FOR BOOTHEM
RICHARD WRENN

IDENTIFICATION

PRODUCT CODE:	MAINDEC-Ø8-DIDFC-A-D
	REPLACES MAINDEC-Ø8-D5CG
PRODUCT NAME:	DF32/DF32D DISK DATA MINI DISK,
	INTERFACE ADDRESS, DATA TEST
DATE:	MARCH 26, 1973
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	JOHN HITTELL/BILL LAFLAME/
	ED FORTMILLER

ADDENDUM

1. With an ASR 37 (15 CPS TTY) change following locations

   loc 5773 from 7635 to 7553
   loc 3155 from 4611 to 3133
   loc 3156 from 3200 to 4652

1. ABSTRACT

The DF32/DF32D Disk Data is a complete test of the disk system. Also included is a short processor test that is executed while waiting for interrupts, and during data breaks.

2. REQUIREMENTS

2.1 Equipment

PDP-8, PDP-8/S, PDP-8/I, PDP-8/L, or PDP-8/E
If PDP-8/S, DATA BREAK INTERFACE
DF32 or DF32D DISK LOGIC
1 to 4 disks.

2.2 Storage

2.2.1 Program Storage - The program uses most of memory-
C000 through 7400
7000 to 7177 is the out buffer storage.
7200 to 7377 is the in buffer storage.

3. LOADING PROCEDURES

3.1 Method

Procedures for normal binary tapes should be followed.

4. STARTING PROCEDURES

4.1 Control Switch Settings

For normal operation, all switches should be 0s ~~(down)~~

4.2 Starting Address

100 is the starting address for DF32/DF32D Disk Data,

(cont)
the program will print an initial printout of "RPM XXXX SYNC TIME = XXXX MICRO SECS", and upon completion of a pass, "PCXX", then will loop to start of program.

4.3 Program and/or Operation Action

Load Disk Data Test into memory.

Select EMO (All other units to OFF).

Write inhibit switches OFF.

REMEMBER TO TURN THE PICKER INTERFACE TO MANUAL or turn power off to interface

Set the SWITCH REGISTER to 100. (77 for the PDP-8/s)

Load Address.

Set the SWITCH REGISTER to all 0's or ØØØ2 for 50 cycle.

Press START

Program will run and loop upon completion. The only printout that should occur are "RPMXXXX SYNC TIME = XXXX MICRO SECS" and "PCXX".

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

SWO	UP	Delete Printouts. Too often
SW1	UP	Halt after error.
SW2	UP	Subtest scope loop.
SW3	UP	Do not exit section.
SW1Ø	UP	50 cycle.
SW11	UP	Trace (Type starting address of each TEST as the program enters it).

5700

5.1.1 Special Entrance Address

101 Address Test (slow).

102 Track Decode Test.

103 Track Error Ratio Test.

104 Data Break Test.

L.

105 Data Test.

106 Read Recovery Time Test. (NOT USED ON PDP-8/S)

107 Disk Write Current Saturation Test.

110 Random, Disk, Track, Address and Data Test.

5.1.2 Special Scope Loops

111 Scope loop for Data Failure, automatic setup.

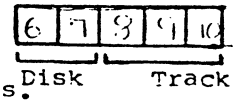
112 Write one word - SR = Disk Address. (Address Test)

113 Read one word - SR = Disk Address. (Address Test)

114 Address loop with bell on error - SR = Disk Address. (Address Test)

115 Data Test.

1st halt SR 6 to 10 = disk and track selections.



2nd halt SR = Disk Address.

3rd halt SR = Data with bell on error.

Routine will monitor SR for data.

5.1.3 Track Scope Loops

116 Writes track. Press START.

1st halt Load data for out buffer in SR, press CONTINUE

2nd halt Set SR 6 to 11 = disk and track selection, press CONTINUE.

117 Read track - SR 6 to 11 = Disk and track selection, SR 0 = 1 to inhibit Printouts

120 Write/Read track.

1st halt Load data in SR. Press CONTINUE.

2nd halt SR 6 to 11 = disk and track selection.

121 Read amplifier adjustment program. SR0 should be up to inhibit printouts.

(Another method of adjusting the read amplifier is to use entrance address 116 to write known data on a track, then use entrance address 117 to continuously read that track)

122 All data patterns on a page basic. All switches down.

123 A quick test of each track to be used for margins.

124 Routine to test extended memory banks with data. Bits 9, 10 and 11 select the bank, (Bank 0 is not extended Memory.

5.2 Subroutine Abstracts

Reference Diagram 11.1

5.2.1 Disk RPM Test

Using the teletype clock, gaps are counted for 10 seconds and multiplied by six to compute RPM. Using the computer clock the duration of one gap is computed. Both numbers are typed out in decimal. Because of the cycle time of the PDP-8/s, the sync time is not computed. ???? will be typed for sync time when running on a PDP-8/s.

Because of the tolerances of the teletype and computer clocks these typeouts are not absolutely accurate. If a typeout occurs outside of the specified ranges, a scope should be used to check the time or speed accurately.

Ranges

	DF32		DF32D	
	50Hz	60Hz	50Hz	60Hz
RPM	1450-1550	1750-1850	1450-1550	1750-1850
SYNC TIME	170-230	170-230	1000-3000	1000-3000

5.2.2 Interface Test (BEGIN)

100

This is an incremental test of flags, interrupts, error condition and status register (Located in core from 425 through 1117)

5.2.3 Disk Address Test - Reference Diagram 11.5

101

a. Using a write instruction test each address at sync time. (4000 to 7777)

b. Using a read instruction test each address at sync time. (0000 to 4000)

c. Using a write instruction test for incrementing address comparison at transfer complete time.

d. Write different data on each track, read and compare data to make sure that each track address can be decoded properly.

e. Test that no address is found more than once per disk cycle. These are located from 1120 through 1777.

5.2.4 Track Error Ratio Test - Reference Diagram 11.4. This is a bad track detector test. Each track is sequentially tested for a high error ratio. If the ratio is high, the count is printed. If the ratio is low there is no print-out. The purpose of this test is to detect a shoe not flying correctly.

102

5.2.5 Data Break Processor Test (DBTST) - This is a small test of JMS, ROTATES, TAD and ISZ instruction while doing a continuous write on the disk; interrupts are also tested.

5.2.6 Data Test (DISKO) - Reference Diagram 11.6. The disk is tested with fixed and random numbers. The tracks are

(cont)
tested from outside to inside, the test sequence is write a track, then read the track. Advance to the next inside track, and repeat until the inside track is tested. Then do a check read from out to in (the second read is a test of the guard band).

5.2.7 Read Recovery Time (RDREC) - This is a test of the turn on time of the readers.

5.2.8 Disk Current Saturation Test (DKI) - Writes all 7s on the disk 10 times. Then, the magnetic complement is written once, and read back. This test makes sure that each write saturates the disk.

5.2.9 Random Selection Test (RANDSK) - This routine randomly selects, data words, disk address and track. Then write and read one word only at these locations.

5.2.10 Margin Test (MARGIN)- 200_8 locations on each track are tested with random data.

5.2.11 Data Breaks to Extended Memory (XBANK)

a. Bank 0 writes (7s) to the disk
b. Disk transfers (7s) to extended memory
c. Bank 0 erases the disk area
d. Extended memory writes back to the disk
e. Disk data is transferred to Bank 0 and compared with Step 1. (Extended memory locations 7200 through 7377 are the storage area.)

5.3 Program and/or Operator Action

6. ERRORS

6.1 Error Printout and Description

6.1.1 Disk RPM Test

See paragraph 5.2.1.

6.1.2 Interface and Logic (Halt on Error SW1 = 1)

(For more detailed information refer to the listing)

Address Tag	Function Tested?
0427	DOES START KEY CLEAR (TRC) TRANSFER COMPLETE FF
0434	DOES START KEY CLEAR THE (DRL) DATA REQUEST LATE FF
0440	DOES START KEY CLEAR THE (ADC) ADDRESS CONFIRMED FF
0445	DOES START KEY CLEAR THE COMPUTER AND DISK EXT ADDRESS REGISTER
0453	NO INTERRUPT BOTH (TRC) AND (NED) ARE CLEARED
0464	DOES THE DCMA INSTRUCTION CLEAR NED?
0472	DOES START KEY CLEAR THE PARITY) FF, STATUS IS TESTED
0503	FLAG UP TOO SOON ON A (DMAW) INSTRUCTION
0514	WILL A WRITE INSTRUCTION RAISE THE (TRC) FLAG
0525	DOES A WRITE INSTRUCTION CLEAR THE AC
0527	SKIP ON NO ERROR, ALL ERROR STATUS BITS ARE DOWN
0541	FLAG UP TOO SOON ON A (DMAR) CLEAR THE INSTRUCTION
0501	WILL A READ INSTRUCTION (DMAR) RAISE THE (TRC) FLAG
0601	DOES A READ INSTRUCTION (DMAR) CLEAR THE AC
0625	A DEAL INSTRUCTION SHOULD NOT CHANGE THE AC
0632	A DEAL INSTRUCTION SHOULD NOT CHANGE THE AC
0642	RAISE NED BY SELECTING EM3 WITH THE COMPUTER
0650	DOES THE DSAC INSTRUCTION CLEAR THE AC
0663	CAN (ADC) BE RAISED, TESTED BY SKIPPING ON (ADC) DSAC
0672	HAS (WLO) ON NED RAISED (PSM) STATUS
0705	TEST FOR NO WLO STATUS BIT
1015	DOES WC BREAK TO 7750
1020	DOES CA BREAK TO 7751
1034	THE SYNC MARK FOUND
1037	NED IS RAISED
1046	ADC IS UP WITH TRC SET (SHOULD ONLY BE UP DURING DATA BREAKS)
1063	DMAC DOES NOT SKP ON "TRC"
1077	WILL THE DISK INTERRUPT ON "TRC"
1111	WILL THE DISK INTERRUPT ON "NED"

6.1.3 Address Test

6.1.3.1 Address Test at Sync Time

note; these bit patterns are only examples of general problems. Any combination of patterns can occur.

```
GA  0002  Sync  0040  /"TTA" OR "TTB" NOT SHIFTING CORRECTLY
GA  0012  Sync  0011  /ADDRESS NOT INCREMENTED CORRECTLY
GA  0014  Sync  0013  /ADDRESS NOT INCREMENTED CORRECTLY
GA  5076  Sync  5066  /BIT BEING DROPPED ON TRANSFER BETWEEN
                       DISK AND COMPUTER
```

GA = Address that is being tested.

Sync = Contents of Disk Memory Address Register at Sync (Photo Cell) Time. (ie address read off of disk)

6.1.3.2 Address Test at TRC Time (TRANSFER COMPLETE = TRC)

1304 GA 2777 BA 3000
Extra Increment of the Address Register

6.1.3.3 Track Address Test

1424 GTXX BTXX

GT = GOOD TRACK
BT = BAD TRACK

6.1.3.4 Track Address Increment and Decode Test

1526 GTXX BTXX

GT = TRACK ADDRESSED
BT = DATA READ

6.1.3.5 Test for False Compare of Address

```
FALCOM  0005
FALCOM  0006
FALCOM  0007
FALCOM  0013
FALCOM  0013
FALCOM  0017
FALCOM  0021
```

These addresses were found twice in one disk cycle.

6.1.4 Track Error Ratio Test

TK XX BAD XXX_8

TK XX = the track being tested
BAD XX = number of errors found on track
Maximum error count = 4020

10

6.1.5 Processor Instruction and Data Break Test, Reference 11

Halt (PC)	Function Tested
2260	ISZ AND DATA BREAKS
2264	ISZ AND DATA BREAKS
2406	ROTATES AND DATA BREAKS
2412	ROTATES AND DATA BREAKS
2424	ROTATES AND DATA BREAKS
2430	ROTATES AND DATA BREAKS
2456	TAD AND DATA BREAKS
2633	JMS AND DATA BREAKS
2654	INTERRUPT (NOT GENERATED BY DISK)

Any of the above halts represent a failure of the processor, while data breaks are occurring.

6.1.6 Read Recovery Time Test (Not used on PDP-8/S)

5200 GD7777 BDXXXX

Read recovery time too slow, replace reader.

6.1.7 Disk Current Saturation Test

Replace Writer

6.1.8 Random Selector Test

5303 XXXX = Error /ERROR CONDITION
5322 GD XXXX BD XXXX /COMPARISON ERROR

6.1.9 Data Test

Status Error Printout

STAT ERR WRITE SA = TKXX DAXXXX
READ
PE = X NED or WLO = X DRL = X

(SA = Starting Address, TK = Track, DA = Disk Address, PE = Parity Error)

Data Error Printout

XXXX TK XX DAXXXX GDXXXX BDXXXX

7. RESTRICTIONS

None

8. MISCELLANEOUS

8.1 Execution Time

Approximately 30 minutes for PDP-8,/I,/L/E	60 Cycles
Approximately 35 minutes for PDP-8,/I,/L/E	50 Cycles
Approximately 40 minutes for PDP-8/S	60 Cycles
Approximately 55 minutes for PDP-8/S	50 Cycles

9. PROGRAM DESCRIPTION

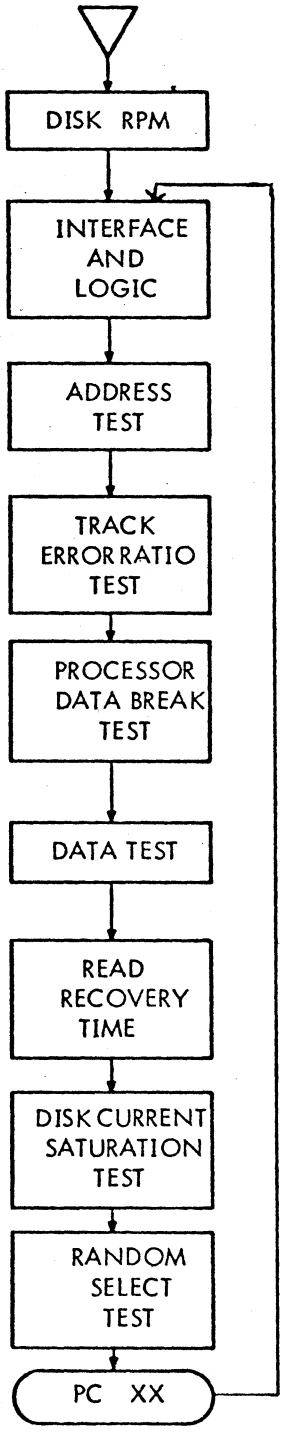
9.1 Discussion

The DF32/DF32D Disk Data Test can be broken down into three sections. Section 1 is an interface test between the disk logic and the computer, testing the disk instructions, error detection interrupts and data break. Section 2 is an address test of the disk using both read and write instructions to verify that all addresses exist on the disk and that maximum access time is not greater than specified, also tested is that no address is found twice in one revolution. Section 3 is data test of the disk. A 200 word outbuffer is filled with a data pattern, this data is a written on the track in 200 word segments into a 200 word input buffer. During the read, the disk error flag is being tested. If an error occurs, the disk address and status register at the time of the error is recorded and printed. After the transfer complete flag is set, the comparison is made between the input buffer and output buffer area. If the comparisons test fails the disk address, the good data and the bad data are printed out.

