(4,2)
     COMMON/FCB18/DFATFD(3),DFATFL(3),DFACOV(3)
     COMMON/FCBNM/DDUNM(4),DFFNM(6),NFFNM(4),DFANM(3)
     COMMON/FCBNM1/BUSNM(8),NBTUNM(10)
     INTEGER DDUNM,DFFNM,DFANM,BUSNM
     REAL NFFTFD,NFFTFL,NFFCOV,NFFPFD
     PRINT 2000,PFRIO,TFRIO
     PRINT 2001
     PRINT 2002,(BUSNM(I),PFRBUS(I),TFRBUS(I),I=1,8)
     PRINT 2001
     PRINT 2003,(NBTUNM(I),(PFRBTU(I,J),J=1,2),(TFRBTU(I,J),J=1,2),I=1,
    1 10)
     PRINT 2001
     PRINT 2002,(DDUNM(I),PFRDDU(I),TFRDDU(I),I=1,4)
     PRINT 2001
     PRINT 2002,(DFFNM(I),PFRDFF(I),TFRDFF(I),I=1,6)
     PRINT 2001
     PRINT2003,(NFFNM(I),(PFRNFF(I,J),J=1,2),(TFRNFF(I,J),J=1,2),I=1,4)
     PRINT 2001
     PRINT 2002,(DFANM(I),PFRDFA(I),TFRDFA(I),I=1,2)
2000 FORMAT(1H1,47HFLIGHT CRITICAL BUS PARTITION --- FAILURE RATES ///
    1 27H NET PERMANENT FAILURE RATE,F15.2,17H  PER MILLION HRS//
    2 27H NET TRANSIENT FAILURE RATE,F15.2,17H  PER MILLION HRS///
    3 3X,6HDEVICE,15X,14HPERMANENT RATE,16X,14HTRANSIENT RATE)
2001 FORMAT(/1X)
2002 FORMAT(1X,A10,14X,F10.2,20X,F10.2)
2003 FORMAT(1X,A10,10X,2F10.2,10X,2F10.2)
     PRINT 1000
     PRINT 1001,BUSTFL,BUSCOV
     PRINT 1002,(NBTUNM(I),BTUTFL(I,1),BTUTFL(I,2),BTUCOV(I,1),
    1 BTUCOV(I,2),I=1,10)
     PRINT 1003,(DDUNM(I),DDUTFD(I,1),DDUTFD(I,2),DDUTFL(I),DDUCOV(I)
    1 ,I=1,4)
     PRINT 1004,(DFFNM(I),(DFFTFD(I,J),J=1,4),DFFTFL(I),(DFFCOV(I,J)
    1 ,J=1,3),I=1,6)
     PRINT 1005,(NFFNM(I),NFFTFD(I,1),NFFTFD(I,2),NFFTFL(I,1),
    1 NFFTFL(I,2),NFFPFD(I,1),NFFCOV(I),I=1,4)
     PRINT 1006,(DFANM(I),DFATFD(I),DFATFL(I),DFACOV(I),I=1,2)
1000 FORMAT(54H1COVERAGE PARAMETERS --- FLIGHT CRITICAL BUS PARTITION )
1001 FORMAT(//22H BUS TRANSIENT LEAKAGE,F11.6
    1 //23H BUS PERMANENT COVERAGE,F10.6)
1002 FORMAT(// 2X,8HBTU NAME,13X,18HTRANSIENT  LEAKAGE,12X,
    1 18HPERMANENT COVERAGE/10(/1X,A10,10X,2F10.6,10X,2F10.6))
1003 FORMAT(// 11H DDU DEVICE,10X,20HTRANSIENT  DETECTION,10X,
    2 17HTRANSIENT LEAKAGE,13X,18HPERMANENT COVERAGE/
```

```
      3 4(/1X,A10,10X,2F10.6,10X,F14.6,16X,F14.6))
 1004 FORMAT(//3X,6HDEVICE,12X,20HTRANSIENT  DETECTION,17X,
      1 17HTRANSIENT LEAKAGE,13X,19HPERMANENT  COVERAGE/
      2 6(/1X,A10,4F10.6,10X,F10.6,10X,3F10.6))
 1005 FORMAT(//
      1 3X,6HDEVICE,12X,19HTRANSIENT DETFCTION,13X,17HTRANSIENT LEAKAGE,
      2 11X,19HPERMANENT DETECTION,8X,18HPERMANENT COVERAGE/
      3 4(/1X,A10,10X,2F10.6,10X,2F10.6,15X,F10.6,15X,F10.6))
 1006 FORMAT(//
      1 3X,6HDEVICE,8X,19HTRANSIENT DETECTION,5X,18HTRANSIENT  LEAKAGE,5X
      2 ,18HPERMANENT COVERAGE/2(/1X,A10,10X,F10.6,12X,F10.6,13X,F10.6))
       RETURN
       FND
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DFF LINE     RFFERENCES
    1  PFCBCF         1          67

VARIABLES     SN  TYPE            RELOCATION
     0 BTUCOV    RFAL       ARRAY    FCB5         REFS         8      2*40
    24 BTUTFL    REAL       ARRAY    FCB5         REFS         8      2*40
     1 BUSCOV    REAL                FCB3         REFS         7        39
     0 BUSNM     INTEGER    ARRAY    FCBNM1       REFS        14        15        19
     0 BUSTFL    REAL                FCB3         REFS         7        39
     0 DOUCOV    REAL       ARRAY    FCB12        REFS         9        42
     0 DOUNM     INTEGER    ARRAY    FCBNM        REFS        13        15        24        42
    10 DOUTFD    REAL       ARRAY    FCB12        REFS         9      2*42
     4 DOUTFL    REAL       ARRAY    FCB12        REFS         9        42
     6 DFACOV    REAL       ARRAY    FCB18        REFS        12        48
    16 DFANM     INTEGER    ARRAY    FCBNM        REFS        13        15        30        48
     0 DFATFD    REAL       ARRAY    FCB18        REFS        12        48
     3 DFATFL    RFAL       ARRAY    FCB18        REFS        12        48
    36 DFFCOV    REAL       ARRAY    FCB14        REFS        10        44
     4 DFFNM     INTFGER    ARRAY    FCBNM        REFS        13        15        26        44
     0 DFFTFD    REAL       ARRAY    FCB14        REFS        10        44
    30 DFFTFL    REAL       ARRAY    FCB14        REFS        10        44
   537 I         INTEGER                          REFS      3*19      3*21      3*24      3*26      3*28      3*30      5*40
                                                  5*42      4*44      7*46      4*48   DEFINED        19        21       ,24
                                                    26        28        30        40        42        44        46        48
   540 J         INTEGER                          REFS      2*21      2*28      2*44   DEFINED      2*21      2*28      2*44
    10 NBTUNM    INTEGER    ARRAY    FCBNM1       REFS        14        21        40
     0 NFCV      INTEGER    ARRAY    FLTMIS       REFS         2
    20 NFFCOV    REAL       ARRAY    FCB16        REFS        11        16        46
    12 NFFNM     INTEGER    ARPAY    FCBNM        REFS        13        28        46
    24 NFFPFD    REAL       ARRAY    FCB16        REFS        11        16        46
     0 NFFTFD    REAL       ARRAY    FCB16        REFS        11        16      2*46
    10 NFFTFL    REAL       ARRAY    FCB16        REFS        11        16      2*46
    12 NSYSF     INTEGER    ARRAY    FLTMIS       REFS         2
    10 PFRBTU    REAL       ARRAY    FCBPF        REFS         3        21
     0 PFRBUS    REAL       ARRAY    FCBPF        REFS         3        19
    34 PFRDOU    REAL       ARRAY    FCBPF        REFS         3        24
    56 PFRDFA    REAL       ARRAY    FCBPF        REFS         3        30
    40 PFRDFF    REAL       ARRAY    FCBPF        REFS         3        26
    24 PFRIO     REAL                FLTMIS       REFS         2        17
    46 PFRNFF    REAL       ARRAY    FCBPF        REFS         3        28
    10 TFRBTU    REAL       ARRAY    FCBTF        REFS         5        21
     0 TFRBUS    REAL       ARRAY    FCBTF        REFS         5        19
    34 TFRDOU    REAL       ARRAY    FCBTF        REFS         5        24
    56 TFRDFA    REAL       ARRAY    FCBTF        REFS         5        30
    40 TFRDFF    REAL       ARRAY    FCBTF        REFS         5        26
    25 TFRIO     REAL                FLTMIS       REFS         2        17
    46 TFRNFF    REAL       ARRAY    FCBTF        REFS         5        28

