IDENTIFICATION

Product Code:	MAINDEC-08-D5DB-D
Product Name:	DF32 MULTI DISK
Date Created:	August 22, 1968
Maintainer:	Diagnostic Group
Author:	E. Haight

1. ABSTRACT

"MULTI DISK" is a high speed confidence test that exercises the disk system with random data and restores the disk surface to its original state at completion.

2. REQUIREMENTS

PDP-8 or PDP-8/I

DF32 DISK LOGIC

Plus additional slave disks up to three

3. STORAGE

The main body of the program is located between loc. 0 and 1250 in memory.

Three buffers of 2000 words each. Take up the rest of memory up to 7500.

1500 to 3477 Disk Storage Buffer

3500 to 5477 Out Buffer

5500 to 7477 In Buffer

4. LOADING PROCEDURE

The procedure for normal binary tape should be followed.

5. STARTING ADDRESS AND PROCEDURE

5.1 Normal Operation

Starting Address 150 (follow procedure 6.1)

5.2 System Operation

Starting Address 155 (follow procedure 6.2)

6. OPERATING PROCEDURE

6.1 Normal Operation

a. Load MULTI DISK into memory.

b. Turn Write Inhibit switches to OFF.

c. Load address 150.

d. Set switch register to mode of operation desired.

e. Press START.

f. The program will continue to loop upon completion of the system being exercised.

g. End of test command.

When the end of test command (CONTROL C) is given in the normal mode of operation, the test comes to a halt at the completion of the 2000 word buffer being exercised at the time.

6.2 MULTI DISK Used in Conjunction with the Disk Builder

a. Call MULTI DISK from the system.

b. Upon successful loading the program will start automatically.

c. Set switches to desired mode of operation. Refer to paragraph 7.

d. End of test command. When the end of test command (CONTROL C) is given in this mode, an exit from MULTI DISK to the system builder is accomplished.

6.3 Printouts

a. When the program is first initialized it prints out the number of existing disks. Refer to paragraph 8.1.

b. Error printouts will occur on any disk error or any data error when the read buffer is compared to the write buffer. Refer to paragraphs 8.2 and 8.3.

c. A report of the number of data errors for each 2000 word buffer may be selected. Refer to paragraph 8.4

6.4 Error Halts

An error halt at loc. 433 will occur when no disk is present.

7. SWITCH REGISTER SETTINGS

0	1	2	3	4	5	6	7	8	9	10	11
				DISK		TRACK SELECTION					

1	0	1	CROSS OVER TEST 7.1
0	1	0	REPORT NUMBER OF ERRORS PER BUFFER 7.3
0	0	1	SELECT TRACK FROM SWITCH REGISTER 7.4
0	0	0	NORMAL

7.1 SR0 set the test exercises 2000 words starting at disk memory address 7000. The track must be selected by the operator.

7.2 With SR1 set only the number of data errors per 2000/word buffer area is reported.

7.3 SR2 set enables the operator to select the disk and track from the switch register.

8. STATUS REPORTING

8.1 Upon initialization the number of existent disks will be reported. If the number is incorrect, do not press PROGRAM HALT! Type CONTROL C, this will enable the program to restore the disk then halt.

Example:

```
3 EXISTENT DISK(s)
```

8.2 When a status register error is detected, only one error in a block will be reported.

Example:

```
TA0300 DA3124 SR0301
TA = DISK and TRACK
SR = STATUS REGISTER
```

8.3 Data Errors

All data compare errors will be reported for each block.

Example:

```
TA0100 WC1021 GD3670 BD3603
TA = DISK and TRACK
WC = WORD COUNT
GD = DATA WRITTEN
BD = DATA READ
```

8.4 The number of data error can also be reported.

Example:

```
TA1100 ERROR(S) 0001
TA = DISK and TRACK
ERROR(S) = NUMBER OF DATA ERRORS PER BUFFER
```

9. DESCRIPTION

MULTI DISK is not a diagnostic it is merely a confidence test, to insure the user the system can transfer data without errors. The test first stores 2000 words of the disk in core, then exercises that 2000 word area with random data. After exercising the disk, the program restores the disk to its original state. Then the test goes on to exercise the next 2000 word block.