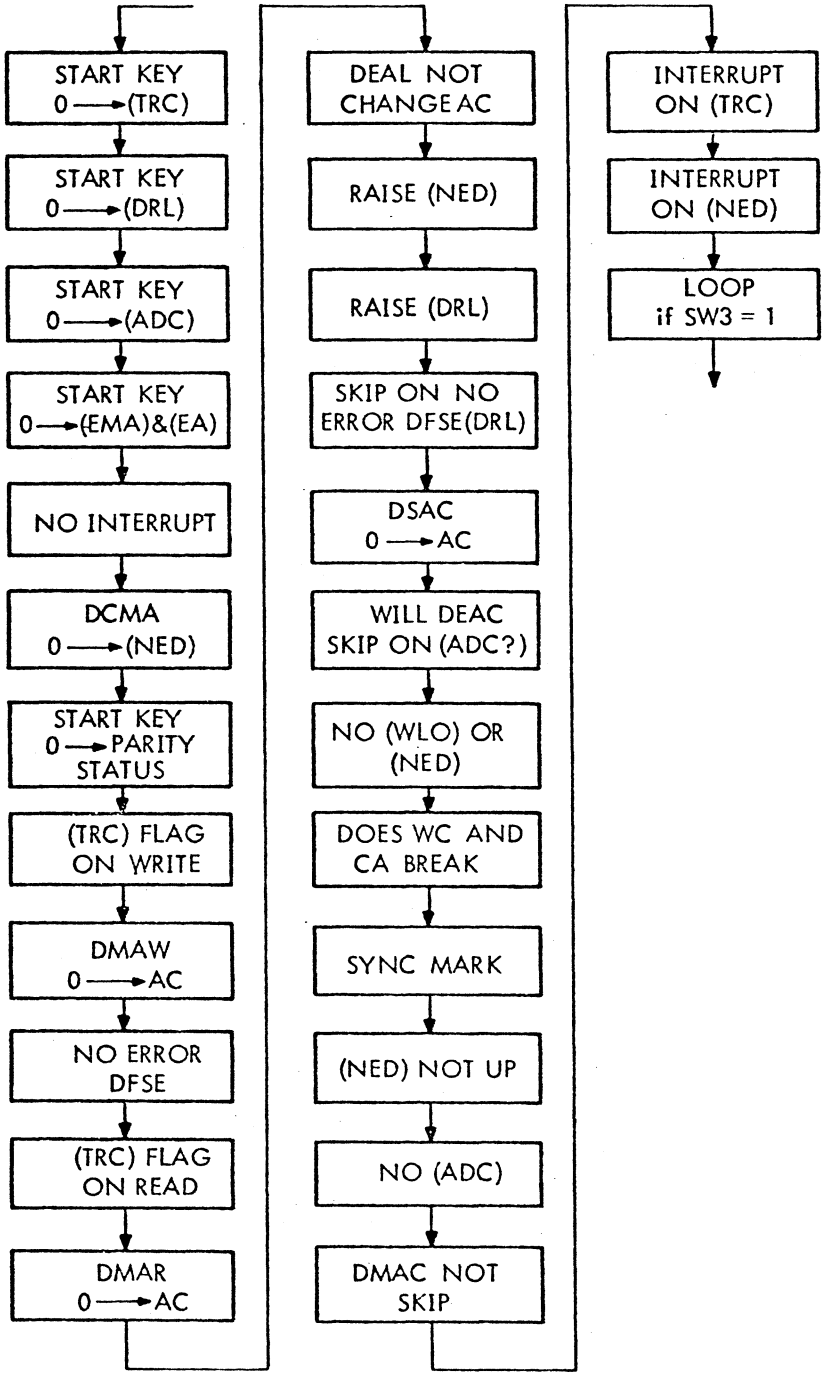
10. LISTINGS

11. 2 FLOW DIAGRAMS

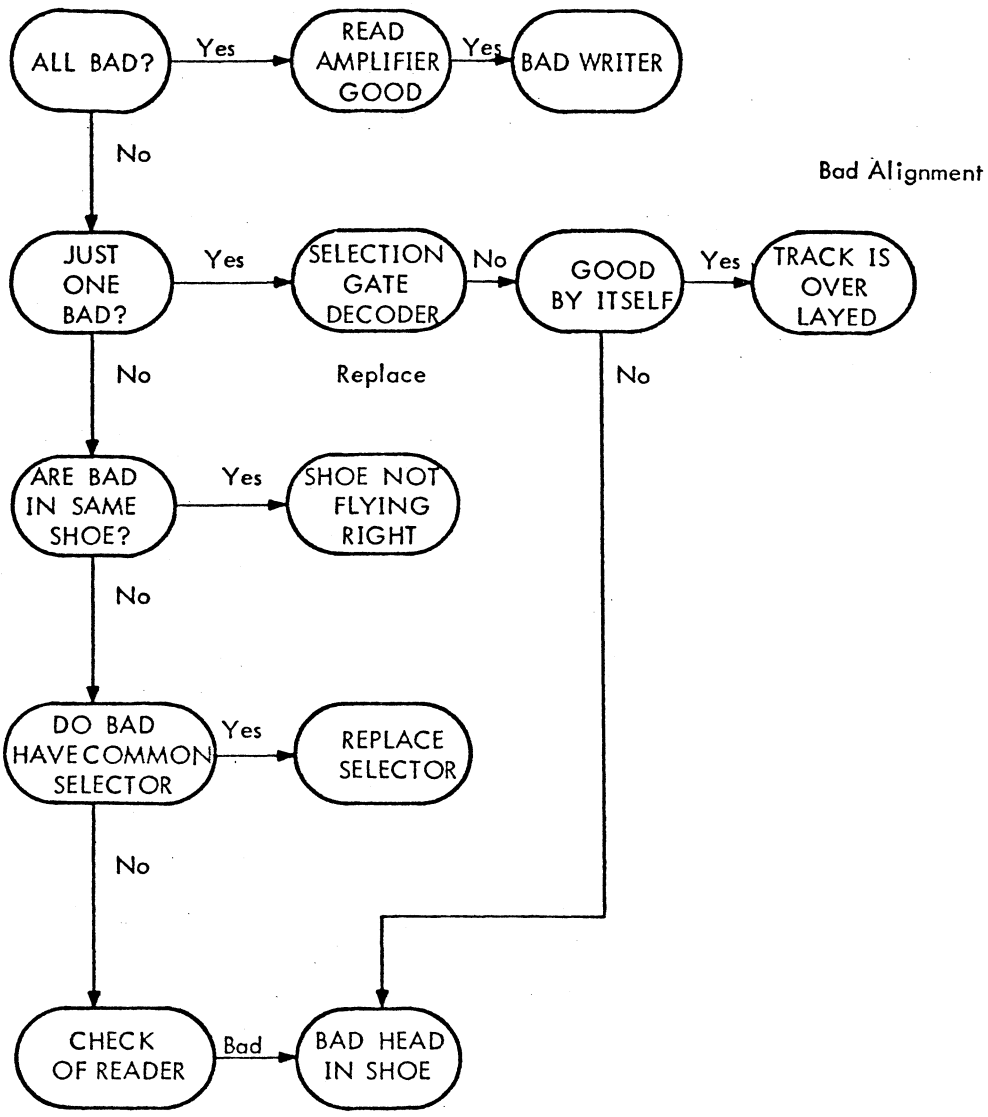
11.1 Basic System Flow



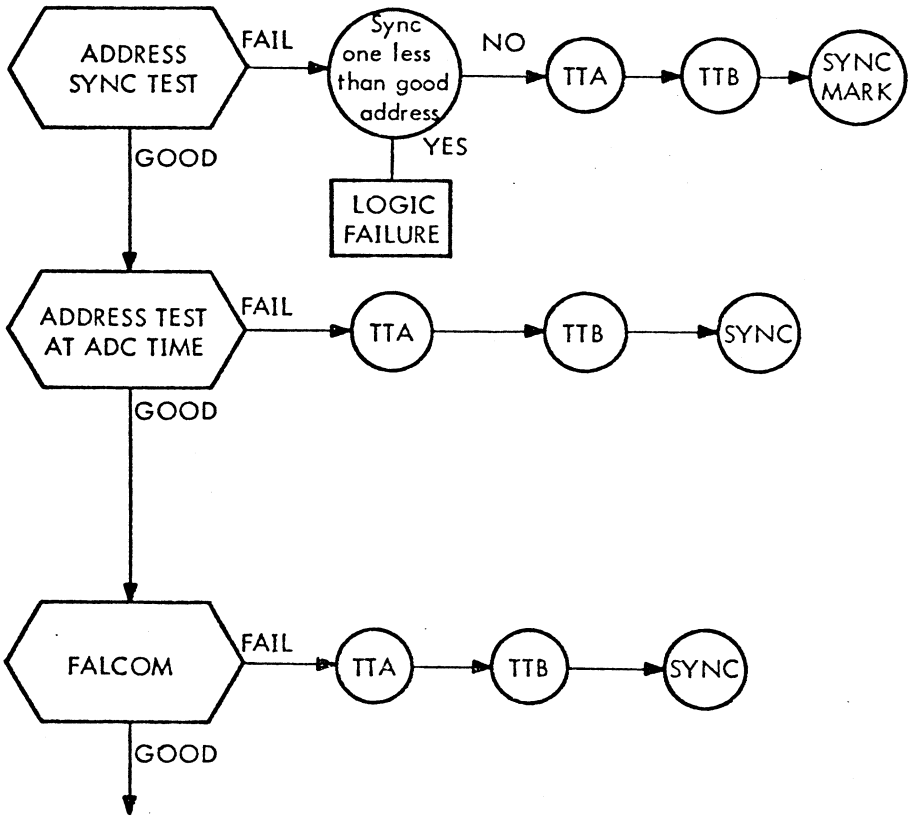
11.3 DF32 Data Disk Interface Flow



11.4 Track Error Ratio Test Trouble Flow

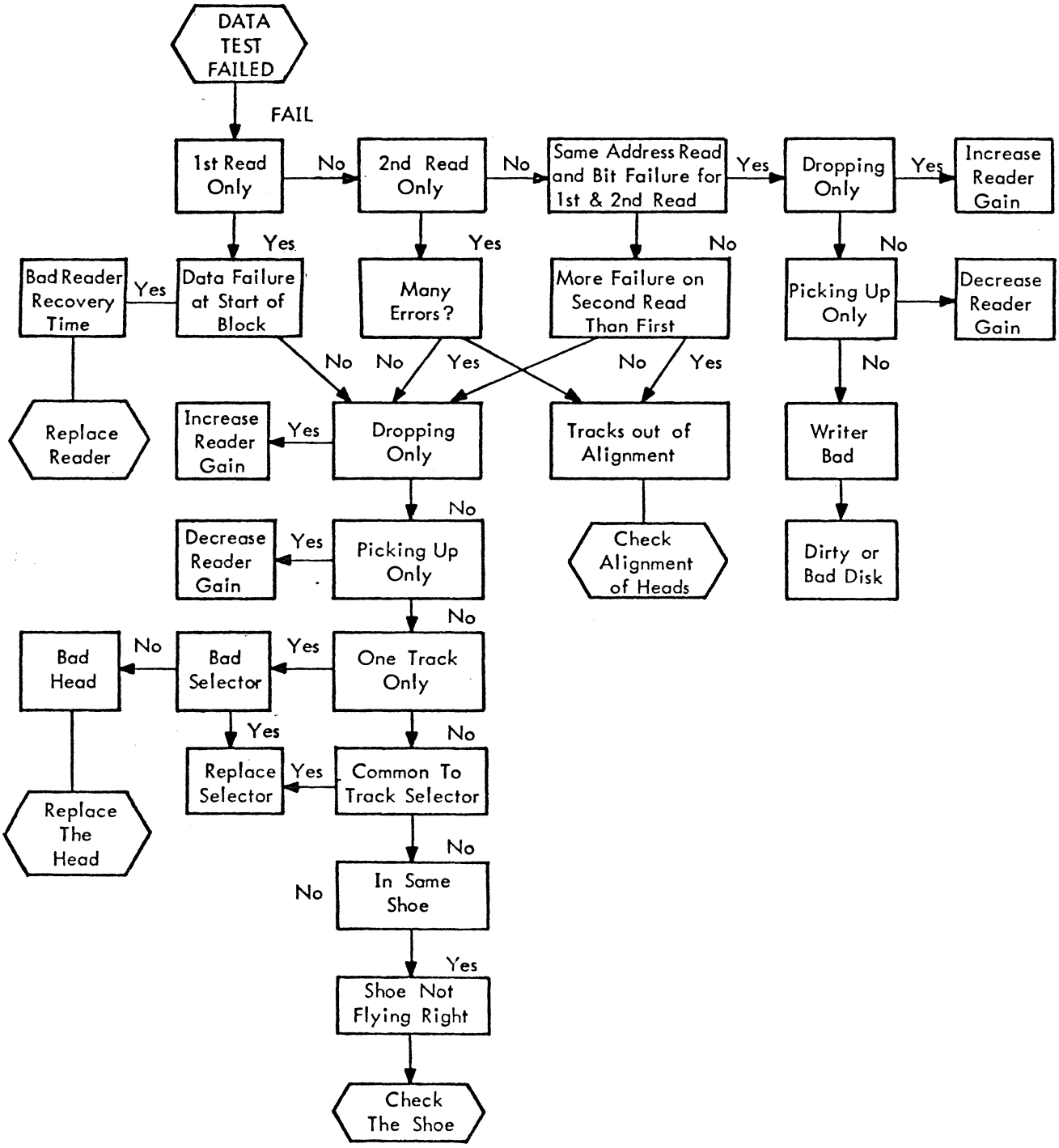


11.5 Disk Data Test (Address) Trouble Flow



TO TRACK ERROR RATIO TEST

11.6 DF32 Data Test Trouble Flow



```
                    /DF32/DF32D DISK DATA TEST  MAINDEC-08-DIDFC-A
                    /COPYRIGHT 1972, 1973 DIGITAL EQUIPMENT CORP., MAYNARD, MASS, 01754
                    /
                    /
                    /SWITCH CONTROLS
                    /SWITCH0=1  - DELETE PRINTOUTS
                    /SWITCH1=1  - HALT AFTER ERROR
                    /SWITCH2=1  - SUBTEST SCOPE LOOP
                    /SWITCH3=1  - DO NOT EXIT SECTION
                    /SWITCH10=1 - 50 CYCLE
                    /SWITCH11=1 - TRACE (TYPE STARTING ADDRESS OF EACH TEST
                    /                    AS THE PROGRAM ENTERS IT)
                    /
                    /STARTING ADDRESSES
                    /0077 -- B/S ENTRANCE ADDRESS
                    /0100 -- START TEST
                    /0101 -- ADDRESS TEST
                    /0102 -- TRACK DECODE TEST
                    /0103 -- TRACK ERROR RATIO TEST
                    /0104 -- DATA BREAK TEST
                    /0105 -- DATA TEST
                    /0106 -- READ RECOVERY TEST
                    /0107 -- DISK CURRENT SATURATION TEST
                    /0110 -- RANDOM SELECTION
                    /
                    /SPECIAL STARTING ADDRESSES FOR SCOPE LOOPS
                    /0111 -- AUTOMATIC SCOPE SETUP
                    /0112 -- WRITE
                    /0113 -- READ
                    /0114 -- ADDRESS WITH BELL ON ERROR
                    /0115 -- DATA SCOPE LOOP
                    /0116 -- WRITE TRACK
                    /0117 -- READ TRACK
                    /0120 -- WRITE READ TRACK
                    /0121 -- READ AMPLIFIER ADJUSTMENT
                    /0122 -- ALL DATA PATTERNS ON A PAGE BASIC
                    /0123 -- QUICK TEST OF EACH TRACK
                    /0124 -- SR9,10,11 = EXT MEMORY BANK
                    /
                    /
                    /
                    /7400 -- RESTART BINARY LOADER (BIN)
                    /
                    /
                    /


          0020      *20
                    /DISPATCH TABLE
0020  2132         DISPAT, DISK7A-53
0021  4777'              JMS RDREC       /READ RECOVERY TEST
0022  7604               LAS
0023  0176               AND (400        /PDP8 ONLY
0024  7640               SZA CLA
0025  5021               JMP .-4
```

```
0026  7000            NOP
0027  7604            LAS
0030  0176            AND (400
0031  7640            SZA CLA
0032  5026            JMP .-4
0033  7000            NOP
0034  7604            LAS
0035  0176            AND (400
0036  7640            SZA CLA
0037  5033            JMP .-4
0040  4775'           JMS DKI         /DISC CURRENT SATURATION TEST
0041  7604            LAS
0042  0176            AND (400
0043  7640            SZA CLA
0044  5040            JMP .-4
0045  4774'           JMS RANDSK      /RANDOM SELECTION
0046  2055            ISZ .+7
0047  5045            JMP .-2
0050  7604            LAS
0051  0176            AND (400
0052  7640            SZA CLA
0053  5045            JMP .-6
0054  5420            JMP I DISPAT    /EXIT
0055  0000            0
0056  7402  RL6,       XX
0057  7106            CLL RTL
0060  7006            RTL
0061  7006            RTL
0062  5456            JMP I RL6


0063  7402  SLOW8,     XX
0064  1173            TAD (JMP DISPAT+20
0065  3021            DCA DISPAT+1
0066  1172            TAD (CLA CMA
0067  3771'           DCA DBTST+5
0070  1170            TAD (SKP
0071  3767'           DCA NOSYNC
0072  5463            JMP I SLOW8


      0077    *77
              /JUMP OFF POINT
0077  4063            JMS SLOW8       /BS ENTRANCE ADDRESS
0100  5776'  START,    JMP RPM         /START OF TEST IE, DISC RPM
0101  5766'           JMP ATEST       /ADDRESS TEST SLOW
0102  5765'           JMP TKDEC       /TRACK DECODE TEST
0103  5764'           JMP RATIO       /TRACK ERROR RATIO TEST
0104  5763'           JMP TSTDB       /DATA BREAK TEST
0105  5762'           JMP DISK0       /DATA TEST
0106  5021            JMP DISPAT+1    /READ RECOVERY TEST
0107  5040            JMP DISPAT+20   /DISC CURRENT SATURATION TEST
0110  5045            JMP DISPAT+25   /RANDOM SELECTION
              /
              /SPECIAL SCOPE LOOPS
```

```
0111  5761'          JMP SCOPE       /AUTOMATIC SCOPE SETUP
0112  5760'          JMP SAWD        /WRITE
0113  5757'          JMP SARD        /READ
0114  5756'          JMP DBELL+41    /ADDRESS WITH BELL ON ERROR
0115  5755'          JMP DBELL       /DATA SCOPE LOOP
0116  5754'          JMP FILLX+11    /WRITE TRACK
0117  5753'          JMP FILLX+6     /READ TRACK
0120  5752'          JMP FILLX+4     /WRITE/READ TRACK
0121  5751'          JMP RDADJ       /READ AMPLIFIER ADJUSTMENT PROGRAM
0122  5750'          JMP WRCX        /ALL DATA PATTERNS ON A PAGE BASIC
0123  5747'          JMP MARGIN      /QUICK TEST OF EACH TRACK
0124  5746'          JMP XBANK       /8R 9,10,11=EXT MEMORY BANK

                /DIGITAL 8-18-U
                /MESSAGE TYPE-OUT
                /CALL WITH A JMS MESAGE
                /WITH DATA FOLLOWING
                /RETURN FOLLOWING END OF MESSAGE
                /CODE(00)


      0200      *200

0200  5100          JMP     START
0201  0000    MESAGE, 0
0202  7240            CLA CMA             /SET C(AC)=-1
0203  1201          TAD MESAGE              /ADD LOCATION
0204  3010            DCA 10              /AUTO-INDEX REGISTTER
0205  1410            TAD I 10            /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+4        /CONTINUE
0217  0000    MSRGHT, 0                   /TEMPORARY STORAGE

0220  0000    TYPECH, 0                   /TYPE CHARACTER IN C(AC)6-11
0221  0251            AND MASK77
0222  7450            SNA                 /IS IT END OF MESSAGE?
0223  5410            JMP I 10            /YES! EXIT
0224  1252            TAD M40             /SUBTRACT 40
0225  7500            SMA                 /<40?
0226  5231            JMP .+3             /NO
0227  1253            TAD C340            /YES! ADD 300
0230  5244            JMP MTP             /TO CODES <40
0231  1254            TAD M3              /SUBTRACT 3
0232  7440            SZA                 /IS IT ZERO?
0233  5236            JMP .+3             /NO
0234  1255            TAD C212            /YES! CODE 43 IS
0235  5244            JMP MTP             /LINE-FEED (212)
0236  1256            TAD M2              /SUBTRACT 2
```

```
0237  7440          SZA                     /IS IT ZERO?
0240  5243          JMP .+3                 /NO
0241  1257          TAD C215                /YES, CODE 45 IS
0242  5244          JMP MTP                 /CARRIAGE-RETURN (215)
0243  1262          TAD C245                /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
                /CONSTANTS
0251  0077  MASK77, 77
0252  7740  M40,    -40
0253  0340  C340,   340
0254  7775  M3,     -3
0255  0212  C212,   212
0256  7776  M2,     -2
0257  0215  C215,   215
0260  0245  C245,   245

0261  7402  SIXTY,  HLT
0262  7000          NOP
0263  7000          NOP                     /STORE INIT NEXT TIME
0264  7200          CLA
0265  1661          TAD I .-4               /ADDRESS OF OPERAND
0266  3270          DCA .+2
0267  5671          JMP I .+2
0270  0000          0                       /ADDRESS OF OPERAND
0271  0273          SIXTY+12                /CHANGING REFERENCE (P)
0272  5264          JMP SIXTY+3
0273  1670          TAD I SIXTY+7           /AC (OPERAND)
0274  0377          AND (0007
0275  3341          DCA MASKA               /000X
0276  1670          TAD I SIXTY+7           /AC (OPERAND)
0277  0376          AND (0070
0300  3342          DCA MASKB               /00X0
0301  1670          TAD I SIXTY+7           /AC (OPERAND)
0302  0375          AND (0700
0303  3343          DCA MASKC               /0X00
0304  1670          TAD I SIXTY+7           /AC (OPERAND)
0305  0374          AND (7000
0306  3344          DCA MASKD               /X000
0307  1343          TAD MASKC               /0X00
0310  7112          RTR CLL
0311  7010          RAR                     /0X00 RS3 00X0
0312  1344          TAD MASKD               /X0X0
0313  7012          RTR
0314  7010          RAR
0315  1345          TAD MASKD+1             /X0X0 RS3 0X0X
0316  3343          DCA MASKC               /TEMP STORAGE
0317  2261          ISZ SIXTY               /INCREMENT FOR STORAGE
0320  4271          JMS SIXTY+10            /FIND STORAGE ADDRESS
0321  1343          TAD MASKC               /6X6X
0322  3670          DCA I SIXTY+7           /STORE OPERAND AS SPECIFIED
```

```
0323  1342            TAD MASKB               /00X0
0324  7004            RAL
0325  7006            RTL                     /00X0 SL3 0X00
0326  1341            TAD MASKA               /0X00+000X=0X0X
0327  1345            TAD MASKD+1             /0x0x+6060=6x6x
0330  3344            DCA MASKD               /TEMP STORAGE
0331  2261            ISZ SIXTY               /INCREMENT FOR STORAGE
0332  4271            JMS SIXTY+10            /FIND STORAGE ADDRESS
0333  1344            TAD MASKD               /6x6X
0334  3670            DCA I SIXTY+7           /STORE OPERAND AS SPECIFIED
0335  1373            TAD (SIXTY+12           /HOUSE KEEPING
0336  3271            DCA SIXTY+10
0337  2261            ISZ SIXTY               /INCREMENT FOR RETURN
0340  5661            JMP I SIXTY             /RETURN

0341  0000    MASKA,  0
0342  0000    MASKB,  0
0343  0000    MASKC,  0
0344  0000    MASKD,  0
0345  6060            6060


                /PDP-8 DISK MEMORY INTERFACE TEST

0373  0273
0374  7000
0375  0700
0376  0070
0377  0007
      0400      PAGE
                /RMX5 DISC TEST
                /DISK MOTOR SPEED CHECK USING SYNC MARK
                /DISK RPM XXXX RMX5  3/31/67

0400  7200    RPM,    CLA
0401  1377              TAD (ADDR&177 200 ISZ
0402  3776'             DCA ADDINC
0403  1375              TAD (-23
0404  3774'             DCA CTC
0405  1373              TAD (TABL
0406  3772'             DCA ADDR
0407  4771'             JMS SPEED
0410  4770'             JMS SYNC
0411  4767'             JMS CONV
0412  7200              CLA
0413  3766'             DCA END
0414  7604              LAS
0415  0365              AND (400
0416  7640              SZA CLA
0417  5200              JMP RPM
0420  5223              JMP BEGIN+2


                DEFINE NPAGE
                <       JMP I (,+200&7600>
```

```
                        DEFINE HALT
                        <       JMS ERADD>
                        /
                        /FLAG TEST (CLEAR)
0421  6601              BEGIN,    DCMA                  /CLEAR MAR, PE DONE, NED
0422  6611                        DCEA                  /CLEAR EXT ADDRESS REGISTER
0423  4764'                       JMS SCOPEA
0424  6622                        DFSC                  /SKIP ON FLAG
0425  7410                        SKP
                                  HALT                  /FLAG SHOULD BEEN CLEARED BY START
0426  4763'                     JMS ERADD
0427  4764'                       JMS SCOPEA
                        /
                        /TEST NO DRL
0430  6616                        DEAC
0431  0362                        AND (4
0432  7440                        SZA
                                  HALT
0433  4763'                     JMS ERADD
0434  4764'                       JMS SCOPEA
                        /
                        /TEST NO ADC
0435  6612                        DSAC
0436  7410                        SKP
                                  HALT                  /START NOT CL ADC
0437  4763'                     JMS ERADD
0440  4764'                       JMS SCOPEA
                        /
                        /EXT ADDRESS CL BY START KEY
0441  6616                        DEAC
0442  0361                        AND (3770
0443  7440                        SZA
                                  HALT
0444  4763'                     JMS ERADD
0445  4764'                       JMS SCOPEA
                        /
                        /INTERRUPT TEST
0446  4768'                       JMS CLFLAG            /CLEAR PD FLAGS


0447  6001                      ION                     /INTERRUPT ON
0450  5253                      JMP .+3
0451  6002                      IOF                     /INTERRUPT UP
                                HALT                    /INTERRUPT
0452  4763'                     JMS ERADD
0453  6002                      IOF
0454  4764'                     JMS SCOPEA
0455  6611                      DCEA
                        /
                        /WILL DCMA CL NED
0456  6601                      DCMA
0457  6616                      DEAC
0460  7000                      NOP
0461  0357                      AND (2
0462  7440                      SZA
```

```
                        HALT                    /NED OR WLO SET
0463  4763'             JMS ERADD
0464  4764'             JMS SCOPEA
                /
                /NO PARITY STATUS BIT
0465  6616              DEAC
0466  7000              NOP
0467  2356              AND (1
0470  7440              SZA
                        HALT                    /PARITY STATUS BIT UP
0471  4763'             JMS ERADD
0472  4764'             JMS SCOPEA
                /
                /DISK MEMORY ADDRESS WRITE
                /          (DMAW)(DFSC)
0473  7240              CLA CMA
0474  3755'             DCA IACW                /MEMORY LOCATION ZERO
0475  7240              CLA CMA                 /AC=7777
0476  3754'             DCA WC                  /WORD COUNT=7777
0477  6605              DMAW                    /START WRITE ONE WORD
0500  6622              DFSC                    /SKIP ON FLAG
0501  7410              SKP
                        HALT                    /FLAG UP TOO SOON
0502  4763'             JMS ERADD
0503  7000              NOP
0504  2753'             ISZ CTD
0505  5304              JMP .-1                 /18 MILL SEC
0506  2753'             ISZ CTD
0507  5306              JMP .-1                 /36 MILL SEC
0510  2753'             ISZ CTD
0511  5310              JMP .-1                 /54 MILL SEC
0512  6622              DFSC                    /SKIP ON FLAG
                        HALT                    /FLAG UP NOT AFTER 54 MILL SEC.
0513  4763'             JMS ERADD
0514  4764'             JMS SCOPEA


                /IS AC CLEARED BY DMAW?
0515  7240              CLA CMA
0516  3754'             DCA WC          /ONE WORD
0517  7240              CLA CMA
0520  6605              DMAW            /IOT SHOULD CLEAR AC
0521  6622              DFSC              DATA TRANSFER COMPLETE ?
0522  5321              JMP .-1         /WAIT FOR FLAG
0523  7440              SZA
                        HALT            /AC NOT CLEARED
0524  4763'             JMS ERADD
                /
                /IS ERROR STILL CLEARED?
0525  4764'             JMS SCOPEA
0526  6621              DFSE
                        HALT            /PARITY ERROR FLAG UP
0527  4763'             JMS ERADD
0530  4764'             JMS SCOPEA
                /
```

```
                        /DISK MEMORY ADDRESS READ
0531  7240                      CLA CMA
0532  3754'                     DCA WC            /READ ONE WORD
0533  7240                      CLA CMA
0534  3755'                     DCA IACW          /MEMORY LOCATION ZERO
0535  6603                      DMAR              /START READ ONE WORD
0536  6622                      DFSC              /SKIP ON FLAG
0537  7410                      SKP
                                HALT              /FLAG UP TOO SOON
0540  4763'                     JMS ERADD
0541  2753'                     ISZ CTD
0542  5341                      JMP .-1           /18 MILL SEC
0543  2753'                     ISZ CTD
0544  5343                      JMP .-1           /36 MILL SEC
0545  2753'                     ISZ CTD
0546  5345                      JMP .-1           /54 MILL SEC
0547  6622                      DFSC              /SKIP ON FLAG
                                HALT              /FLAG NOT UP AFTER 54 MILL SEC
0550  4763'                     JMS ERADD

                        NPAGE
0551  5752                      JMP I (.+20087600
0552  0600
0553  6611
0554  7750
0555  7751
0556  0001
0557  0002
0560  4600
0561  3770
0562  0004
0563  5600
0564  5042
0565  0400
0566  6617
0567  4271
0570  4235
0571  5701
0572  5754
0573  6733
0574  6603
0575  7755
0576  5746
0577  2354
      0600        PAGE
                        /IS AC CLEARED BY DMAR
0600  4777'                     JMS SCOPEA
0601  7240                      CLA CMA
0602  3776'                     DCA WC            /ONE WORD
0603  7240                      CLA CMA
0604  6603                      DMAR              /IOT SHOULD CLEAR AC
0605  6622                      DFSC
0606  5205                      JMP .-1           /WAIT FOR FLAG
0607  7440                      SZA
```

```
                        HALT            /AC NOT CLEARED
0610  4775'             JMS ERADD
0611  4777'             JMS SCOPEA


                    /LOAD EXTENDED ADDRESS
                    /DOES "DEAL" CHANGE THE AC?
0612  7200              CLA
0613  6614              DIEF            /LOOK FOR SYNC
0614  7700              SMA CLA         /SYNC YET?
0615  5212              JMP     .-3     /NO, CONTINUE WAITING,
0616  6614              DIEF            /LOOK FOR SYNC TO GO AWAY,
0617  7710              SPA CLA         /SYNC GONE?
0620  5216              JMP     .-2     /NO, WAIT FOR IT TO GO BY,
0621  6601              DCMA
0622  6615              DEAL            /IOT SHOULD NOT CHANGE AC
0623  7440              SZA
                        HALT            /AC SHOULD BE ZERO
0624  4775'             JMS ERADD
0625  7240              CLA CMA         /AC=7777
0626  6615              DEAL            /SHOULD NOT CHANGE AC
0627  7040              CMA
0630  7440              SZA
                        HALT            /AC SHOULD BE ZERO
0631  4775'             JMS ERADD
0632  4777'             JMS SCOPEA
                    /
                    /RAISE NED (NON EXISTANT DISC)
0633  7200              CLA
0634  1374              TAD (3000       /EM3
0635  6615              DEAL            /SELECT EM3
0636  6616              DEAC
0637  0373              AND (2          /NED STATUS
0640  7450              SNA
                        HALT            /EM3 DID NOT RAISE NED
0641  4775'             JMS ERADD
0642  4777'             JMS SCOPEA
                    /


                    /DOES 6612 CLEAR THE AC? (DSAC)
0643  6611              DCEA