FILE NAMES        MODE
       OUTPUT      FMT                 WRITES       17        18        19        20        21        23        24        25
                                           26       27        28        29        30        38        39        40        42
                                           44       46        48
```

R3

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STATEMENT LABELS               DEF LINE    REFERENCES
  412  1000     FMT                49         38
  421  1001     FMT                50         39
  431  1002     FMT                52         40
  444  1003     FMT                54         42
  462  1004     FMT                57         44
  500  1005     FMT                60         46
  521  1006     FMT                64         48
  350  2000     FMT                31         17
  400  2001     FMT                35         18         20         23         25         27         29
  402  2002     FMT                36         19         24         26         30
  406  2003     FMT                37         21         28

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   17          * I            19          11B                EXT REFS
   37          * I            21          24B                EXT REFS  NOT INNER
   42          * J            21           7B                EXT REFS
   52          * J            21           7B                EXT REFS
   72          * I            24          11B                EXT REFS
  112          * I            26          11B                EXT REFS
  132          * I            28          22B                EXT REFS  NOT INNER
  135          * J            28           6B                EXT REFS
  144          * J            28           6B                EXT REFS
  163          * I            30          11B                EXT REFS
  212          * I            40          15B                EXT REFS
  233          * I            42          15B                EXT REFS
  254          * I            44          26B                EXT REFS  NOT INNER
  257          * J            44           7B                EXT REFS
  271          * J            44           7B                EXT REFS
  306          * I            46          21B                EXT REFS
  333          * I            48          13B                EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FLTMIS        22               0 NFCV   (10)              10 NSYSF  (10)              20 PFRIO  (1)
                                     21 TFRIO  (1)
       FCBPF         48               0 PFRBUS (8)                8 PFRBTU (20)              28 PFRDOU (4)
                                     32 PFRDFF (6)               38 PFRNFF (8)               46 PFRDFA (2)
       FCBTF         48               0 TFRBUS (8)                8 TFRBTU (20)              28 TFRDOU (4)
                                     32 TFPDFF (6)               38 TFRNFF (8)               46 TFRDFA (2)
       FCB3           2               0 BUSTFL (1)                1 BUSCOV (1)
       FCB5          40               0 BTUCOV (20)              20 BTUTFL (20)
       FCB12         16               0 DDUCOV (4)                4 DDUTFL (4)                8 DDUTFD (8)
       FCB14         48               0 DFFTFD (24)              24 DFFTFL (6)               30 DFFCOV (18)
       FCB16         28               0 NFFTFD (8)                8 NFFTFL (8)               16 NFFCOV (4)
                                     20 NFFPFD (8)
       FCB18          9               0 DFATFD (3)                3 DFATFL (3)                6 DFACOV (3)
       FCBNM         17               0 DDUNM  (4)                4 DFFNM  (6)               10 NFFNM  (4)
                                     14 DFANM  (3)
       FCBNM1        18               0 BUSNM  (8)                8 NBTUNM (10)

STATISTICS
  PROGRAM LENGTH    541B      353
   COMMON LENGTH    450B      296
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```
      SUBROUTINE PFISO(LOC,IP1)
      COMMON/RFRFCB/PF0(6),PF1(8),PF2(10),PF2X(10;4),PF3(2),PF3X(2,4)
     1,PF4(4),PF4X(4,6),PF5(4),PF5X(4,4),PF5Y(4,2),PF6(4),PF6X(4,3)
      DIMENSION IP(5)
      IGRP=ISTEPD(6,PF0)
      IP(1)=IP1
      IP(2)=IGPP
      IP(5)=0
      GOTO(1000,2000,3000,4000,5000,6000),IGRP
 1000   CONTINUE
          IP(3)=ISTEPO(8,PF1)
          IP(4)=0
          GOTO 9000
 2000   CONTINUE
          MDM=ISTEPD(10,PF2)
          IP(3)=MDM
          IP(4)=MSTEPD(MDM,PF2X,10,4)-1
          GOTO 9000
 3000   CONTINUE
          MDM=ISTEPD(2,PF3)
          IP(3)=MDM
          IP(4)=MSTEPD(MDM,PF3X,2,4)
          GOTO 9000
 4000   CONTINUE
          MDM=ISTEPD(4,PF4)
          IP(3)=MDM
          IP(4)=MSTEPD(MDM,PF4X,4,6)
          GOTO 9000
 5000   CONTINUE
          IDEV=ISTEPD(4,PF5)
          IP(5)=IDEV
          IP(3)=MSTEPO(IDEV,PF5X;4,4)-1
          IP(4)=MSTEPO(IDFV,PF5Y,4,2)
          GOTO 9000
 6000   CONTINUE
          MDM=ISTEPD(4,PF6)
          IP(3)=MDM
          IP(4)=MSTEPO(MDM,PF6X,4,3)
          GOTO 9000
 9000 CONTINUE
      CALL PACK(IP,LOC)
      RETURN
      END
      SYMBOLIC REFERENCE MAP

ENTRY POINTS      DEF LINE      REFERENCES
    2  PFISO          1           42

VARIABLES     SN  TYPE             RELOCATION
  175  IDEV        INTEGER                          REFS      31       32       33   DEFINED      30
  173  IGRP        INTEGER                          REFS       7        9  DEFINED        5
  176  IP          INTEGER    ARRAY                 REFS       4       41  DEFINED        6        7        8       11
                                                      12      16       17       21       22       26       27       31
                                                      32      33       37       38
    0  IP1         INTEGER              F.P.        REFS       6  DEFINED        1
    0  LOC         INTEGER              F.P.        REFS      41  DEFINED        1
  174  MOM         INTEGER                          REFS      16       17       21       22       26       27       37
                                                      38 DEFINED       15       20       25       36
    0  PF0         REAL       ARRAY    RFRFCB       REFS       2        5
    6  PF1         REAL       ARRAY    RFRFCB       REFS       2       11
   16  PF2         REAL       ARRAY    RFRFCB       REFS       2       15
   30  PF2X        REAL       ARRAY    RFRFCB       REFS       2       17
  100  PF3         REAL       ARRAY    RFRFCB       REFS       2       20
  102  PF3X        REAL       ARRAY    RFRFCB       REFS       2       22
  112  PF4         REAL       ARRAY    RFRFCB       REFS       2       25
  116  PF4X        REAL       ARRAY    RFRFCB       REFS       2       27
  146  PF5         REAL       ARRAY    RFRFCB       REFS       2       30
  152  PF5X        REAL       ARRAY    RFRFCB       REFS       2       32
  172  PF5Y        REAL       ARRAY    RFRFCB       REFS       2       33
  202  PF6         REAL       ARRAY    RFRFCB       REFS       2       36
  206  PF6X        REAL       ARRAY    RFRFCB       REFS       2       38

EXTERNALS           TYPE    ARGS        REFERENCES
       ISTEPD      INTEGER    2              5      11       15       20       25       30       36
       MSTEPD      INTEGER    4             17      22       27       32       33       38
       PACK                   2             41

STATEMENT LABELS                 DEF LINE    REFERENCES
   24  1000                         10           9
   30  2000                         14           9
   37  3000                         19           9
   45  4000                         24           9
   53  5000                         29           9
   64  6000                         35           9
   72  9000                         40          13      18       23       28       34       39

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       RFRFCB       146             0 PF0      (6)               6 PF1      (8)                14 PF2      (10)
                                   24 PF2X     (40)             64 PF3      (2)                66 PF3X     (8)
                                   74 PF4      (4)              78 PF4X     (24)              102 PF5      (4)
                                  106 PF5X     (16)            122 PF5Y     (8)               130 PF6      (4)
                                  134 PF6X     (12)

STATISTICS
  PROGRAM LENGTH     203B       131
   COMMON LENGTH     222B       146
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```
          SUBROUTINE PIOCNF
          COMMON/FCB1/BUSSTS(8),FCB(8,10),BTUSTS(10)
          COMMON/FCB7/NDDUDV,DDUDVS(4),DDUDV(2,4),DDUDVN(4)
          COMMON/FCB8/NDFFDV,DFFDVS(6),DFFDV(4,6),DFFDVN(6)
          COMMON/FCB9/NNFFDV,NFFDVS(2,4),NFFDV(3,2,4),NFFDVN(4)
          COMMON/FCB10/NDFADV,DFADVS(3).DFADV(4,3),DFADVN(3)
          INTEGER BTUSTS,BUSSTS,FCB,DDUDV,DDUDVN,DDUDVS,DFFDV
          INTEGER DFFDVN,DFFDVS,DFADVS,DFADV,DFADVN
          PRINT 1001,((FCB(I,J);J=1,10),I=1,8)
          PRINT 1000,BTUSTS
          PRINT 1002,((DDUDV(I,J),J=1,4),I=1,2)
          PRINT 1000,DBUDVS
          PRINT 1003,((DFFDV(I,J),J=1,6),I=1,4)
          PRINT 1000,DFFDVS
          PRINT 2004,(((NFFDV(I,J,K),J=1,2),K=1,4),I=1,3)
          PRINT 1000,NFFDVS
          PRINT 1005,((DFADV(I,J),J=1,3),I=1,4)
          PRINT 1000,DFADVS
     1000 FORMAT(10I3)
     1001 FORMAT(///8(10I3/))
     1002 FORMAT(///2(4I3/))
     1003 FORMAT(///4(6I3/))
     2004 FORMAT(///8(8I3/))
     1005 FORMAT(///4(3I3/))
          RETURN
          END
```

```
      SUBROUTINE  PIOCNF                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE       2

      SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    1  PIOCNF         1          25

VARIABLES      SN  TYPE            RELOCATION
  130  BTUSTS     INTEGER    ARRAY    FCB1         REFS         2         7         10
    0  BUSSTS     INTEGER    ARRAY    FCB1         REFS         2         7
    5  DDUDV      INTEGER    ARRAY    FCB7         REFS         3         7         11
   15  DDUDVN     INTEGER    ARRAY    FCB7         REFS         3         7
    1  DDUDVS     INTEGER    ARRAY    FCB7         REFS         3         7         12
    4  DFADV      INTEGER    ARRAY    FCB10        REFS         6         8         17
   20  DFADVN     INTEGER    ARRAY    FCB10        REFS         6         8
    1  DFADVS     INTEGER    ARRAY    FCB10        REFS         6         8         18
    7  DFFDV      INTEGER    ARRAY    FCB8         REFS         4         7         13
   37  DFFDVN     INTEGER    ARRAY    FCB8         REFS         4         8
    1  DFFDVS     INTEGER    ARRAY    FCB8         REFS         4         8         14
   10  FCB        INTEGER    ARRAY    FCB1         REFS         2         7          9
  164  I          INTEGER                          REFS         9        11         13        15        17
                                                 DEFINED        9        11         13        15        17
  165  J          INTEGER                          REFS         9        11         13        15        17
                                                 DEFINED        9        11         13        15        17
  166  K          INTEGER                          REFS        15     DEFINED       15
    0  NDDUDV     INTEGER             FCB7         REFS         3
    0  NDFADV     INTEGER             FCB10        REFS         6
    0  NDFFDV     INTEGER             FCB8         REFS         4
   11  NFFDV      INTEGER    ARRAY    FCB9         REFS         5        15
   41  NFFDVN     INTEGER    ARRAY    FCB9         REFS         5
    1  NFFDVS     INTEGER    ARRAY    FCB9         REFS         5        16
    0  NNFFDV     INTEGER             FCB9         REFS         5

FILE NAMES        MODE
       OUTPUT      FMT                  WRITES       9         10        11        12        13        14        15        16
                                           17       18

STATEMENT LABELS              DEF LINE    REFERENCES
   143  1000     FMT              19          10        12        14        16        18
   145  1001     FMT              20           9
   150  1002     FMT              21          11
   153  1003     FMT              22          13
   161  1005     FMT              24          17
   156  2004     FMT              23          15

LOOPS   LABEL     INDEX       FROM-TO     LENGTH     PROPERTIES
    5           * I             9          11B                 EXT REFS  NOT INNER
    6           * J             9           6B                 EXT REFS
   27           * I            11          11B                 EXT REFS  NOT INNER
   30           * J            11           6B                 EXT REFS
   51           * I            13          11B                 EXT REFS  NOT INNER
   52           * J            13           6B                 EXT REFS
   73           * I            15          17B                 EXT REFS  NOT INNER
   74           * K            15          13B                 EXT REFS  NOT INNER
   75           * J            15          10B                 EXT REFS
  123           * I            17          11B                 EXT REFS  NOT INNER
```

```
LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
  124         * J           17           6B              EXT REFS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FCB1         98              0 BUSSTS (8)                   8 FCB    (80)                  88 BTUSTS (10)
       FCB7         17              0 NODUDV (1)                   1 DDUDVS (4)                    5 DDUDV  (8)
                                   13 DDUDVN (4)
       FCB8         37              0 NDFFDV (1)                   1 DFFDVS (6)                    7 DFFDV  (24)
                                   31 DFFDVN (6)
       FCB9         37              0 NNFFDV (1)                   1 NFFDVS (8)                    9 NFFDV  (24)
                                   33 NFFDVN (4)
       FCB10        19              0 NDFADV (1)                   1 DFADVS (3)                    4 DFADV  (12)
                                   16 DFADVN (3)

STATISTICS
  PROGRAM LENGTH    167B     119
   COMMON LENGTH    320B     208
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```
      SUBROUTINE PIOSTS
      COMMON/FLTMIS/NFCV(10),NSYSF(10),PFRIO,TFRIO
      COMMON/FCBCNT/FCBSF,FALFCB(50)
      COMMON/FCB4/NBUSTF,NBUSPF,NBUSTR
      COMMON/CO12/NTR,IFAU
      COMMON/FCB11/NDDUTF(4),NDDUPF(4),NDDUTR(4)
      COMMON/FCB13/NDFFTF(6),NDFFPF(6),NDFFTR(6)
      COMMON/FCB15/NNFFTF(4,2),NNFFPF(4,2),NNFFTR(4,2)
      COMMON/FCB17/NDFATF(3),NDFAPF(3),NDFATR(3)
      INTEGER FCBSF,FALFCB
      COMMON/FCBNM/DDUNM(4),DFFNM(6),NFFNM(4),DFANM(3)
      DIMENSION NN1(3),NN2(3),NN3(3)
      INTEGER DDUNM,DFFNM,DFANM
      COMMON/FCB6/NBTUTF(10,2),NBTUPF(10,2),NBTUTR(10,2)
      DO 10 I=1,3
        NN1(I)=NBTUTF(I,1)+NBTUTF(I,2)
        NN2(I)=NBTUPF(I,1)+NBTUPF(I,2)
      NN3(I)=NBTUTR(I,1)+NBTUTR(I,2)
   10 CONTINUE
      PRINT 1000
      NPR=IFAU-NTR
      PRINT1001,NTR,NPR,IFAU
      PRINT 1002,FCBSF
      NUNSF=FALFCB(1)+FALFCB(2)+FALFCB(3)+FALFCB(4)+FALFCB(5)+FALFCB(6)
      PRINT 1003,NUNSF
      PRINT 1004,(FALFCB(I),I=1,6)
      PRINT 1005
      PRINT 1006,NBUSTF,NBUSPF,NBUSTR,FALFCB(24)
      PRINT 1007,NN1(1),NN2(1),NN3(1),FALFCB(25)
      DO 20 I=1,4
        PRINT 1008,DDUNM(I),NDDUTF(I),NDDUPF(I),NDDUTR(I),FALFCB(I+6)
   20 CONTINUE
      PRINT 1009,NN1(2),NN2(2),NN3(2),FALFCB(26)
      DO 30 I=1,6
        PRINT 1008,DFFNM(I),NDFFTF(I),NDFFPF(I),NDFFTR(I),FALFCB(I+10)
   30 CONTINUE
      PRINT 1020
      DO 40 I=1,4
        N1=NNFFTF(I,1)+NNFFTF(I,2)
        N2=NNFFPF(I,1)+NNFFPF(I,2)
        N3=NNFFTR(I,1)+NNFFTR(I,2)
      PRINT 1008,NFFNM(I),N1,N2,N3,FALFCB(I+16)
   40 CONTINUF
      PRINT 1010,NN1(3),NN2(3),NN3(3),FALFCB(27)
      DO 50 I=1,2
      PRINT 1008,DFANM(I),NDFATF(I),NDFAPF(I),NDFATR(I),FALFCB(I+20)
   50 CONTINUE
      PRINT 1030,(I,I=1,10),(NFCV(I),I=1,10),(NSYSF(I),I=1,10)
      RETURN
 1000 FORMAT(
     158H1 FLIGHT  CRITICAL  BUS  PARTITION --- MISSION  STATISTICS  )
 1001 FORMAT(/
     120H   TRANSIENT FAULTS    ,I7/
     220H   PERMANENT FAULTS    ,I7/
     320H       TOTAL  FAULTS    ,I7/)
```

```
1002 FORMAT(37H   NUMBER OF FLIGHT CRITICAL FAILURES  ,I7)
1003 FORMAT(/30H   UNCOVERED SYSTEM FAILURES    ,I7)
1004 FORMAT(/
    122H      BUS               ,I7/
    222H      BTU               ,I7/
    322H      DDU DEVICE        ,I7/
    422H      FF-MDM DEVICE     /
    522H         DEDICATED      ,I7/
    622H         NON-DEDICATED  ,I7/
    722H      FA-MDM DEVICE     ,I7//)
1005 FORMAT(44X,23HUNCOVERED     UNCOVERED /
    119X,50HTRANSIENT   PERMANENT    TRANSIENT     PERMANENT   )
1006 FORMAT(/6X,3HBUS,10X,I7,5X,I7,6X,I7,6X,I7)
1007 FORMAT(/6X,3HDDU,10X,I7,5X,I7,6X,I7,6X,I7)
1009 FORMAT(/6X,6HFF-MDM,7X,I7,5X,I7,6X,I7,6X,I7)
1010 FORMAT(/6X,6HFA-MDM,7X,I7,5X,I7,6X,I7,6X,I7)
1008 FORMAT(8X,A10,1X,I7,5X,I7,6X,I7,6X,I7)
1020 FORMAT(1X)
1030 FORMAT(///
    1 26H NUMBER OF FAULTS/MISSION ,10I8//
    2 26H NUMBER OF MISSIONS       ,10I8//
    3 26H NUMBER OF SYSTEM FAILURES,10I8)
     END
```

```
              SYMBOLIC REFERENCE MAP

        ENTRY POINTS     DEF LINE     RFFERENCES
           1  PIOSTS           1         49

        VARIABLES    SN  TYPE          RELOCATION
           0  DDUNM     INTEGER   ARRAY   FCBNM       REFS       11       13       31