Execution Time: 15 seconds per disk.

```
                        /MULTI DISK II
                        /DF32 IOT'S
 7750                   WC=7750                 /WORD COUNT
 7751                   CA=7751                 /INITIAL ADDRESS
 6601                   DCMA=6601               /CLEAR DISK FLAGS
 6603                   DMAR=6603               /READ
 6605                   DMAW=6605               /WRITE
 6611                   DCEA=6611               /CLEAR DISK EXT, ADDRESS
 6612                   DSAC=6612               /SKIP ON ADC
 6615                   DEAL=6615               /LOAD DISK EXT, ADDRESS
 6616                   DEAC=6616               /READ DISK STATUS
 6621                   DFSE=6621               /SKIP ON NO ERROR
 6622                   DFSC=6622               /SKIP ON COMPLETION FLAG
 6626                   DMAC=6626               /READ DISK MEMORY ADDRESS REGISTER
 6762                   DTCA=6762               /CLEAR DECTAPE FLAGS
```

```
0020 0020                *20
                         /CONSTANTS + TAGS
0020 0000                SAV,    0
0021 0000                SAV1,   0
0022 0000                SAV2,   0
0023 0000                SAV3,   0
0024 0000                BCOUNT, 0
0025 0000                DCOUNT, 0
0026 0002                K0002,  0002
0027 0200                K0200,  0200
0030 0260                K0260,  0260
0031 7600                K7600,  7600
0032 0100                K0100,  0100
0033 0004                K0004,  0004
0034 1000                K1000,  1000
0035 0370                K0370,  0370
0036 3000                K3000,  3000
0037 6000                K6000,  6000
0040 7000                K7000,  7000
0041 1777                K1777,  1777
0042 5477                K5477,  5477
0043 2000                K2000,  2000
0044 3477                K3477,  3477
0045 0003                K0003,  0003
0046 4000                K4000,  4000
0047 0700                K0700,  0700
0050 0070                K0070,  0070
0051 0007                K0007,  0007
0052 1477                K1477,  1477
0053 3777                K3777,  3777
0054 0000                CC,     0
0055 0000                TKA,    0
0056 0203                K0203,  0203
0057 0057                M1,     M1
0060 0215                        0215
0061 0212                        0212
0062 0000                        0
0063 0240                        0240    /SPACE
0064 0305                        0305    /E
0065 0330                        0330    /X
0066 0311                        0311    /I
0067 0323                        0323    /S
0070 0324                        0324    /T
0071 0305                        0305    /E
0072 0316                        0316    /N
0073 0324                        0324    /T
0074 0240                        0240    /SPACE
0075 0304                        0304    /D
0076 0311                        0311    /I
0077 0323                        0323    /S
0100 0313                        0313    /K
0101 0250                        0250    /(
0102 0323                        0323    /S
0103 0251                        0251    /)
```

```
0104  0000          0       /STOP CODE
0105  0542  RAN,    RANDOM
0106  7750  WCT,    WC
0107  7751  CAT,    CA
0110  0667  ER,     ERROR
0111  0561  RE,     RESTORE
0112  0714  CO,     COMPARE
0113  0421  NO,     0421
0114  0000  BU,     0
0115  0000  GO,     0
0116  0000  SR,     0
0117  0000  DMA,    0
0120  1035  EP1,    SRP
0121  1071  EP2,    UP
0122  0600  L1,     L1A
0123  0200  MES1,   MESAGE
0124  0204  SETUP,  SIXTY
0125  0400  BEG,    BEGIN
0126  0466  DAT,    DA+15
0127  0756  CHK,    ICB
0130  0276  PNT,    SIXTY+12
0131  7600  SYSTEM, 7600
0132  0000  AC,     0
0133  0000  LINL,   0
0134  0000  LINK,   0
0135  0000  ECOUNT, 0
0136  1200  SHERTL, SHERT
0137  1000  CLFL,   CLF
0140  1135  IR2L,   IR2
```

```
                        /WITH DATA FOLLOWING
                        /RETURN FOLLOWING END OF MESSAGE
                        /CODE (00)
     0200               *200
0200 0000               MESAGE, 0
0201 6002                       IOF
0202 7240                       CLA CMA          /SET C(AC)=-1
0203 1200                       TAD MESAGE       /ADD LOCATION
0204 3012                       DCA 12           /AUTO-INDEX REGISTER
0205 1412                       TAD I 12                 /FETCH FIRST WORD
0206 3217                       DCA MSRGHT       /SAVE IT
0207 1217                       TAD MSRGHT
0210 7012                       RTR
0211 7012                       RTR              /ROTATE 6 BITS RIGHT