0644  7240              CLA CMA         /SET AC TO SEVENS
0645  6612              DSAC
0646  7440              SZA
                        HALT            /HALT BECAUSE AC NOT ZERO OR ADC UP
0647  4775'             JMS ERADD
0650  4777'             JMS SCOPEA
                    /
                    /WILL DEAC SKIP DURING DATA BREAK?
0651  6611              DCEA
0652  3776'             DCA WC
0653  3772'             DCA IACW        /ONE WORD
0654  6605              DMAW
0655  6616              DEAC
```

```
0656  7410            SKP
0657  5263            JMP .+4
0660  6622            DFSC
0661  5255            JMP .-4         /DID NOT SEE ADC PULSE
                      HALT
0662  4775'           JMS ERADD
0663  4777'           JMS SCOPEA
                /
                /CHECK TO SEE IF WRITE LOCK OR NED = (1)
0664  6611            DCEA
0665  6616            DEAC            /READ STATUS
0666  7000            NOP
0667  7006            RTL
0670  7430            SZL
                      HALT            /AC1 UP WRITE LOCK OUT SWITCH
0671  4775'           JMS ERADD
0672  4777'           JMS SCOPEA
                /
                /TEST WRITE LOCK OUT
0673  7240            CLA CMA
0674  3776'           DCA WC
0675  6605            DMAW
0676  6622            DFSC
0677  5276            JMP .-1
0700  6616            DEAC
0701  7000            NOP
0702  0373            AND (2
0703  7440            SZA
                      HALT
0704  4775'           JMS ERADD
                      NPAGE
0705  5771            JMP I (.+200&7600


0771  1000
0772  7751
0773  0002
0774  3000
0775  5600
0776  7750
0777  5042
      1000    PAGE

                /DOES DISK BREAK TO RIGHT LOC
1000  4777'           JMS SCOPEA
1001  6611            DCEA
1002  7240            CLA CMA
1003  3776'           DCA WC
1004  7240            CLA CMA
1005  3775'           DCA IACW        /WRITE ONE WORD
1006  6605            DMAW
1007  6622            DFSC
1010  5207            JMP .-1
1011  7200            CLA
1012  1776'           TAD WC
```

```
1013  7640            SZA CLA
1014  4774'           JMS ERADD       /WORD COUNT NOT CORRECT
1015  1775'           TAD IACW
1016  7440            SZA
1017  4774'           JMS ERADD       /ADDRESS CONTROL WORD NOT CORRECT
1020  4777'           JMS SCOPEA
                /
                /DEAC READ DISK EXTENDED ADDRESS
                /CHECK FOR SYNC MARK
                /CHECK FOR ADDRESS COMPAR
1021  6611            DCEA
1022  7301            CLA CLL IAC
1023  3773'           DCA CTD
1024  6616            DEAC
1025  7000            NOP
1026  7700            SMA CLA         /SYNC?
1027  7410            SKP             /NO
1030  5234            JMP .+4         /YES
1031  2773'           ISZ CTD         /LOOP
1032  5224            JMP .-6
                      HALT            /NO SYNC PULSE
1033  4774'           JMS ERADD
1034  1773'           TAD CTD
1035  7450            SNA
                      HALT            /SYNC OR NED ALWAYS UP
1036  4774'           JMS ERADD
1037  4777'           JMS SCOPEA
                /
                /CHECK FOR NO ADDRESS COMPARE PULSE
1040  6611            DCEA
1041  7200            CLA
1042  3773'           DCA CTD
1043  6616            DEAC            /SKIP ON ADC
1044  7410            SKP
                      HALT            /ADC PULSE
1045  4774'           JMS ERADD
1046  2773'           ISZ CTD
1047  5243            JMP .+4
1050  4777'           JMS SCOPEA


                /CHECK THAT DMAC DOES NOT SKIP ON DONE FLAG
1051  6611            DCEA
1052  7240            CLA CMA
1053  3776'           DCA WC          /ONE WORD
1054  3775'           DCA IACW
1055  6605            DMAW
1056  6622            DFSC
1057  5256            JMP .+1
1060  6626            DMAC            /FLAG IS SET
1061  7410            SKP
                      HALT            /DMAC SKIPPED
1062  4774'           JMS ERADD
1063  4777'           JMS SCOPEA
                /
```

```
                        /WILL THE DISK HONOR AN INTERRUPT ON DONE
1064  6611              DCEA
1065  4772'             JMS CLFLAG
1066  1371              TAD (JMP I .+11
1067  3001              DCA 0001
1070  7240              CLA CMA
1071  3776'             DCA WC
1072  6605              DMAW
1073  6001              ION
1074  6622              DFSC
1075  5274              JMP .-1           /DONE FLAG
                        HALT
1076  4774'             JMS ERADD
1077  4777'             JMS SCOPEA
                        /
                        /INTERRUPT ON NED
1100  4772'             JMS CLFLAG
1101  1370              TAD (3000
1102  6615              DEAL
1103  7200              CLA
1104  1367              TAD (JMP I .+5
1105  3001              DCA 0001          /INSTRUCTION TO BE EXECUTED ON INTERRUPT
1106  6001              ION
1107  7000              OPR
                        HALT              /NO INTERRUPT ON NED
1110  4774'             JMS ERADD
1111  4777'             JMS SCOPEA
1112  6611              DCEA
1113  6601              DCMA
1114  7604              LAS
1115  0366              AND (400          /SWITCH 3
1116  7640              SZA CLA
1117  5765'             JMP BEGIN         /LOOP ON INTERFACE TEST
                        PAUSE


                        /TAPE 2
                        /CHECK FOR ALL ADDRESS + SYNC WRITE
                        /NOT USING DATA BREAK 4000-7777
1120  7000    ATEST,    OPR
1121  4777'             JMS SCOPEA
1122  6611              DCEA
1123  1364              TAD (4000
1124  3763'             DCA CA
1125  7200              CLA
1126  1763'             TAD CA            /IACW-1
1127  4762'             JMS WONEW7
1130  6616              DEAC
1131  7500              SMA               /SYNC PULSE
1132  5330              JMP .-2           /NO
1133  6626              DMAC              /YES + READ MAC
1134  3761'             DCA BA
1135  1761'             TAD BA
1136  7041              CIA
1137  1763'             TAD CA
```

```
1140  7450            SNA
1141  5347            JMP .+6
1142  4760'           JMS ERSYNC      /A=GOOD BA=BAD
1143  7604            LAS
1144  3357            AND (1000
1145  7440            SZA
1146  5325            JMP .+21
1147  2763'           ISZ GA
1150  5325            JMP .+23
                      NPAGE
1151  5756            JMP I (.+20087600


1156  1200
1157  1000
1160  6100
1161  6621
1162  4731
1163  6622
1164  4000
1165  0421
1166  0400
1167  5544
1170  3000
1171  5545
1172  4600
1173  6611
1174  3600
1175  7751
1176  7750
1177  5042
      1200    PAGE

              /CHECK ALL ADDRESS SYNC READ
              /NOT USING DATA BREAK 0000 TO 3777
1200  4777'           JMS SCOPEA
1201  6611            DCEA
1202  1376            TAD (4000
1203  3775'           DCA KA          /TIMES COUNTER
1204  3774'           DCA GA          /INITIAL ADDRESS=0000
1205  7200    ASR1,   CLA
1206  3773'           DCA CTC
1207  1774'           TAD GA          /ADDRESS ON DISK
1210  3000            DCA 0000        /STORE IN ZERO
1211  7240            CLA CMA
1212  3772'           DCA WC          /ONE WORD
1213  7240            CLA CMA
1214  3771'           DCA IACW
1215  1000            TAD 0000
1216  6603            DMAR            /START READ
1217  6622    ASR2,   DFSC            /SKIP ON FLAG
1220  7610            SKP CLA         /NO
1221  5225            JMP ASR3        /YES
1222  0222            AND     ,       /TIME KILLER
1223  2773'           ISZ CTC
```

```
1224  5217            JMP ASR2
1225  6616  ASR3,     DEAC            /READ STATUS
1226  7030            OPR
1227  7500            SMA             /SYNC PULSE
1230  5225            JMP .-3         /NO
1231  6626            DMAC            /YES - READ ADDRESS
1232  3770'           DCA BA
1233  1770'           TAD BA
1234  7041            CIA
1235  2774'           ISZ GA
1236  1774'           TAD GA
1237  7450            SNA             /COMPARE WITH GOOD
1240  5253            JMP .+13        /NO
1241  4767'           JMS ERSYNC
1242  7604            LAS
1243  0366            AND (1000
1244  7450            SNA
1245  5253            JMP .+6
1246  7200            CLA
1247  1774'           TAD GA
1250  1365            TAD (-1
1251  3774'           DCA GA
1252  5205            JMP ASR1
1253  2775'           ISZ KA          /YES - HAVE WE CHECKED ALL
1254  5205            JMP ASR1        /NO - LOOP
1255  4777'           JMS SCOPEA      /YES


                /CHECK FOR ALL ADDRESS INCREMENTS USING DATA BREAK
                /TRACKS 0000 TO 7777
                /
1256  6601            DCMA                    /CLEAR DISC ADDRESS AND FLAGS
1257  6611            DCEA                    /CLEAR DISC EXTENDED ADDRESS
1260  7200            CLA
1261  3774'           DCA GA                  /SET ADDRESS TO 0
1262  7200            CLA
1263  1364            TAD (-2
1264  3772'           DCA WC                  /WORD COUNT=2
1265  3771'           DCA IACW
1266  1774'           TAD GA                  /FETCH DISC ADDRESS
1267  6605            DMAW                    /WRITE 2 WORDS
1270  6622            DPSC                    /WRITE COMPLETE?
1271  5270            JMP .-1                 /NO WAIT
1272  2774'           ISZ GA                  /INCREMENT GOOD ADDRESS FOR COMPARE
1273  7000            NOP
1274  6626            DMAC                    /READ DISC ADDRESS
1275  3770'           DCA BA                  /SAVE DISC ADDRESS
1276  1770'           TAD BA                  /BRING UP DISC ADDRESS
1277  7041            CIA
1300  1774'           TAD GA                  /SUBTRACT DISC ADDRESS FROM GOOD ADDRESS
1301  7450            SNA                     /DO ADDRESSES COMPARE
1302  5315            JMP .+13                /NO, GO TO ERROR
1303  4763'           JMS BADADD
1304  7604            LAS
1305  0366            AND (1000
```

```
1306  7450          SNA
1307  5315          JMP .+6
1310  7200          CLA
1311  1774'         TAD GA
1312  1365          TAD (-1
1313  3774'         DCA GA
1314  5262          JMP .-32
1315  1774'         TAD GA                  /YES, LOAD ADDRESS
1316  7440          SZA                     /END?
1317  5262          JMP .-35                /NO, RETURN
1320  4777'         JMS SCOPEA              /YES, EXIT


              NPAGE
1321  5762          JMP I (.+200&7600

1362  1400
1363  6316
1364  7776
1365  7777
1366  1000
1367  6100
1370  6621
1371  7751
1372  7750
1373  6603
1374  6622
1375  6600
1376  4000
1377  5042
      1400    PAGE

              /TRACK INCREMENT ADDRESS TEST

1400  4777'         JMS SCOPEA
1401  7000    TKING, NOP
1402  6611          DCEA
1403  7200          CLA
1404  1376          TAD (-7
1405  3775'         DCA CTA
1406  3774'         DCA GT          /GOOD TRACK
1407  7200          CLA
1410  1774'         TAD GT
1411  6615          DEAL            /LOAD TRACK ADDRESS
1412  7240          CLA CMA
1413  4773'         JMS WONEW7      /WRITE ONE WORD
1414  6616          DEAC            /READ TRACK ADDRESS
1415  0372          AND (3700       /TRACK MASK
1416  3771'         DCA BT          /BAD TRACK
1417  1771'         TAD BT
1420  7041          CIA
1421  1774'         TAD GT
1422  7640          SZA CLA         /COMPARISON ERROR
1423  4770'         JMS ETRACK
1424  1774'         TAD GT
```

```
1425  1367          TAD (100
1426  2775'         ISZ CTA
1427  5206          JMP TKING+5     /LOOP TILL DONE
1430  4777'         JMS SCOPEA


              /CHECK TO SEE THAT ALL TRACK ADDRESSES CAN BE DECODED
              /THIS ROUTINE WRITES THE TRACK ADDRESS IN THE FIRST
              /AND LAST WORDS ON EACH TRACK THEN READS THEM BACK
              /AND COMPARES THEM
              /IF AN ERROR PRINT OUT OCCURS GT IS THE ADDRESS EXPECTED
              /AND BT IS THE ADDRESS READ
              /
              /
1431  6611    TKDEC,  DCEA                    /CLEAR TRACK ADDRESS
1432  6601            DCMA                    /CLEAR DISC ADDRESS
1433  1366            TAD (-20
1434  3775'           DCA CTA                 /SET TRACK COUNT
1435  3765'           DCA OUTBUF              /FIRST DATA WORD-0
1436  7001            IAC
1437  3764'           DCA OUTBUF+1            /SECOND DATA WORD-1
1440  1363    TKWT,   TAD (-2
1441  3762'           DCA WC                  /SET WORD COUNT FOR 2 WORDS
1442  1361            TAD (OUTBUF-1
1443  3760'           DCA IACW                /SET BEGINNING ADDRESS
1444  6626            DMAC
1445  1357            TAD (3777               /BRING IN DISC ADDRESS AND MODIFY
1446  6605            DMAW                    /WRITE THE LAST WORD OF
1447  6622            DFSC                    /ONE TRACK AND THE FIRST
1450  5247            JMP .-1                 /WORD OF THE NEXT TRACK
1451  2765'           ISZ OUTBUF              /INCREMENT DATA
1452  2764'           ISZ OUTBUF+1
1453  2775'           ISZ CTA                 /INCREMENT TRACK COUNTER
1454  5240            JMP TKWT
1455  6611            DCEA                    /CLEAR TRACK ADDRESS
1456  1366            TAD (-20
1457  3775'           DCA CTA                 /SET TRACK COUNT
1460  3774'           DCA GT                  /SET COMPARE WORD-0
1461  6601            DCMA                    /CLEAR DISC ADDRESS
1462  7300            CLA CLL
1463  3756'           DCA CTADC


1464  2756'   TKRD,   ISZ CTADC
1465  7200            CLA
1466  1756'           TAD CTADC
1467  7420            SNL
1470  1355            TAD (3776
1471  3756'           DCA CTADC
1472  1361            TAD (OUTBUF-1
1473  3760'           DCA IACW
1474  7040            CMA
1475  3762'           DCA WC
1476  1756'           TAD CTADC
1477  6603            DMAR
```

```
1500  6622            DFSC
1501  5300            JMP .-1
1502  7210            CLA RAR
1503  3754'           DCA CTB
1504  1765'           TAD OUTBUF
1505  7041            CIA
1506  1774'           TAD GT
1507  7440            SZA
1510  5323            JMP TKERR
1511  7300            CLA CLL
1512  1754'           TAD CTB
1513  7004            RAL
1514  7020            CML
1515  7420            SNL
1516  5264            JMP TKRD
1517  2774'           ISZ GT
1520  2775'           ISZ CTA
1521  5264            JMP TKRD
1522  5330            JMP .+6
1523  7200  TKERR,     CLA
1524  1765'           TAD OUTBUF
1525  3771'           DCA BT
1526  4770'           JMS ETRACK
1527  5312            JMP .+15
                      NPAGE
1530  5753            JMP I (.+20007600


1553  1600
1554  3661
1555  3776
1556  6627
1557  3777
1560  7751
1561  6777
1562  7750
1563  7776
1564  7001
1565  7000
1566  7760
1567  0100
1570  6002
1571  6624
1572  3700
1573  4731
1574  6623
1575  6610
1576  7771
1577  5042
      1600            PAGE

                /CHECK FOR NO MORE THAN ONE ADC PER REV
                /DETECT FALSE ADDRESS COMPARE
                /THIS ROUTINE FINDS ITS OWN ISE TIME AND SHOULD WORK IN ANY MACHINE
1600  7604            LAS             /READ SWITCHES FOR 50 CYCLE
```

```
1601  7112            CLL RTR          /SR10=0->LINK
1602  7630            SZL CLA          /50 CYCLE?
1603  1377            TAD     (64-6    /YES,
1604  1376            TAD     (6       /
1605  3302            DCA     TOL      /
1606  4775'           JMS SCOPEA
1607  7000    FCOM,   NOP
1610  6611            DCEA
1611  7200            CLA              /SET UP TO FIND ISZ
1612  3774'           DCA GA           /TIME
1613  7200    FCOM1,  CLA
1614  1373            TAD     (-5
1615  3301            DCA     REVCNT
1616  7200            CLA
1617  1774'           TAD GA
1620  4772'           JMS WONE         /START-REFERENCE
1621  6622            DFSC             /DONE FLAG
1622  5221            JMP .-1          /FOUND REFERENCE
1623  7200            CLA
1624  1774'           TAD GA
1625  4772'           JMS WONE         /LOOK AGAIN
1626  7200            CLA
1627  3771'           DCA CTC          /CTC=HOW LONG
1630  6622            DFSC
1631  7410            SKP
1632  5237            JMP .+5          /FOUND SECOND TIME
1633  0233            AND     ,        /TIME KILLER
1634  2771'           ISZ CTC
1635  5230            JMP .-5
                      HALT             /TOOK OVER 40 MILLISEC /REF
1636  4770'           JMS ERADD
1637  7200            CLA
1640  1771'           TAD CTC          /HOW LONG
1641  7040            CMA
1642  1302            TAD     TOL      /ADD
1643  3367            DCA (XX          /TEM STORAGE


1644  7200    FALCOM, CLA
1645  1774'           TAD GA           /ADDRESS
1646  4772'           JMS WONE         /WRITE IN
1647  6622            DFSC
1650  5247            JMP .-1          /FLAG - DID IT
1651  7200            CLA
1652  1774'           TAD GA
1653  4772'           JMS WONE         /DO IT AGAIN
1654  1367            TAD (XX
1655  3771'           DCA CTC
1656  6622            DFSC
1657  5262            JMP .+3
1660  4766'           JMS TEXTE        /FALSE COMPARE, FLAG BEFORE ISE OUT
1661  5244            JMP FALCOM
1662  0262            AND     ,        /TIME KILLER
1663  2771'           ISZ CTC
1664  5256            JMP .+6          /ISZ AND CHECK FOR FLAG
```

```
1665  6622            DFSC
1666  5265            JMP .-1
1667  2774'           ISZ GA          /INCREMENT ADDRESS
1670  5276            JMP     .+6     /TRY ALL ADDRESS
1671  7604            LAS
1672  0365            AND (400
1673  7640            SZA CLA
1674  5764'           JMP ATEST       /LOOP ON ADDRESS TEST
                      NPAGE
1675  5763            JMP I (.+200&7600
1676  2301            ISZ     REVCNT
1677  5244            JMP     FALCOM
1700  5213            JMP     FCOM1
1701  0000    REVCNT, 0
1702  0000    TOL,    0

1763  2000
1764  1120
1765  0400
1766  6130
1767  7402
1770  5600
1771  6603
1772  2665
1773  7773
1774  6622
1775  5042
1776  0006
1777  0056
      2000    PAGE
              /
              /ROUTINE TO DETECT TRACK WITH HIGH ERROR RATIO
              /
2000  4777'   RATIO,  JMS SCOPEA
2001  7200            CLA
2002  1376            TAD (RPAGE+128377 200 JMP       /EQUAL TO (JMP RPAGE+12#JMP .-1)
2003  3775'           DCA RPAGE+13            /SKIP ON DONE
2004  1374            TAD (JMS I 0000         /TO CORRECT TRACK COUNT ON NO ERRORS
2005  3773'           DCA RPAGE+11            /READ ROUTINE
2006  1372            TAD (ISZ I CKA          /INS ERROR CT
2007  3771'           DCA COMA+11             /COMPARE ROUTINE
2010  1370            TAD (NOP
2011  3767'           DCA RPAGE+10
2012  1366            TAD (TKTST              /INCREMENT KA ON ERROR
2013  3000            DCA 0000
2014  3765'           DCA ERRTK               /TRACK COUNTER
2015  3764'           DCA KA                  /ERROR COUNT PER TRACK
2016  7240            CLA CMA
2017  4763'           JMS FILL
2020  7777            7777
2021  4762'           JMS WDISK               /WRITE THE DISC
2022  4761'           JMS CKRDDI              /READ AND INCREMENT ON ERROR
2023  1360            TAD (JMS I CSTATUS
2024  3773'           DCA RPAGE+11            /RESTORE
2025  1357            TAD (DFSE
```