          16  DFANM     INTEGEP   ARRAY   FCBNM       REFS       11       13       46
           4  DFFNM     INTEGER   ARRAY   FCBNM       REFS       11       13       35
           1  FALFCB    INTEGER   ARRAY   FCBCNT      REFS        3       10     6*24       26       28       29       31
                                                        33       35       42       44       46
           0  FCRSF     INTEGER           FCBCNT      REFS        3       10       23
         427  I         INTEGER                       REFS     3*16     3*17     3*18       26     5*31     5*35     2*39
                                                      2*40     2*41     2*42     5*46     3*48  DEFINED       15       26
                                                        30       34       38       45     3*48
           1  IFAU      INTEGER           C012        REFS        5       21       22
          24  NBTUPF    INTEGER   ARRAY   FCB6        REFS       14     2*17
           0  NBTUTF    INTEGER   ARRAY   FCB6        REFS       14     2*16
          50  NBTUTR    INTEGER   ARRAY   FCB6        REFS       14     2*18
           1  NBUSPF    INTEGER           FCB4        REFS        4       28
           0  NBUSTF    INTEGER           FCB4        REFS        4       28
           2  NBUSTR    INTEGER           FCB4        REFS        4       28
           4  NDDUPF    INTEGER   ARRAY   FCB11       REFS        6       31
           0  NDDUTF    INTEGER   ARRAY   FCB11       REFS        6       31
          10  NDDUTR    INTEGER   ARRAY   FCB11       REFS        6       31
           3  NDFAPF    INTEGER   ARRAY   FCB17       REFS        9       46
           0  NDFATF    INTEGER   ARRAY   FCB17       REFS        9       46
           6  NDFATR    INTEGER   ARRAY   FCB17       REFS        9       46
           6  NDFFPF    INTEGER   ARRAY   FCB13       REFS        7       35
           0  NOFFTF    INTEGER   ARRAY   FCB13       REFS        7       35
          14  NDFFTR    INTEGER   ARRAY   FCB13       REFS        7       35
           0  NFCV      INTEGER   ARRAY   FLTMIS      REFS        2       48
          12  NFFNM     INTEGER   ARRAY   FCBNM       REFS       11       42
          10  NNFFPF    INTEGER   ARRAY   FCB15       REFS        8     2*40
           0  NNFFTF    INTEGER   ARRAY   FCB15       REFS        8     2*39
          20  NNFFTR    INTEGER   ARRAY   FCB15       REFS        8     2*41
         435  NN1       INTFGER   ARRAY               REFS       12       29       33       44  DEFINED       16
         440  NN2       INTEGER   ARRAY               REFS       12       29       33       44  DEFINED       17
         443  NN3       INTEGER   ARRAY               REFS       12       29       33       44  DEFINED       18
         430  NPR       INTEGER                       REFS       22  DEFINED       21
          12  NSYSF     INTEGER   ARRAY   FLTMIS      REFS        2       48
           0  NTR       INTEGER           C012        REFS        5       21       22
         431  NUNSF     INTEGER                       REFS       25  DEFINED       24
         432  N1        INTEGER                       REFS       42  DEFINED       39
         433  N2        INTEGER                       REFS       42  DEFINED       40
         434  N3        INTEGER                       REFS       42  DEFINED       41
          24  PFRIO     REAL              FLTMIS      REFS        2
          25  TFRIO     REAL              FLTMIS      REFS        2

        FILE NAMES       MODE
              OUTPUT     FMT                WRITES      20       22       23       25       26       27       28       29
                                                31      33       35       37       42       44       46       48
```

```
STATEMENT LABELS              DEF LINE   REFERENCES
    0  10                         19         15
    0  20                         32         30
    0  30                         36         34
    0  40                         43         38
    0  50                         47         45
  267  1000   FMT                 50         20
  277  1001   FMT                 52         22
  311  1002   FMT                 56         23
  317  1003   FMT                 57         25
  324  1004   FMT                 58         26
  351  1005   FMT                 66         27
  363  1006   FMT                 68         28
  367  1007   FMT                 69         29
  405  1008   FMT                 72         31         35         42         46
  373  1009   FMT                 70         33
  400  1010   FMT                 71         44
  411  1020   FMT                 73         37
  413  1030   FMT                 74         48

LOOPS  LABEL     INDEX      FROM-TO    LENGTH    PROPERTIES
    6  10          I         15 19       6B       INSTACK
  110  20        * I         30 32      20B                 EXT REFS
  144  30        * I         34 36      20B                 EXT REFS
  170  40        * I         38 43      26B                 EXT REFS
  232  50        * I         45 47      20B                 EXT REFS
  255            * I         48          5B                 EXT REFS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       FLTMIS        22               0 NFCV    (10)         10 NSYSF   (10)         20 PFRIO   (1)
                                     21 TFRIO   (1)
       FCBCNT        51               0 FCBSF   (1)           1 FALFCB  (50)
       FCB4           3               0 NBUSTF  (1)           1 NBUSPF  (1)           2 NBUSTR  (1)
       C012           2               0 NTR     (1)           1 IFAU    (1)
       FCB11         12               0 NDDUTF  (4)           4 NDDUPF  (4)           8 NDDUTR  (4)
       FCB13         18               0 NDFFTF  (6)           6 NDFFPF  (6)          12 NDFFTR  (6)
       FCB15         24               0 NNFFTF  (8)           8 NNFFPF  (8)          16 NNFFTR  (8)
       FCB17          9               0 NDFATF  (3)           3 NDFAPF  (3)           6 NDFATR  (3)
       FCBNM         17               0 DDUNM   (4)           4 DFFNM   (6)          10 NFFNM   (4)
                                     14 DFANM   (3)
       FCB6          60               0 NBTUTF  (20)         20 NBTUPF  (20)         40 NBTUTR  (20)

STATISTICS
  PROGRAM LENGTH    446B      294
   COMMON LENGTH    332B      218
```

```
      SUBROUTINE RDIOFR(PFRIO,TFRIO)
      COMMON/PFRFCB/PF0(6),PF1(8),PF2(10),PF2X(10,4),PF3(2),PF3X(2,4)
     1,PF4(4),PF4X(4,6),PF5(4),PF5X(4,4),PF5Y(4,2),PF6(4),PF6X(4,3)
      COMMON/TFRFCB/TF0(6),TF1(8),TF2(10),TF2X(10,4),TF3(2),TF3X(2,4)
     1,TF4(4),TF4X(4,6),TF5(4),TF5X(4,4),TF5Y(4,2),TF6(4),TF6X(4,3)
      COMMON/IFCB7/NODUDV,DDUDVS(4),DDUDV(2,4)
      COMMON/IFCB8/NDFFDV,DFFDVS(6),DFFDV(4,6)
      COMMON/IFCB9/NNFFDV,NFFDVS(2,4),NFFDV(3,2,4)
      COMMON/IFCB10/NDFADV,DFADVS(3),DFADV(4,3)
      COMMON/IFCB1/BUSSTS(8),FCB(8,10),BTUSTS(10)
      COMMON/FCBPF/PFRBUS(8),PFRBTU(10,2),PFRDDU(4),PFRDFF(6),
     1 PFRNFF(4,2),PFRDFA(2)
      COMMON/FCBTF/TFRBUS(8),TFRBTU(10,2),TFRDDU(4),TFRDFF(6),
     1 TFRNFF(4,2),TFRDFA(2)
      INTEGER DDUDVS,DDUDV,DFFDVS,DFFDV,DFADVS,DFADV,BUSSTS,FCB,BTUSTS
      CALL GIORF1(TOT,PF1,PFRBUS)
      PF0(1)=TOT
      CALL GIORF2(TOT,PF2,PF2X,BTUSTS,PFRBTU)
      PF0(2)=TOT
      CALL GIORF3(TOT,PF3,PF3X,DDUDV,2,4,PFRDDU)
      PF0(3)=TOT
      CALL GIORF3(TOT,PF4,PF4X,DFFDV,4,6,PFRDFF)
      PF0(4)=TOT
      CALL GIORF4(TOT,PF5,PF5X,PF5Y,NFFDVS,PFRNFF)
      PF0(5)=TOT
      CALL GIORF3(TOT,PF6,PF6X,DFADV,4,2,PFRDFA)
      PF0(6)=TOT
      CALL GIORF1(TOT,TF1,TFRBUS)
      TF0(1)=TOT
      CALL GIORF2(TOT,TF2,TF2X,BTUSTS,TFRBTU)
      TF0(2)=TOT
      CALL GIORF3(TOT,TF3,TF3X,DDUDV,2,4,TFRDDU)
      TF0(3)=TOT
      CALL GIORF3(TOT,TF4,TF4X,DFFDV,4,6,TFRDFF)
      TF0(4)=TOT
      CALL GIORF4(TOT,TF5,TF5X,TF5Y,NFFDVS,TFRNFF)
      TF0(5)=TOT
      CALL GIORF3(TOT,TF6,TF6X,DFADV,4,2,TFRDFA)
      TF0(6)=TOT
      DO 10 I=2,6
         TF0(I)=TF0(I)+TF0(I-1)
         PF0(I)=PF0(I)+PF0(I-1)
   10 CONTINUE
      PFRIO=PF0(6)
      TFRIO=TF0(6)
      DO 20 I=1,6
         IF(PFRIO.NE.0) PF0(I)=PF0(I)/PFRIO
         IF(TFRIO.NE.0) TF0(I)=TF0(I)/TFRIO
   20 CONTINUE
      RETURN
      END
      SYMBOLIC REFERENCE MAP

ENTRY POINTS      DEF LINE     REFERENCES
    2  RDIOFR         1         50

VARIABLES      SN  TYPE           RELOCATION
  130  BTUSTS    INTEGER    ARRAY    IFCB1       REFS        10        15        18        30
    0  BUSSTS    INTEGER    ARRAY    IFCB1       REFS        10        15
    5  DDUDV     INTEGER    ARRAY    IFCB7       REFS         6        15        20        32
    1  DDUDVS    INTEGER    ARRAY    IFCB7       REFS         6        15
    4  DFADV     INTEGER    ARRAY    IFCB10      REFS         9        15        26        38
    1  DFADVS    INTEGER    ARRAY    IFCB10      REFS         9        15
    7  DFFDV     INTEGER    ARRAY    IFCB8       REFS         7        15        22        34
    1  DFFDVS    INTEGER    ARRAY    IFCB8       REFS         7        15
   10  FCB       INTEGER    ARRAY    IFCB1       REFS        10        15
  226  I         INTEGER                         REFS      3*41      3*42      2*47      2*48  DEFINED        40        46
    0  NDDUDV    INTEGER             IFCB7       REFS         6
    0  NDFADV    INTEGER             IFCB10      REFS         9
    0  NDFFDV    INTEGER             IFCB8       REFS         7
   11  NFFDV     INTEGER    ARRAY    IFCB9       REFS         8
    1  NFFDVS    INTEGER    ARRAY    IFCB9       REFS         8        24        36
    0  NNFFDV    INTEGER             IFCB9       REFS         8
   10  PFRBTU    REAL       ARRAY    FCBPF       REFS        11        18
    0  PFRBUS    REAL       ARRAY    FCBPF       REFS        11        16
   34  PFRDDU    REAL       ARRAY    FCBPF       REFS        11        20
   56  PFRDFA    REAL       ARRAY    FCBPF       REFS        11        26
   40  PFRDFF    REAL       ARRAY    FCBPF       REFS        11        22
    0  PFRIO     REAL                  F.P.      REFS      2*47   DEFINED         1        44
   46  PFRNFF    REAL       ARRAY    FCBPF       REFS        11        24
    0  PF0       REAL       ARRAY    RFRFCB      REFS         2      2*42        44        47  DEFINED        17        19
                                                   21        23        25        27        42        47
    6  PF1       REAL       ARRAY    RFRFCB      REFS         2        16
   16  PF2       REAL       ARRAY    RFRFCB      REFS         2        18
   30  PF2X      REAL       ARRAY    RFRFCB      REFS         2        18
  100  PF3       REAL       ARRAY    RFRFCB      REFS         2        20
  102  PF3X      REAL       ARRAY    RFRFCB      REFS         2        20
  112  PF4       REAL       ARRAY    RFRFCB      REFS         2        22
  116  PF4X      REAL       ARRAY    RFRFCB      REFS         2        22
  146  PF5       REAL       ARRAY    RFRFCB      REFS         2        24
  152  PF5X      REAL       ARRAY    RFRFCB      REFS         2        24
  172  PF5Y      REAL       ARRAY    RFRFCB      REFS         2        24
  202  PF6       REAL       ARRAY    RFRFCB      REFS         2        26
  206  PF6X      REAL       ARRAY    RFRFCB      REFS         2        26
   10  TFRBTU    REAL       ARRAY    FCBTF       REFS        13        30
    0  TFRBUS    REAL       ARRAY    FCBTF       REFS        13        28
   34  TFRDDU    REAL       ARRAY    FCBTF       REFS        13        32
   56  TFRDFA    REAL       ARRAY    FCBTF       REFS        13        38
   40  TFRDFF    REAL       ARRAY    FCBTF       REFS        13        34
    0  TFRIO     REAL                  F.P.      REFS      2*48   DEFINED         1        45
   46  TFRNFF    REAL       ARRAY    FCBTF       REFS        13        36
    0  TF0       REAL       ARRAY    TFRFCB      REFS         4      2*41        45        48  DEFINED        29        31
                                                   33        35        37        39        41        48
    6  TF1       REAL       ARRAY    TFRFCB      REFS         4        28
   16  TF2       REAL       ARRAY    TFRFCB      REFS         4        30
```

```
VARIABLES     SN  TYPE           RELOCATION
   30  TF2X      REAL       ARRAY    TFRFCB       REFS         4        30
  100  TF3       REAL       ARRAY    TFRFCB       REFS         4        32
  102  TF3X      REAL       ARRAY    TFRFCB       REFS         4        32
  112  TF4       REAL       ARRAY    TFRFCB       REFS         4        34
  116  TF4X      REAL       ARRAY    TFRFCB       REFS         4        34
  146  TF5       REAL       ARRAY    TFRFCB       REFS         4        36
  152  TF5X      REAL       ARRAY    TFRFCB       REFS         4        36
  172  TF5Y      REAL       ARRAY    TFRFCB       REFS         4        36
  202  TF6       REAL       ARRAY    TFRFCB       REFS         4        38
  206  TF6X      REAL       ARRAY    TFRFCB       REFS         4        38
  225  TOT       REAL                             REFS        16        17        18        19        20        21        22
                                                    23        24        25        26        27        28        29        30
                                                    31        32        33        34        35        36        37        38
                                                    39

EXTERNALS          TYPE   ARGS       REFERENCES
       GIORF1               3             16        28
       GIORF2               5             18        30
       GIORF3               7             20        22        26        32        34        38
       GIORF4               6             24        36

STATEMENT LABELS             DEF LINE   REFERENCES
    0  10                       43        40
    0  20                       49        46

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   53  10       I           40 43        4B     INSTACK
   64  20       I           46 49       11B        OPT

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       RFRFCB      146              0 PF0    (6)                  6 PF1    (8)                14 PF2    (10)
                                   24 PF2X   (40)                64 PF3    (2)                66 PF3X   (8)
                                   74 PF4    (4)                 78 PF4X   (24)              102 PF5    (4)
                                  106 PF5X   (16)               122 PF5Y   (8)               130 PF6    (4)
                                  134 PF6X   (12)
       TFRFCB      146              0 TF0    (6)                  6 TF1    (8)                14 TF2    (10)
                                   24 TF2X   (40)                64 TF3    (2)                66 TF3X   (8)
                                   74 TF4    (4)                 78 TF4X   (24)              102 TF5    (4)
                                  106 TF5X   (16)               122 TF5Y   (8)               130 TF6    (4)
                                  134 TF6X   (12)
       IFCB7        13              0 NDOUDV (1)                  1 DDUDVS (4)                 5 DDUDV  (8)
       IFCB8        31              0 NDFFDV (1)                  1 DFFDVS (6)                 7 DFFDV  (24)
       IFCB9        33              0 NNFFDV (1)                  1 NFFDVS (8)                 9 NFFDV  (24)
       IFCB10       16              0 NDFADV (1)                  1 DFADVS (3)                 4 DFADV  (12)
       IFCB1        98              0 BUSSTS (8)                  8 FCB    (80)               88 BTUSTS (10)
       FCBPF        48              0 PFRBUS (8)                  8 PFRBTU (20)               28 PFRDDU (4)
                                   32 PFRDFF (6)                 38 PFRNFF (8)                46 PFRDFA (2)
       FCBTF        48              0 TFRBUS (8)                  8 TFRBTU (20)               28 TFRDDU (4)
                                   32 TFRDFF (6)                 38 TFRNFF (8)                46 TFRDFA (2)

STATISTICS
  PROGRAM LENGTH    227B     151
   COMMON LENGTH   1103B     579
```

```
      SUBROUTINE SETSTS(ISTS)
      COMMON/STATUS/STS(20)
      INTEGER STS
      N=STS(1)
      IF(N.GT.18) STOP 1001
      STS(1)=N+1
      STS(N+2)=ISTS
      RETURN
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  SETSTS          1           8

VARIABLES     SN  TYPE            RELOCATION
    0  ISTS      INTEGER                F.P.        REFS        7   DEFINED        1
   15  N         INTEGER                            REFS        5         6        7   DEFINED        4
    0  STS       INTEGER    ARRAY    STATUS         REFS        2         3        4   DEFINED        6         7

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       STATUS       20               0 STS     (20)

STATISTICS
  PROGRAM LENGTH      20B       16
   COMMON LENGTH      24B       20
```

```
      SUBROUTINE STATE1(NEXT)
C                           THIS VERSION:   MARCH 1976
C ACFAU(10,6)IS THE TABLE OF THE ACTIVE FAULTS. THEY ARE NO MORE THAN 10
C ACFAU(I,1) : OCCURRENCE TIME.
C ACFAU(I,2) : DISAPPEARANCE TIME.
C ACFAU(I,3) : MODULE (=0 TO INDICATE NO FAULTS).
C ACFAU(I,4) : COMPUTER.
C ACFAU(I,5) : EXTENT.
C ACFAU(I,6) : DETECTION TIME.
C DETEC   DETECTION TIME COMPUTED BY DETTIME
C EXTEN IS THE EXTENT OF THE FAULT
C IDETECT POINTS IN ACFAU TO THE NEXT FAULT TO BE DETECTED