0212 7012                       RTR
0213 4220                       JMS TYPECH       /TYPE IT
0214 1217                       TAD MSRGHT       /GET DATA AGAIN
0215 4220                       JMS TYPECH       /TYPE RIGHT HALF
0216 5205                       JMP MESAGE+5
0217 0000               MSRGHT, 0                /TEMPORARY STORAGE
0220 0000               TYPECH, 0                /TYPE CHARACTER IN C(AC)6-11
0221 0254                       AND MASK77
0222 7450                       SNA              /IS IT END OF MESSAGE?
0223 5251                       JMP MTP+5                /YES: EXIT
0224 1255                       TAD M40          /SUBTRACT 40
0225 7500                       SMA              /<40?
0226 5231                       JMP ,+3          /NO
0227 1256                       TAD C340                 /YES: ADD 300
0230 5244                       JMP MTP          /TO CODES <40
0231 1257                       TAD M3           /SUBTRACT 3
0232 7440                       SZA              /IS IT ZERO?
0233 5236                       JMP ,+3          /NO
0234 1260                       TAD C212                 /YES:  CODE 45 IS
0235 5244                       JMP MTP          /LINE FEED (212)
0236 1261                       TAD M2           /SUBTRACT 2
0237 7440                       SZA              /IS IT ZERO?
0240 5243                       JMP ,+3          /NO
0241 1262                       TAD C215                 /YES: CODE 45 IS
0242 5244                       JMP MTP          /CARRIAGE-RETURN (215)
0243 1263                       TAD C240                 /ADD 200 TO OTHERS >40
0244 6046               MTP,    TLS              /TRANSMIT CHARACTER
0245 6041                       TSF              /WAIT FOR FLAG
0246 5245                       JMP ,-1          /NOT SET YET
0247 7200                       CLA              /SET: CLEAR C(AC)
0250 5620                       JMP I TYPECH     /RETURN
0251 6042                       TCF              /CLEAR TELEPRINTER
0252 6001                       ION              /TURN INTERRUPT ON
0253 5412                       JMP I 12         /RETURN
```

```
                        /CONSTANTS
0254  0077              MASK77, 77
0255  7740              M40,    -40
0256  0340              C340,   340
0257  7775              M5,     -5
0260  0212              C212,   212
0261  7776              M2,     -2
0262  0215              C215,   215
0263  0245              C245,   245

0264  7402              SIXTY,  HLT
0265  7000                      NOP
0266  7000                      NOP                 /STORE INIT NEXT TIME
0267  7200                      CLA
0270  1664                      TAU I ,-4               /ADDRESS OF OPERAND
0271  3273                      DCA ,+2
0272  5674                      JMP I ,+2
0273  0000                      0                   /ADDRESS OF OPERAND
0274  0276                      SIXTY+12                /CHANGING REFERENCE (P)
0275  5267                      JMP SIXTY+3
0276  1673                      TAU I SIXTY+7       /AC (OPERAND)
0277  0051                      AND K0007
0300  3344                      DCA MASKA               /000X
0301  1673                      TAU I SIXTY+7       /AC (OPERAND)
0302  0050                      AND K0070
0303  3345                      DCA MASKB               /00X0
0304  1673                      TAU I SIXTY+7       /AC (OPERAND)
0305  0047                      AND K0700
0306  3346                      DCA MASKC               /0X00
0307  1673                      TAU I SIXTY+7       /AC (OPERAND)
0310  0040                      AND K7000
0311  3347                      DCA MASKD               /X000
0312  1346                      TAU MASKC               /0X00
0313  7112                      RTR CLL
0314  7010                      RAR                 /0X00 RS3 00X0
0315  1347                      TAU MASKD               /X0X0
0316  7012                      RTR
0317  7010                      RAR
0320  1350                      TAU MASKD+1         /X0X0 RS3 0X0X
0321  3346                      DCA MASKC               /TEMP STORAGE
0322  2264                      ISZ SIXTY               /INCREMENT FOR STORAGE
0323  4274                      JMS SIXTY+10        /FIND STORAGE ADDRESS
0324  1346                      TAU MASKC               /6X6X
0325  3673                      DCA I SIXTY+7       /STORE OPERAND AS SPECIFIED
0326  1345                      TAU MASKA               /00X0
0327  7004                      RAL