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2026  3767'           DCA RPAGE+10
2027  1356            TAD (JMS I CERRCOM
2030  3771'           DCA COMA+11             /RESTORE
2031  1355            TAD (RPAGE+100377 200 JMP       /JMP .+3
2032  3775'           DCA RPAGE+13
2033  4777'           JMS SCOPEA
2034  7604            LAS
2035  0354            AND (400                /SW3
2036  7640            SZA CLA
2037  5200            JMP RATIO               /LOOP ON RATIO TEST
2040  4753'  TSTDB,   JMS DBTST               /3 CYCLE BREAK TEST
2041  7604            LAS
2042  0354            AND (400
2043  7640            SZA CLA
2044  5240            JMP .+4         /DATA BREAK TEST
                /ROUTINE TO WRITE READ COMPARE AND CHECK READ DISK

2045  4777'  DISK0,   JMS SCOPEA
2046  7200            CLA
2047  4763'           JMS FILL
2050  0000            0000
2051  4752'           JMS DISK


2052  4777'  DISK7,   JMS SCOPEA
2053  1255            TAD DISK7+3
2054  4763'           JMS FILL
2055  7777            7777
2056  4752'           JMS DISK

2057  4777'  DISK7A,  JMS SCOPEA
2060  1255            TAD DISK7+3
2061  4763'           JMS FILL
2062  0000            0000
2063  4752'           JMS DISK
2064  4777'           JMS SCOPEA
2065  1267            TAD .+2
2066  4763'           JMS FILL
2067  7070            7070
2070  4752'           JMS DISK
2071  4777'           JMS SCOPEA
2072  1267            TAD .+3
2073  4763'           JMS FILL
2074  0707            0707
2075  4752'           JMS DISK
2076  4777'           JMS SCOPEA
2077  1351            TAD (5252
2100  4763'           JMS FILL
2101  2525            2525
2102  4752'           JMS DISK
2103  4777'           JMS SCOPEA
2104  1306            TAD .+2
2105  4763'           JMS FILL
2106  0002            0002
2107  4752'           JMS DISK
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2110  4777'           JMS SCOPEA
2111  1350            TAD (3776
2112  4763'           JMS FILL
2113  4021            4021
2114  4752'           JMS DISK
2115  4777'           JMS SCOPEA
2116  1347            TAD (-20
2117  3346            DCA (XX
2120  4777'           JMS SCOPEA
2121  4745'           JMS RANFIL
2122  4752'           JMS DISK
2123  2346            ISZ (XX
2124  5321            JMP .-3
2125  7604            LAS
2126  0354            AND (400
2127  7440            SZA
2130  5245            JMP DISK0       /LOOP ON DATA TEST
2131  4020            JMS DISPAT
2132  4744'           JMS ENDCT
2133  2743'           ISZ END
2134  6611            DCEA
2135  6601            DCMA
2136  5742'           JMP BEGIN
2137  7000            NOP             /COMPLETED DISK TEST
2142  0421
2143  6617
2144  5657
2145  4627
2146  7402
2147  7760
2150  3776
2151  5252
2152  2200
2153  2205
2154  0400
2155  5225
2156  4541
2157  6621
2160  4542
2161  3504
2162  5065
2163  5013
2164  6600
2165  6606
2166  4504
2167  3625
2170  7000
2171  3635
2172  2543
2173  3626
2174  4400
2175  3630
2176  5227
2177  5042
      2200    PAGE
```

```
2200  7000    DISK,   NOP
2201  4777'           JMS DWRCOI              /DISK WRITE READ OUT IN
2202  4776'           JMS CKRDOI              /CHECK READ DISK OUT IN
2203  5600            JMP I DISK
2204  7000            NOP
                /DATA BREAK TEST FOR DISK

2205  7402    DBTST,  XX
2206  6611            DCEA
2207  4775'           JMS CLFLAG
2210  4774'           JMS WONEW7              /SET FLAG
2211  7200            CLA
2212  1373            TAD (7760               /CLA CMA FOR PDP8S
2213  3772'           DCA KA
2214  1371            TAD (JMS I CWTRK
2215  3001            DCA 1
2216  1370            TAD (JMP I 0000
2217  3002            DCA 0002
2220  4767'           JMS WTRK
2221  4245            JMS ISZTST
2222  4766'           JMS ROT1TS
2223  4765'           JMS ROT2TS
2224  4764'           JMS TADTST
2225  4763'           JMS JMSTST
2226  4245            JMS ISZTST
2227  4245            JMS ISZTST
2230  4766'           JMS ROT1TS
2231  4765'           JMS ROT2TS
2232  4765'           JMS ROT2TS
2233  4764'           JMS TADTST
2234  4764'           JMS TADTST
2235  4763'           JMS JMSTST
2236  4763'           JMS JMSTST
2237  2772'           ISZ KA
2240  5221            JMP DBTST+14
2241  6002            IOF
2242  6622            DFSC
2243  5242            JMP .-1
2244  5605            JMP I DBTST

                /PROCESS OR TEST FOR DISK
                /TESTS ARE RUN WHILE WAITING FOR INT


                /ISZ TEST ABOUT 61 MILLISECONDS
2245  7402    ISZTST, XX
2246  7040            CMA
2247  3762'           DCA TEMP3
2250  3761'           DCA TEMP2
2251  3760'           DCA TEMP1
2252  2760'           ISZ TEMP1
```

```
2253  2761'           ISZ TEMP2
2254  5252            JMP .+2
2255  1761'           TAD TEMP2
2256  7440            SZA
2257  7402            HLT                 /COMPUTER BAD
2260  7240            CLA CMA
2261  1760'           TAD TEMP1
2262  7440            SZA
2263  7402            HLT                 /COMPUTER BAD
2264  2762'           ISZ TEMP3
2265  7410            SKP
2266  5251            JMP ISZTST+4
2267  5645            JMP I ISZTST
2360  2641
2361  2642
2362  2645
2363  2600
2364  2434
2365  2416
2366  2400
2367  2651
2370  5400
2371  4540
2372  6600
2373  7760
2374  4731
2375  4600
2376  3504
2377  3400
      2400    PAGE

              /ROTATE 1 TEST ABOUT 67 MILLISECONDS
2400  7402    ROT1TS, XX
2401  1777'           TAD TEMP2
2402  7130            STL RAR
2403  7004            RAL
2404  7420            SNL
2405  7402            HLT                 /COMPUTER BAD
2406  7041            CMA IAC
2407  1777'           TAD TEMP2
2410  7440            SZA
2411  7402            HLT                 /COMPUTER BAD
2412  2777'           ISZ TEMP2
2413  5201            JMP ROT1TS+1
2414  7200            CLA
2415  5600            JMP I ROT1TS

              /ROTATE 2 TEST ALSO ABOUT 67 MILLISECONDS
2416  7402    ROT2TS, XX
2417  1777'           TAD TEMP2
2420  7106            CLL RTL
2421  7012            RTR
2422  7430            SZL
2423  7402            HLT                 /COMPUTER BAD
```

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2424  7041          CMA IAC
2425  1777'         TAD TEMP2
2426  7440          SZA
2427  7402          HLT                 /COMPUTER BAD
2430  2777'         ISZ TEMP2
2431  5217          JMP ROT2TS+1
2432  7200          CLA
2433  5616          JMP I ROT2TS

                /TAD TEST ADD EVERY COM TO RAN NO
                /ABOUT 86 MILLISECONDS
2434  7402    TADTST, XX
2435  3776'         DCA TEMP3
2436  1775'         TAD PRAN1
2437  7104          CLL RAL
2440  7430          SZL
2441  7001          IAC
2442  3775'         DCA PRAN1
2443  1774'         TAD PRAN2
2444  1775'         TAD PRAN1
2445  3774'         DCA PRAN2
2446  1774'         TAD PRAN2
2447  3773'         DCA TEMP4
2450  1774'         TAD PRAN2
2451  1776'         TAD TEMP3
2452  7041          CMA IAC
2453  1773'         TAD TEMP4
2454  7440          SZA
2455  7402          HLT                 /COMPUTER BAD
2456  2773'         ISZ TEMP4
2457  7000          NOP
2460  2776'         ISZ TEMP3
2461  5250          JMP .-11
2462  7200          CLA
2463  5634          JMP I TADTST


2464  7200    NOTBE,  CLA
2465  1372            TAD     (-I1            /CTA,Y=NO, OF CYCLES
2466  3771'           DCA     CTD
2467  1770'           TAD     CTA
2470  2771'           ISZ     CTD
2471  5267            JMP     .-2
2472  3770'           DCA     CTA
2473  4767'           JMS     CTIME           /GET CYCLE TIME
2474  3771'           DCA     CTD
2475  3766'           DCA     BD              /MSH
2476  3765'           DCA     GD              /LSH
2477  1770'           TAD     CTA
2500  7041            CIA
2501  3770'           DCA     CTA
2502  7100            CLL
2503  1771'           TAD     CTD             /NO, OF CYCLES,CYCLE TIME
2504  7430            SZL
2505  2766'           ISZ     BD
```

```
2506  2770'          ISZ     CTA
2507  5302           JMP     .-5
2510  3765'          DCA     GD
2511  7300           CLA CLL
2512  1765'          TAD     GD
2513  1364           TAD     (-144
2514  3765'          DCA     GD
2515  1766'          TAD     BD
2516  7430           SZL
2517  7001           IAC
2520  7100           CLL
2521  1363           TAD     (-1
2522  3766'          DCA     BD
2523  7420           SNL
2524  5327           JMP     .+3
2525  2770'          ISZ     CTA
2526  5311           JMP     .-15
2527  5762'          JMP     CONVB


2562  4314
2563  7777
2564  7634
2565  6626
2566  6625
2567  3000
2570  6610
2571  6611
2572  7767
2573  2644
2574  2647
2575  2646
2576  2643
2577  2642
      2600     PAGE

               /JMS TST MAKE 13 PASSES OF 128 CONSECUTIVE JMS ,
               /AND COMPARE RESULTS FOR ABOUT 63 MILLISECONDS
2600  7402     JMSTST, XX
2601  1377             TAD (7763              /NUMBER OF LOOPS
2602  3241             DCA TEMP1
2603  1376             TAD (7001              /200 LOCATIONS
2604  3242             DCA TEMP2
2605  1375             TAD (OUTBUF            /STARTING LOCATION
2606  3243             DCA TEMP3
2607  1374             TAD (4200              /JMS INSTRUCTION
2610  3244             DCA TEMP4
2611  1244             TAD TEMP4              /STORE 128 JMS ,
2612  3643             DCA I TEMP3            /STARTING AT ADDRESS
2613  2244             ISZ TEMP4              /0000
2614  2243             ISZ TEMP3
2615  2242             ISZ TEMP2
2616  5211             JMP .-5
2617  1373             TAD (5600              /STORE JMP I RETURN
2620  3643             DCA I TEMP3            /TO RETURN FROM JMS
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2621  4775'           JMS OUTBUF              /EXECUTE 128 JMS
2622  1372    JMRETU, TAD (7603               /RETURN FROM EXECUTE
2623  3242            DCA TEMP2
2624  1371            TAD (OUTBUF+2
2625  3243            DCA TEMP3               /COMPARE ADDRESSES
2626  1243            TAD TEMP3               /FOR ,+1
2627  7040            CMA
2630  1643            TAD I TEMP3
2631  7440            SZA
2632  7402            HLT                     /PROCESSOR BAD
2633  2243            ISZ TEMP3               /INC COMP AND FETCH
2634  2242            ISZ TEMP2               /DONE 128 YET
2635  5226            JMP JMRETU+4
2636  2241            ISZ TEMP1
2637  5203            JMP JMSTST+3
2640  5600            JMP I JMSTST

2641  0000    TEMP1,  0
2642  0000    TEMP2,  0
2643  0000    TEMP3,  0
2644  0000    TEMP4,  0
2645  0000    TEMP5,  0
2646  4263    PRAN1,  4263
2647  2634    PRAN2,  2634
2650  2622    RETUJM, JMRETU

                /

2651  7402    WTRK,   XX
2652  6622            DFSC            /SKIP ON DONE FLAG
2653  7402            HLT             /PARITY ERROR GEN INTERRUPT
2654  3770'           DCA AC          /SAVE AC
2655  6611            DCEA            /TRACK ZERO
2656  7200            CLA
2657  3767'           DCA WC
2660  3766'           DCA IACW
2661  6605            DMAW
2662  6001            ION
2663  1770'           TAD AC          /RESTORE AC
2664  5651            JMP I WTRK


                /WRITE ONE WORD AT DISK ADDRESS CONTAINED IN SR
                /DO NOT WAIT FOR DONE FLAG

2665  7402    WONE,   XX
2666  3000            DCA 0000
2667  7240            CLA CMA
2670  3767'           DCA WC
2671  7240            CLA CMA
2672  3766'           DCA IACW
2673  1000            TAD 0000
2674  6605            DMAW            /START WRITE
```

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2675  5665          JMP I WONE

                /READ ONE WORD DO NOT WAIT FOR FLAG
2676  7402    RONE, XX
2677  3000          DCA 0000
2700  7240          CLA CMA
2701  3767'         DCA WC
2702  7240          CLA CMA
2703  3766'         DCA IACW
2704  1000          TAD 0000
2705  6603          DMAR            /START READ
2706  5676          JMP I RONE