C PTR POINTS TO THE NEXT FAULT TO OCCUR
C     NEXT  = NEXT STATE
C********** ********* ********* ********** ********* ********* ********
C
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/COM8/FOGO
      COMMON/CO11/MISTAK
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO38/IOCU(5),NONDED,NWOIO
      COMMON/CO42/MISTKI(3)
      DIMENSION IGO(5)
      INTEGER EXTEN,PTR
      INTEGER REASON
C ***********************************************************************
C
      IRA=0
C SUPPRESSION OF THE FAULTS IN THE SWITCHED OFF COMPUTER
      DO 10 J=1,IDIM
      IF(ACFAU(J,3).EQ.0.) GO TO 15
      I=ACFAU(J,4)
      IF (NOON(I).EQ.1) GO TO 10
      ACFAU(J,3)=0.
      IRA=IRA+1
      IF((ACFAU(J,2).GE.ENDMIS).OR.(IRA.NE.1))GOTO 10
      MISTAK=MISTAK+1
      MISTKI(NWORK-1)=MISTKI(NWORK-1)+1
   10 CONTINUE
   15 CONTINUE
      IF (IRA.GE.1) CALL GATHER
C IF THERE IS A LURKING FAULT GO TO 1
      IF (ACFAU(1,3).NE.0.) GO TO 1
    4 CONTINUE
C IF NO MORE FAULT RETURN (NEXT=6)
      TIME=TABLE(PTR,1)
      IF (TIME.LT.ENDMIS) GO TO 2
   22 CONTINUE
      NEXT=6
      RETURN
    2 CONTINUE
      CALL FIFAU(IN,NEXT,ISYNC)
      IF(NEXT.EQ.5) RETURN
      IF(IN.EQ.0) GOTO 4
C
C DETERMINE NEXT DETECTION TIME.
    1 CONTINUE
      DET=1000000000000.                                                SP15APR4
      DO 20 I=1,IDIM
C        FIRST RECORD THATS NON-ACTIVE SAYS YOU VE LOOKED ENOUGH        SP08APR4
      IF (ACFAU(I,3).EQ.0.) GO TO 21
      IF (ACFAU(I,6).GE. DET) GO TO 20
      DET=ACFAU(I,6)
      IDETEC=I
      FOCO=ACFAU(IDETEC,4)
   20 CONTINUE
   21 CONTINUE
C
C TESTS ON MULTIPLE FAULT.
C IF NO FAULT BEFORE DET, START RECOVERY.
      TIME=AMIN1(TABLE(PTR,1),DET)
      IF (TIME.GE.ENDMIS) GO TO 22
      IF (TIME.NE.DET) GO TO 27
      NEXT=2
C        TEST ON MULTIPLE FAULT                                         OL29APR4
      K = IDETEC + 1                                                    OL29APR4
C IGO INDICATES A FAULT IN A COMPUTER IF 1
      IF (K.GT.IDIM) RETURN
      DO 26 I=1,5
   26 IGO(I)=0
      IGO(ACFAU(IDETEC,4))=1
      MUL=1
      DO 23 I=K,IDIM                                                    OL29APR4
      IF (ACFAU(I,3).EQ.0.)  GO TO 24                                   OL29APR4
      IF (ACFAU(I,6).GT.DET) GO TO 23
      IF (IGO(ACFAU(I,4)).EQ.1) GO TO 23
      MUL=MUL+1
      IGO(ACFAU(I,4))=1
 23   CONTINUE                                                          OL29APR4
  24  CONTINUE                                                          OL29APR4
      IF ((MUL.GE.NWORK-1).AND.( NWORK.GE.3)) NEXT=3
      RETURN                                                            OL29APR4
C
C
C NEW FAULT BEFORE DETECTION
   27 CONTINUE
      CALL FIFAU(IN,NEXT,ISYNC)
      IF(NEXT.EQ.5)RETURN
      IF(IN.EQ.0) GOTO 21
      GOTO 1
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  STATE1          1         53        56        81        95       101

VARIABLES     SN  TYPE           RELOCATION
    0  ACFAU     REAL       ARRAY    COM3         REFS        18        34        35        39        46        64        65
                                                    66        68        84        87        88        89        91
                                               DEFINED        37
 2265  DELAY     REAL                COM1         REFS        17
  206  DET       REAL                             REFS        65        74        76        88   DEFINED        61        66
   74  ENDMIS    REAL                COM3         REFS        18        39        50        75
 2262  EXTEN     INTEGER             COM1         REFS        17        27
    0  FOCO      REAL                COM8         REFS        20   DEFINED        68
  204  I         INTEGER                          REFS        36        64        65        66        67        83        87
                                                    88        89        91   DEFINED        35        62        82        86
 2263  IDETEC    INTEGER             COM1         REFS        17        68        79        84   DEFINED        67
    0  IDIM      INTEGER             COM1         REFS        17        33        62        81        86
  211  IGO       INTEGER    ARRAY                 REFS        26        89   DEFINED        83        84        91
  205  IN        INTEGER                          REFS        55        57       100       102
    0  IOCU      INTEGER    ARRAY    C038         REFS        24
  202  IRA       INTEGER                          REFS        38        39        44   DEFINED        31        38
    1  ISYNC     INTEGER             C031         REFS        23        55       100
  203  J         INTEGER                          REFS        34        35        37        39   DEFINED        33
  207  K         INTEGER                          REFS        81        86   DEFINED        79
   75  MEMSIZ    INTEGER             COM3         REFS        18
    0  MISTAK    INTEGER             C011         REFS        21        40   DEFINED        40
    0  MISTKI    INTEGER    ARRAY    C042         REFS        25        41   DEFINED        41
  210  MUL       INTEGER                          REFS        90        94   DEFINED        85        90
    0  NEXT      INTEGER              F.P.        REFS        55        56       100       101   DEFINED         1        52
                                                    77        94
    5  NONDED    INTEGER             C038         REFS        24
    0  NOON      INTEGER    ARRAY    C015         REFS        22        36
    6  NWOIO     INTEGER             C038         REFS        24
    5  NWORK     INTEGER             C015         REFS        22      2*41      2*94
 2261  PTR       INTEGER             COM1         REFS        17        27        49        74
    0  RATINT    REAL                C031         REFS        23
    0  REASON    INTEGER             COM7         REFS        19        28
 2264  RECOV     REAL                COM1         REFS        17
    1  TABLE     REAL       ARRAY    COM1         REFS        17        49        74
   76  TC        REAL                COM3         REFS        18
 2266  TIME      REAL                COM1         REFS        17        50        75        76   DEFINED        49        74

EXTERNALS           TYPE   ARGS       REFERENCES
       FIFAU          -      3           55        100
       GATHER                0           44

INLINE FUNCTIONS    TYPE   ARGS         DEF LINE  REFERENCES
       AMIN1     REAL        0  INTRIN             74

STATEMENT LABELS             DEF LINE    REFERENCES
   62  1                           60        46       103
   47  2                           54        50
   40  4                           47        57
```

```
STATEMENT LABELS            DEF LINE   REFERENCES
   27  10                      42        33        36        39
   31  15                      43        34
  100  20                      69        62        65
  102  21                      70        64       102
   44  22                      51        75
  147  23                      92        86        88        89
  151  24                      93        87
    0  26                      83        82
  161  27                      99        76

LOOPS  LABEL    INDEX    FROM-TO    LENGTH    PROPERTIES
   12  10     * J          33 42      17B         OPT     EXITS
   71  20     * I          62 69      11B         OPT     EXITS
  123  26       I          82 83       2B      INSTACK
  135  23     * I          86 92      14B         OPT     EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207             0 IDIM   (1)                  1 TABLE  (1200)               1201 PTR     (1)
                                1202 EXTEN  (1)               1203 IDETEC (1)                  1204 RECOV   (1)
                                1205 DELAY  (1)               1206 TIME   (1)
       COM3         63             0 ACFAU  (60)                60 ENDMIS (1)                    61 MEMSIZ  (1)
                                  62 TC     (1)
       COM7          1             0 REASON (1)
       COM8          1             0 FOCO   (1)
       CO11          1             0 MISTAK (1)
       CO15          6             0 NOON   (5)                  5 NWORK  (1)
       CO31          2             0 RATINT (1)                  1 ISYNC  (1)
       CO38          7             0 IOCU   (5)                  5 NONDED (1)                     6 NWOIO   (1)
       CO42          3             0 MISTKI (3)

STATISTICS
  PROGRAM LENGTH    216B     142
   COMMON LENGTH   2413B    1291
```

```
      SUBROUTINE STATE2(NEXT)
C                          THIS VERSION!   MARCH 1976
C THIS SUBROUTINES SIMULATES THE RECOVERY PROCEDURE (ROLLAHEAD)
C
C********** ********* ********* ********** ********* ********* ********
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/COM8/FOCO
      COMMON/CO11/MISTAK
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO17/NTRI,NQUA
      COMMON/CO18/IREP
      COMMON/CO28/MODSIM,NSPB
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO41/ICATAS,I3
      COMMON/CO42/MISTKI(3)
      COMMON/PERM/LAST(5),MININT,PSUC
      COMMON/PHILM3/NTR3,NTR2,NTR1,NTNR1
      COMMON/RAHEAD/RACPU
      INTEGER EXTEN,PTR
      INTFGER REASON
      REAL LAST,MININT
C********** ********* ********* ********** ********* ********* ********
C
C IREP+   COMPUTER IN CHARGE OF THE REPAIR
      IREP=IPAN(1,NWORK-1)
   40 CONTINUE
      IF ((NOON(IREP).EQ.1).AND.(IRFP.NE.INT(FOCO))) GO TO 30
      IREP=IREP+1
      IF (IREP.GT.MODSIM) IREP=1
      GO TO 40
   30 CONTINUE
      IDELET=0
C IF THE FAULT IS NOT RECURRENT, GO TO 10
      IF (TIME-LAST(FOCO).GT.MININT) GO TO 10
      NEXT=7
      RETURN
   10 CONTINUE
C IF THERE IS NO OTHER FAULT, GO TO 20
      IF (TABLE(PTR,1).GT.TIME+RECOV) GO TO 20
      CALL FIFAU(IN,NEXT,1)
      IF(NEXT.EQ.5) RETURN
      GOTO 10
C
   20 CONTINUE
C AFAULT IN AN OTHER COMPUTER PREEMPTS THE FIRST ONE WHICH IS SEEN AS A
C PERMANENT
      IDE=0
      DET=TIME+RECOV
      DO 21 I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) GO TO 22
      IF (ACFAU(I,4).EQ.FOCO) GO TO 21
      IF (ACFAU(I,6).GE.DET) GO TO 21
      DET=ACFAU(I,6)
      IDE=I
   21 CONTINUF
   22 CONTINUE
C IF NO OTHER FAULT, GO TO 23. ELSE DISCONNECT ONE COMPUTER.
      IF (IDE.EQ.0) GO TO 23
      NOON(FOCO)=0
      NWORK=NWORK-1
      TIME=DET
      NEXT=1
      IF (NWORK.EQ.4) NQUA=NQUA+1
      IF (NWORK.EQ.3) NTRI=NTRI+1
      IF (NWORK.EQ.2) NEXT=4
      RETURN
   23 CONTINUE
      IGOOD=1
C IS THE REPAIRING COMPUTER GOOD.
      DO 75 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 76
      JJ=J
      IF (INT(ACFAU(J,4)).EQ. IREP) IGOOD=0
   75 CONTINUE
   76 CONTINUE
      TIMS=TIME+RECOV
C ERASING AND UPDATING OF DETECTION TIME
      IEFFA=0
      DO 80 J=1,IDIM
      ACF3=ACFAU(J,3)
      IF (ACF3.EQ.0.) GO TO 81
C  IF THE FAULT IS NOT DETECTED, GO  TO 90
      IF ((ACFAU(J,6).GT.TIME-DELAY).OR.(ACFAU(J,4).NE.FOCO)) GO TO 90
C IF THE FAULT LASTS TOO LONG, GO TO 101
      IF (ACFAU(J,2).GT.TIME) GO TO 101
      IF(RANF(0.0).GE.RACPU) GOTO 101
      IF (ACFAU(J,5).NE.0.) GO TO 101
      IF (IGOOD.EQ.0) GO TO 50
      IDELET=1
      IF (ISYNC.EQ.1) GO TO 1111
C ASYNCHRONOUS CASE. DO NOT COUNT A SUCCESSFUL RECOVERY IF ALL PSEUDO-
C FAULTS HAVE NOT YET BEEN ERASED.
      DO  1110 I=1,JJ
      IF (ACFAU(I,3).EQ.0.) GO TO 1110
      IF (I.EQ.J) GO TO 1110
      IF (ACFAU(I,2).NE.ACFAU(J,2)) GO TO 1110
      IDELET=IDELET-1
      NTR3=NTR3-1
      GO TO 1111
 1110 CONTINUF
 1111 CONTINUC
      IFFFA=1
      ACFAU(J,3)=0.
      NTR3 = NTR3 + 1                                                   OL29APR4
      GOTO 80
C
   50 CONTINUE
      ACFAU(J,6)=ACFAU(J,6)+TC
      GO TO 80
   90 CONTINUE
C UPDATING FOR THE NON DETECTED FAULTS
      ACFAU(J,6)=AMAX1(TIMF-DELAY+TC*(1.+AINT((DELAY+RECOV) /TC))
     1                ,ACFAU(J,6))
      GO TO 80
  101 CONTINUE
      CALL DETTIM(DETFC,TIMS,ACFÅU(J,3))
      ACFAU(J,6)=DETEC
   80 CONTINUE
   81 CONTINUE
      IF (IEFFA.EQ.1) CALL GATHER
      NEXT=1
      TIME=TIMS
      LAST(FOCO)=TIME
      CALL MISCYC(TIME-RECOV,TIME,NEXT)
      IF (NEXT.NE.5) RETURN
      ICATAS=ICATAS+1
      REASON=6
      IF (IDELET.EQ.0) RETURN
      NTR3=NTR3-1
      MISTAK=MISTAK+1
      MISTKI(NWORK-2)=MISTKI(NWORK-2)+1
      END
```

```
SYMBOLIC REFERENCE MAP

ENTRY POINTS      DEF LINE      REFERENCES
    2  STATE2          1          38        43        68       127       130       134

VARIABLES      SN  TYPE            RELOCATION
     0  ACFAU         REAL           ARRAY     COM3          REFS         7        52        53        54        55        73        75
                                                               82      2*85        87        89        96      2*98       110       114
                                                              118   DEFINED       105       110       114       119
   340  ACF3          REAL                                   REFS        83   DEFINED        82
  2265  DELAY         REAL                     COM1          REFS         6        85     2*114
   331  DET           REAL                                   REFS        54        63   DEFINED        50        55
   341  DETEC         REAL                                   REFS       118       119
    74  ENDMIS        REAL                     COM3          REFS         7
  2262  EXTEN         INTEGER                  COM1          REFS         6        21
     0  FOCO          REAL                     COM8          REFS         9        29        36        53        61        85       125
   332  I             INTEGER                                REFS        52        53        54        55        56        96        97
                                                               98   DEFINED        51        95
     0  ICATAS        INTEGER                  C041          REFS        16       128   DEFINED       128
   330  IDE           INTEGER                                REFS        60   DEFINED        49        56
   326  IDELET        INTEGER                                REFS        99       130   DEFINED        34        91        99
  2263  IDETEC        INTEGER                  COM1          REFS         6
     0  IDIM          INTEGER                  COM1          REFS         6        51        72        81
   337  IEFFA         INTEGER                                REFS       122   DEFINED        80       104
   333  IGOOD         INTEGER                                REFS        90   DEFINED        70        75
   327  IN          * INTEGER                                REFS        42
     0  IREP          INTEGER                  C018          REFS        13      2*29        30        31        75
                                                          DEFINED        27        30        31
     1  ISYNC         INTEGER                  C031          REFS        15        92
     1  I3            INTEGER                  C041          REFS        16
   334  J             INTEGER                                REFS        73        74        75        82      2*85        87        89
                                                               97        98       105     2*110     2*114       118       119
                                                          DEFINED        72        81
   335  JJ            INTEGER                                REFS        95   DEFINED        74
     0  LAST          REAL           ARRAY     PERM          REFS        18        23        36   DEFINED       125
    75  MEMSIZ        INTEGER                  COM3          REFS         7
     5  MININT        REAL                     PERM          REFS        18        23        36
     0  MISTAK        INTEGER                  C011          REFS        10       132   DEFINED       132
     0  MISTKI        INTEGER        ARPAY     C042          REFS        17       133   DEFINED       133
     0  MODSIM        INTEGER                  C028          REFS        14        31
     0  NEXT          INTEGER                  F.P.          REFS        42        43       126       127   DEFINED         1        37
                                                               64        67       123
     0  NOON          INTEGER        ARRAY     C015          REFS        11        29   DEFINED        61
     1  NQUA          INTEGER                  C017          REFS        12        65   DEFINED        65
     1  NSPB          INTEGER                  C028          REFS        14
     3  NTNR1         INTEGER                  PHILM3        REFS        19
     0  NTRI          INTEGER                  C017          REFS        12        66   DEFINED        66
     2  NTR1          INTEGER                  PHILM3        REFS        19
     1  NTR2          INTEGER                  PHILM3        REFS        19
     0  NTR3          INTEGER                  PHILM3        REFS        19       100       106       131   DEFINED       100       106
                                                              131
     5  NWORK         INTEGER                  C015          REFS        11        27        62        65        66        67     2*133
                                                          DEFINED        62
     6  PSUC          REAL                     PERM          REFS        18
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