0330  7006                      RTL                 /00X0 SL3 0X00
0331  1344                      TAU MASKA               /0X00+00X=0X0X
0332  1350                      TAU MASKD+1         /0X0X+6060=6X6X
0333  3347                      DCA MASKD               /TEMP STORAGE
0334  2264                      ISZ SIXTY               /INCREMENT FOR STORAGE
0335  4274                      JMS SIXTY+10        /FIND STORAGE ADDRESS
0336  1347                      TAU MASKD               /6X6X
0337  3673                      DCA I SIXTY+7       /STORE OPERAND AS SPECIFIED
```

```
0340  1150          TAU PNT          /HOUSE KEEPING
0341  3274          DCA SIXTY+10
0342  2264          ISZ SIXTY                /INCREMENT FOR RETURN
0343  5564          JMP I SIXTY      /RETURN
0344  0000  MASKA,   0
0345  0000  MASKB,   0
0346  0000  MASKC,   0
0347  0000  MASKD,   0
0350  6060          6060
```

```
      0000          *0
0000  0000          INT,    0
0001  5537                  JMP I CLFL          /GO SERVICE INTERRUPT
                    /
0002  0000          CUSU,   0
0003  5525                  JMP I REG       /ENTER MAIN ROUTINE
0004  6002                  ION
0005  5402                  JMP I CUSU
```

```
                0400            *400
                                /ROUTINE TO DETERMINE # OF DISK'S
                                /ON EACH SYSTEM
0400  6601       BEGIN,  DCMA
0401  7200               CLA
0402  3054               DCA CC
0403  3021               DCA SAV1                /DISK ADDRESS
0404  3023               DCA DCOUNT      /# COUNT OF DISK
0405  6615               DEAL
0406  7200               CLA
0407  6616               DEAC
0410  0026               AND K0002               /TEST FOR NON-EXTSTENT
0411  7440               SZA
0412  5250               JMP .+10
0413  1023               TAD DCOUNT
0414  7001               IAC             /+1 DISK COUNT
0415  3023               DCA DCOUNT
0416  1021               TAD SAV1
0417  1054               TAD K1000               /SELECT NEXT DISK
0420  3021               DCA SAV1
0421  1023               TAD DCOUNT
0422  7041               CIA
0423  1053               TAD K0004
0424  7650               SNA CLA
0425  5250               JMP .+3
0426  1021               TAD SAV1                /NEXT DISK
0427  5205               JMP BEGIN+5
0430  7200               CLA
0431  1023               TAD DCOUNT
0432  7450               SNA
0433  7402               HLT             /NO DISK PRESENT
0434  1050               TAD K0200
0435  3062               DCA M1+3                /ASCII CODE
0436  1057               TAD M1
0437  3010               DCA 10
0440  6042               TCF
0441  7200               CLA
0442  1410               TAD I 10                /AUTO INDEX
0443  7450               SNA             /END OF MESSAGE
0444  5251               JMP DA          /YES
0445  6046               TLS
0446  6041               TSF
0447  5246               JMP .-1
0450  5240               JMP .-10
0451  7200      DA,      CLA             /DATA TEST
0452  6611               DCEA            /CLEAR DISK EXT, ADDRESS
0453  6661               DCMA            /CLEAR DISK FLAGS
0454  6001               ION             /TURN INTERRUPT ON
0455  3024               DCA BCOUNT
0456  3055               DCA TKA
0457  1040               TAD K7000               /MINUS 1000
0460  1021               TAD SAV1
0461  1047               TAD K0700               /MAX, AMOUNT OF STORAGE PER DISK
0462  7040               CMA
```

```
0963  5020          DCA SAV
0964  1020          TAD SAV
0965  5021          DCA SAV1
0966  7604          LAS             /SELECT MODE OF OPERATION
0967  5022          DCA SAV2
                    /
```

```
0470  1055          TK,     TAD TKA         /TRACK
0471  6615                  DEAL            /LOAD DISK AND TRACK
0472  7200                  CLA             /
0473  4565                  JMS I RAW               /GENERATE RANDOM WORD
0474  1022                  TAD SAV2                /FETCH MODE
0475  7000                  NOP
0476  0034                  AND K1000               /COMPARE FOR TRACK SELECT
0477  7450                  SNA
0500  5322                  JMP RA1         /NO
0501  7200                  CLA             /YES
0502  1022                  TAD SAV2
0503  0035                  AND K0370
0504  7006                  RTL
0505  7004                  RAL
0506  3055                  DCA TKA
0507  1055                  TAD TKA
0510  6615                  DEAL            /LOAD TRACK ADDRESS
0511  7200                  CLA