                /SCOPE LOOP FOR ADDRESS TEST (WRITE)
                /CONTENTS OF SWITCH REGISTER EQUAL DISK ADDRESS
2707  7604    SAWD, LAS
2710  4265          JMS WONE
2711  6622          DFSC
2712  2765'         ISZ CTA
2713  5312          JMP .-1
2714  5307          JMP .-5

                /SCOPE LOOP FOR ADDRESS TEST READ
2715  7604    SARD, LAS
2716  4276          JMS RONE
2717  6622          DFSC
2720  2765'         ISZ CTA
2721  5320          JMP .-1
2722  5315          JMP .-5


                /WRITE EACH TRACK WITH IT RACK ADDRESS
                /READ EACH TRACK 5 TIMES BEFORE SEQUENCING TO NEXT
                /
2723  0000          0               /COUNTER
2724  7200    RDADJ, CLA
2725  3764'         DCA BT          /TRACK ADDRESS
2726  4763'         JMS TKCAL       /WRITE TRACKS
2727  1362          TAD (-5         /READ EACH TRACK 5 TIMES
2730  3323          DCA RDADJ-1
2731  1764'         TAD BT
2732  7010          RAR
2733  7630          SZL CLA         /ODD OR EVEN?
2734  5341          JMP .+5         /ODD
2735  1764'         TAD BT          /EVEN
2736  4761'         JMS RL5
2737  4760'         JMS RDLD
2740  5344          JMP .+4
2741  1764'         TAD BT
2742  4761'         JMS RL5
2743  4757'         JMS RDHI
2744  2323          ISZ RDADJ-1     /READ 5 TIMES
2745  5331          JMP RDADJ+5     /NO
2746  1356          TAD (-17        /YES
2747  1764'         TAD BT
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2750  7650          SNA CLA          /ALL TRACKS
2751  5324          JMP RDADJ        /YES --- START OVER
2752  2764'         ISZ BT           /NO --- INCREMENT TRACK
2753  5327          JMP RDADJ+3
2756  7761
2757  4121
2760  4104
2761  4724
2762  7773
2763  3200
2764  6624
2765  6610
2766  7751
2767  7750
2770  6614
2771  7002
2772  7603
2773  5600
2774  4200
2775  7000
2776  7601
2777  7763
      3000    PAGE

3000  0000    CTIME,  0                        /COMPUTE CYCLE TIME
3001  6032            KCC
3002  6042            TCF
3003  7300            CLA CLL
3004  1377            TAD     (JMP I 2         /SET UP FOR INTERRUPT
3005  3001            DCA     1
3006  1376            TAD     (CTIMEA
3007  3002            DCA     2
3010  3345            DCA     CTIMEX
3011  3346            DCA     CTIMEY
3012  6046            TLS                      /SET TTY PRINTER FLAG
3013  6041            TSF
3014  5213            JMP     .-1
3015  6046            TLS                      /START TTY FOR 100 MS TIME DELAY
3016  6001            ION
3017  2345            ISZ     CTIMEX           /COUNT NO. OF CYCLES
3020  5217            JMP     .-1              /IN 100 MSECS
3021  2346            ISZ     CTIMEY
3022  5217            JMP     .-3
3023  7402            HLT                      /NO INTERRUPT FROM TTY
3024  6041    CTIMEA, TSF
3025  5336            JMP     CTIMEB           /WRONG INTERRUPT
3026  7200            CLA
3027  1373            TAD     (-3
3030  3350            DCA     CMPYR
3031  3351            DCA     X                /MPY CTIMEX TIMES 3
3032  7100            CLL
3033  1345            TAD     CTIMEX           /ADD LEAST SIG HALF
3034  7430            SZL                      /OVERFLOW?
3035  2351            ISZ     X                /YES, INCREMENT MOST SIG HALF
```

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3236  2350          ISZ     CMPYR           /INCREMENT MULTIPLIER
3237  5242          JMP     .-5
3240  3352          DCA     X+1             /STORE LEAST SIG HALF
3241  1346          TAD     CTIMEY
3242  7041          CIA
3243  3350          DCA     CMPYR           /MULTIPLIER=-Y
3244  3353          DCA     Y
3245  3354          DCA     Y+1
3246  7300          CLA CLL                 /MPY CTIMEY TIMES 12291
3247  1353          TAD     Y               /ADD MSH
3250  1374          TAD     (3
3251  3353          DCA     Y
3252  7300          CLA CLL
3253  1354          TAD     Y+1             /ADD LSH
3254  1374          TAD     (3
3255  3354          DCA     Y+1
3256  7430          SZL                     /OVERFLOW?
3257  2353          ISZ     Y               /YES, INCREMENT MSH
3260  2350          ISZ     CMPYR           /INCREMENT MULTIPLIER
3261  5246          JMP     .-13
3262  7200          CLA                     /(Y,12291)*(X,3)
3263  1351          TAD     X               /ANSWER IN Y AND Y+1
3264  1353          TAD     Y
3265  3353          DCA     Y
3266  7200          CLA
3267  7100          CLL


3270  1352          TAD     X+1
3271  1354          TAD     Y+1
3272  3354          DCA     Y+1
3273  7430          SZL                     /OVERFLOW?
3274  2353          ISZ     Y               /YES, INCREMENT MSH
3275  7200          CLA                     /1,10**7/Y=CYCLE TIME,100
3276  3347          DCA     CYCLE
3277  1353          TAD     Y               /Y=-Y
3300  7040          CMA
3301  3353          DCA     Y
3302  7300          CLA CLL
3303  1354          TAD     Y+1
3304  7041          CIA
3305  3354          DCA     Y+1
3306  7430          SZL
3307  2353          ISZ     Y
3310  7200          CLA
3311  1355          TAD     C4611           /MOST SIG HALF OF 10**7
3312  3351          DCA     X
3313  1356          TAD     C3200           /LEAST SIG HALF OF 10**7
3314  3352          DCA     X+1
3315  7300          CLA CLL
3316  1352          TAD     X+1             /X=Y LSH
3317  1354          TAD     Y+1
3320  3352          DCA     X+1
3321  1351          TAD     X               /X=Y MSH
3322  7430          SZL
```

```
3123  7001            IAC
3124  7100            CLL
3125  1353            TAD     Y
3126  3351            DCA     X
3127  7420            SNL
3130  5333            JMP     .+3
3131  2347            ISZ     CYCLE
3132  5315            JMP     .-15
3133  7200            CLA
3134  1347            TAD     CYCLE
3135  5600            JMP I   CTIME
3136  6032    CTIMEB, KCC                     /WRONG INTERRUPT
3137  1345            TAD     CTIMEX
3140  1373            TAD     (7
3141  3345            DCA     CTIMEX
3142  7430            SZL
3143  2346            ISZ     CTIMEY
3144  5400            JMP I   0
3145  0000    CTIMEX, 0
3146  0000    CTIMEY, 0
3147  0000    CYCLE,  0
3150  0000    CMPYR,  0
3151  0000    X,      0
3152  0000            0
3153  0000    Y,      0
3154  0000            0
3155  4611    C4611,  4611
3156  3200    C3200,  3200


3173  0007
3174  0003
3175  7775
3176  3024
3177  5402
      3200      PAGE
                /TRACK WRITERS FOR DISC CALIBRATION
3200  7402    TKCAL,  XX
3201  6611            DCEA
3202  7200            CLA
3203  1377            TAD (0000
3204  4776'           JMS FILL
3205  0000            0000
3206  1377            TAD (0
3207  4775'           JMS WRTLO
3210  1374            TAD (1
3211  4776'           JMS FILL
3212  0001            1
3213  1377            TAD (0
3214  4773'           JMS WRTHI
3215  1372            TAD (2
3216  4776'           JMS FILL
3217  0002            2
3220  1371            TAD (100
3221  4775'           JMS WRTLO
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3222  1370          TAD (3
3223  4776'         JMS FILL
3224  0003          3
3225  1371          TAD (100
3226  4773'         JMS WRTHI
3227  1367          TAD (4
3230  4776'         JMS FILL
3231  0004          4
3232  1366          TAD (200
3233  4775'         JMS WRTLO
3234  1365          TAD (5
3235  4776'         JMS FILL
3236  0005          5
3237  1366          TAD (200
3240  4773'         JMS WRTHI
3241  1364          TAD (6
3242  4776'         JMS FILL
3243  0006          6
3244  1363          TAD (300
3245  4775'         JMS WRTLO
3246  1362          TAD (7
3247  4776'         JMS FILL
3250  0007          7
3251  1363          TAD (300
3252  4773'         JMS WRTHI
3253  1361          TAD (10
3254  4776'         JMS FILL
3255  0010          10
3256  1360          TAD (400
3257  4775'         JMS WRTLO

3260  1357          TAD (11
3261  4776'         JMS FILL
3262  0011          11
3263  1360          TAD (400
3264  4773'         JMS WRTHI
3265  1356          TAD (12
3266  4776'         JMS FILL
3267  0012          12
3270  1355          TAD (500
3271  4775'         JMS WRTLO
3272  1354          TAD (13
3273  4776'         JMS FILL
3274  0013          13
3275  1355          TAD (500
3276  4773'         JMS WRTHI
3277  1353          TAD (14
3300  4776'         JMS FILL
3301  0014          14
3302  1352          TAD (600
3303  4775'         JMS WRTLO
3304  1351          TAD (15
3305  4776'         JMS FILL
3306  0015          15
```

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3307  1352            TAD (600
3310  4773'           JMS WRTHI
3311  1350            TAD (16
3312  4776'           JMS FILL
3313  0016            16
3314  1347            TAD (700
3315  4775'           JMS WRTLO
3316  1346            TAD (17
3317  4776'           JMS FILL
3320  0017            17
3321  1347            TAD (700
3322  4773'           JMS WRTHI
3323  5600            JMP I TKCAL

                PAUSE


3346  0017
3347  0700
3350  0016
3351  0015
3352  0600
3353  0014
3354  0013
3355  0500
3356  0012
3357  0011
3360  0400
3361  0010
3362  0007
3363  0300
3364  0006
3365  0005
3366  0200
3367  0004
3370  0003
3371  0100
3372  0002
3373  4067
3374  0001
3375  4053
3376  5013
3377  0000
      3400      PAGE
                /DATA TEST - TAPE 3
                /WRITE READ DISK COMPAR (OUT TO IN)
3400  7000      DWRCOI, NOP
3401  7200            CLA
3402  1377            TAD (0                  /TRACK 0
3403  4776'           JMS WRTLO
3404  1377            TAD (0
3405  4775'           JMS RDLO
3406  1377            TAD (0                  /TRACK 1
3407  4774'           JMS WRTHI
3410  1377            TAD (0
```

```
3411  4773'          JMS RDHI
3412  1372           TAD (100                /TRACK 2
3413  4776'          JMS WRTLO
3414  1372           TAD (100
3415  4775'          JMS RDLO
3416  1372           TAD (100                /TRACK 3
3417  4774'          JMS WRTHI
3420  1372           TAD (100
3421  4773'          JMS RDHI
3422  1371           TAD (200                /TRACK 4
3423  4776'          JMS WRTLO
3424  1371           TAD (200
3425  4775'          JMS RDLO
3426  1371           TAD (200                /TRACK 5
3427  4774'          JMS WRTHI
3430  1371           TAD (200
3431  4773'          JMS RDHI
3432  1370           TAD (300                /TRACK 6
3433  4776'          JMS WRTLO
3434  1370           TAD (300
3435  4775'          JMS RDLO
3436  1370           TAD (300                /TRACK 7
3437  4774'          JMS WRTHI
3440  1370           TAD (300
3441  4773'          JMS RDHI
3442  1367           TAD (400                /TRACK 8
3443  4776'          JMS WRTLO
3444  1367           TAD (400
3445  4775'          JMS RDLO
3446  1367           TAD (400                /TRACK 9
3447  4774'          JMS WRTHI

3450  1367           TAD (400
3451  4773'          JMS RDHI
3452  1366           TAD (500                /TRACK 10
3453  4776'          JMS WRTLO
3454  1366           TAD (500
3455  4775'          JMS RDLO
3456  1366           TAD (500                /TRACK 11
3457  4774'          JMS WRTHI
3460  1366           TAD (500
3461  4773'          JMS RDHI
3462  1365           TAD (600                /TRACK 12
3463  4776'          JMS WRTLO
3464  1365           TAD (600
3465  4775'          JMS RDLO
3466  1365           TAD (600                /TRACK 13
3467  4774'          JMS WRTHI
3470  1365           TAD (600
3471  4773'          JMS RDHI
3472  1364           TAD (700                /TRACK 14
3473  4776'          JMS WRTLO
3474  1364           TAD (700
3475  4775'          JMS RDLO
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3476  1364          TAD (700                /TRACK 15
3477  4774'         JMS WRTHI
3500  1364          TAD (700
3501  4773'         JMS RDHI
3502  7000          NOP
3503  5600          JMP I DWRCOI


              /DISK CHECK READ (OUT TO IN)
3504  7000    CKRDOI, NOP
3505  7200          CLA                     /TRACK 1ST
3506  4775'         JMS RDLO
3507  1377          TAD (0                  /TRACK 2ND
3510  4773'         JMS RDHI
3511  1372          TAD (100                /TRACK 3RD
3512  4775'         JMS RDLO
3513  1372          TAD (100                /TRACK 4TH
3514  4773'         JMS RDHI
3515  1371          TAD (200                /TRACK 5TH
3516  4775'         JMS RDLO
3517  1371          TAD (200                /TRACK 6TH
3520  4773'         JMS RDHI
3521  1370          TAD (300                /TRACK 7TH
3522  4775'         JMS RDLO
3523  1370          TAD (300                /TRACK 8TH
3524  4773'         JMS RDHI
3525  1367          TAD (400                /TRACK 9TH
3526  4775'         JMS RDLO
3527  1367          TAD (400                /TRACK 10TH
3530  4773'         JMS RDHI
3531  1366          TAD (500                /TRACK 11TH
3532  4775'         JMS RDLO
3533  1366          TAD (500                /TRACK 12TH
3534  4773'         JMS RDHI
3535  1365          TAD (600                /TRACK 13TH
3536  4775'         JMS RDLO
3537  1365          TAD (600                /TRACK 14TH
3540  4773'         JMS RDHI
3541  1364          TAD (700                /TRACK 15TH
3542  4775'         JMS RDLO
3543  1364          TAD (700                /TRACK 16TH
3544  4773'         JMS RDHI
3545  5704          JMP I CKRDOI            /EXIT
              /EXECT WRITE READ DISK

3546  4200          JMS DWRCOI
3547  4304          JMS CKRDOI
3550  5346          JMP .-2


3564  0700
3565  0600
3566  0500
3567  0400
3570  0300
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3571  0200
3572  0100
3573  4121
3574  4067
3575  4104
3576  4053
3577  3000
      3600    PAGE
              /WRITE ONE PAGE
              /JMS ;;; WITH DISK ADDRESS IN AC
3600  7000    WPAGE,  NOP
3601  3777'           DCA WADD                /DISK ADDRESS
3602  1376            TAD (-200
3603  3775'           DCA WC                  /WORD COUNT
3604  1374            TAD (OUTBUF-1
3605  3773'           DCA IACW                /INITIAL ADDRESS
3606  1777'           TAD WADD                /DISK ADDRESS
3607  6605            DMAW                    /LOAD DISK - WRITE
3610  6621            DFSE                    /WAIT FOR FLAG
3611  4772'           JMS STATUS
3612  6622            DFSC
3613  5210            JMP .-3
3614  5600            JMP I WPAGE             /EXIT
              /
              /READ ONE PAGE
              /JMS ;;; WITH DISK ADDRESS IN AC

3615  7000    RPAGE,  NOP
3616  3771'           DCA RADD                /DISK ADDRESS
3617  1376            TAD (-200
3620  3775'           DCA WC                  /WORD COUNT
3621  1370            TAD (INBUF-1
3622  3773'           DCA IACW                /INITIAL ADDRESS
3623  1771'           TAD RADD                /DISK ADDRESS
3624  6603            DMAR                    /LOAD DISK ;;; READ
3625  6621            DFSE                    /WAIT FOR FLAG
3626  4772'           JMS STATUS
3627  6622            DFSC
3630  5225            JMP .-3
3631  5615            JMP I RPAGE             /EXIT


              /COMPARE OUTBUFFER WITH INBUFFER
3632  5232    COMPARE,        JMP .
3633  7200            CLA
3634  1367            TAD (-10
3635  3766'           DCA ERCT                /ERROR COUNT
3636  1370            TAD (INBUF-1            /INBUFFER - IAW
3637  3011            DCA 11
3640  1374            TAD (OUTBUF-1           /OUTBUFFER - IAW
3641  3012            DCA 12
3642  1376            TAD (-200
3643  3261            DCA CTB                 /LOOP COUNTER
3644  7200    COMA,   CLA
3645  1411            TAD I 11
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3646  3765'           DCA BD                  /DATA THAT WAS READ
3647  1412            TAD I 12
3650  3764'           DCA GD                  /DATA THAT WAS WRITTEN
3651  1764'           TAD GD
3652  7041            CIA
3653  1765'           TAD BD
3654  7640            SZA CLA
3655  4763'           JMS ERRCOM              /ERROR
3656  2261            ISZ CTB                 /DONE
3657  5244            JMP COMA                /NO
3660  5632            JMP I COMPAR            /YES EXIT
3661  0000  CTB,     0


                      /WRITE READ COMPARE
3662  7000  PWRC,     NOP
3663  7200            CLA
3664  1262            TAD     PWRC
3665  3762'           DCA     RDLO
3666  1361            TAD (3700
3667  4200            JMS WPAGE
3670  4760'           JMS FLUSH
3671  1361            TAD (3700
3672  4215            JMS RPAGE
3673  4232            JMS COMPARE
3674  5662            JMP I PWRC

                      /CHECK ZEROS

3675  7000  WRC00,     NOP
3676  7200            CLA
3677  1357            TAD (0000               /0000
3700  4756'           JMS FILL
3701  0000            0000
3702  4262            JMS PWRC
3703  5675            JMP I WRC00

                      /CHECK SEVENS
3704  7000            NOP
3705  7000  WRC77,     NOP
3706  7200            CLA                     /7777
3707  1355            TAD (7777               /7777
3710  4756'           JMS FILL
3711  7777            7777
3712  4262            JMS PWRC
3713  5705            JMP I WRC77

3755  7777
3756  5013
3757  0000
3760  5000
3761  3700
3762  4104
3763  6200
3764  6626
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3765  6625
3766  6612
3767  7770
3772  7177
3771  6602
3772  6400
3773  7751
3774  6777
3775  7750
3776  7600
3777  6601
      4000    PAGE

              /DO WRC OF DIFFERENT NUMBER - PAGE BASIC

4000  7000    WRCX,   NOP
4001  7200            CLA
4002  6615            DEAL
4003  7200            CLA
4004  1377            TAD (7777               /7777
4005  4776'           JMS FILL
4006  0000            0000            /0000
4007  4775'           JMS PWRC
4010  1374            TAD (7070               /7070
4011  4776'           JMS FILL
4012  7070            7070            /7070
4013  4775'           JMS PWRC
4014  1373            TAD (0707               /0707
4015  4776'           JMS FILL
4016  7070            7070            /7070
4017  4775'           JMS PWRC
4020  1372            TAD (5252               /5252
4021  4776'           JMS FILL
4022  2525            2525            /2525
4023  4775'           JMS PWRC
4024  1371            TAD (0123               /0123
4025  4776'           JMS FILL
4026  4567            4567            /4567
4027  4775'           JMS PWRC
4030  1370            TAD (0303               /0303
4031  4776'           JMS FILL
4032  0303            0303            /0303
4033  4775'           JMS PWRC
4034  1367            TAD (7474               /7474
4035  4776'           JMS FILL
4036  7474            7474            /7474
4037  4775'           JMS PWRC
4040  4766'           JMS RANFIL
4041  4775'           JMS PWRC
4042  1377            TAD (7777
4043  4776'           JMS FILL
4044  0001            0001
4045  4775'           JMS PWRC
4046  1365            TAD (3776
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4047  4776'           JMS FILL
4250  4001            4001
4251  4775'           JMS PWRC
4252  5200            JMP WRCX