```
VARIABLES     SN  TYPE            RELOCATION
 2261  PTR        INTEGER           COM1        REFS        6       21       41
    0  RACPU      REAL              RAHEAD      REFS       20       88
    0  RATINT     REAL              C031        REFS       15
    0  REASON     INTEGER           COM7        REFS        8       22    DEFINED     129
 2264  RECOV      REAL              COM1        REFS        6       41       50        78       114       126
    1  TABLE      REAL      ARRAY   COM1        REFS        6       41
   76  TC         REAL              COM3        REFS        7      110    2*114
 2266  TIME       REAL              COM1        REFS        6       36       41        50        78        85        87
                                                 114      125    2*126    DEFINED      63       124
  336  TIMS       REAL                          REFS      118      124    DEFINED      78

EXTERNALS           TYPE    ARGS        REFERENCES
       DETTIM                3             118
       FIFAU                 3              42
       GATHER                0             122
       IRAN       INTEGER    2              27
       MISCYC                3             126
       RANF       REAL       1              88

INLINE FUNCTIONS    TYPE    ARGS          DEF LINE  REFERENCES
       AINT       REAL       1  INTRIN                114
       AMAX1      REAL       0  INTRIN                114
       INT        INTEGER    1  INTRIN                 29        75

STATEMENT LABELS              DEF LINE   REFERENCES
   33  10                        39         36        44
   47  20                        46         41
   67  21                        57         51        53        54
   71  22                        58         52
  117  23                        69         60
   23  30                        33         29
   10  40                        28         32
  217  50                       109         90
    0  75                        76         72
  135  76                        77         73
  241  80                       120         81       107       111       116
  244  81                       121         83
  222  90                       112         85
  234  101                      117         87        88        89
  211  1110                     102         95        96        97        98
  213  1111                     103         92       101

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   57  21      * I          51 57        120         OPT     EXITS
  124  75      * J          72 76        110         OPT     EXITS
  141  80      * J          81 120      1030              EXT REFS     EXITS    NOT INNER
  177  1110    * I          95 102       140         OPT     EXITS

COMMON BLOCKS   LENGTH      MEMBERS - BIAS NAME(LENGTH)
       COM1       1207                0 TDIM    (1)                1 TABLE  (1200)           1201 PTR     (1)
                                   1202 EXTEN   (1)             1203 IDETEC (1)              1204 RECOV   (1)
                                   1205 DELAY   (1)             1206 TIME   (1)
       COM3         63                0 ACFAU   (60)              60 ENDMIS (1)                61 MEMSIZ (1)
                                     62 TC      (1)
```

```
COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM7          1              0 REASON (1)
       COM8          1              0 FOCO   (1)
       CO11          1              0 MISTAK (1)
       CO15          6              0 NOON   (5)                  5 NWORK  (1)
       CO17          2              0 NTRI   (1)                  1 NQUA   (1)
       CO18          1              0 IREP   (1)
       CO28          2              0 MODSIM (1)                  1 NSPB   (1)
       CO31          2              0 RATINT (1)                  1 ISYNC  (1)
       CO41          2              0 ICATAS (1)                  1 I3     (1)
       CO42          3              0 MISTKI (3)
       PERM          7              0 LAST   (5)                  5 MININT (1)                 6 PSUC   (1)
       PHILM3        4              0 NTR3   (1)                  1 NTR2   (1)                 2 NTR1   (1)
                                    3 NTNR1  (1)
       RAHEAD        1              0 RACPU  (1)

STATISTICS
  PROGRAM LENGTH    342B     226
   COMMON LENGTH   2427B    1303
```

```
      SUBROUTINE STATE3(NEXT)
C                           THIS VERSION:   MARCH 1976
C SIMULATION OF A SYSTEM RESTART
C
C *******************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/COM9/COPLAS(5),RMC,DURMC
      COMMON/CO11/MISTAK
      COMMON/CO13/DURRES
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO41/ICATAS,I3
      COMMON/CO42/MISTKI(3)
      COMMON/PERM/LAST(5),MININT,PSUC
      COMMON/PHILM3/NTR3,NTR2,NTR1,NTHR1
      INTEGER PTR,EXTEN,REASON
      REAL LAST,MININT
C*********** ********* ********* ********** ********* ********* ********
C
   10 CONTINUE
      IF (TABLE(PTR,1).GT.TIME+DURRES) GO TO 20
      CALL FIFAU(IN,NEXT)
      IF(NEXT.EQ.5) RETURN
      GOTO 10
   20 CONTINUE
      IRA=0
      DO 60 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 61
      IF((ACFAU(J,2).LT.TIME).OR. ((ACFAU(J,2).LT.TIME+DURRES).AND.
     1                             (ACFAU(J,5).EQ.0.))) ACFAU(J,3)=0.
      IF (ACFAU(J,3).NE.0.) GO TO 60
      IRA=IRA+1
      NTR3=NTR3+1
   60 CONTINUE
   61 CONTINUE
      IF (IRA.GE.1) CALL GATHER
      TIME=TIME+DURRES
      DO 100 J=1,IDIM
      ACF3=ACFAU(J,3)
      IF (ACF3.EQ.0.) GO TO 110
      CALL DETTIM(ACFAU(J,6),TIME,ACF3)
  100 CONTINUE
  110 NEXT=1
      DO 120 I=1,5
      COPLAS(I)=TIME
      LAST(I)=TIME
  120 CONTINUE
      CALL MISCYC(TIME-DURRES,TIME,NEXT)
      IF (NEXT.NE.5) RETURN
      ICATAS=ICATAS+1
      REASON=6
      NTR3=NTR3-IRA
      MISTAK=MISTAK+IRA
      MISTKI(NWORK-2)=MISTKI(NWORK-2)+IRA
```

```
                    END
```

```
         SYMBOLIC REFERENCF MAP

ENTRY POINTS        DEF LINE        PEFERENCES
     2  STATE3              1          24          50          56

VARIABLES        SN   TYPE              RELOCATION
     0  ACFAU       REAL          ARRAY      COM3             REFS           7          29        3*30          32          40          42
                                                           DEFINED          30
   136  ACF3        REAL                                      REFS          41          42     DEFINED          40
     0  COPLAS      REAL          ARRAY      COM9             REFS           9     DEFINED          46
  2265  DELAY       REAL                     COM1             REFS           6
     6  DURMC       REAL                     COM9             REFS           9
     0  DURRES      REAL                     CO13             REFS          11          22          30          38          49
    74  ENDMIS      REAL                     COM3             REFS           7
  2262  EXTEN       INTEGER                  COM1             REFS           6          17
   137  I           INTEGER                                   REFS          46          47     DEFINED          45
     0  ICATAS      INTEGER                  CO41             REFS          13          51     DEFINED          51
  2263  IDETEC      INTEGER                  COM1             REFS           6
     0  IDIM        INTEGER                  COM1             REFS           6          28          39
   133  IN        * INTEGER                                   REFS          23
   134  IRA         INTEGER                                   REFS          33          37          53          54          55
                                                           DEFINED          27          33
     1  I3          INTEGER                  CO41             REFS          13
   135  J           INTEGER                                   REFS          29        4*30          32          40          42
                                                           DEFINED          28          39
     0  LAST        REAL          ARRAY      PERM             REFS          15          18     DEFINED          47
    75  MEMSIZ      INTEGER                  COM3             REFS           7
     5  MININT      REAL                     PERM             REFS          15          18
     0  MISTAK      INTEGER                  CO11             REFS          10          54     DEFINED          54
     0  MISTKI      INTEGER       ARRAY      CO42             REFS          14          55     DEFINED          55
     0  NEXT        INTEGER                   F.P.            REFS          23          24          49          50     DEFINED           1          44
     0  NOON        INTEGER       ARRAY      CO15             REFS          12
     3  NTNR1       INTEGER                  PHILM3           REFS          16
     2  NTR1        INTEGER                  PHILM3           REFS          16
     1  NTR2        INTEGER                  PHILM3           REFS          16
     0  NTR3        INTEGER                  PHILM3           REFS          16          34          53     DEFINED          34          53
     5  NWORK       INTEGER                  CO15             REFS          12        2*55
     6  PSUC        REAL                     PERM             REFS          15
  2261  PTR         INTEGER                  COM1             PEFS           6          17          22
     0  REASON      INTEGER                  COM7             REFS           8          17     DEFINED          52
  2264  RECOV       REAL                     COM1             REFS           6
     5  RMC         REAL                     COM9             REFS           9
     1  TABLE       REAL          ARRAY      COM1             REFS           6          22
    76  TC          REAL                     COM3             REFS           7
  2266  TIME        REAL                     COM1             REFS           6          22        2*30          38          42          46          47
                                                              2*49     DEFINED          38

EXTERNALS              TYPE    ARGS          REFERENCES
        DETTIM                    3               42
        FIFAU                     2               23
        GATHER                    0               37
        MISCYC                    3               49
```

```
STATEMENT LABELS             DEF LINE   REFERENCES
    4  10                       21         25
   20  20                       26         22
   42  60                       35         28         32
   44  61                       36         29
    0  100                      43         39
   65  110                      44         41
    0  120                      48         45