0512  1022                  TAD SAV2                /COMPARE FOR CROSSOVER
0513  7000                  NOP
0514  0046                  AND K4000
0515  7450                  SNA
0516  5322                  JMP .+4         /EXERCISE TRACK
0517  7200                  CLA
0520  1040                  TAD K7000               /CROSSOVER ADDRESS
0521  3024                  DCA BCOUNT
0522  1057          RA1,    TAD K6000
0523  3506                  DCA I WCT
                            /
0524  1052                  TAD K1477
0525  3507                  DCA I CAT               /LOAD CURRENT ADDRESS
0526  1024                  TAD BCOUNT
0527  6603                  DMAR            /SAVE DISK CONTENTS
0530  7000                  NOP
0531  5331                  JMP .
0532  4511          WA1,    JMS I RE                /RESTORE ORG, TRACK
0533  1057                  TAD K6000               /2000 TRANSFERS
0534  3506                  DCA I WCT
0535  1044                  TAD K5477       /WRITE BUFFER=1
0536  3507                  DCA I CAT
0537  1024                  TAD BCOUNT
0540  6605                  DMAW            /WRITE
0541  7000                  NOP
0542  5342                  JMP .
0543  4511          RA2,    JMS I RE                /RESTORE ORG TRACK
0544  1057                  TAD K6000
0545  3506                  DCA I WCT
0546  1042                  TAD K5477               /READ BUFFER=1
0547  3507                  DCA I CAT
0550  1024                  TAD BCOUNT
0551  6603                  DMAR            /READ
0552  7000                  NOP
0553  5353                  JMP .
0554  4512                  JMS I CO        /COMPARE DATA
```

```
0000  4011          WAIT,   JMS I RE
0001  7200                  CLA
0002  1037                  TAD K6006
0003  3006                  DCA I WCT           /LOAD W.C.
0004  1032                  TAD K1477
0005  3007                  DCA I CAT           /LOAD C.A.
0006  1024                  TAD BCOUNT
0007  6603                  DMAW                /WRITE
0010  7000                  NOP
0011  5366                  JMP .               /CHECK FOR ERROR
0012  4011                  JMS I RE            /RESTORE DRC, TRACK.
0013  5222                  JMP I L1
```

```
0500            *0500
0500  7200  LIA,  CLA
0501  1054        TAD CC
0502  7041        CIA
0503  1056        TAD K0203       /COMPARE FOR COMPLETION COMMAND
0504  7650        SNA CLA
0505  5004        JMP CCSU+2      /YES EXIT
0506  1024  IBT,  TAD BCOUNT             /NO CONTINUE
                  /
0507  7041        CIA
0510  1057        TAD K6000
0511  7450        SNA
0512  5220        JMP ,+6         /INCREMENT TRACK
0513  7200        CLA
0514  1024        TAD BCOUNT
0515  1043        TAD K2000
0516  3024        DCA BCOUNT
0517  5526        JMP I DAT
0520  7200        CLA
0521  3024        DCA BCOUNT              /ZERO BUFFER COUNT
0522  1055        TAD TKA
0523  1052        TAD K0100
0524  3055        DCA TKA
0525  1021        TAD SAV1
0526  7040        CMA
0527  7640        SZA CLA
0530  7410        SKP
0531  5236        JMP ,+5
0532  1021        TAD SAV1
0533  1052        TAD K0100
0534  3021        DCA SAV1
0535  5526        JMP I DAT
0536  1020        TAD SAV
0537  3021        DCA SAV1                /SET UP FOR NEXT PASS
0540  3055        DCA TKA
0541  5526        JMP I DAT
                  /FILL OUTBUFFER WITH RANDOM DATA
0542  0000  RANDOM, 0
0543  1057        TAD K6000               /2000 TRANSFERS
0544  3023        DCA SAV3
0545  1044        TAD K3477               /OUT PUT BUFFER-1
0546  3011        DCA 11          /AUTO INDEX
0547  1113        TAD NU          /RANDOM#
0550  7104        RAL CLL
0551  7430        SZL
0552  1045        TAD K0003
0553  3113        DCA NU
0554  1113        TAD NU
0555  3411        DCA I 11                /FILL BUFFER
0556  2023        ISZ SAV3                /DONE
0557  5247        JMP ,-10                /NO
0560  5642        JMP I RANDOM    /YES
                  /
```

```
                                        /
0001  0000      RESTORE,        0
0002  7200              CLA
0003  1055              TAD TKA
0004  6615              DEAL            /LOAD TK
0005  7200              CLA
0006  5601              JMP I RESTORE
                                        /
0007  7200      ERROR,  CLA
0010  6621              DFSE
0011  5300              JMP .+7
0012  6622              DFSC
0013  5267              JMP .-4
0014  6611              DCEA
0015  6601              DCMA            /NO ERROR'S
0016  6001              ION
0017  5400              JMP I INT