                      /ROUTINE TO WRITE EVEN TRACKS
                      /JMS WRTLO ,,, WITH TRACK ADDRESS IN AC

4253  5253    WRTLO,  JMP .
4254  0364            AND (3700
4255  3763'           DCA TKADD               /TRACK ADDRESS
4256  1763'           TAD TKADD
4257  6615            DEAL                    /LOAD TRACK ADDRESS
4260  7200            CLA
4261  4762'           JMS WPAGE               /WRITE A PAGE
4262  4761'           JMS WSYNC               /RETURN WITH MAC I N AC
4263  7500            SMA                     /SAME TRACK
4264  5261            JMP .-3                 /YES
4265  7200            CLA
4266  5653            JMP I WRTLO             /NO DONE EXIT

                      /ROUTINE TO WRITE ODD TRACKS
                      /JMS WRTLO ,,, WITH TRACK ADDRESS IN AC
4267  5267    WRTHI,  JMP .
4270  0364            AND (3700
4271  3763'           DCA TKADD               /STORE TRACK ADDRESS
4272  1763'           TAD TKADD
4273  6615            DEAL                    /LOAD EXTENDED ADDRESS
4274  7200            CLA
4275  1360            TAD (4000               /2048 TO 4095
4276  4762'           JMS WPAGE               /WRITE A PAGE
4277  4761'           JMS WSYNC               /RETURN WITH MAC IN AC
4100  7510            SPA                     /SAME TRACK
4101  5276            JMP .-3                 /YES
4102  7200            CLA
4103  5667            JMP I WRTHI             /NO DONE EXIT