LOOPS  LABEL     INDEX     FROM-TO    LENGTH     PROPERTIES
   26  60      * J           28 35       16B        OPT     EXITS
   53  100     * J           39 43       12B              EXT REFS    EXITS
   71  120       I           45 48        2B       INSTACK

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207          0 IDIM   (1)                   1 TABLE  (1200)            1201 PTR     (1)
                             1202 EXTEN  (1)                1203 IDETEC (1)               1204 RECOV   (1)
                             1205 DELAY  (1)                1206 TIME   (1)
       COM3         63          0 ACFAU  (60)                 60 ENDMIS (1)                 61 MEMSIZ  (1)
                               62 TC     (1)
       COM7          1          0 REASON (1)
       COM9          7          0 COPLAS (5)                   5 RMC    (1)                  6 DURMC   (1)
       CO11          1          0 MISTAK (1)
       CO13          1          0 DURRES (1)
       CO15          6          0 NOON   (5)                   5 NWORK  (1)
       CO41          2          0 ICATAS (1)                   1 I3     (1)
       CO42          3          0 MISTKI (3)
       PERM          7          0 LAST   (5)                   5 MININT (1)                  6 PSUC    (1)
       PHILM3        4          0 NTR3   (1)                   1 NTR2   (1)                  2 NTR1    (1)
                                3 NTNR1  (1)

STATISTICS
  PROGRAM LENGTH    140B      96
   COMMON LENGTH   2426B    1302
```

```
      SUBROUTINE STATF4(NEXT)
C                      THIS VERSION:   MARCH 1976
C SIMULATION OF DUPLEX
C
C **************************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/CO11/MISTAK
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO38/IOCU(5),NONDED,NWOIO
      COMMON/CO42/MISTKI(3)
      INTEGER PTR,EXTEN
      INTEGER REASON
C********** ********* ********* ********** ********* ********* ********
C
C SUPPRESSION OF THE FAULTS IN THE SWITCHED-OFF COMPUTER
      IRA=0
      DO 10 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 20
      IF (NOON(ACFAU(J,4)).EQ.1) GO TO 10
C TEST IF A TRANSIENT IS MISTAKEN AS A PERMANENT
      ACFAU(J,3)=0.
      IRA=IRA+1
      IF((ACFAU(J,2).GE.ENDMIS).OR.(IRA.NE.1)) GOTO 10
      MISTAK=MISTAK+1
      MISTKI(1)=MISTKI(1)+1
   10 CONTINUE
   20 CONTINUE
      IF (IRA.GE.1) CALL GATHER
C IF THERE  IS A LURKING FAULT GO TO 30.
      IF (ACFAU(1,3).NE.0.) GO TO 30
C IF THERE IS NO MORE FAULT, RETURN
   70 CONTINUE
      TIME=TABLE(PTR,1)
      IF (TIME.LT.ENDMIS) GO TO 40
   50 CONTINUF
      NEXT=6
      RETURN
   40 CONTINUE
      CALL FIFAU(IN,NFXT,ISYNC)
      IF(NEXT.EQ.5) RETURN
      IF(IN.EQ.0) GOTO 70
C DETERMINE DETECTION TIME
   30 CONTINUE
C         THE FAMOUS ONE TRILLION APPROACH AGAIN, SPORTSFANS ...         SP29APR4
      DET=1000000000000.                                                 SP29APR4
      DO 90 I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) GO TO 100
      IF (ACFAU(I,6).GE.DET ) GO TO 90
      DET=ACFAU(I,6)
      IDETEC=I
   90 CONTINUE
  100 CONTINUE
```

```
      C IF THERE IS NO FAULT BEFORE DFT, START ROLLBACK.
            TIME=AMIN1(TABLE(PTR,1),DFT)
            IF (TIME.GE.ENDMTS) GO TO 50
            IF (TIME.NE.DET) GO TO 110
            NEXT=8
            RETURN
        110 CONTINUE
            CALL FIFAU(IN,NEXT,ISYNC)
            IF(NEXT.EQ.5) RETURN
            IF(IN.EQ.0) GOTO 100
            GOTO 30
            END
```

```
       SYMBOLIC REFERENCE MAP  .

ENTRY POINTS     DEF LINE     REFERENCES
    2  STATE4          1         40        43        61        64

VARIABLES     SN  TYPE            RELOCATION
    0  ACFAU     REAL       ARRAY    COM3         REFS         7        21        22        26        33        50        51
                                                    52   DEFINED        24
 2265  DELAY     REAL                COM1         REFS         6
  140  DET       REAL                             REFS        51        57        59   DEFINED        48        52
   74  ENDMIS    REAL                COM3         REFS         7        26        37        58
 2262  EXTEN     INTEGER             COM1         REFS         6        14
  141  I         INTEGER                          REFS        50        51        52        53   DEFINED        49
 2263  IDETEC    INTEGER             COM1         REFS         6   DEFINED        53
    0  IDIM      INTEGER             COM1         REFS         6        20        49
  137  IN        INTEGER                          REFS        42        44        63        65
    0  IOCU      INTEGER    ARRAY    C038         REFS        12
  135  IRA       INTEGER                          REFS        25        26        31   DEFINED        19        25
    1  ISYNC     INTEGER             C031         REFS        11        42        63
  136  J         INTEGER                          REFS        21        22        24        26   DEFINED        20
   75  MEMSIZ    INTEGER             COM3         REFS         7
    0  MISTAK    INTEGER             C011         REFS         9        27   DEFINED        27
    0  MISTKI    INTEGER    ARRAY    C042         REFS        13        28   DEFINED        28
    0  NEXT      INTEGER              F.P.        REFS        42        43        63        64   DEFINED         1        39
                                                    60
    5  NONDED    INTEGER             C038         REFS        12
    0  NOON      INTEGER    ARRAY    C015         REFS        10        22
    6  NWOIO     INTEGER             C038         REFS        12
    5  NWORK     INTEGER             C015         REFS        10
 2261  PTR       INTEGER             COM1         REFS         6        14        36        57
    0  RATINT    REAL                C031         REFS        11
    0  REASON    INTEGER             COM7         REFS         8        15
 2264  RECOV     REAL                COM1         REFS         6
    1  TABLE     REAL       ARRAY    COM1         REFS         6        36        57
   76  TC        REAL                COM3         REFS         7
 2266  TIME      REAL                COM1         REFS         6        37        58        59   DEFINED        36        57

EXTERNALS           TYPE   ARGS       REFERENCES
       FIFAU                 3             42        63
       GATHER                0             31

INLINE FUNCTIONS    TYPE   ARGS        DEF LINE  REFERENCES
       AMIN1     REAL        0  INTRIN                 57

STATEMENT LABELS             DEF LINE   REFERENCES
   27  10                         29         20        22        26
   31  20                         30         21
   62  30                         46         33        66
   47  40                         41         37
   44  50                         38         58
   40  70                         35         44
   77  90                         54         49        51
  101  100                        55         50        65
  114  110                        62         59
```

```
LOOPS  LABEL    INDEX       FROM-TO     LENGTH     PROPERTIES
   12  10      * J           20 29        17B         OPT      EXITS
   71  90      * I           49 54        10B         OPT      EXITS

COMMON BLOCKS   LFNGTH     MEMBERS - BIAS NAME(LFNGTH)
       COM1       1207               0 IDIM    (1)                 1 TABLE  (1200)         1201 PTR     (1)
                                  1202 EXTEN   (1)              1203 IDETEC (1)            1204 RECOV   (1)
                                  1205 DELAY   (1)              1206 TIME   (1)
       COM3         63               0 ACFAU   (60)               60 ENDMIS (1)              61 MEMSIZ  (1)
                                    62 TC      (1)
       COM7          1               0 REASON  (1)
       CO11          1               0 MISTAK  (1)
       CO15          6               0 NOON    (5)                 5 NWORK  (1)
       CO31          2               0 RATINT  (1)                 1 ISYNC  (1)
       CO38          7               0 IOCU    (5)                 5 NONDED (1)               6 NHOIO   (1)
       CO42          3               0 MISTKT  (3)

STATISTICS
  PROGRAM LENGTH     142B      98
   COMMON LENGTH    2412B    1290
```

```
      SUBROUTINF STATE7(NEXT)
C                            THIS VERSION:   MARCH 1976
C THIS IS A MEMORY COPY. THE COMPUTFR IN CHARGE OF THE REPAIR IS IREP.
C IF A NEW FAULT HIT THE SYSTEM BEFORE THE END OF THE MEMORY COPY, THE
C FIRST FAULT IS CONSIDERED AS A PERMANENT.
C
C ***********************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/COM8/FOCO
      COMMON/COM9/COPLAS(5),RMC,DURMC
      COMMON/CO11/MISTAK
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO17/NTRI,NQUA
      COMMON/CO18/IREP
      COMMON/CO28/MODSIM,NSPB
      COMMON/CO29/NMC
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO41/ICATAS,I3
      COMMON/CO42/MISTKI(3)
      COMMON/CO45/PSMC
      COMMON/PERM/LAST(5),MININT,PSUC
      COMMON/PHILM3/NTR3,NTR2,NTR1,NTNR1
      INTEGER EXTEN,PTR,REASON
      REAL LAST,MININT
C********** ********* ********* ********** ********* ********* ********
C
      IDELET=0
C IF THE FAULT IS NOT RECURRENT, GO TO 10.
      IF (TIME-COPLAS(FOCO).GT.RMC) GO TO 10
      NMC=NMC-1
      NOON(FOCO)=0
      IF (NSPB.NE.0) GO TO 24
      NWORK=NWORK-1
      NEXT=1
      IF (NWORK.EQ.4)NQUA=NQUA+1
      IF (NWOPK.EQ.3)NTRI=NTRI+1
      IF (NWORK.LT.3) NEXT=4
      RFTURN
   24 CONTINUE
      NEXT=12
      RETURN
   10 CONTINUE
C IF THERE IS NO OTHER FAULT, GO TO 20
      IF (TABLE(PTR,1).GT.TIMF+DURMC) GO TO 20
      CALL FIFAU(IN,NEXT,1)
      IF(NEXT.EQ.5) RETURN
      GOTO 10
   20 CONTINUE
C A FAULT IN ANOTHE R COMPUTER PREEMPTS THE FIRST ONE WHICH IS SEEN AS A
C PERMANENT
      IDE=0
      DFT=TIME+DURMC
      DO 21  I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) GO TO 22
      IF (ACFAU(I,4).EQ.FOCO) GO TO 21
      IF (ACFAU(I,6).GE.DET) GO TO 21
      DET=ACFAU(I,6)
      IDE=I
   21 CONTINUF
   22 CONTINUE
      IF (IDE.EQ.0) GO TO 23
      NOON(FOCO)=0
      NWORK=NWORK-1
      TIME=DET
      NEXT=1
      IF (NWORK.EQ.4) NQUA=NQUA+1
      IF (NWORK.EQ.3) NTRI=NTRI+1
      IF (NWORK.EQ.2) NEXT=4
      RETURN
   23 CONTINUF
      MUL=0
      DO 40 I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) GO TO 50
      JJ=I
      IF (INT(ACFAU(I,4)).EQ.IREP) MUL=I
   40 CONTINUE
   50 CONTINUE
C ERASING OF THE FAULT
      IEFFA=0
      DO 60 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 61
C ERASED FAULTS : MEMORY-FAULT DYING BEFORE BEGINNING OF THE CORRECTION
C                 OTHER FAULT (EXTENT0) DYING BEFORE END OF CORRECTION
      IF ((ACFAU(J,2).LT.TIME).OR.((ACFAU(J,2).LT.TIME+DURMC).AND.
     1                             (ACFAU(J,5).EQ.0.))) GO TO 70        OL29APR4
      GO TO 60
   90 CONTINUE
      ACFAU(J,5)=ACFAU(J,5)+ACFAU(MUL,5)
      IF (ACFAU(MUL,3).EQ.3.) ACFAU(J,3)=3.
      GO TO 60
  70  CONTINUE                                                          OL29APR4
      IF (RANF(0.).GT.PSMC) GO TO 61
      IF (MUL.NE.0) GO TO 90
      IDELET=1
      IF (ISYNC.EQ.1) GO TO 1111
      DO  1110 I=1,JJ
      IF (ACFAU(I,3).EQ.0.) GO TO 1110
      IF (I.EQ.J) GO TO 1110
      IF (ACFAU(I,2).NE.ACFAU(J,2)) GO TO 1110
      IDELET=IDELET-1
      NTR3=NTR3-1
      GO TO 1111
 1110 CONTINUE
 1111 CONTINUE
      IEFFA=1
      ACFAU(J,3) = 0.                                                   OL29APR4
      NTR3 = NTR3 + 1                                                   OL29APR4
   60 CONTINUF
   61 CONTINUE
      IF (IEFFA.EQ.1) CALL GATHER
C UPDATING DETECTION TIME
      TIME=TIME+DURMC
      DO 100 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 110
      CALL DETTIM(DETEC,TIME,ACFAU(J,3))
      ACFAU(J,6)=DETEC
  100 CONTINUE
  110 NEXT=1
      COPLAS(FOCO)=TIME
      LAST(FOCO)=TIME
      CALL MISCYC(TIME-RECOV,TIME,NEXT)
      IF (NEXT.NE.5) RETURN
      ICATAS=ICATAS+1
      REASON=6
      IF (IDELET.EQ.0) RETURN
      NTR3=NTR3-1
      MISTAK=MISTAK+1
      MISTKI(NWORK-2)=MISTKI(NWORK-2)+1
      END
```

```
        SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  STATE7           1        40      43      48      71     124     127     131