0100  7200              CLA
0101  1024              TAD BCOUNT
0102  3117              DCA DMA         /STORE
0103  6616              DEAC            /READ STATUS
0104  7000              NOP
0105  3116              DCA SR          /STORE
0106  6622              DFSC            /SKIP ON COMPLETION
0107  5306              JMP .-1
0110  6611              DCEA
0111  6601              DCMA            /CLEAR THE WORLD
0112  4520              JMS I EP1               /PRINT ERROR
0113  5400              JMP I INT       /CONTINUE
0114  0000      COMPARE,        0               /COMPARE FOR DATA ERROR
0115  7200              CLA
0116  3135              DCA ECOUNT              /ZERO ERROR COUNT
0117  1044              TAD K5477               /OUT BUFFER-1
                                        /
                                        /
0120  3010              DCA 10          /AUTO INDEX
0121  1042              TAD K5477               /IN BUFFER-1
0122  3011              DCA 11          /AUTO INDEX
0123  1037              TAD K6000               /MINUS 2000
0124  3025              DCA DCOUNT
0125  1410              TAD I 10
0126  3115              DCA GD          /GOOD WORD (OUT BUFFER)
0127  1411              TAD I 11
0130  3114              DCA BD          /BAD WORD (IN BUFFER)
0131  1115              TAD GD
0132  7041              CIA
0133  1114              TAD BD
0134  7640              SZA CLA
0135  5341              JMP .+4         /ERROR
0136  2025      ICB,    ISZ DCOUNT
0137  5325              JMP COMPARE+11  /FETCH NEXT WORD
0140  5354              JMP ERXT        /DONE
0141  7604              LAS
0142  0043              AND K2000
0143  7640              SZA CLA
```

```
0744  5352          JMP .+6
0745  1225          TAD JCOUNT
0746  0041          AND K177
0747  7000          NOP
0750  6117          DCA DMA          /DISK ADDRESS
0751  5360          JMP .+14
0752  2135          ISZ ECOUNT               /+1 ERROR COUNT
0753  5356          JMP ICB                  /FETCH NEXT WORD
0754  7604  ERX1,   LAS                      /COMPARE FOR AC BIT 1
0755  0043          AND K2000
0756  7450          SNA
0757  5714          JMP I COMPARE            /NORMAL TYPE OUT
0760  7200          CLA
0761  1135          TAD ECOUNT
0762  7440          SZA
0763  4536          JMS I SHERTL
0764  5714          JMP I COMPARE            /RETURN TO ROUTINE
0765  4521          JMS I EP2                /PRINT DATA ERROR
0766  5356          JMP ICB
```

```
      1000              *1000
                                        /
                                        /ROUTINE TO SERVICE INTERRUPTS
                                        /
                                        /
1000  3132    CLF,      DCA AC          /STORE AC
1001  7010              RAR
1002  3134              DCA LINK        /STORE LINK
1003  6041              TSF             /SKIP ON TELEPRINTER FLAG
1004  5207              JMP .+3         /NO FLAG
1005  6042              TCF             /CLEAR FLAG
1006  5227              JMP EXIT                /EXIT SERVICE
1007  6031              KSF             /SKIP ON KEYBOARD FLAG
1010  5214              JMP .+4         /NO FLAG
1011  6036              KRB             /READ BUFFER
1012  3054              DCA CC          /STORE CHARACTER
1013  5227              JMP EXIT        /EXIT SERVICE
1014  7200              CLA
1015  1051              TAD K0007
1016  7040              CMA
1017  3155              DCA ECOUNT
1020  2155              ISZ ECOUNT
1021  5220              JMP .-1
1022  6622              DFSC            /SKIP ON DISK COMPLETION
1023  5226              JMP .+3
1024  2000              ISZ INT
1025  5210              JMP I ER
1026  5540              JMP I IR2L      /REPORT UNDEFINED INTERRUPT
1027  7200    EXIT,     CLA
1030  1134              TAD LINK        /FETCH LINK
1031  7004              RAL             /RESTORE LINK
1032  1132              TAD AC          /FETCH AC
1033  6001              ION             /TURN INTERRUPT ON
1034  5400              JMP I INT       /RETURN
1035  0000    SKP,      0
1036  4524              JMS I SETUP
1037  0055              IKA             /TRACK ADDRESS
1040  1055              .+15
1041  1056              .+15
1042  4524              JMS I SETUP
1043  0117              DMA
1044  1061              .+15
1045  1062              .+15
1046  4524              JMS I SETUP
1047  0116              SR
1050  1065              .+15
1051  1066              .+15
1052  4523              JMS I MES1
1053  4543              4543