                      /ROUTINE TO READ EVEN TRACKS
                      /JMS RDLO ,,, WITH TRACK ADDRESS IN AC

4104  5304    RDLO,   JMP .
4105  0364            AND (3700
4106  3763'           DCA TKADD               /TRACK ADDRESS
4107  1763'           TAD TKADD
4110  6615            DEAL                    /LOAD TRACK ADDRESS
4111  7200            CLA
4112  4757'           JMS RPAGE               /READ A PAGE
4113  4756'           JMS COMPAR              /COMPARE
4114  4755'           JMS SYNC                /RETURN WITH MAC IN AC
4115  7500            SMA                     /SAME TRACK
4116  5312            JMP .-4                 /YES
4117  7200            CLA
```

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4120  5704          JMP I RDLO              /NO DONE = EXIT

                    /ROUTINE TO READ ODD TRACKS
                    /JMS RDHI ,,, WITH TRACK ADDRESS IN AC

4121  5321    RDHI, JMP .
4122  0364          AND (3700
4123  3763'         DCA TKADD               /TRACK ADDRESS
4124  1763'         TAD TKADD               /LOAD TRACK ADDRESS
4125  6615          DEAL
4126  7200          CLA
4127  1360          TAD (4000
4130  4757'         JMS RPAGE               /READ A PAGE
4131  4756'         JMS COMPAR              /COMPARE
4132  4755'         JMS SYNC                /RETURN WITH MAC IN AC
4133  7510          SPA                     /SAME TRACK
4134  5330          JMP .+4                 /YES
4135  7200          CLA
4136  5721          JMP I RDHI              /NO = DONE = EXIT


4155  4472
4156  3632
4157  3615
4160  4000
4161  4500
4162  3600
4163  6604
4164  3700
4165  3776
4166  4627
4167  7474
4170  0303
4171  0123
4172  5252
4173  0707
4174  7070
4175  3662
4176  5013
4177  7777
      4200    PAGE


                    /QUICK TEST OF EACH TRACK

4200  0000          0                       /TRACK STORAGE
4201  0000          0                       /COUNTER
4202  4777'   MARGIN, JMS RANFIL            /RANDOM FILL
4203  1376          TAD (-7
4204  3201          DCA MARGIN-1            /COUNTER
4205  7200          CLA
4206  3200          DCA MARGIN-2            /TRACK
4207  1200          TAD MARGIN-2
4210  3200          DCA MARGIN-2
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4211  1200            TAD MARGIN-2
4212  6615            DEAL
4213  4775'           JMS PWRC                /PAGE WRITE READ COMPARE
4214  7200            CLA
4215  1374            TAD (0100
4216  2201            ISZ MARGIN-1
4217  5207            JMP .-10
4220  7200            CLA
4221  5203            JMP MARGIN+1

                /WRITE ONE PAGE TO BE USED WITH MARGIN TEST
                /WRITE FROM INBUFFER AREA

4222  7402      WPAGEX, XX
4223  3773'           DCA WADD                /DISC ADDRESS
4224  1372            TAD (-200
4225  3771'           DCA WC                  /WORD COUNT
4226  1370            TAD (INBUF-1
4227  3767'           DCA IACW                /CURRENT ADDRESS
4230  1773'           TAD WADD
4231  6605            DMAW                    /WRITE
4232  6622            DFSC                    /SKIP ON DONE
4233  5232            JMP .-1
4234  5622            JMP I WPAGEX            /EXIT


4235  0000      SYNCT,  0
4236  7200            CLA
4237  3766'           DCA CTA
4240  1365            TAD (-6660
4241  3764'           DCA CTC
4242  1764'           TAD CTC
4243  3763'           DCA CTD
4244  6616            DEAC
4245  7000            NOP
4246  7500            SMA
4247  5253            JMP .+4
4250  2764'           ISZ CTC
4251  5244            JMP .-5
4252  5635            JMP I SYNCT
4253  6616            DEAC
4254  7000            NOP
4255  7510            SPA
4256  5266            JMP .+10
4257  2763'           ISZ CTD
4260  5253            JMP .-5
4261  5635            JMP I SYNCT
4262  6616            DEAC
4263  7000            NOP
4264  7500            SMA
4265  5635            JMP I SYNCT
4266  2766'           ISZ CTA
4267  5262            JMP .-5
4270  5635            JMP I SYNCT
```

```
4271  0000    CONV,   0
4272  7200            CLA
4273  1362            TAD (-6
4274  3763'           DCA CTD
4275  1761'           TAD CTB
4276  2763'           ISZ CTD
4277  5275            JMP .-2
4300  3761'           DCA CTB
4301  7330            CLA CLL CML RAR
4302  7002            7002
4303  7710            SPA CLA
4304  5760'           JMP     NOT8E
4305  1357            TAD (12
4306  7041            CIA
4307  3763'           DCA CTD
4310  1766'           TAD CTA
4311  2763'           ISZ CTD
4312  5310            JMP .-2
4313  3766'           DCA CTA
4314  7200    CONVB,  CLA
4315  1761'           TAD CTB
4316  4756'           JMS DEC
4317  4333            RCT
4320  7200            CLA
4321  1766'           TAD CTA

4322  4756'   NOSYNC, JMS DEC
4323  4343            SCT
4324  6046            TLS
4325  6041            TSF
4326  5325            JMP .-1
4327  4755'           JMS MESAGE
4330  4543            4543
4331  2220            2220
4332  1540            1540
4333  0000    RCT,    0
4334  0000            0
4335  4023            4023
4336  3116            3116
4337  0340            0340
4340  2411            2411
4341  1505            1505
4342  7540            7540
4343  7777    SCT,    7777
4344  7777            7777
4345  4015            4015
4346  1103            1103
4347  2217            2217
4350  4023            4023
4351  0503            0503
4352  2300.           2300
4353  5671            JMP I CONV
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4356  6634
4357  7012
4360  2464
4361  3661
4362  7772
4363  6611
4364  6603
4365  1120
4366  6610
4367  7751
4370  7177
4371  7750
4372  7600
4373  6601
4374  0120
4375  3662
4376  7771
4377  4627
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                4400    PAGE
                        /DISK WRITE CURRENT TEST
4400  7402      DKI,    XX
4401  7200              CLA
4402  1377              TAD (7777               /FILL WITH SEVENS
4403  4776'             JMS FILL
4404  7777              7777
4405  4775'             JMS WDISK               /MAKE SURE DISC IS SATURATED
4406  4775'             JMS WDISK
4407  4775'             JMS WDISK
4410  1374              TAD (3777               /WRITE COMPLIMENT
4411  4776'             JMS FILL
4412  3777              3777
4413  4775'             JMS WDISK
4414  4773'             JMS CKRDOI              /READ COMPARE
4415  4775'             JMS WDISK
4416  4775'             JMS WDISK               /WRITE NEW PATTERN
4417  1377              TAD (7777               /TO SATURATE DISK
4420  4776'             JMS FILL                /COMPLIMENTED DATA
4421  7777              7777
4422  4775'             JMS WDISK               /WRITE COMPLIMENT
4423  4773'             JMS CKRDOI              /READ COMPARE
4424  5600              JMP I DKI


                        /ROUTINE TO TRANSFER DATA TO EXT MEMORY
                        /S, R, BIT 9,10,11 , , , SELECT EXT BANK

4425  7402      XBANK,  HLT
4426  7604              LAS
4427  7004              RAL
4430  7006              RTL
4431  0372              AND (0070
4432  3771'             DCA BX                  /BANK "X"
4433  6615              DEAL
4434  4770'             JMS WRC77               /BANK 0 TO DISC
4435  7200              CLA
4436  1771'             TAD BX
4437  6615              DEAL
4440  7200              CLA
4441  1367              TAD (3700               /DISC TO X6200 TO X6400
4442  4766'             JMS RPAGE               /DISC TO BANK "X"
4443  7200              CLA
4444  6615              DEAL
4445  4765'             JMS WRC00               /CLEAN THE DISC FROM BANK 0
4446  7200              CLA
4447  1771'             TAD BX
4450  6615              DEAL
4451  7200              CLA
4452  1367              TAD (3700
4453  4764'             JMS WPAGEX              /BANK X TO DISC
4454  7200              CLA
4455  6615              DEAL
4456  7200              CLA
```

```
4457  1367          TAD (3700
4460  4766'         JMS RPAGE               /DISC TO BANK 0
4461  7240          CLA CMA
4462  4763'         JMS FILLA
4463  7777          7777
4464  4762'         JMS COMPAR
4465  5226          JMP XBANK+1


              /GROUP OF SUBROUTINES
              /WAIT FOR FLAG
4466  5266    FLAG, JMP .
4467  6622          DFSC                    /FLAG
4470  5267          JMP .+1                 /NO
4471  5666          JMP I FLAG              /YES EXIT

              /WAIT FOR SYNC ... EXIT WITH DMAC IN AC

4472  5272    SYNC, JMP .
4473  6616          DEAC                    /READ SYNC BIT 0
4474  7500          SMA                     /SYNC
4475  5273          JMP .+2                 /NO
4476  6626          DMAC                    /YES = READ MAC
4477  5672          JMP I SYNC              /EXIT

              /EXIT WITH DMAC PLUS ONE IN AC
4500  5300    WSYNC, JMP .
4501  4272          JMS SYNC
4502  1361          TAD (1)
4503  5700          JMP I WSYNC             /EXIT


              /SUBROUTINE TO INCREMENT ON TRACK ERROR
              /
4504  7402    TKTST, XX
4505  2760'         ISZ KA
4506  4292          JMS SYNC                /DMA IN AC
4507  0357          AND (3776
4510  7640          SZA CLA                 /NEW TRACK
4511  5704          JMP I TKTST             /NO
4512  1760'         TAD KA                  /ERROR PER TRACK
4513  0356          AND (7300
4514  7640          SZA CLA                 /LESS THAN 400
4515  4755'         JMS ERTK                /NO
4516  2754'         ISZ ERRTK               /YES *** TRACK BEING TESTED
4517  3760'         DCA KA                  /CLEAR FOR NEXT TRACK
4520  5704          JMP I TKTST

              /INHIBIT PRINT OUT WHEN SW0 = 1
              /
4521  7402    IPRINT, XX
4522  3753'         DCA AC
4523  7604          LAS                     /CHECK SWITCH
4524  7700          SMA CLA                 /SW0 = 1
4525  5333          JMP .+6                 /NO *** PRINTOUT
```

```
4526  1321          TAD IPRINT              /YES --- SET UP RETURN TO
4527  1352          TAD (-2                 /SKIP PRINT ROUTINE
4530  3321          DCA IPRINT
4531  1721          TAD I IPRINT
4532  3321          DCA IPRINT
4533  1753'         TAD AC
4534  5721          JMP I IPRINT
                    /
                    /WRITE MEMORY IN FIRST TWO TRACKS

4535  5335    WALL, JMP .
4536  6611          DCEA                    /TRACK ZERO
4537  3751'         DCA WC                  /4096 WORDS
4540  3750'         DCA IACW                /0000
4541  6605          DMAW                    /LOAD MAC, WRITE
4542  5735          JMP I WALL              /EXIT

4543  7402    EXSW, XX
4544  7604          LAS
4545  6615          DEAL
4546  7200          CLA
4547  5743          JMP I EXSW


4550  7751
4551  7750
4552  7776
4553  6614
4554  6606
4555  5632
4556  7300
4557  3776
4560  6600
4561  0001
4562  3632
4563  5035
4564  4222
4565  3675
4566  3615
4567  3700
4570  3705
4571  6613
4572  0070
4573  3504
4574  3777
4575  5065
4576  5013
4577  7777
      4600    PAGE
                    /
                    /ROUTINE TO CLEAR FLAG AND SETUP INTERRUPT
4600  7000    CLFLAG, NOP
4601  7200          CLA
4602  1377          TAD (JMP I 0000
4603  3001          DCA 0001
```

```
4604  6002            IOF
4605  6022            PCF
4606  6042            TCF
4607  6012            RRB
4610  6072            6072
4611  7000            NOP
4612  6032            KCC
4613  7000            NOP
4614  6104            6104
4615  6601            DCMA
4616  5600            JMP I CLFLAG

4617  5217    RANDOM, JMP .
4620  1776'           TAD NUM
4621  7104            RAL CLL
4622  7430            SZL
4623  1375            TAD (3
4624  3776'           DCA NUM
4625  1776'           TAD NUM
4626  5617            JMP I RANDOM

4627  7402    RANFIL, HLT
4630  7200            CLA
4631  1374            TAD (-200
4632  3773'           DCA CTA
4633  1372            TAD (OUTBUF-1
4634  3011            DCA 11
4635  7200            CLA
4636  4217            JMS RANDOM
4637  3411            DCA I 11
4640  2773'           ISZ CTA
4641  5235            JMP .-4
4642  4771'           JMS    FLUSH
4643  5627            JMP I RANFIL


                /ROUTINE TO WRITE A TRACK
                /1ST HALT LOAD DATA IN SR
                /WHILE RUNNING SR 8-11=TRACK
                /
4644  4255            JMS FILLX               /WRITE A TRACK
4645  4266            JMS WRTX
4646  5245            JMP .-1
4647  4305            JMS RDX         //      /READ A TRACK
4650  5247            JMP .-1
4651  4255            JMS FILLX               /WRITE/READ A TRACK
4652  4266            JMS WRTX
4653  4305            JMS RDX
4654  5252            JMP .-2

4655  7402    FILLX,  XX                      /FILL OUT BUFFER
4656  7402            HLT
4657  7604            LAS
4660  3263            DCA .+3
4661  1263            TAD .+2
```

```
4662  4770'           JMS FILL
4663  7402            XX
4664  7402            HLT                     /TO SET UP TK SELECTION
4665  5655            JMP I FILLX

4666  7402    WRTX,   XX                      /WRITE SPECIFIED TRACK
4667  7604            LAS
4670  3767'           DCA TKADD
4671  1767'           TAD TKADD
4672  7010            RAR
4673  7630            SZL CLA
4674  5301            JMP .+5
4675  1767'           TAD TKADD
4676  4324            JMS RL5
4677  4766'           JMS WRTLO
4700  5666            JMP I WRTX
4701  1767'           TAD TKADD
4702  4324            JMS RL5
4703  4765'           JMS WRTHI
4704  5666            JMP I WRTX

4705  7402    RDX,    XX                      /READ SPECIFIED TRACK
4706  7604            LAS
4707  3767'           DCA TKADD
4710  1767'           TAD TKADD
4711  7010            RAR
4712  7630            SZL CLA
4713  5320            JMP .+5
4714  1767'           TAD TKADD
4715  4324            JMS RL5
4716  4764'           JMS RDLO
4717  5705            JMP I RDX
4720  1767'           TAD TKADD
4721  4324            JMS RL5
4722  4763'           JMS RDHI
4723  5705            JMP I RDX

                /ROTATE LEFT 5 AND CLEAR LINK
4724  7402    RL5,    XX
4725  7106            CLL RTL
4726  7006            RTL
4727  7004            RAL
4730  5724            JMP I RL5


                /SUB ROUTINES
                /WRITE ONE WORD OF 7777 AT SPECIFIED ADDRESS
                /JMS WONEW7
                /AC=ADDRESS OF WHERE TO BE WRITTEN

4731  5331    WONEW7, JMP .
4732  3000            DCA 0000                /ST  STORE DISK ADDRESS
4733  3762'           DCA CTC                      CLEAR WAIT COUNTER
4734  7240            CLA CMA
4735  3761'           DCA WC                  /ONE WORD  SET WORD COUNT = -1
```

```
4736  7240            CLA CMA
4737  3760'           DCA IACW                /(IACW) = 0000 =1  SET CURRENT ADDRESS = 7777
4740  1000            TAD 0000                /LOAD DISK ADDRESS AND INITIATE WRITE
4741  6605            DMAW
4742  7000            NOP
4743  7000            NOP                     /CHECK FOR COMPLETION
4744  6622            DFSC                    /WAIT
4745  7410            SKP
4746  5351            JMP .+3                 /RETURN IF COMPLETE
4747  2762'           ISZ CTC                 /TIME OUT ?
4750  5342            JMP .-6
4751  5731            JMP I WONEW7
4752  0000            0

4760  7751
4761  7750
4762  6603
4763  4121
4764  4104
4765  4067
4766  4053
4767  6604
4770  5013
4771  5000
4772  6777
4773  6610
4774  7600
4775  0003
4776  6607
4777  5400
      5000      PAGE
                /CLEAR INBUF TO ALL ZEROS
5000  5200      FLUSH,  JMP .
5001  7200              CLA
5002  1377              TAD (-200
5003  3776'             DCA CTA
5004  1375              TAD (INBUF-1            /IACW OF INBUF
5005  3011              DCA 11
5006  7200              CLA
5007  3411              DCA I 11                /DEPOSIT ZERO
5010  2776'             ISZ CTA                 /DONE
5011  5206              JMP .-3                 /NO LOOP
5012  5600              JMP I FLUSH             /YES EXIT

                /FILL OUTBUFFER WITH DATA
                /JMS FILL FIRST WORD IN AC
                /XXXX = SECOND WORD

5013  5213      FILL,   JMP .
5014  3774'             DCA WORD1               /FIRST WORD
5015  4200              JMS FLUSH
5016  1613              TAD I FILL
5017  3773'             DCA WORD2               /SECOND WORD
5020  2213              ISZ FILL
5021  1372              TAD (-100
```

```
5022  3776'           DCA CTA
5023  1371            TAD (OUTBUF-1           /IACW OF OUTBUFFER
5024  3011            DCA 11
5025  7200            CLA
5026  1774'           TAD WORD1               /DEPOSIT FIRST WORD
5027  3411            DCA I 11
5030  1773'           TAD WORD2               /DEPOSIT SECOND WORD
5031  3411            DCA I 11
5032  2776'           ISZ CTA                 /DONE
5033  5225            JMP .-6                 /NO ;;; LOOP
5034  5613            JMP I FILL              /YES ;;; EXIT
5035  0000  FILLA,    0
5036  3774'           DCA WORD1
5037  1235            TAD FILLA
5040  3213            DCA FILL
5041  5216            JMP FILL+3



                /SCOPE LOOP SET UP
5042  7402  SCOPEA,   XX
5043  4770'           JMS TRACE
5044  7604            LAS                     /LOAD ADDRESS SWITCH
5045  0367            AND (1000               /AND FOR SCOPE LOOP
5046  7640            SZA CLA                 /SCOPE LOOP
5047  5653            JMP I RETURN            /YES
5050  1242            TAD SCOPEA              /NO-SETUP REFERENCE
5051  3253            DCA RETURN
5052  5642            JMP I SCOPEA
                /POINTER FOR SCOPE LOOP

5053  5166  RETURN,   (BEGIN
5054  5653            JMP I .-1

                /ROUTINE TO RING BELL
5055  7402  BELL,     XX
5056  7200            CLA
5057  1365            TAD (207
5060  6046            TLS
5061  6041            TSF
5062  5261            JMP .-1
5063  5655            JMP I BELL
5064  7000            NOP

                /ROUTINE TO WRITE DISK (ANY NUMBER OF DISKS)
5065  7402  WDISK,    XX
5066  6611            DCEA                    /TRACK ZERO
5067  7200            CLA
5070  3764'           DCA GA                  /DISC ADDRESS ZERO
5071  3763'           DCA TKADD               /TRACK ZERO
5072  1362            TAD (-10
5073  3776'           DCA CTA                 /TRACK COUNTER
5074  1361            TAD (-40
5075  3360            DCA (XX                 /PAGE COUNTER
5076  4757'           JMS WPAGE               /WRITE
```

```
5077  1356          TAD (200                /INCREMENT BY
5100  1764'         TAD GA                  /PREVIOUS INITIAL ADDRESS
5101  3764'         DCA GA                  /STORE
5102  1764'         TAD GA                  /LOAD FOR WRITE
5103  2360          ISZ (XX                 /ALL PAGES
5104  5276          JMP .+6                 /NO
5105  7200          CLA                     /YES
5106  1355          TAD (100                /INCREMENT TRACKS
5107  1763'         TAD TKADD
5110  6615          DEAL                    /LOAD TRACK
5111  3763'         DCA TKADD               /STORE TRACK
5112  2776'         ISZ CTA                 /ALL TRCKS
5113  5274          JMP WDISK+7             /NO
5114  6611          DCEA                    /YES
5115  5665          JMP I WDISK             /EXIT

                /ROUTINE OF DISK CAN NUMBER OF DISK1
5116  7402    RDISK,  XX
5117  7200          CLA
5120  1354          TAD (-377               /NUMBER OF TRACKS
5121  3360          DCA (XX
5122  6615          DEAL
5123  7200          CLA
5124  4753'         JMS RPAGE               /READ
5125  4752'         JMS SYNC                /FIND NEXT ADDRESS
5126  2360          ISZ (XX
5127  5324          JMP .+3
5130  7200          CLA
5131  5716          JMP I RDISK


5152  4472
5153  3615
5154  7401
5155  0100
5156  0200
5157  3600
5160  7402
5161  7740
5162  7770
5163  6604
5164  6622
5165  0207
5166  0421
5167  1000
5170  5327
5171  6777
5172  7700
5173  6616
5174  6615
5175  7177
5176  6610
5177  7600
      5200    PAGE
```

```
                    /READ RECOVERY TIME
                    /WRITE 200 TO 377
                    /READ 400 TO 577
                    /TIME FROM WRITE TO READ 16,5 * 21 MICROSECONDS
5200  7402    RDREC,  XX
5201  7240            CLA CMA
5202  4777'           JMS FILL                /OUTPUT=7777
5203  7777            7777
5204  7200            CLA
5205  1376            TAD (RDREC
5206  3775'           DCA RDLO                /TAG FOR PRINTOUT
5207  4774'           JMS WDISK               /WRITE THE DISC
5210  6611            DCEA
5211  1137            TAD C200
5212  1373            TAD (-1
5213  3772'           DCA WADD
5214  1371            TAD (-200
5215  3770'           DCA WC
5216  1367            TAD (OUTBUF-1
5217  3766'           DCA IACW
5220  1772'           TAD WADD
5221  6605            DMAW                    /REWRITE 200 TO 377
5222  1365            TAD (401
5223  1373            TAD (-1
5224  3764'           DCA RADD
5225  1371            TAD (-200
5226  6622            DFSC                    /READ FLAG
5227  5226            JMP .-1                 /NO
5230  3770'           DCA WC
5231  1363            TAD (INBUF-1
5232  3766'           DCA IACW
5233  1764'           TAD RADD
5234  6603            DMAR                    /READ 401 TO 600
5235  4762'           JMS FLAG
5236  6621            DFSE
5237  4761'           JMS STATUS
5240  4760'           JMS COMPAR
5241  5600            JMP I RDREC
                    PAUSE


                    /TAPE 4
                    /RANDOM WORD ADDRESS AND TRACK TEST
5242  7000    RANDSK, NOP
5243  7200            CLA
5244  6601            DCMA
5245  4757'           JMS RANDOM
5246  0356            AND (0700
5247  3323            DCA RANTK               /TRACK ADDRESS
5250  4757'           JMS RANDOM
5251  3324            DCA RANAD               /MEMORY ADDRESS COUNTER
5252  4757'           JMS RANDOM
5253  3325            DCA RANWD               /WORD
5254  7240            CLA CMA
5255  3770'           DCA WC                  /WORD CT=7777
```

```
5256  7200          CLA
5257  1355          TAD (RANWD-1
5260  3766'         DCA IACW
5261  1323          TAD RANTK
5262  6615          DEAL                    /LOAD TRACK ADDRESS
5263  7200          CLA
5264  1324          TAD RANAD
5265  6605          DMAW                    /LOAD MAC WRITE
5266  4762'         JMS FLAG
5267  7240          CLA CMA
5270  3770'         DCA WC                  /ONE WORD
5271  1354          TAD (RANWD              /ONE GREATER THAN READ

                    /
5272  3766'         DCA IACW
5273  1323          TAD RANTK
5274  6615          DEAL                    /LOAD TRACK
5275  7200          CLA
5276  1324          TAD RANAD
5277  6603          DMAR                    /LOAD MAC READ
5300  4762'         JMS FLAG
5301  6621          DFSE                    /PARITY ERROR
5302  4753'         JMS ERADD               /YES
5303  7200          CLA                     /NO
5304  1325          TAD RANWD               /WRITE
5305  7041          CIA
5306  1326          TAD RANWD+1             /READ FROM DISK
5307  7650          SNA CLA                 /READ FROM DISK
5310  5642          JMP I RANDSK
5311  6616          DEAC                    /READ STATUS
5312  7112          CLL RTR
5313  7630          SZL CLA                 /WRITE LOCK OR NO DISC
5314  5642          JMP I RANDSK
5315  1326          TAD RANWD+1
5316  3752'         DCA BD
5317  1325          TAD RANWD
5320  3751'         DCA GD
5321  4750'         JMS BADCOM              /GOOD DATA
5322  5642          JMP I RANDSK

5323  0000  RANTK,  0                       /RANDOM TRACK ADDRESS
5324  7402  RANAD,  HLT                     /RANDOM DISK MEMORY ADDRESS COUNTER
5325  0000  RANWD,  0                       /RANDOM DATA WORD TO BE WRITTEN
5326  0000          0                       /RANDOM DATA WORD READ BACK
5327  0000  TRACE,  0
5330  7604          LAS
5331  7010          RAR
5332  7420          SNL
5333  5727          JMP I TRACE
5334  4747'         JMS SIXTY
5335  5042          SCOPEA
5336  5342          ,+4
5337  5343          ,+4
5340  4746'         JMS MESAGE
5341  4543          4543
```

```
5342  6060            6060
5343  6060            6060
5344  0000            0000
5345  5727            JMP I TRACE



5346  2221
5347  2261
5350  6040
5351  6626
5352  6625
5353  5600
5354  5325
5355  5324
5356  0700
5357  4617
5360  3632
5361  6400
5362  4466
5363  7177
5364  6602
5365  0401
5366  7751
5367  6777
5370  7750
5371  7600
5372  6601
5373  7777
5374  5065
5375  4104
5376  5200
5377  5013
      5400    PAGE
              /SCOPE LOOP FOR FAILING DATA LOCATION
              /THIS ROUTINE USES THE RESULTS OF ERRCOM
5400  1377            TAD (NOP                /HOUSEKEEPING
5401  7200    SCOPE,  CLA
5402  1776'           TAD ERRDSK
5403  7450            SNA                     /EQUAL TO ZERO
5404  5232            JMP SCOPE1              /YES
5405  0377            AND (7000               /NO
5406  7450            SNA                     /EQUAL TO 0XXX
5407  5217            JMP SCOPE2              /YES
5410  0375            AND (4000               /NO
5411  7640            SZA CLA                 /EQUAL TO (1XX) (XXX) (XXX) (XXX)
5412  5224            JMP SCOPE3              /YES
5413  1776'           TAD ERRDSK              /NO
5414  1377            TAD (7000               /SUBTRACT 1000 FROM DISK ADDRESS
5415  3776'           DCA ERRDSK
5416  5236            JMP SCOPE4
5417  7200    SCOPE2, CLA                     /CORRECT LOW TRACK
5420  1776'           TAD ERRDSK
5421  1374            TAD (2777
5422  3776'           DCA ERRDSK
```

```
5423  5236            JMP SCOPE4
5424  7200  SCOPE3,  CLA                     /CORRECT HIGH TRACK
5425  1776'           TAD ERRDSK
5426  1373            TAD (3777
5427  1375            TAD (4000
5430  3776'           DCA ERRDSK
5431  5236            JMP SCOPE4
5432  7200  SCOPE1,  CLA                     /CORRECT ZERO CASE
5433  1373            TAD (3777
5434  1776'           TAD ERRDSK
5435  3776'           DCA ERRDSK
5436  7000  SCOPE4,  OPR

                      /WRITE 1 WORD AT LOCATION BEFORE FAILING LOCATION,
5437  7240            CLA CMA
5440  3772'           DCA WC                  /ONE WORD
5441  1371            TAD (GD-1
5442  3770'           DCA IACW                /GOOD DATA - WRITE
5443  1767'           TAD ERRTK               /TRACK ADDRESS
5444  6615            DEAL                    /LOAD TRACK
5445  1776'           TAD ERRDSK              /LOAD DISK ADDRESS START WRITE
5446  6605            DMAW
5447  6622            DFSC                    /DONE?
5450  5247            JMP .-1                 /NO
5451  7000            OPR


                      /READ ONE WORD
5452  7240            CLA CMA
5453  3772'           DCA WC                  /ONE WORD
5454  1366            TAD (BD-1               /BAD DATA-READ
5455  3770'           DCA IACW
5456  1767'           TAD ERRTK               /TRACK ADDRESS
5457  6615            DEAL                    /LOAD TRACK
5460  1776'           TAD ERRDSK              /DISK ADDRESS
5461  6603            DMAR                    /START READ
5462  6622            DFSC                    /DONE
5463  5262            JMP .-1                 /NO
5464  7000            OPR
5465  5236            JMP SCOPE4              /JUMP TO WRITE

                      /DATA TONE LOOP WITH BELL ON ERROR
5466  7402  DBELL,   HLT
5467  7604            LAS
5470  0365            AND     (76
5471  4764'           JMS RL5
5472  6615            DEAL                    /LOAD TRACK AND DISC
5473  7402            HLT
5474  7604            LAS                     /LOAD ADDRESS
5475  3763'           DCA CA
5476  7402            HLT
5477  7604            LAS                     /LOAD DATA
5500  3762'           DCA CD
5501  7240            CLA CMA
5502  3772'           DCA WC                  /ONE WORD
```

```
5503  1371          TAD (GD-1
5504  3772'         DCA IACW
5505  1763'         TAD GA
5506  6605          DMAW                    /WRITE
5507  4761'         JMS FLAG
5510  7240          CLA CMA
5511  3772'         DCA WC                  /ONE WORD
5512  1366          TAD (BD-1
5513  3770'         DCA IACW
5514  1763'         TAD GA
5515  6603          DMAR                    /READ
5516  4761'         JMS FLAG
5517  7200          CLA
5520  1762'         TAD GD
5521  7041          CIA
5522  1771'         TAD BD
5523  7440          SZA                     /COMPARE
5524  4760'         JMS BELL                /ERROR
5525  5276          JMP DBELL+10



                /ADDRESS SCOPE LOOP WITH BELL ON ERROR
                    HALT
5526  4757'         JMS ERADD                       /LOAD ADDRESS
5527  7604          LAS
5530  3763'         DCA GA
5531  1763'         TAD GA
5532  4756'         JMS WONEW7              /AC=ADDRESS      WRITE ONE WORD AT DISK ADDR. IN SWITCHES
5533  4755'         JMS SYNC                /ADDRESS+1 IN AC WAIT FOR PHOTO CELL SYNC AND READ BACK ADDRESS
5534  7041          CIA
5535  1763'         TAD GA
5536  7440          SZA             /TEST GOOD
5537  4760'         JMS BELL                /NO
5540  5327          JMP .+11                /YES



                /PDP 8 DISC
5555  4472
5556  4731
5557  5600
5560  5055
5561  4466
5562  6626
5563  6622
5564  4724
5565  0076
5566  6624
5567  6606
5570  7751
5571  6625
5572  7750
5573  3777
```

```
5574  2777
5575  4000
5576  6605
5577  7000
      5600    PAGE
              /PRINT OUT ROUTINES
              /ROUTINE TO PRINT OUT FAILING TEST ADDRESS
5600  7402    ERADD,  XX
5601  4777'           JMS IPRINT
5602  6002            IOF
5603  4776'           JMS SIXTY
5604  5600            ERADD

5605  5611            ,+4
5606  5612            ,+4
5607  4775'           JMS MESAGE
5610  4543            4543
5611  6060            6060
5612  6060            6060
5613  4000            4000
5614  4776'           JMS SIXTY
5615  6614            AC
5616  5622            ,+4
5617  5623            ,+4
5620  4775'           JMS MESAGE
5621  4040            4040
5622  6060            6060
5623  6060            6060
5624  0000            0000
5625  7604            LAS                     /TEST FOR HALT
5626  0374            AND (2000
5627  7640            SZA CLA
5630  7402            HLT                     /HALT IF SW1 = ONE
5631  5600            JMP I ERADD

              /TRACK ERROR RATIO PRINT OUT
              /TKXX BAD XXXX ----- LESS THAN 200 NOT PRINTED
              /
5632  7402    ERTK,   XX
5633  4777'           JMS IPRINT
5634  4776'           JMS SIXTY
5635  6606            ERRTK                   /TRACK NUMBER
5636  5647            ,+11
5637  5647            ,+10
5640  4776'           JMS SIXTY
5641  6600            KA                      /NUMBER OF ERRORS
5642  5653            ,+11
5643  5654            ,+11
5644  4775'           JMS MESAGE
5645  4543            4543
5646  2413            2413
5647  6060            6060
5650  4040            4040
5651  0201            0201
```

```
5652  0440            0440
5653  6060            6060
5654  6060            6060
5655  0000            0
5656  5632            JMP I ERTK

                      /
                      /PRINT OUT NUMBER OF PASSES
                      /
5657  7402    ENDCT,  XX
5660  4776'           JMS SIXTY
5661  6617            END                     /NUMBER OF PASS COMPLETED
5662  5667            ,+5
5663  5667            ,+4
5664  4775'           JMS MESAGE
5665  4543            4543
5666  2003            2003
5667  6060            6000
5670  0000            0
5671  5657            JMP I ENDCT


5672  7402    STOP,   XX
5673  7604            LAS
5674  0374            AND (2000
5675  7650            SNA CLA
5676  7410            SKP
5677  7402            HLT
5700  5672            JMP I STOP
5701  0000    SPEED,  0
5702  6032            KCC
5703  6042            TCF
5704  1373            TAD (-143
5705  3772'           DCA CTA
5706  3771'           DCA CTB
5707  7200            CLA
5710  1370            TAD (RINT
5711  3002            DCA 2
5712  1367            TAD (JMP I 2
5713  3001            DCA 1
5714  7200            CLA
5715  6046            TLS
5716  6001            ION
5717  6616            DEAC
5720  7000            NOP
5721  7700            SMA CLA
5722  5317            JMP .+3
5723  6616            DEAC
5724  7000            NOP
5725  7710            SPA CLA
5726  5323            JMP .+3
5727  2771'           ISZ CTB
5730  7000            NOP
5731  5317            JMP .+12
```

```
5732  6041    RINT,   TSF
5733  5355            JMP ADDR+1
5734  6042            TCF
5735  3357            DCA ACSAV
5736  1754            TAD I ADDR
5737  6046            TLS
5740  6001            ION
5741  7200            CLA
5742  2766'           ISZ CTC
5743  5346            JMP .+3
5744  1365            TAD (NOP
5745  3346            DCA .+1
5746  2354    ADDINC, ISZ ADDR
5747  1357            TAD ACSAV
5750  2772'           ISZ CTA
5751  5400            JMP I 0
5752  6002            IOF
5753  5701            JMP I SPEED
5754  0000    ADDR,   0
5755  6001            ION
5756  5400            JMP I 0
5757  0000    ACSAV,  0


5765  7000
5766  6603
5767  5402
5770  5732
5771  3661
5772  6610
5773  7635
5774  2000
5775  0201
5776  0261
5777  4521
      6000    PAGE
              /PRINT OUT ROUTINE FOR BAD TRACK
6000  7402    ETRACK, XX
6001  4777'           JMS IPRINT
6002  4776'           JMS SIXTY
6003  6000            .+3
6004  6010            .+4
6005  6011            .+4
6006  4775'           JMS MESAGE
6007  4543            4543
6010  6060            6060
6011  6060            6060
6012  0000            0000
6013  4776'           JMS SIXTY
6014  6623            GT                      /GOOD TRACK
6015  6027            .+12
6016  6030            .+12
6017  4776'           JMS SIXTY
6020  6624            BT                      /BAD TRACK
6021  6033            .+12
```

```
6022  6034            ,+12
6023  4775'           JMS MESAGE
6024  4040            4040
6025  0724            0724
6026  4040            4040
6027  6060            6060
6030  6060            6060
6031  4002            4002
6032  2440            2440
6033  6060            6060
6034  6060            6060
6035  0000            0000
6036  4774'           JMS STOP
6037  5600            JMP I ETRACK


                /COMPARISON ERROR PRINT OUT
                /GDXXXX  BDXXXX
6040  7402      BADCOM, XX
6041  4777'           JMS IPRINT
6042  4776'           JMS SIXTY
6043  6040            ,-3
6044  6050            ,+4
6045  6051            ,+4
6046  4775'           JMS MESAGE
6047  4543            4543
6050  6060            6060
6051  6060            6060
6052  0000            0000
6053  4776'           JMS SIXTY
6054  6626            GD                      /GOOD
6055  6067            ,+12
6056  6070            ,+12
6057  4776'           JMS SIXTY
6060  6625            BD                      /BAD
6061  6073            ,+12
6062  6074            ,+12
6063  4775'           JMS MESAGE
6064  4040            4040                    /CR LF
6065  0704            0704                    /GOOD DATA
6066  4040            4040
6067  6060            6060
6070  6060            6060
6071  4002            4002
6072  0440            0440                    /BAD DATA
6073  6060            6060
6074  6060            6060
6075  0000            0000
6076  4774'           JMS STOP
6077  5640            JMP I BADCOM            /EXIT

                /SYNC ADDRESS TEST PRINT OUT GAXXXX  SYNCXXXX
6100  7402      ERSYNC, XX
6101  4777'           JMS IPRINT
```

```
6102  4776'           JMS SIXTY
6103  6621            BA                      /MAC
6104  6123            SYNC1+11                /BAD ADDRESS
6105  6124            SYNC1+12
6106  4776'           JMS SIXTY
6107  6622            GA
6110  6116            SYNC1+4                 /GOOD ADDRESS
6111  6117            SYNC1+5
6112  4775'   SYNC1,   JMS MESAGE
6113  4543            4543                    /CR LF
6114  0701            0701                    /GA
6115  4040            4040
6116  6060            6060                    /GOOD ADDRESS
6117  6060            6060
6120  4023            4023                    /SYNC
6121  3116            3116
6122  0340            0340
6123  6060            6060                    /BAD ADDRESS
6124  6060            6060
6125  0000            0000
6126  4774'           JMS STOP
6127  5700            JMP I ERSYNC


              /FALSE COMPARE AT ADDRESS XXXX
              /FALCOM XXXX
6130  7402    TEXTE,  XX
6131  4777'           JMS IPRINT
6132  4776'           JMS SIXTY
6133  6622            GA                      /FROM
6134  6144            .+10                    /TO
6135  6145            .+10                    /TO
6136  4775'           JMS MESAGE
6137  4543            4543                    /FALCOM XXXX
6140  0601            0601
6141  1403            1403
6142  1715            1715
6143  4040            4040
6144  6060            6060
6145  6060            6060
6146  0000            0000
6147  4774'           JMS STOP
6150  5730            JMP I TEXTE

6174  5672
6175  0201
6176  0261
6177  4521
      6200    PAGE


              /COMPARISON ERROR PRINTOUT
6200  7402    ERRCOM, XX
6201  4777'           JMS IPRINT
6202  2776'           ISZ ERCT                /ERROR COUNT
```

```
6203  7410          SKP
6204  5775'         JMP CTB-1
6205  7300          CLA CLL
6206  1774'         TAD CTB                 /COMPARE LOOP COUNTER
6207  0373          AND (0177               /EXTRACT HOW FAR
6210  1772'         TAD RADD                /ADD TO INITIAL DISK ADDRESS
6211  1371          TAD (1                  /CORRECT
6212  3770'         DCA ERRDSK              /ERROR DISK ADDRESS
6213  4767'         JMS SYNC
6214  6616          DEAC                    /READ TRACK COUNTER
6215  0366          AND (0700               /EXTRACT TRACK
6216  3765'         DCA ERRTK               /ERROR TRACK ADDRESS
6217  7100          CLL
6220  1770'         TAD ERRDSK
6221  7004          RAL
6222  3770'         DCA ERRDSK
6223  7004          RAL
6224  3764'         DCA LINKA
6225  1765'         TAD ERRTK
6226  7012          RTR
6227  7012          RTR
6230  7012          RTR
6231  3765'         DCA ERRTK
6232  1764'         TAD LINKA
6233  7010          RAR
6234  1765'         TAD ERRTK
6235  7004          RAL
6236  3765'         DCA ERRTK
6237  1770'         TAD ERRDSK
6240  7010          RAR
6241  3770'         DCA ERRDSK
6242  4763'         JMS SIXTY
6243  4104          RDLO
6244  6250          ,+4
6245  6251          ,+4
6246  4762'         JMS MESAGE
6247  4543          4543
6250  6060          6060
6251  6060          6060
6252  4000          4000
6253  4763'         JMS SIXTY
6254  6606          ERRTK                   /ERROR TRACK
6255  6276          ,+21
6256  6276          ,+20
6257  4763'         JMS SIXTY
6260  6605          ERRDSK                  /DISK ADDRESS
6261  6301          ,+20
6262  6302          ,+20
6263  4763'         JMS SIXTY
6264  6626          GD                      /GOOD DATA
6265  6305          ,+20
6266  6306          ,+20
6267  4763'         JMS SIXTY
6270  6625          BD                      /BAD DATA
6271  6311          ,+20
```

```
6272  6312            ,+20
6273  4762'           JMS MESAGE
6274  4024            4024                    /DSK ADDRESS
6275  1340            1340
6276  6060            6060
6277  4004            4004
6300  0140            0140
6301  6060            6060                    /GOOD DATA
6302  6060            6060
6303  4007            4007
6304  0440            0440
6305  6060            6060
6306  6060            6060                    /BAD DATA
6307  4002            4002
6310  0440            0440
6311  6060            6060
6312  6060            6060
6313  0000            0000
6314  4761'           JMS STOP
6315  5600            JMP I ERRCOM


6316  7402    BADADD, XX
6317  4777'           JMS IPRINT              /INHIBIT PRINTOUT
6320  4763'           JMS SIXTY
6321  6316            ,+3
6322  6326            ,+4
6323  6327            ,+4
6324  4762'           JMS MESAGE
6325  4543            4543
6326  6060            6060
6327  6060            6060
6330  0000            0000
6331  4763'           JMS SIXTY
6332  6622            GA
6333  6345            ,+12
6334  6346            ,+12
6335  4763'           JMS SIXTY
6336  6621            BA
6337  6351            ,+12
6340  6352            ,+12
6341  4762'           JMS MESAGE
6342  4040            4040
6343  0701            0701
6344  4040            4040
6345  6060            6060
6346  6060            6060
6347  4002            4002
6350  0140            0140
6351  6060            6060
6352  6060            6060
6353  0000            0000
6354  4761'           JMS STOP
6355  5716            JMP I BADADD
```

```
6361  5672
6362  0201
6363  0261
6364  6632
6365  6606
6366  0700
6367  4472
6370  6605
6371  0001
6372  6602
6373  0177
6374  3661
6375  3660
6376  6612
6377  4521
      6400    PAGE

6400  0000    STATUS, 0
6401  4777'           JMS IPRINT
6402  6616            DEAC
6403  3776'           DCA SR
6404  4775'           JMS MESAGE
6405  4543            4543
6406  2324            2324                    /ST
6407  0124            0124                    /AT
6410  4005            4005                    /E
6411  2222            2222                    /RR
6412  4040            4040
6413  0000            0000
6414  7200            CLA
6415  1200            TAD STATUS
6416  7041            CIA
6417  1374            TAD (WPAGE-12
6420  7440            SZA
6421  5227            JMP .+6
6422  4775'           JMS MESAGE
6423  2722            2722                    /WR
6424  1124            1124                    /IT
6425  0500            0500                    /E
6426  5233            JMP .+5
6427  4775'           JMS MESAGE
6430  2205            2205                    /RE
6431  0104            0104                    /AD
6432  0000            0000
6433  1773'           TAD TKADD
6434  0372            AND (0700
6435  7012            RTR
6436  7012            RTR
6437  7012            RTR
6440  3771'           DCA ERRTK
6441  1770'           TAD RADD
6442  7100            CLL
6443  7004            RAL
6444  3767'           DCA ERRDSK
```

```
6445  1771'           TAD ERRTK
6446  7004            RAL
6447  3771'           DCA ERRTK
6450  1767'           TAD ERRDSK
6451  7010            RAR
6452  3767'           DCA ERRDSK
6453  4766'           JMS SIXTY
6454  6606            ERRTK
6455  6471            ,+14
6456  6471            ,+13
6457  4766'           JMS SIXTY

6460  6605            ERRDSK
6461  6474            ,+13
6462  6475            ,+13
6463  4775'           JMS MESAGE
6464  4040            4040
6465  2301            2301                    /SA
6466  7540            7540                    /=
6467  4024            4024                    /T
6470  1340            1340                    /K
6471  6060            6060
6472  4004            4004                    /D
6473  0140            0140                    /A
6474  6060            6060
6475  6060            6060
6476  0000            0000
6477  7200            CLA
6500  1776'           TAD SR
6501  4341            JMS STAT
6502  3306            DCA ,+4
6503  4775'           JMS MESAGE
6504  4543            4543
6505  2005            2005                    /PE
6506  6060            6060
6507  0000            0000
6510  7200            CLA
6511  1765'           TAD STATSV
6512  4341            JMS STAT
6513  3323            DCA ,+10
6514  4775'           JMS MESAGE
6515  4040            4040
6516  1605            1605                    /NE
6517  0440            0440                    /D
6520  1722            1722                    /OR
6521  4027            4027                    /W
6522  1417            1417                    /LO

6523  6060            6060
6524  0000            0000
6525  7200            CLA
6526  1765'           TAD STATSV
6527  4341            JMS STAT
6530  3335            DCA ,+5
6531  4775'           JMS MESAGE
```

```
6532  4040              4040
6533  0422              0422                    /DR
6534  1440              1440                    /L
6535  6060              6060
6536  4300              4300
6537  4764'             JMS STOP
6540  5600              JMP I STATUS
6541  0000    STAT,     0
6542  7120              CLL
6543  7010              RAR
6544  3765'             DCA STATSV
6545  7430              SZL
6546  5351              JMP .+3
6547  1353              TAD STAT0
6550  5741              JMP I STAT
6551  1354              TAD STAT1
6552  5741              JMP I STAT
6553  7560    STAT0,    7560
6554  7561    STAT1,    7561
6564  5692
6565  6633
6566  0261
6567  6605
6570  6602
6571  6606
6572  0700
6573  6604
6574  3612
6575  0201
6576  6620
6577  4521
      6600    PAGE


              /CONSTANTS
      6611    DCEA=6611                         /CL EXT ADDRESS REGISTER
      6614    DIEF=6614
      6601    DCMA=6601                         /CLEAR MAR, PE, DONE
      6612    DSAC=6612                         /CLEAR AC SKIP ON ADC
      6603    DMAR=6603                         /LOAD AND START READ
      6605    DMAW=6605                         /LOAD AND START WRITE
      6615    DEAL=6615                         /LOAD EXTENDED ADDRESS
      6616    DEAC=6616                         /READ EXTENDED ADDRESS
      6621    DFSE=6621                         /SKIP ON NO ERROR
      6622    DFSC=6622                         /SKIP ON FLAG
      6626    DMAC=6626                         /READ DISK ADDRESS
      7402    XX=7402                           /
      7750    WC=7750
      7751    IACW=7751
      7751    CACW=IACW
6600  0000    KA,       0
6601  0000    WADD,     0                       /IACW=1 FOR WRITE
6602  0000    RADD,     0                       /IACW=1 FOR READ
6603  0000    CTC,      0
```

```
6604  0000    TKADD,  0
6605  0000    ERRDSK, 0                       /DISK ERROR ADDRESS
6606  0000    ERRTK,  0
6607  0001    NUM,    1
6610  0000    CTA,    0
6611  0000    CTD,    0
6612  0000    ERCT,   0                       /ERROR COUNT FOR COMPARES
6613  0000    BX,     0                       /STORE EXT. MEMORY BANK
6614  0000    AC,     0                       /SAVE AC
6615  0000    WORD1,  0
6616  0000    WORD2,  0
6617  0000    END,    0                       /NUMBER OF PASS COMPLETED
6620  0000    SR,     0                       /STATUS REGISTER
6621  0000    BA,     0                       /BAD ADDRESS
6622  0000    GA,     0                       /GOOD ADDRESS
6623  0000    GT,     0                       /GOOD TRACK
6624  0000    BT,     0                       /BAD TRACK
6625  0000    BD,     0                       /BAD DATA
6626  0000    GD,     0                       /GOOD DATA
6627  0000    CTADC,  0
6630  0000            0
6631  0000            0
6632  0000    LINKA,  0
6633  0000    STATSV, 0

6634  0000    DEC,    0
6635  3326            DCA DECA
6636  3327            DCA THOU
6637  3330            DCA HUND
6640  3331            DCA TENS
6641  3332            DCA UNIT
6642  1326            TAD DECA
6643  7450            SNA
6644  5302            JMP PACK
6645  7100            CLL
6646  1377            TAD (-1750
6647  7420            SNL
6650  5253            JMP .+3
6651  2327            ISZ THOU
6652  5245            JMP .-5
6653  1376            TAD (1750
6654  7450            SNA
6655  5302            JMP PACK
6656  1375            TAD (-144
6657  7510            SPA
6660  5263            JMP .+3
6661  2330            ISZ HUND
6662  5256            JMP .-4
6663  1374            TAD (144
6664  7450            SNA
6665  5302            JMP PACK
6666  1373            TAD (-12
6667  7510            SPA
6670  5273            JMP .+3
6671  2331            ISZ TENS
```

```
6672  5266            JMP .-4
6673  1372            TAD (12
6674  7450            SNA
6675  5302            JMP PACK
6676  1371            TAD (-1
6677  2332            ISZ UNIT
6700  7440            SZA
6701  5276            JMP .-3
6702  7200    PACK,   CLA
6703  1634            TAD I DEC
6704  3326            DCA DECA
6705  2234            ISZ DEC
6706  1327            TAD THOU
6707  7106            RTL CLL
6710  7006            RTL
6711  7006            RTL
6712  1330            TAD HUND
6713  1370            TAD (6060
6714  3726            DCA I DECA
6715  2326            ISZ DECA
6716  1331            TAD TENS
6717  7106            RTL CLL
6720  7006            RTL
6721  7006            RTL
6722  1332            TAD UNIT

6723  1370            TAD (6060
6724  3726            DCA I DECA
6725  5634            JMP I DEC
6726  0000    DECA,   0
6727  0000    THOU,   0
6730  0000    HUND,   0
6731  0000    TENS,   0
6732  0000    UNIT,   0

6733  0215    TABL,   215
6734  0212            212
6735  0304            304
6736  0311            311
6737  0323            323
6740  0315            315
6741  0240            240
6742  0304            304
6743  0301            301
6744  0324            324
6745  0301            301
6746  0240            240
6747  0324            324
6750  0305            305
6751  0323            323
6752  0324            324
6753  0215            215
6754  0212            212
6755  0252            252
6770  6060
```