VARIABLES      SN  TYPE            RELOCATION
    0  ACFAU         REAL        ARRAY    COM3       REFS       9      56      57      58      59      75      77
                                                       83    3*86    2*90      91      99   2*101     116     117
                                                  DEFINED      90      91     108     118
    0  COPLAS        REAL        ARRAY    COM9       REFS      12      31 DEFINED     121
 2265  DELAY         REAL                 COM1       REFS       8
  334  DET           REAL                            REFS      58      66 DEFINED      54      59
  342  DETEC         REAL                            REFS     117     118
    6  DURMC         REAL                 COM9       REFS      12      46      54      86     114
   74  ENDMIS        REAL                 COM3       REFS       9
 2262  EXTEN         INTEGER              COM1       REFS       8      25
    0  FOCO          REAL                 COM8       REFS      11      31      33      57      64     121     122
  335  I             INTEGER                         REFS      56      57      58      59      60      75      76
                                                     2*77      99     100     101 DEFINED      55      74      98
    0  ICATAS        INTEGER              C041       REFS      20     125 DEFINED     125
  333  IDE           INTEGER                         REFS      63 DEFINED      53      60
  331  IDELET        INTEGER                         REFS     102     127 DEFINED      29      96     102
 2263  IDETEC        INTEGER              COM1       REFS       8
    0  IDIM          INTEGER              COM1       REFS       8      55      74      82     115
  340  IEFFA         INTEGER                         REFS     112 DEFINED      81     107
  332  IN          * INTEGER                         REFS      47
    0  IREP          INTEGER              C018       REFS      16      77
    1  ISYNC         INTEGER              C031       REFS      19      97
    1  I3            INTEGER              C041       REFS      28
  341  J             INTEGER                         REFS      83    3*86    2*90      91     100     101     108
                                                      116     117     118 DEFINED      82     115
  337  JJ            INTEGER                         REFS      98 DEFINED      76
    0  LAST          REAL        ARRAY    PERM       REFS      23      26 DEFINED     122
   75  MEMSIZ        INTEGER              COM3       REFS       9
    5  MININT        REAL                 PERM       REFS      23      26
    0  MISTAK        INTEGER              C011       REFS      13     129 DEFINED     129
    0  MISTKI        INTEGER     ARRAY    C042       REFS      21     130 DEFINED     130
    0  MODSIM        INTEGER              C028       REFS      17
  336  MUL           INTEGER                         REFS      90      91      95 DEFINED      73      77
    0  NEXT          INTEGER              F.P.       REFS      47      48     123     124 DEFINED       1      36
                                                       39      42      67      70     120
    0  NMC           INTFGFR              C029       REFS      18      32 DEFINED      32
    0  NOON          INTEGER     ARRAY    C015       REFS      14 DEFINED      33      64
    1  NOUA          INTEGER              C017       REFS      15      37      68 DEFINED      37      68
    1  NSPB          INTEGER              C028       REFS      17      34
    3  NTNR1         INTEGER              PHILM3     REFS      24
    0  NTRI          INTEGER              C017       REFS      15      38      69 DEFINED      38      69
    2  NTR1          INTEGFR              PHILM3     REFS      24
    1  NTR2          INTEGER              PHILM3     REFS      24
    0  NTR3          INTEGER              PHILM3     REFS      24     103     109     128 DEFINED     103     109
                                                      128
    5  NWORK         INTEGER              C015       REFS      14      35      37      38      39      65      68
                                                       69      70   2*130 DEFINED      35      65
    0  PSMC          REAL                 C045       REFS      22      94
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

```
VARIABLES     SN  TYPE           RELOCATION
     6 PSUC      REAL                PERM         REFS        23
  2261 PTR       INTEGER             COM1         REFS         8        25        46
     0 RATINT  . REAL                CO31         REFS        19
     0 REASON    INTEGER             COM7         REFS        10        25   DEFINED       126
  2264 RECOV     REAL                COM1         REFS         8       123
     5 RMC       REAL                COM9         REFS        12        31
     1 TABLE     REAL       ARRAY    COM1         REFS         8        46
    76 TC        REAL                COM3         REFS         9
  2266 TIME      REAL                COM1         PEFS         8        31        46        54      2*86       114       117
                                                   121       122     2*123   DEFINED        66       114

FXTERNALS          TYPE   ARGS       REFERENCES
       DETTIM               3              117
       FIFAU                3               47
       GATHER               0              112
       MISCYC               3              123
       RANF      REAL       1               94

INLINE FUNCTIONS   TYPE   ARGS        DEF LINE  REFEPENCES
       INT       INTEGER    1  INTRIN                  77

STATEMENT LABELS             DEF LINE   REFERENCES
   41  10                          44         31        49
   55  20                          50         46
   75  21                          61         55        57        58
   77  22                          62         56
  125  23                          72         63
   36  24                          41         34
    0  40                          78         74
  144  50                          79         75
  230  60                         110         82        88        92
  233  61                         111         83        94
  171  70                          93         86
  160  90                          89         95
    0  100                        119        115
  256  110                        120        116
  222  1110                       105         98        99       100       101
  224  1111                       106         97       104

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   65  21      * I          55 61       12B        OPT     EXITS
  133  40      * I          74 78       11B        OPT     EXITS
  146  60      * J          82 110      65B              EXT REFS    EXITS   NOT INNER
  210  1110    * I          98 105      14B        OPT     EXITS
  243  100     * J         115 119      13B              EXT REFS    EXITS

COMMON BLOCKS   LENGTH     MEMBEPS - BIAS NAME(LENGTH)
       COM1       1207                 0 IDIM    (1)                   1 TABLE  (1200)           1201 PTR     (1)
                                    1202 EXTEN   (1)                1203 IDETEC (1)              1204 RECOV   (1)
                                    1205 DELAY   (1)                1206 TIME   (1)
       COM3         63                 0 ACFAU   (60)                 60 ENDMIS (1)                61 MEMSIZ (1)
                                      62 TC      (1)
       COM7          1                 0 REASON  (1)
       COM8          1                 0 FOCO    (1)
```

```
COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM9          7               0 COPLAS (5)                 5 RMC      (1)                 6 DURMC   (1)
       CO11          1               0 MISTAK (1)
       CO15          6               0 NOON   (5)                 5 NWORK    (1)
       CO17          2               0 NTRI   (1)                 1 NQUA     (1)
       CO18          1               0 IREP   (1)
       CO28          2               0 MODSIM (1)                 1 NSPB     (1)
       CO29          1               0 NMC    (1)
       CO31          2               0 RATINT (1)                 1 ISYNC    (1)
       CO41          2               0 ICATAS (1)                 1 I3       (1)
       CO42          3               0 MISTKI (3)
       CO45          1               0 PSMC   (1)
       PERM          7               0 LAST   (5)                 5 MININT (1)                   6 PSUC    (1)
       PHILM3        4               0 NTR3   (1)                 1 NTR2   (1)                   2 NTR1    (1)
                                     3 NTNR1  (1)

STATISTICS
  PROGRAM LENGTH     343B      227
   COMMON LENGTH   2437B     1311
```

```
      SUBROUTINE STATE8(NEXT)
C                       THIS VERSION:   MARCH 1976
C THIS IS A ROLLBACK
C
C **********************************************************************
C        IREPET INDICATES A SUCCESSFUL ROLLBACK IF 0 .                  OL29APR4
C        WHEN ROLLBACK IS SUCCESSFUL WE HAVE TO DETERMINE WHICH COMPUTEROL29APR4
C        IS STILL GOOD, THIS IS DONE IN STATE9                          OL29APR4
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/CO10/MAXRLB,DURRA
      COMMON/CO16/NDIAG,NUNDI
      COMMON/CO25/END
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO32/IBAD
      COMMON/CO50/IMOBA
      COMMON/COVER/ITLKP,IFWE                                           SP11APR4
      COMMON/PHILM3/NTR3,NTR2,NTR1,NTNR1
      COMMON/PBACK/RBCPU
      INTEGER EXTEN,PTR,REASON
C********** ********* ********* ********** ********* ********* ********
C
C        SET DETECTION TIME OF FAULT CAUSING THIS ROLLBACK              SP09APR4
      IDELET=0
      END=ACFAU(IDETEC,2)
      IMOBA=ACFAU(IDETEC,3)
      IBAD=ACFAU(IDETEC,4)
      TIME=ACFAU(IDETEC,6)
      DURRB=DURRA
      IF (ISYNC.EQ.0) DURRB=DURRA*2.*RANF(0.)
      TIMI=TIME
      LRB=0
      IF(MAXRLB.GT.0) GOTO 10
      NEXT=9
      RETURN
   10 CONTINUE
      LRB=LRB+1
   40 CONTINUE
C        SEE IF NEXT FAULT OCCURANCE IS AFTER THE TIME IT WILL BE AFTER SP12APR4
C        THE ROLLBACK IS COMPLETE                                       SP09APR4
C
      IF (TABLE(PTR,1).GT.TIME+DURRB) GO TO 20
C
C        SEE IF WE ARE POINTING TO A FAULT IN A LIVE COMPUTER            P09APR4
      CALL FIFAU(IN,NEXT,1)
      IF(NEXT.EQ.5) RETURN
      GO TO 40
   20 CONTINUE
C        NICE CLEAN BREAK BETWEEN FAULTS                                SP09APR4
      IREPET=0
      IF (ISYNC.EQ.1) GO TO 32
      DO  30 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 32
      JJ=J
   30 CONTINUE
   32 CONTINUE
      IEFFA=0
      DO 80 J=1,IDIM
      ACF3=ACFAU(J,3)
      IF (ACF3.EQ.0.) GO TO 81
      IF (ACFAU(J,6).GT.TIME) GO TO 90
C        SEE IF THERE IS AN ACTIVE FAULT THAT DISAPPEARS AFTER THE      SP09APR4
C        DETECTION OF THIS FAULT (THAT HAS BEEN DETECTED)               SP09APR4
      IF (ACFAU(J,2).GT.TIME) GO TO 100
C        SEE IF THERE IS AN EXTENT ASSOCIATED WITH THE FAULT (MEANS     SP09APR4
C        THE ROLLBACK WON T HELP FIX IT)                                SP09APR4
      IF (ACFAU(J,5).NE.0.) GO TO 100
      IF(RANF(0.0).GE.RBCPU) GOTO 100
      IF (ISYNC.EQ.1) GO TO 1111
      IDELET=1
      DO  1110 I=1,JJ
      IF (ACFAU(I,3).EQ.0.) GO TO 1110
      IF (I.EQ.J) GO TO 1110
      IF (ACFAU(I,2).NE.ACFAU(J,2)) GO TO 1110
      IDELET=IDELET-1
      NTR2=NTR2-1
      GO TO 1111
 1110 CONTINUE
 1111 CONTINUE
      IEFFA=1
      ACFAU(J,3)=0.
      NTR2 = NTR2 + 1                                                   OL29APR4
      GO TO 80
C
   90 CONTINUE
C A ROLLBACK MAY DELAY THE DETECTION OF A LURKING FAULT
      ACFAU(J,6)=ACFAU(J,6)+DURRB
      GO TO 80
C
  100 CONTINUE
C
      IREPET=1
   80 CONTINUE
   81 CONTINUE
      TIME=TIME+DURRB
      IF (IEFFA.EQ.1) CALL GATHER
C
C
C        HOT DAMN -- WE RE STILL IN BUSINESS, THE ROLLBACK WAS          SP09APR4
C        SUCCESSFUL                                                     SP09APR4
      NEXT = 4                                                          SP09APR4
      CALL MISCYC(TIMI,TIME,NEXT)
      IF (IREPET.EQ.1) GO TO 160
      IF (NEXT.NE.5)RETURN
      GO TO 161
C
  160 CONTINUE
C
C        SEE IF WE TRY THE ROLLBACK AGAIN                               SP09APR4
```

```
      IF(NEXT.EQ.5) GO TO 161
      IF (LRB.LT.MAXRLB) GO TO 10
C
      NEXT = 9                                                          OL29APR4
      RCTURN
  161 CONTINUF
      NDIAG=NDIAG+1
      NUNDI=NUNDI+1
      IF (IDELET.EQ.1) NTR2=NTR2-1
      IF (END.LT.ENDMIS) ITLKP=ITLKP+1
      REASON=6
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  STATE8          1         36        47        105       115       122

VARIABLES     SN  TYPE           RELOCATION
    0  ACFAU     REAL       ARRAY    COM3         REFS        10        26        27        28        29        54        60
                                                    62        65        68        73      2*75        88
                                                DEFINED       82        88
  242  ACF3      REAL                             REFS        61   DEFINED        60
 2265  DELAY     REAL                COM1         REFS         9
    1  DURRA     REAL                CO10         REFS        12        30        31
  232  DURRB     REAL                             REFS        43        88        96   DEFINED        30        31
    0  END       REAL                CO25         REFS        14       120   DEFINED        26
   74  ENDMIS    REAL                COM3         REFS        10       120
 2262  EXTEN     INTEGER             COM1         REFS         9        21
  243  I         INTEGER                          REFS        73        74        75   DEFINED        72
    0  IBAD      INTEGER             CO32         REFS        16   DEFINED        28
  231  IDELET    INTEGER                          REFS        76       119   DEFINED        25        71        76
 2263  IDETEC    INTEGER             COM1         REFS         9        26        27        28        29
    0  IDIM      INTEGER             COM1         REFS         9        53        59
  241  IEFFA     INTEGER                          REFS        97   DEFINED        58        81
    1  IFWE      INTEGER             COVER        REFS        18
    0  IMOBA     INTEGER             CO50         REFS        17   DEFINED        27
  235  IN      * INTEGER                          REFS        46
  236  IREPET    INTEGER                          REFS       104   DEFINED        51        93
    1  ISYNC     INTEGER             CO31         REFS        15        31        52        70
    0  ITLKP     INTEGER             COVER        REFS        18       120   DEFINED       120
  237  J         INTEGER                          REFS        54        55        60        62        65        68        74
                                                    75        82      2*88   DEFINED        53        59
  240  JJ        INTEGER                          REFS        72   DEFINED        55
  234  LRB       INTEGER                          REFS        38       112   DEFINED        33        38
    0  MAXRLB    INTEGER             CO10         REFS        12        34       112
   75  MEMSIZ    INTEGER             COM3         REFS        10
    0  NOIAG     INTEGER             CO16         REFS        13       117   DEFINED       117
    0  NEXT      INTEGER              F.P.        REFS        46        47       103       105       111
                                                DEFINED        1        35       102       114
    3  NTNR1     INTEGER             PHILM3       REFS        19
    2  NTR1      INTEGER             PHILM3       REFS        19
    1  NTR2      INTEGER             PHILM3       REFS        19        77        83       119   DEFINED        77        83
                                                   119
    0  NTR3      INTEGER             PHILM3       REFS        19
    1  NUNDI     INTEGER             CO16         REFS        13       118   DEFINED       118
 2261  PTR       INTEGER             COM1         REFS         9        21        43
    0  RATINT    REAL                CO31         REFS        15
    0  RBCPU     REAL                RBACK        REFS        20        69
    0  REASON    INTFGER             COM7         REFS        11        21   DEFINED       121
 2264  RECOV     REAL                COM1         REFS         9
    1  TABLE     REAL       ARRAY    COM1         REFS         9        43
   76  TC        RFAL                COM3         REFS        10
 2266  TIME      REAL                COM1         REFS         9        32        43        62        65        96       103
                                                DEFINED       29        96
  233  TIMI      REAL                             REFS       103   DEFINED        32
```

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

```
EXTERNALS          TYPE    ARGS        RFFERENCFS
       FIFAU                  3            46
       GATHER                 0            97
       MISCYC                 3           103
       RANF      REAL         1            31         69

STATEMENT LABELS              DFF LINF    REFERENCES
   30  10                        37          34         112
   46  20                        49          43
    0  30                        56          53
   62  32                        57          52         54
   32  40                        39          48
  141  80                        94          59         84         89
  144  81                        95          61
  135  90                        86          62
  140  100                       91          65         68         69
  166  160                      108         104
  176  161                      116         106        111
  127  1110                      79          72         73         74         75
  131  1111                      80          70         78

LOOPS  LABEL    INDEX      FROM-TO    LENGTH     PROPERTIES
   56  30      * J          53 56        40       INSTACK    EXITS
   64  80      * J          59 94       60B                 EXT REFS    EXITS   NOT INNER
  115  1110    * I          72 79       140           OPT    EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207             0 IDIM    (1)                1 TABLE  (1200)              1201 PTR     (1)
                                1202 EXTEN   (1)             1203 IDETEC (1)                 1204 RECOV   (1)
                                1205 DELAY   (1)             1206 TIME   (1)
       COM3         63             0 ACFAU   (60)              60 ENDMIS (1)                   61 MEMSIZ  (1)
                                  62 TC      (1)
       COM7          1             0 REASON  (1)
       CO10          2             0 MAXRLB  (1)                1 DURRA  (1)
       CO16          2             0 NDIAG   (1)                1 NUNDI  (1)
       CO25          1             0 END     (1)
       CO31          2             0 RATINT  (1)                1 ISYNC  (1)
       CO32          1             0 IBAD    (1)
       CO50          1             0 IMOBA   (1)
       COVER         2             0 ITLKP   (1)                1 IFHE   (1)
       PHILM3        4             0 NTR3    (1)                1 NTR2   (1)                    2 NTR1    (1)
                                   3 NTNR1   (1)
       RBACK         1             0 RBCPU   (1)

STATISTICS
  PROGRAM LENGTH     244B     164
   COMMON LENGTH    2407B    1287
```

```
      SUBROUTINE STATE9(NEXT)                                           SP09APR4
C                 THIS VERSION:   MARCH 1976
C         THIS IS THE FAMOUS DIAGONISTIC AND RECOVERY STATE.
C         THE ONLY WAY TO ARRIVE AT THIS STATE IS TO HAVE HAD THE DUPLEX
C         MODE RECOVERY TECHNIQUE (NAMELY ROLLBACK) NOT SUCCESSFUL ENOUGH
C         (THIS HINGES ON THE PROBABILITY OF SUCCESS OF A ROLLBACK
C
C********** ********* ********* ********** ********* ********* ********
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC                          SP29APR4
      COMMON/COM7/REASON                                                SP08APR4
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO16/NDIAG,NUNDI
      COMMON/CO25/END
      COMMON/CO26/TW2
      COMMON/CO32/IBAD
      COMMON/CO50/IMOBA
      COMMON/COVER/ITLKP,IFWE
      COMMON/D/DIAGN
      COMMON/DETE/P,DETMAX,PDM
      COMMON/FAILD2/FOCO2                                               SP29APR4
      INTEGER  PTR,EXTEN                                                SP29APR4
      INTEGER  REASON                                                   SP10APR4
C *********************************************************************
C
C A TRANSIENT FAULT CANNOT BE DIAGNOSED IF IT HAS DISAPPEARED
      PDET=PDM
      IF(IMOBA.EQ.1) PDET=P
   68 U=RANF(0.)
      IF (U.LT.PDET) GO TO 169
      IF (END.LT.TIME) GO TO 110
      IF (U.GT.DETMAX) GO TO 101
      U=DIAGN*2.*(U-PDET)/(DETMAX-PDET)
  171 CONTINUE
      CALL  MISCYC(TIME,TIME+U+TW2,NEXT)
      TIME=TIME+U+TW2
      IF (NEXT.NE.5) GO TO 100
  101 CONTINUE
      NEXT=5
      REASON=4
C        TOO BAD ABOUT THAT -- IT S A SYSTEM FAILURE                    SP08APR4
      NUNDI=NUNDI+1
      IF (END.LT.ENDMIS) ITLKP=ITLKP+1
      RETURN                                                            SP08APR4
  110 CONTINUE
      IF (RANF(0.).GT.0.5) GO TO 101
      U=2.*DIAGN
      GO TO 171
C                                                                       SP08APR4
  100 CONTINUE                                                          SP08APR4
C        DETERMINE THE ONLY GOOD COMPUTER                               SP29APR4
      DO 150 J=1,5
      IF ((NOON(J).EQ.0). OR.(IBAD.EQ.J)) GO TO  150
      FOCO2=J
      GO TO 200
      150 CONTINUE
      200 CONTINUE
          NOON(IBAD)=0
          NWORK=1
      201 CONTINUE
          IF(TABLE(PTR,1).GE.TIME) GO TO 210
          CALL FIFAU(IN,NEXT,1)
          IF(NEXT.EQ.5) RETURN
          IF(IN.EQ.1) GOTO 101
          GOTO 201
      210 CONTINUE
     C
     C        WELL, YOU RE NOT A WHOLE LOT BETTER OFF, BUT AT LEAST A SIMPLEXSP08APR4
     C        COMPUTER SYSTEM MIGHT KEEP THE PLANE IN THE AIR.                SP08APR4
          NEXT = 10                                                           SP08APR4
          RETURN                                                              SP08APR4
      169 CONTINUE
          U=0.
          GO TO 171
          END                                                                 SP08APR4
     SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
   2 STATE9           1         44      63      71

VARIABLES    SN  TYPE        RELOCATION
   0 ACFAU  REAL    ARRAY COM3   REFS     10
2265 DELAY  REAL          COM1   REFS      9
   1 DETMAX REAL          DETE   REFS     20      32      33
   0 DIAGN  REAL          0      REFS     19      33      47
   0 END    REAL          C025   REFS     14      31      43
  74 ENDMIS REAL          COM3   REFS     10      43
2262 EXTEN  INTEGER       COM1   REFS      9      22
   0 FOCO2  REAL          FAILD2 REFS     21 DEFINED      54
   0 IBAD   INTEGER       C032   REFS     16      53      58
2263 IDETEC INTEGER       COM1   REFS      9
   0 IDIM   INTEGER       COM1   REFS      9
   1 IFWE   INTEGER       COVER  REFS     18
   0 IMOBA  INTEGER       C050   REFS     17      28
 147 IN     INTEGER              REFS     62      64
   0 ITLKP  INTEGER       COVER  REFS     18      43 DEFINED      43
 146 J      INTEGER              REFS   2*53      54 DEFINED      52
  75 MEMSIZ INTEGER       COM3   REFS     10
   0 NDIAG  INTEGER       C016   REFS     13
   0 NEXT   INTEGER       F.P.   REFS     35      37      62      63  DEFINED          39
                                  70
   0 NOON   INTEGER ARRAY C015   REFS     12      53 DEFINED      58
   1 NUNDI  INTEGER       C016   REFS     13      42 DEFINED      42
   5 NWORK  INTEGER       C015   REFS     12 DEFINED      59
   0 P      REAL          DETE   REFS     20      28
 144 PDET   REAL                 REFS     30    2*33 DEFINED      27      28
   2 PDM    REAL          DETE   REFS     20      27
2261 PTR    INTEGER       COM1   REFS      9      22      61
   0 REASON INTEGER       COM7   REFS     11      23 DEFINED      40
2264 RECOV  REAL          COM1   REFS      9
   1 TABLE  REAL    ARRAY COM1   REFS      9      61
  76 TC     REAL          COM3   REFS     10
2266 TIME   REAL          COM1   REFS      9      31    2*35      36      61
                              DEFINED     36
   0 TW2    REAL          C026   REFS     15      35      36
 145 U      REAL                 REFS     30      32      33      35      36
                              DEFINED     29      33      47      73

EXTERNALS   TYPE    ARGS      REFERENCES
     FIFAU            3          62
     MISCYC           3          35
     RANF   REAL      1          29      46

STATEMENT LABELS       DEF LINE     REFERENCES
   0 68     INACTIVE    29
  62 100                50          37
  43 101                38          32      46      64
  54 110                45          31
  74 150                56          52      53
```

```
STATEMENT LABELS             DEF LINE   REFERENCES
  123  169                      72         30
   27  171                      34         48         74
   76  200                      57         55
  101  201                      60         65
  120  210                      66         61

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   66  150    * J           52 56       108         OPT     EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207              0 IDIM   (1)                  1 TABLE  (1200)              1201 PTR    (1)
                                 1202 FXTEN  (1)               1203 IDETEC (1)                 1204 RECOV  (1)
                                 1205 DFLAY  (1)               1206 TIME   (1)
       COM3         63              0 ACFAU  (60)                60 ENDMIS (1)                   61 MEMSIZ (1)
                                   62 TC     (1)
       COM7          1              0 PEASON (1)
       CO15          6              0 NOON   (5)                  5 NWORK  (1)
       CO16          2              0 NDIAG  (1)                  1 NUNDI  (1)
       CO25          1              0 END   -(1)
       CO26          1              0 TW2    (1)
       CO32          1              0 IBAD   (1)
       CO50          1              0 IMOBA  (1)
       COVFR         2              0 ITLKP  (1)                  1 IFWE   (1)
       D             1              0 DIAGN  (1)
       DETF          3              0 P      (1)                  1 DETMAX (1)                    2 PDM    (1)
       FAIL02        1              0 FOCO2  (1)

STATISTICS
  PROGRAM LENGTH    150B      104
   COMMON LENGTH   2412B     1290
```

```
      SUBROUTINE STATEA(NEXT)                                           SP08APR4
C                     THIS VERSTON:   MARCH 1976
C        THIS IS THE PRECARIOUSLY POSTURED SIMPLEX COMPUTER SYSTEM STATESP08APR4
C        IN THIS STATE YOU VE REALLY GOT YOURSELF OUT ON A LIMB BECAUSE SP08APR4
C        THERE S ABSOLUTELY NO REDUNDANCY - YOU RE ZINGING IN THERE ON  SP08APR4
C        ONE AND ONLY ONE COMPUTER                                      SP08APR4
C ********* ********* ********* ********** ********** ********** *****  SP08APR4
C
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC                          SP09APR4
      COMMON/COM7/REASON
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO60/LSTFLT
      COMMON/COVER/ITLKP,IFHE                                           SP29APR4
      COMMON/FAILD2/FOCO2                                               SP08APR4
      INTEGER PTR,EXTEN,REASON
C *******************************************************************
C
C SUPPRESSION OF THE FAULTS IN THE SHITCHED OFF COMPUTER
      IRA=0
      DO 10 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.)GO TO 20
      IF (ACFAU(J,4).EQ.FOCO2) GO TO 10
      ACFAU(J,3)=0.
      IRA=IRA+1
      IF ((ACFAU(J,2).LT.ENDMIS).AND.(IRA.EQ.1)) ITLKP=ITLKP+1
   10 CONTINUE
   20 CONTINUE
      IF (IRA.GE.1) CALL GATHER
C IF THERE IS A LURKING FAULT GO TO 30
      IF (ACFAU(1,3).NE.0.)GO TO 30
C IF THERE IS NO MORE FAULT, RETURN
   70 CONTINUE
      TIME=TABLE(PTR,1)
      IF (TIME.LT.ENDMIS) GO TO 40
      NEXT=6
      RETURN
   40 CONTINUE
      CALL FIFAU(IN,NEXT,1)
      IF(NEXT.EQ.5)RETURN
      IF(IN.EQ.0) GOTO 70
C IN STATEB, WHEN ACFAU(J,6) IS -1, IT IS DETERMINED IF THE FAULT IS
C DETECTED OR NOT. IF WE FOLLOWED EXACTLY THE STATE DIAGRAM, IT SHOULD
C BE DETERMINED HERE.
      ACFAU(LSTFLT,6)=-1
      PTR=PTR+1
      NEXT=11
      RETURN
   30 CONTINUE
      TIMI=ACFAU(1,1)
      DO 1 J=2,IDIM
      IF (ACFAU(J,3).FQ.0.) GO TO 2
      TIMI=AMIN1(TIMI,ACFAU(J,2))
    1 CONTINUE
    2 CONTINUF
```