1054  2401              2401            /TA (TRACK ADDRESS)
                                        /
1055  4060              4060
1056  6060              0060            /DISK MEMORY ADDRESS
1057  4004              4004
```

```
1000  0140                    0140
1001  6000                    0000
1002  6000                    0000
1003  4023                    4023            /SWITCH REGISTER
1004  2240                    2240
1005  6000                    0000
1006  6000                    0000
1007  0000                    0
1010  5633                    JMP I SRP
                              /
                              /DATA PRINT OUT ROUTINE
                              /
1011  0000            DP,     0
1012  4524                    JMS I SETUP
1013  0055                    IKA
1014  1115                    ,+21
1015  1116                    ,+21
1016  4524                    JMS I SETUP
1017  0117                    UMA
                              /
                              /
1100  1121                    ,+21
1101  1122                    ,+21
1102  4524                    JMS I SETUP
1103  0115                    GD              /GOOD DATA
1104  1125                    ,+21
1105  1126                    ,+21
```

```
1106  4524                    JMS I SETUP
1107  0114                    BD              /BAD DATA
1110  1131                    .+21
1111  1132                    .+21
1112  4523                    JMS I MES1
1113  4543                    4543
1114  2401                    2401            /TA (TRACK ADDRESS
1115  4060                    4060
1116  6060                    6060
1117  4027                    4027            /WORDCOUNT
1120  0340                    0340
1121  6060                    6060
1122  6060                    6060
1123  4007                    4007            /GD (GOOD DATA)
1124  0440                    0440
1125  6060                    6060
1126  6060                    6060
1127  4002                    4002            /BD (BAD DATA)
1130  0440                    0440
1131  6060                    6060
1132  6060                    6060
1133  0000                    0
1134  5671                    JMP I DP
                              /ERROR MESSAGE FOR UNDEFINED
                              /INTERRUPT
                              /
1135  4523            IR2,    JMS I MES1          /GO TO PRINTOUT ROUTINE
1136  4543                    4543            /CARRIAGE RETURN*LINE FEED
                              /CHARACTERS
1137  2516                    2516            /U AND N
1140  0405                    0405            /D AND E
1141  0656                    0656            /F AND ,
1142  4011                    4011            /SPACE AND I
1143  1624                    1624            /N AND T
1144  5640                    5640            /, AND SPACE
1145  0000                    0               /STOP CODE
1146  7402                    HLT
                    /
                    /PRINTOUT ROUTINE FOR DATA ERROR'S
                    /PRINTS # OF ERROR'S

      1200          *1200
1200  0000          SHERT,  0
1201  4524                  JMS I SETUP
1202  0055                  IKA
1203  1215                  .+12
1204  1216                  .+12
1205  4524                  JMS I SETUP     /SETUP WORD FOR PRINTOUT
1206  0135                  ECOUNT          /#OF DATA ERRORS
1207  1225                  .+16
1210  1226                  .+16
1211  4523                  JMS I MES1      /PRINT REPORT
1212  4543                  4543
1213  4024                  4024
```

```
1214  0140                    0140
1215  6060                    6060
1216  6060                    6060
1217  4040                    4040
1220  0522                    0522
1221  2217                    2217
1222  2250                    2250
1223  2351                    2351
1224  7240                    7240
1225  6060                    6060
1226  6060                    6060
1227  0000                    0          /STOP CODE
1230  5600                    JMP I SHERT /RETURN

      0150          *150
0150  4002          START1, JMS CCSU
0151  7402                  HLT

      0155          *155
0155  6012          START2, KRB          /CLEAR READER FLAG
0156  6022                  PCF          /CLEAR PUNCH FLAG
0157  6762                  DTCA         /CLEAR DECTAPE FLAG
0160  7000                  NOP
0161  7000                  NOP
0162  7000                  NOP
0163  4002                  JMS CCSU
0164  5551                  JMP I SYSTEM

$
```