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6771  7777
6772  0012
6773  7766
6774  0144
6775  7634
6776  1750
6777  6030
```

```
                7000    PAGE
7000    0000    OUTBUF, 0
                7200    PAGE
7200    0000    INBUF,  0



                7400    *7400
                        /ROUTINE TO RESTORE ADDRESSES 7750 AND 7751 IN BINARY LOADER
                        /AND TO START BINARY LOADER,

7400    7300            CLA CLL
7401    1206            TAD K1355
7402    3610            DCA I I7750
7403    1207            TAD K5743
7404    3611            DCA I I7751
7405    5612            JMP I I7777             /START BINARY LOADER,
7406    1355    K1355,  1355
7407    5743    K5743,  5743
7410    7750    I7750,  7750
7411    7751    I7751,  7751
7412    7777    I7777,  7777

                $
0137    0200
0140    2651
0141    6200
0142    6400
0143    6600
0144    1111
0145    1077
0146    4425
0147    4202
0150    4000
0151    2724
0152    4651
0153    4647
0154    4644
0155    5466
0156    5527
0157    2715
0160    2707
0161    5401
0162    2045
0163    2040
0164    2000
0165    1431
0166    1120
0167    4322
0170    7410
0171    2212
0172    7240
0173    5040
0174    5242
0175    4400
```

```
0176  0400
0177  5200
```

```
:000  00000000  00000000  11111111  11111111  11111111  11111111  11111111  11100001
'100  11111111  11111111  11110000  00000001  11111111  11111111  11111111  11111111

'200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
'300  11111111  11111111  11111111  11111111  11111100  00000000  00000000  00011111

'400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
'500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

'600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
'700  11111100  00000000  00000000  00000000  00000000  00000000  00000000  01111111


000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
100  11111111  11111111  11111111  11111111  11111111  11000011  11111111  11111111

200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
300  11111111  11111111  11000000  00000000  00000000  00000000  00111111  11111111

400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
500  11111111  11111111  11111111  10000000  00000000  00011111  11111111  11111111

600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
700  11100000  00000000  00000000  00000000  00000000  00000000  00001111  11111111


000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
100  11111111  11111111  11111111  11111111  00111111  11111111  11111111  11111111

200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  00000000
300  00000000  00000000  00000000  00000000  00000000  00000000  11111111  11111111

400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
500  11111111  11111111  11111111  00000000  00000000  00000000  00111111  11111111

600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
700  11111111  11111111  11111111  11111111  11111111  11110011  11111111  11111111


000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
100  11111111  11111111  11111111  11111111  11111111  11111110  00000000  00011111

200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
300  11111111  11111111  11110000  00000000  00000011  11111111  11111111  11111111

400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
500  11111111  11111111  11111111  11111111  11111111  10000000  00001111  11111111

600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
700  11111111  11110000  00000000  00000000  00000000  00000111  11111111  11111111
```

```
4000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4100  11111111  11111111  11111111  11111110  00000000  00000111  11111111  11111111

4200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4300  11111111  11111111  11111111  11111111  11111111  11110111  11111111  11111111

4400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

4600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
4700  11111111  11111111  11111111  11111111  11111111  11100000  11111111  11111111

5000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5100  11111111  11111111  11111111  11000000  00000000  00111111  11111111  11111111

5200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5500  11111111  11111111  11111111  11111111  10000000  00000111  11111111  11111111

5600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5700  11111111  11111111  11111111  11111111  11111111  11111111  00000111  11111111

6000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6100  11111111  11111111  11111111  11111111  11111111  10000000  00000000  00001111

6200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6300  11111111  11111111  11111111  11111111  11111111  11111100  01111111  11111111

6400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6500  11111111  11111111  11111111  11111111  11111111  11111000  00001111  11111111

6600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6700  11111111  11111111  11111111  11111111  11111111  11111100  00000000  11111111

7000  10000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
7100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

7200  10000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
7300  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

7400  11111111  11100000  00000000  00000000  00000000  00000000  00000000  00000000
7500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

7600
7700
```

AC	6614	DISK	2200	MASKA	0341	SPEED	5701
ACSAV	5757	DISK0	2045	MASKB	0342	SR	6620
ADDINC	5746	DISK7	2052	MASKC	0343	START	0100
ADDR	5754	DISK7A	2057	MASKD	0344	STAT	6541
ASR1	1205	DISPAT	0020	MESAGE	0201	STAT0	6553
ASR2	1217	DKI	4400	MSRGHT	0217	STAT1	6554
ASR3	1225	DMAC	6626	MTP	0244	STATSV	6633
ATEST	1120	DMAR	6603	NOSYNC	4322	STATUS	6400
BA	6621	DMAW	6605	NOTBE	2464	STOP	5672
BADADD	6316	DSAC	6612	NUM	6607	SYNC	4472
BADCOM	6040	DWRCOI	3400	OUTBUF	7000	SYNC1	6112
BD	6625	END	6617	PACK	6702	SYNCT	4235
BEGIN	0421	ENDCT	5657	PHAN1	2646	TABL	6733
BELL	5055	ERADD	5600	PHAN2	2647	TADTST	2434
BT	6624	ERCT	6612	PWRC	3662	TEMP1	2641
BX	6613	ERRCOM	6200	RADD	6602	TEMP2	2642
C212	0255	ERRDSK	6605	RANAD	5324	TEMP3	2643
C215	0257	ERRTK	6606	RANDOM	4617	TEMP4	2644
C245	0260	ERSYNC	6100	RANDSK	5242	TEMP5	2645
C3200	3156	ERTK	5632	RANFIL	4627	TENS	6731
C340	0253	ETRACK	6000	RANTK	5323	TEXTE	6130
C4611	3155	EXSW	4543	RANWD	5325	THOU	6727
CACW	7751	FALCOM	1644	RATIO	2000	TKADD	6604
CKRDOI	3504	FCOM	1607	RCT	4333	TKCAL	3200
CLFLAG	4600	FCOM1	1613	RDADJ	2724	TKDEC	1431
CMPYR	3150	FILL	5013	RDHI	4121	TKERR	1523
COMA	3644	FILLA	5035	RDISK	5116	TKING	1401
COMPAR	3632	FILLX	4655	RDLO	4104	TKRD	1464
CONV	4271	FLAG	4466	RDREC	5200	TKTST	4504
CONVB	4314	FLUSH	5000	RDX	4705	TKWT	1440
CTA	6610	GA	6622	RETUJM	2650	TOL	1702
CTADC	6627	GD	6626	RETURN	5053	TRACE	5327
CTB	3661	GI	6623	REVCNT	1701	TSTDB	2040
CTC	6603	HUND	6730	RINT	5732	TYPECH	0220
CTD	6611	I7750	7410	RL5	4724	UNIT	6732
CTIME	3000	I7751	7411	RL6	0056	WADD	6601
CTIMEA	3024	I7777	7412	RONE	2676	WALL	4535
CTIMEB	3136	IACW	7751	ROT1TS	2400	WC	7700
CTIMEX	3145	INBUF	7200	ROT2TS	2416	WDISK	5065
CTIMEY	3146	IPRINT	4521	RPAGE	3615	WONE	2665
CYCLE	3147	ISETST	2245	RPM	0400	WONEW7	4731
DBELL	5466	JMRETU	2622	SARD	2715	WORD1	6615
DBTST	2205	JMSTST	2600	SAWD	2707	WORD2	6616
DCEA	6611	K1355	7406	SCOPE	5401	WPAGE	3600
DCMA	6601	K5743	7407	SCOPE1	5432	WPAGEX	4222
DEAC	6616	KA	6600	SCOPE2	5417	WRC00	3675
DEAL	6615	LINKA	6632	SCOPE3	5424	WRC77	3705
DEC	6634	M2	0256	SCOPE4	5436	WRCX	4000
DECA	6726	M3	0254	SCOPEA	5042	WRTHI	4067
DFSC	6622	M40	0252	SCT	4343	WRTLO	4053
DFSE	6621	MARGIN	4202	SIXTY	0261	WRTX	4666
DIEF	6614	MASK77	0251	SLOWB	0063	WSYNC	4500

```
WTRK    2651
X       3151
XBANK   4425
XX      7422
Y       3153


ERRORS DETECTED: 0

LINKS GENERATED: 749

RUN-TIME:  20 SECONDS

3K CORE USED
```