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ORIGINAL PAGE IS POOR

```
      TIME=AMAX1(TIMI,TIME)
      NEXT=11
      END                                                         SP08APR4
```

```
        SYMROLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
   2  STATEA         1       37         40         48         58

VARIABLES     SN  TYPE            RELOCATION
    0  ACFAU      REAL        ARRAY   COM3          REFS       10         22         23         26         31         50         52
                                                       53    DEFINED        24         45
 2265  DELAY      REAL                COM1          REFS        9
   74  ENDMIS     REAL                COM3          REFS       10         26         35
 2262  EXTEN      INTEGER             COM1          REFS        9         16
    0  FOCO2      REAL                FAILO2        REFS       15         23
 2263  IDETEC     INTEGER             COM1          REFS        9
    0  IDIM       INTEGER             COM1          REFS        9         21         51
    1  IFWE       INTEGER             COVER         REFS       14
  115  IN         INTEGER                           REFS       39         41
  113  IRA        INTEGER                           REFS       25         26         29   DEFINED         20         25
    1  ISYNC      INTEGER             CO31          REFS       12
    0  ITLKP      INTEGER             COVER         REFS       14         26    DEFINED         26
  114  J          INTEGER                           REFS       22         23         24         26         52         53
                                                  DEFINED      21         51
    0  LSTFLT     INTEGER             CO60          REFS       13         45
   75  MEMSIZ     INTEGER             COM3          REFS       10
    0  NEXT       INTEGER              F.P.         REFS       39         40    DEFINED          1         36         47         57
 2261  PTR        INTEGER             COM1          REFS        9         16         34         46    DEFINED         46
    0  RATINT     REAL                CO31          REFS       12
    0  REASON     INTEGER             COM7          REFS       11         16
 2264  RECOV      REAL                COM1          REFS        9
    1  TABLE      REAL        ARPAY   COM1          REFS        9         34
   76  TC         REAL                COM3          REFS       10
 2266  TIME       REAL                COM1          REFS        9         35         56   DEFINED         34         56
  116  TIMI       REAL                              REFS       53         56    DEFINED         50         53

EXTERNALS           TYPE    ARGS        REFERENCES
       FIFAU                  3             39
       GATHER                 0             29

INLINE FUNCTIONS    TYPE    ARGS         DEF LINE  REFERENCES
       AMAX1      REAL        0  INTRIN                 56
       AMIN1      REAL        0  INTRIN                 53

STATEMENT LABELS                 DEF LINE   REFEPENCES
    0  1                            54         51
  100  2                            55         52
   25  10                           27         21         23
   27  20                           28         22
   64  30                           49         31
   44  40                           38         35
   36  70                           33         41

LOOPS  LABEL    INDEX      FROM-TO    LENGTH    PROPERTIES
   12  10     * J           21 27       150        OPT       EXITS
   72  1      * J           51 54        60      INSTACK     EXITS
```

```
COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207              0 IDIM    (1)              1 TABLE  (1200)          1201 PTR    (1)
                                 1202 FXTEN   (1)           1203 IDETEC (1)             1204 RECOV  (1)
                                 1205 DELAY   (1)           1206 TIME   (1)
       COM3         63              0 ACFAU   (60)            60 ENDMIS (1)               61 MEMSIZ (1)
                                   62 TC      (1)
       COM7          1              0 REASON  (1)
       CO31          2              0 RATINT  (1)              1 ISYNC  (1)
       CO60          1              0 LSTFLT  (1)
       COVER         2              0 ITLKP   (1)              1 IFHE   (1)
       FAILD2        1              0 FOCO2   (1)

STATISTICS
  PROGRAM LENGTH    117B      79
   COMMON LENGTH  2375B     1277
```

```
      SUBROUTINE STATEB(NEXT)
C                           THIS VERSION:   MARCH 1976
C THIS CORRESPONDS TO  DETECTION AND ROLLBACK IN SIMPLEX
C
C ********************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/CO10/M,DURRA
      COMMON/CO31/RATINT,ISYNC
      COMMON/CO60/LSTFLT
      COMMON/DETE/PDET,DETMAX,PDM
      COMMON/FAILD2/FOCO2
      COMMON/PHILM3/NTR3,NTR2,NTR1,NTNR1
      INTEGER PTR,EXTEN
      INTEGER REASON
C ********************************************************************
C
      TIMI=TIME
      IF (ISYNC.EQ.0) GO TO 1
      DURRB=TIME-AINT(TIME/TC)*TC
      GO TO 40
    1 CONTINUE
      DURRB=DURRA*2.*RANF(0.)
   40 CONTINUE
      IF (TABLE(PTR,1).GT.TIME+DURRB) GO TO 20
      CALL FIFAU(IN,NEXT,1)
      IF(NEXT.EQ.5) RETURN
      IF(IN.EQ.1) ACFAU(LSTFLT,6)=-1
      GO TO 40
   20 CONTINUE
      IREPET=0
      IEFFA=0
      DO 80 J=1,IDIM
      ACF3=ACFAU(J,3)
      IF (ACF3.EQ.0.) GO TO 81
      IF (ACFAU(J,6).EQ.0.)GO TO 82
C TEST ON THE DETECTION OF THIS FAULT
      U=RANF(0.)
      IF(((ACF3.EQ.3.).AND.(U.LT.PDM)).OR.
     1   ((ACF3.EQ.1.).AND.(U.LT.PDET))) GO TO 83
      IF (ACFAU(J,2).LT.ENDMIS) NTNR1=NTNR1+1
      NEXT=5
      REASON=5
      RETURN
   83 CONTINUE
      ACFAU(J,6)=0.
   82 CONTINUE
      IF (ACFAU(J,2).GT.TIME) GO TO 100
      IF (ACFAU(J,5).NE.0.) GO TO 100
      NTR1=NTR1+1
      IEFFA=1
      ACFAU(J,3)=0.
      GO TO 80
  100 CONTINUE
```

```
      IREPET=1
   80 CONTINUF
   81 CONTINUE
      TIME=TIME+DURRB
      IF (IEFFA.EQ.1) CALL GATHER
      REASON=5
      CALL MISCYC(TIMI,TIME,NEXT)
      IF (NEXT.EQ.5) GO TO 10
      IF (IREPET.EQ.1) GO TO 40
      NEXT=10
      RETURN
   10 CONTINUE
      DO 50 I=1,IDIM
      IF (ACFAU(I,3).EQ.0.) RETURN
      IF (ACFAU(I,2).LT.ENDHIS)NTNR1=NTNR1+1
   50 CONTINUE
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
     2 STATEB         1        28        45        66        69        72

VARIABLES     SN  TYPE           RELOCATION
     0 ACFAU     REAL       ARRAY    COM3         REFS         7        35        37        42        49        50        69
                                                    70   DEFINED        29        47        53
   210 ACF3      REAL                             REFS        36      2*40   DEFINED        35
  2265 DELAY     REAL                COM1         REFS         6
     1 DETMAX    REAL                DETE         REFS        12
     1 DURRA     REAL                C010         REFS         9        24
   203 DURRB     REAL                             REFS        26        59   DEFINED        21        24
    74 ENDMIS    REAL                COM3         REFS         7        42        70
  2262 EXTFN     INTEGER             COM1         REFS         6        15
     0 FOCO2     REAL                FAIL02       REFS        13
   212 I         INTEGER                          REFS        69        70   DEFINED        68
  2263 IDETEC    INTEGER             COM1         REFS         6
     0 IDIM      INTEGER             CON1         REFS         6        34        68
   206 IEFFA     INTEGER                          REFS        60   DEFINED        33        52
   204 IN        INTEGER                          REFS        27        29
   205 IREPET    INTEGER                          REFS        64   DEFINED        32        56
     1 ISYNC     INTEGER             C031         REFS        10        20
   207 J         INTEGER                          REFS        35        37        42        47        49        50        53
                                               DEFINED        34
     0 LSTFLT    INTEGER             C060         REFS        11        29
     0 M         INTEGER             C010         REFS         9
    75 MEMSIZ    INTEGER             COM3         REFS         7
     0 NEXT      INTEGER              F.P.        REFS        27        28        62        63   DEFINED         1        43
                                                    65
     3 NTNR1     INTEGER             PHILM3       REFS        14        42        70   DEFINED        42        70
     2 NTR1      INTEGER             PHILM3       REFS        14        51   DEFINED        51
     1 NTR2      INTEGER             PHILM3       REFS        14
     0 NTR3      INTEGER             PHILM3       REFS        14
     0 PDET      REAL                DETE         REFS        12        40
     2 PDM       REAL                DETE         REFS        12        40
  2261 PTR       INTEGER             COM1         REFS         6        15        26
     0 RATINT    REAL                C031         REFS        10
     0 REASON    INTEGER             COM7         REFS         8        16   DEFINED        44        61
  2264 RECOV     REAL                COM1         REFS         6
     1 TABLE     REAL       ARRAY    COM1         REFS         6        26
    76 TC        REAL                COM3         REFS         7      2*21
  2266 TIME      REAL                COM1         REFS         6        19      2*21        26        49        59        62
                                               DEFINED        59
   202 TIMI      REAL                             REFS        62   DEFINED        19
   211 U         REAL                             REFS      2*40   DEFINED        39

EXTERNALS          TYPE   ARGS       REFERENCES
       FIFAU                 3            27
       GATHER                0            60
       MISCYC                3            62
       RANF      REAL        1            24        39
```

```
INLINE FUNCTIONS   TYPE   ARGS        DEF LINE  REFERENCES
       AINT      REAL       1  INTRIN               21

STATEMENT LABELS             DEF LINE   REFERENCES
   24  1                        23        28
  145  10                       67        63
   51  20                       31        26
   30  40                       25        22        30        64
    0  50                       71        68
  120  80                       57        34        54
  123  81                       58        36
  105  82                       48        37
  103  83                       46        40
  117  100                      55        49        50

LOOPS  LABEL    INDEX     FROM-TO    LENGTH    PROPERTIES
   54  80     * J           34 57       47B              EXT REFS    EXITS
  152  50     * I           68 71       10B        OPT     EXITS

COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1       1207              0 IDIM   (1)                  1 TABLE  (1200)            1201 PTR    (1)
                                 1202 EXTEN  (1)               1203 IDETEC (1)               1204 RECOV  (1)
                                 1205 DELAY  (1)               1206 TIME   (1)
       COM3         63              0 ACFAU  (60)                60 ENDMIS (1)                 61 MEMSIZ (1)
                                   62 TC     (1)
       COM7          1              0 REASON (1)
       CO10          2              0 M      (1)                  1 DURRA  (1)
       CO31          2              0 RATINT (1)                  1 ISYNC  (1)
       CO60          1              0 LSTFLT (1)
       DETE          3              0 PDET   (1)                  1 DETMAX (1)                  2 PDM    (1)
       FAILD2        1              0 FOCO2  (1)
       PHILM3        4              0 NTR3   (1)                  1 NTR2   (1)                  2 NTR1   (1)
                                    3 NTNR1  (1)

STATISTICS
  PROGRAM LENGTH    215B     141
   COMMON LENGTH   2404B    1284
```

```
      SUBROUTINF STATEC(NEXT)
C                       THIS VERSION:    MARCH 1976
C INTRODUCTION OF A  SPARE
C
C ***********************************************************************
      COMMON/COM1/IDIM,TABLE(300,4),PTR,EXTEN,IDETEC,RECOV,DELAY,TIME
      COMMON/COM3/ACFAU(10,6),ENDMIS,MEMSIZ,TC
      COMMON/COM7/REASON
      COMMON/CO15/NOON(5),NWORK
      COMMON/CO18/IREP
      COMMON/CO28/MODSIM,NSPB
      COMMON/CO33/RMUP(5)
      COMMON/CO34/ISPARE(5)
      COMMON/CO35/CONDIT
      COMMON/CO36/RMISTM
      COMMON/CO37/ RMU
      COMMON/DETE/PDET,DETMAX
      INTEGER PTR,REASON,EXTEN
C ***********************************************************************
C
C DETERMINATION OF THE SPARE NUMBER
      DO 1 I=1,5
      IF (ISPARE(I).EQ.0) GO TO 1
      II=ISPARE(I)
      NOON(II)=1
      GO TO 2
    1 CONTINUE
C I IS THE SPARE NUMBER
    2 CONTINUE
      I=II
   10 CONTINUE
      IF (TABLE(PTR,1).GT.TIME+CONDIT) GO TO 20
      CALL FIFAU(IN,NEXT,1)
      IF(NEXT.EQ.5) RETURN
      GOTO 10
   20 CONTINUE
C A FAULT IN ANOTHER COMPUTER INTERRUPTS THE SWITCHING OF THE SPARE
      IDE=0
      DET=TIME+CONDIT
      DO 21 J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 22
      IUN=ACFAU(J,4)
      IF((IUN.EQ.I).OR.(NOON(IUN).EQ.0)) GOTO 21
      IF (ACFAU(J,6).GE.DET) GO TO 21
      DFT=ACFAU(J,6)
      IDE=J
   21 CONTINUF
   22 CONTINUE
      IF (IDE.EQ.0) GO TO 23
      NOON(I)=0
      NWORK=NWORK-1
      TIME=DET
      NEXT=1
      IF (NWORK.EQ.2) NFXT=4
      RETURN
   23 CONTINUE
      MUL=0
      DO 40  J=1,IDIM
      IF (ACFAU(J,3).EQ.0.) GO TO 50
      IUN=ACFAU(J,4)
      IF(NOON(IUN).EQ.0) GOTO 40
      IF(IUN.EQ.IREP) MUL=I
   40 CONTINUE
   50 CONTINUE
C DETERMINE IF THE SPARE IS GOOD
      IF(RANF(0.).LT.EXP(-RMU*(TIME-ENDMIS-RMISTM)/3600000.)) GO TO 51
C THE SPARE IS BAD. ARE WE AWARE OF IT
      IF (RANF(0.) .GT.DETMAX)GO TO 52
C DO NOT INJECT THIS SPARE
      ISPARE(I)=0
      NSPB=NSPB-1
      NOON(I)=0
      TIME=TIME+CONDIT
      IF (NSPB.GT.0) GO TO 53
      NWORK=NWORK-1
      NEXT=1
      IF (NWORK.EQ.2) NEXT=4
      IF (NWORK.EQ.1) NEXT=10
      RETURN
   53 CONTINUE
      NEXT=12
      RETURN
C THE SPARE IS BAD AND THIS IS NOT KNOWN. WE CREATE A NEW FAULT
   52 CONTINUE
      PTR=PTR-1
      TABLE(PTR,1)=TIME+CONDIT
      TABLE(PTR,2)=10.*ENDMIS
      TABLE(PTR,3)=1.
      IF (RANF(0.).GT.RMUP(1)/RMU) TABLE(PTR,3)=3.
      TABLE(PTR,4)=I
   51 CONTINUE
C A FAULT IN IREP GIVES A FAULT IN THE SPARE
      IF (MUL.EQ.0) GO TO  54
      PTR=PTR-1
      TABLE(PTR,1)=TIME+CONDIT
      TABLE(PTR,2)=TIME+CONDIT
      TABLE(PTR,3)=3.
      TABLE(PTR,4)=I
   54 CONTINUE
      NEXT=1
      IF (NWORK.EQ.2) NEXT=8
      IF (NWORK.EQ.1) NEXT=10
      ISPARE(I)=0
      END
```

```
       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  STATEC          1         34        55        79        82       104

VARIABLES     SN  TYPE           RELOCATION
    0  ACFAU     REAL       ARRAY    COM3         REFS         7        41        42        44        45        59        60
    0  CONDIT    REAL                C035         REFS        14        32        39        73        86        95        96
 2265  DELAY     REAL                COM1         REFS         6
  253  DET       REAL                             REFS        44        52   DEFINED        39        45
    1  DETMAX    REAL                DETE         REFS        17        68
   74  ENDMIS    REAL                COM3         REFS         7        66        87
 2262  EXTEN     INTEGER             COM1         REFS         6        18
  247  I         INTEGER                          REFS        23        24        43        50        62        70        72
                                                    90        98       103   DEFINED        22        30
  252  IDE       INTEGER                          REFS        49   DEFINED        38        46
 2263  IDETEC    INTEGER             COM1         REFS         6
    0  IDIM      INTEGER             COM1         REFS         6        40        58
  250  II        INTEGER                          REFS        25        30   DEFINED        24
  251  IN      * INTEGER                          REFS        33
    0  IREP      INTEGER             C018         REFS        10        62
    0  ISPARE    INTEGER    ARRAY    C034         REFS        13        23        24   DEFINED        70       103
  255  IUN       INTEGER                          REFS      2*43        61        62   DEFINED        42        60
  254  J         INTEGER                          REFS        41        42        44        45        46        59        60
                                               DEFINED        40        58
   75  MEMSIZ    INTEGER             COM3         REFS         7
    0  MODSIM    INTEGER             C028         REFS        11
  256  MUL       INTEGER                          REFS        93   DEFINED        57        62
    0  NEXT      INTEGER              F.P.        REFS        33        34   DEFINED         1        53        54        76
                                                    77        78        81       100       101       102
    0  NOON      INTEGER    ARRAY    C015         REFS         9        43        61   DEFINED        25        50        72
    1  NSPB      INTEGER             C028         REFS        11        71        74   DEFINED        71
    5  NWORK     INTEGER             C015         REFS         9        51        54        75        77        78       101
                                                   102   DEFINED        51        75
    0  PDET      REAL                DETE         REFS        17
 2261  PTR       INTEGER             COM1         REFS         6        18        32        85        86        87        88
                                                    89        90        94        95        96        97        98
                                               DEFINED        85        94
    0  REASON    INTEGER             COM7         REFS         8        18
 2264  RECOV     REAL                COM1         REFS         6
    0  RMISTM    REAL                C036         REFS        15        66
    0  RMU       REAL                C037         REFS        16        66        89
    0  RMUP      REAL       ARRAY    C033         REFS        12        89
    1  TABLE     REAL       ARRAY    COM1         REFS         6        32   DEFINED        86        87        88        89
                                                    90        95        96        97        98
   76  TC        REAL                COM3         REFS         7
 2266  TIME      REAL                COM1         REFS         6        32        39        66        73        86        95
                                                    96   DEFINED        52        73

EXTERNALS          TYPE   ARGS       REFERENCES
       EXP       REAL       1 LIBRARY     66
       FIFAU                3             33
       RANF      REAL       1             66        68        89
```

```
STATEMENT LABELS              DEF LINE   REFERENCES
   15  1                          27        22          23
   17  2                          29        26
   21  10                         31        35
   35  20                         36        32
   61  21                         47        40          43         44
   63  22                         48        41
  100  23                         56        49
  120  40                         63        58          61
  122  50                         64        59
  204  51                         91        66
  164  52                         84        68
  161  53                         80        74
  216  54                         99        93

LOOPS  LABEL     INDEX       FROM-TO     LENGTH     PROPERTIES
   10  1       * I            22 27        7B       INSTACK     EXITS
   45  21      * J            40 47       16B          OPT      EXITS
  106  40      * J            58 63       14B          OPT      EXITS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
       COM1        1207                0 IDIM    (1)                 1 TABLE  (1200)            1201 PTR     (1)
                                    1202 EXTEN   (1)              1203 IDETEC (1)               1204 RECOV   (1)
                                    1205 DELAY   (1)              1206 TIME   (1)
       COM3          63                0 ACFAU   (60)               60 ENDMIS (1)                 61 MEMSIZ (1)
                                      62 TC      (1)
       COM7           1                0 REASON (1)
       CO15           6                0 NOON    (5)                 5 NWORK  (1)
       CO18           1                0 IREP    (1)
       CO28           2                0 MODSIM (1)                  1 NSPB   (1)
       CO33           5                0 RMUP    (5)
       CO34           5                0 ISPARE (5)
       CO35           1                0 CONDIT (1)
       CO36           1                0 RMISTM (1)
       CO37           1                0 RMU     (1)
       DETE           2                0 PDET    (1)                 1 DETMAX (1)

STATISTICS
  PROGRAM LENGTH     257B      175
   COMMON LENGTH    2417B     1295
```

```
      SUBROUTINE TFISO(LOC,IP1)
      COMMON/TFRFCB/TF0(6),TF1(8),TF2(10),TF2X(10,4),TF3(2),TF3X(2,4)
     1,TF4(4),TF4X(4,6),TF5(4),TF5X(4,4),TF5Y(4,2),TF6(4),TF6X(4,3)
      DIMENSION IP(5)
      IGRP=ISTEPD(6,TF0)
      IP(2)=IGRP
      IP(1)=IP1
      IP(5)=0
      GOTO(1000,2000,3000,4000,5000,6000),IGRP
 1000   CONTINUE
          IP(3)=ISTEPD(8,TF1)
          IP(4)=0
          GOTO 9000
 2000   CONTINUE
          MDM=ISTEPD(10,TF2)
          IP(3)=MDM
          IP(4)=MSTEPD(MDM,TF2X,10,4)-1
          GOTO 9000
 3000   CONTINUE
          MDM=ISTEPD(2,TF3)
        IP(3)=MDM
          IP(4)=MSTEPD(MDM,TF3X,2,4)
          GOTO 9000
 4000   CONTINUE
          MDM=ISTEPD(4,TF4)
          IP(3)=MDM
          IP(4)=MSTEPD(MDM,TF4X,4,6)
          GOTO 9000
 5000   CONTINUE
          IDEV=ISTEPD(4,TF5)
          IP(5)=IDEV
          IP(3)=MSTEPD(IDEV,TF5X,4,4)-1
        IP(4)=MSTEPD(IDEV,TF5Y,4,2)
          GOTO 9000
 6000   CONTINUE
          MDM=ISTEPD(4,TF6)
          IP(3)=MDM
          IP(4)=MSTEPD(MDM,TF6X,4,3)
          GOTO 9000
 9000 CONTINUE
      CALL PACK(IP,LOC)
      RETURN
      END
```

```
        SYMBOLIC REFERENCE MAP

 ENTRY POINTS     DEF LINE     REFERENCES
     2  TFISO           1          42

 VARIABLES     SN  TYPE           RELOCATION
   175  IDEV      INTEGER                          REFS         31        32        33   DEFINED        30
   173  IGRP      INTEGER                          REFS          6         9   DEFINED         5
   176  IP        INTEGER    ARRAY                 REFS          4        41   DEFINED         6         7         8        11
                                                      12        16        17        21        22        26        27        31
                                                      32        33        37        38
     0  IP1       INTEGER              F.P.        REFS          7   DEFINED         1
     0  LOC       INTEGER              F.P.        REFS         41   DEFINED         1
   174  MDH       INTEGER                          REFS         16        17        21        22        26        27        37
                                                      38   DEFINED        15        20        25        36
     0  TF0       REAL       ARRAY    TFRFCB       REFS          2         5
     6  TF1       REAL       ARRAY    TFRFCB       REFS          2        11
    16  TF2       REAL       ARRAY    TFRFCB       REFS          2        15
    30  TF2X      REAL       ARRAY    TFRFCB       REFS          2        17
   100  TF3       REAL       ARRAY    TFRFCB       REFS          2        20
   102  TF3X      REAL       ARRAY    TFRFCB       REFS          2        22
   112  TF4       REAL       ARRAY    TFRFCB       REFS          2        25
   116  TF4X      REAL       ARRAY    TFRFCB       REFS          2        27
   146  TF5       REAL       ARRAY    TFRFCB       REFS          2        30
   152  TF5X      REAL       ARRAY    TFRFCB       REFS          2        32
   172  TF5Y      REAL       ARRAY    TFRFCB       REFS          2        33
   202  TF6       REAL       ARRAY    TFRFCB       REFS          2        36
   206  TF6X      REAL       ARRAY    TFRFCB       REFS          2        38

 EXTERNALS          TYPE   ARGS       REFERENCES
        ISTEPD    INTEGER    2               5        11        15        20        25        30        36
        MSTEPD    INTEGER    4              17        22        27        32        33        38
        PACK                 2              41

 STATEMENT LABELS             DEF LINE   REFERENCES
    24  1000                        10         9
    30  2000                        14         9
    37  3000                        19         9
    45  4000                        24         9
    53  5000                        29         9
    64  6000                        35         9
    72  9000                        40        13        18        23        28        34        39

 COMMON BLOCKS   LENGTH     MEMBERS - BIAS NAME(LENGTH)
        TFRFCB      146             0 TF0    (6)                  6 TF1    (8)                 14 TF2    (10)
                                   24 TF2X   (40)                64 TF3    (2)                 66 TF3X   (8)
                                   74 TF4    (4)                 78 TF4X   (24)               102 TF5    (4)
                                  106 TF5X   (16)               122 TF5Y   (8)                130 TF6    (4)
                                  134 TF6X   (12)

 STATISTICS
   PROGRAM LENGTH    203B     131
    COMMON LENGTH    222B     146
```

```
      SUBROUTINE TSTRNF(IPLACE)
      DIMENSION MP1(2,20)
      DIMENSION MP2(6,20)
      DIMENSION IPLACE(5)
      DATA IP1P/0/,IP2P/0/,IP1C/0/,IP2C/0/
      DATA MP1/40*0/,MP2/120*0/
      IP1=IPLACE(1)
      IP2=IPLACE(2)
      IF(IP1.LE.0) GOTO 10
         IF(IP1.EQ.IP1P) IP1C=IP1C+1
         IF(IP1.NE.IP1P) IP1C=1
         IF(IP2.EQ.IP2P) IP2C=IP2C+1
         IF(IP2.NE.IP2P)IP2C=1
         IP1P=IP1
         IP2P=IP2
         MP1(IP1,IP1C)=MP1(IP1,IP1C)+1
         MP2(IP2,IP2C)=MP2(IP2,IP2C)+1
         RETURN
   10 CONTINUE
      PRINT 1000,((MP1(I,J),J=1,20),I=1,2)
      PRINT 1000,((MP2(I,J),J=1,20),I=1,6)
 1000 FORMAT(/1X,20I6)
      RETURN
      END
```

```
       SUBROUTINE  TSTRNF                                 CDC 6600 FTN V3.0-P355 OPT=1  04/08/76  17.50.49.      PAGE       2

       SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     REFERENCES
    2  TSTRNF         1        18         23

VARIABLES     SN  TYPE           RELOCATION
  120  I         INTEGER                          REFS        20        21   DEFINED        20        21
    0  IPLACE    INTEGEP    ARRAY     F.P.        REFS         4         7         8   DEFINED         1
  116  IP1       INTEGER                          REFS         9        10        11        14      2*16
                                               DEFINED         7
  112  IP1C      INTEGER                          REFS        10      2*16   DEFINED         5        10        11
  110  IP1P      INTEGER                          REFS        10        11   DEFINED         5        14
  117  IP2       INTEGER                          REFS        12        13        15      2*17   DEFINED         8
  113  IP2C      INTEGER                          REFS        12      2*17   DEFINED         5        12        13
  111  IP2P      INTEGER                          REFS        12        13   DEFINED         5        15
  121  J         INTEGER                          REFS        20        21   DEFINED        20        21
  122  MP1       INTEGER    ARRAY                 REFS         2        16        20   DEFINED         6        16
  172  MP2       INTEGER    ARRAY                 REFS         3        17        21   DEFINED         6        17

FILE NAMES        MODE
       OUTPUT      FMT                WRITES        20        21

STATEMENT LABELS             DEF LINE   REFERENCES
   52  10                       19         9
  114  1000    FMT              22        20         21

LOOPS  LABEL    INDEX     FROM-TO     LENGTH     PROPERTIES
   55          * I          20          11B                EXT REFS  NOT INNER
   56          * J          20           6B                EXT REFS
   72          * I          21          12B                EXT REFS  NOT INNER
   73          * J          21           7B                EXT REFS

STATISTICS
  PROGRAM LENGTH     366B     246
```

```
      SUBROUTINE UNIF(FAU,N,RMINT,RMAXT)
C                                      THIS VERSION≠ 25 FEBRUARY 1974
C IT GENERATES N UNIFORMLY DISTRIBUTED DURATIONS
C FAU     ARRAY OF DURATIONS
C N       DIMENSION OF FAU
C RMINT   MINIMUM DURATION
C RMAXT   MAXIMUM DURATION
C
C********** ********* ********* ********** ********* ********* ********
      DIMENSION FAU(N)
C ***********************************************************************
C
      DO 20 K=1,N
      Y=RANF(0.)
      FAU(K)=(RMAXT-RMINT)*Y+RMINT
   20 CONTINUF
      END
      SYMBOLIC REFERENCE MAP

NTRY POINTS     DEF LINE     REFERENCES
   2  UNIF            1        17

ARIABLES     SN  TYPE            RELOCATION
   0  FAU         REAL       ARRAY     F.P.        REFS         10    DEFINED         1        15
  32  K           INTEGER                          REFS         15    DEFINED        13
   0  N           INTEGER              F.P.        REFS         10        13   DEFINED         1
   0  RMAXT       REAL                 F.P.        REFS         15    DEFINED         1
   0  RMINT       REAL                 F.P.        REFS       2*15    DEFINED         1
  33  Y           REAL                             REFS         15    DEFINED        14

XTERNALS          TYPE   ARGS       REFERENCES
      RANF        REAL       1           14

TATEMENT LABELS             DEF LINE   REFERENCES
   0  20                         16         13

OOPS  LABEL    INDEX     FROM-TO    LENGTH    PPOPERTIES
  15  20     * K           13 16       10B                EXT REFS

TATISTICS
 PROGRAM LENGTH     44B      36
```

```
      SUBROUTINF UNPACK(LOC,PLACE)
      INTEGER PLACE
      DIMENSION PLACE(5)
      DO 10 J=1,5
        PLACE(J)=AND(63,LOC)
        LOC=SHIFT(LOC,-6)
   10 CONTINUE
      RETURN
      END
      SYMBOLIC REFERENCE MAP

ENTRY POINTS     DEF LINE     RFFERENCES
    2  UNPACK        1           8

VARIABLES     SN  TYPE          RELOCATION
   25  J         INTEGER                            REFS         5    DEFINED       4
    0  LOC       INTEGER                 F.P.       REFS         5         6   DEFINED       1         6
    0  PLACE     INTEGER    ARRAY        F.P.       REFS         2         3   DEFINED       1         5

INLINE FUNCTIONS   TYPE   ARGS          DEF LINE  REFEPENCES
       AND       NO TYPE    2  INTRIN                  5
       SHIFT     NO TYPE    2  INTRIN                  6

STATEMENT LABELS              DEF LINE   REFERENCES
    0  10                         7         4

LOOPS  LABEL     INDEX      FROM-TO    LFNGTH     PROPERTIES
   17  10        J             4 7         3B      INSTACK

STATISTICS
  PROGRAM LENGTH     33B      27
```