THERE ARE NO ERRORS

SYMBOL TABLE

AC	0132
BCOUNT	0024
BD	0114
BEG	0125
BEGIN	0400
CA	7751
CAT	0107
CC	0054
CCSD	0002
CHK	0127
CLF	1000
CLFL	0137
CD	0112
COMPAR	0714
C212	0260
C215	0252
C245	0263
C340	0256
DA	0451
DAT	0126
DCEA	6611
DCMA	6601
DCOUNT	0025
DEAC	6616
DEAL	6615
DFSC	6622
DFSE	6621
DMA	0117
DMAC	6626
DMAR	6603
DMAW	6605
DP	1071
DSAC	6612
DTCA	6752
ECOUNT	0135
EP1	0120
EP2	0121
ER	0110
ERROR	0667
ERXT	0754
EXIT	1027
GD	0115
IBT	0606
ICB	0736
INT	0000
IN2	1135
IN2L	0140
K0002	0026
K0003	0045
K0004	0033
K0007	0051
K0070	0050
K0100	0032

SYMBOL TABLE

K0200	0027
K0203	0030
K0260	0030
K0370	0035
K0700	0047
K1000	0034
K1477	0052
K1777	0041
K2000	0043
K3000	0036
K3477	0044
K3777	0055
K4000	0046
K5477	0042
K6000	0037
K7000	0040
K7600	0031
LINK	0134
LINL	0135
L1	0122
L1A	0060
MASKA	0344
MASKB	0345
MASKC	0346
MASKD	0347
MASK77	0254
MESAGE	0200
MES1	0123
MSRGHT	0217
MIP	0244
M1	0057
M2	0261
M3	0257
M40	0255
NU	0113
PNT	0130
RANDOM	0642
RAW	0105
RA1	0322
RA2	0343
RE	0111
RESTOR	0051
SAV	0020
SAV1	0021
SAV2	0022
SAV3	0023
SETUP	0124
SMERT	1200
SMERTL	0136
SIXTY	0264
SR	0110
SRP	1035
START1	0150

SYMBOL TABLE

START2	0155
SYSTEM	0131
TK	0470
TKA	0000
TYPECH	0220
WA1	0032
WA2	0000
WC	7750
WCT	0106

SYMBOL TABLE

INT	0000
OCSU	0002
SAV	0020
SAV1	0021
SAV2	0022
SAV3	0023
BCOUNT	0024
OCOUNT	0025
K0002	0026
K0200	0027
K0260	0030
K7600	0031
K0100	0032
K0004	0033
K1000	0034
K0370	0035
K3000	0036
K0000	0037
K7000	0040
K1777	0041
K3477	0042
K2000	0043
K3477	0044
K0003	0045
K4000	0046
K0700	0047
K0070	0050
K0007	0051
K1477	0052
K3777	0053
CC	0054
IRA	0055
K0203	0056
M1	0057
RAW	0100
WCT	0106
CAT	0107
EK	0110
RE	0111
CU	0112
NU	0113
BU	0114
GU	0115
SK	0116
UMA	0117
EF1	0120
EF2	0121
L1	0122
MES1	0123
SETUP	0124
BEG	0125
CAT	0126
CHK	0127

SYMBOL TABLE

PNT	0150
SYSTEM	0151
AC	0152
LINL	0153
LINK	0154
ECOUNT	0155
SMERTL	0156
CLFL	0157
IN2L	0140
START1	0150
START2	0155
MESAGE	0200
MSRGHT	0217
TYPECH	0220
MIP	0244
MASK//	0254
M40	0255
C340	0256
M3	0257
C212	0260
M2	0261
C213	0262
C243	0263
SIXTY	0264
MASKA	0344
MASKB	0345
MASKC	0346
MASKD	0347
BEGIN	0400
DA	0451
IR	0470
RA1	0522
WA1	0552
RA2	0543
WA2	0555
LIA	0600
IBT	0606
RANDOM	0642
RESTOR	0661
ERROR	0667
COMPAR	0714
IOB	0736
ERXT	0754
CLF	1000
EXIT	1027
SKP	1035
OP	1071
IN2	1155
SMERT	1200
DCMA	6601
DMAR	6603
DMAW	6605
DCEA	6611

SYMBOL TABLE

UDAC	6612
UEAL	6615
UEAC	6616
UPSE	6621
UPSC	6622
UMAC	6626
UICA	6762
AC	7750
CA	7751