

IDENTIFICATION

Product Code: HAINDEC-08-D5CE-D
Product Name: DF32/DF32D Disk Data
Mini Disk, Interface
Address, Data Test
Date: June 15, 1970
Maintainer: Diagnostic Group
Author: John L. Wittell/Bill LaFlamme

ADDENDUM

1. With 50 cycle power, change memory location 1772 to 0064.
2. With an ASR37 (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 or PDP-8/L
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-
6000 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
Set the SWITCH REGISTER to 100. (77 for the PDP-8/s)
Load Address
Set the SWITCH REGISTER to all 0s (down)
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

SW0 UP Delete Printouts
SW1 UP Halt after error.
SW2 UP Subtest scope loop.
SW3 UP Do not exit section.
SW11 UP Trace (Type starting address of each TEST
as the program enters it)

5.1.1 Special Entrance Address

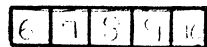
101 Address Test (slow)
102 Track Decode Test
103 Track Error Ratio Test
104 Data Break Test.

- 105 Data Test.
- 106 Read Recovery Time Test. (NOT USED ON IDP-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. Disk Track

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. SRO 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)

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

- 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.

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)- 200g 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)

<u>Address Tag</u>	<u>Function Tested?</u>
0433	DOES START KEY CLEAR (TRC) TRANSFER COMPLETE FF
0440	DOES START KEY CLEAR THE (DRL) DATA REQUEST LATE FF
0444	DOES START KEY CLEAR THE (ADC) ADDRESS CONFIRMED FF
0451	DOES START KEY CLEAR THE COMPUTER AND DISK EXT ADDRESS REGISTER
0457	NO INTERRUPT BOTH (TRC) AND (NED) ARE CLEARED
0470	DOES THE DCMA INSTRUCTION CLEAR NED?
0476	DOES START KEY CLEAR THE PARITY FF, STATUS IS TESTED
0507	FLAG UP TOO SOON ON A (DMAW) INSTRUCTION
0520	WILL A WRITE INSTRUCTION RAISE THE (TRC) FLAG
0531	DOES A WRITE INSTRUCTION CLEAR THE AC
0534	SKIP ON NO ERROR, ALL ERROR STATUS BITS ARE DOWN
0545	FLAG UP TOO SOON ON A (DMAR) CLEAR THE INSTRUCTION
0555	WILL A READ INSTRUCTION (DMAR) RAISE THE (TRC) FLAG
0610	DOES A READ INSTRUCTION (DMAR) CLEAR THE AC
0615	A DEAL INSTRUCTION SHOULD NOT CHANGE THE AC
0622	A DEAL INSTRUCTION SHOULD NOT CHANGE THE AC
0632	RAISE NED BY SELECTING EM3 WITH THE COMPUTER
0640	DOES THE DSAC INSTRUCTION CLEAR THE AC
0653	CAN (ADC) BE RAISED, TESTED BY SKIPPING ON (ADC) DSAC
0662	HAS (WLO) ON NED RAISED (PSM) STATUS
0675	TEST FOR NO WLO STATUS BIT
1014	DOES WC BREAK TO 7750
1017	DOES CA BREAK TO 7751
1033	THE SYNC MARK FOUND
1036	NED IS RAISED
1045	ADC IS UP WITH TRC SET (SHOULD ONLY BE UP DURING DATA BREAKS)
1062	DMAC DOES NOT SKP ON "TRC"
1076	WILL THE DISK INTERRUPT ON "TRC"
1110	WILL THE DISK INTERRUPT ON "NED"

6.1.3 Address Test

6.1.3.1 Address Test at Sync Time

GA 0002 Sync 0040 /"TA" OR "TB" 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.

6.1.3.2 Address Test at TRC Time

1303 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 XXX₈

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

6.1.5 Processor Instruction and Data Break Test, Reference 11

Halt (PC)	<u>Function Tested</u>
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

3.1 Execution Time

Approximately 30 minutes for PDP-8 or 8/1	60 cycles
Approximately 40 minutes for PDP-8/S	60 cycles
Approximately 55 minutes for PDP-8/S	50 cycles

9. PROGRAM DESCRIPTION

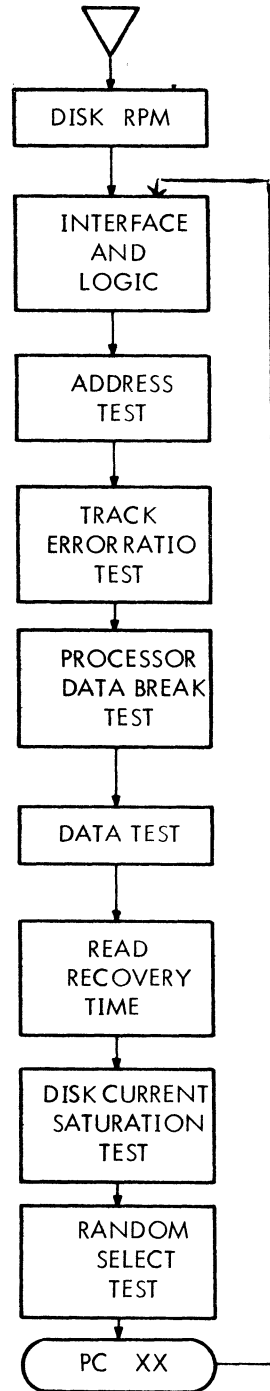
9.1 Discussion

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 written on the track in 200 word segments until the track is full. Then the track is read in segments into a 200 word inbuffer. 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, comparison is made between the inbuffer and out buffer area. If the comparisons test fails the disk address, the good data and the bad data are printed out.

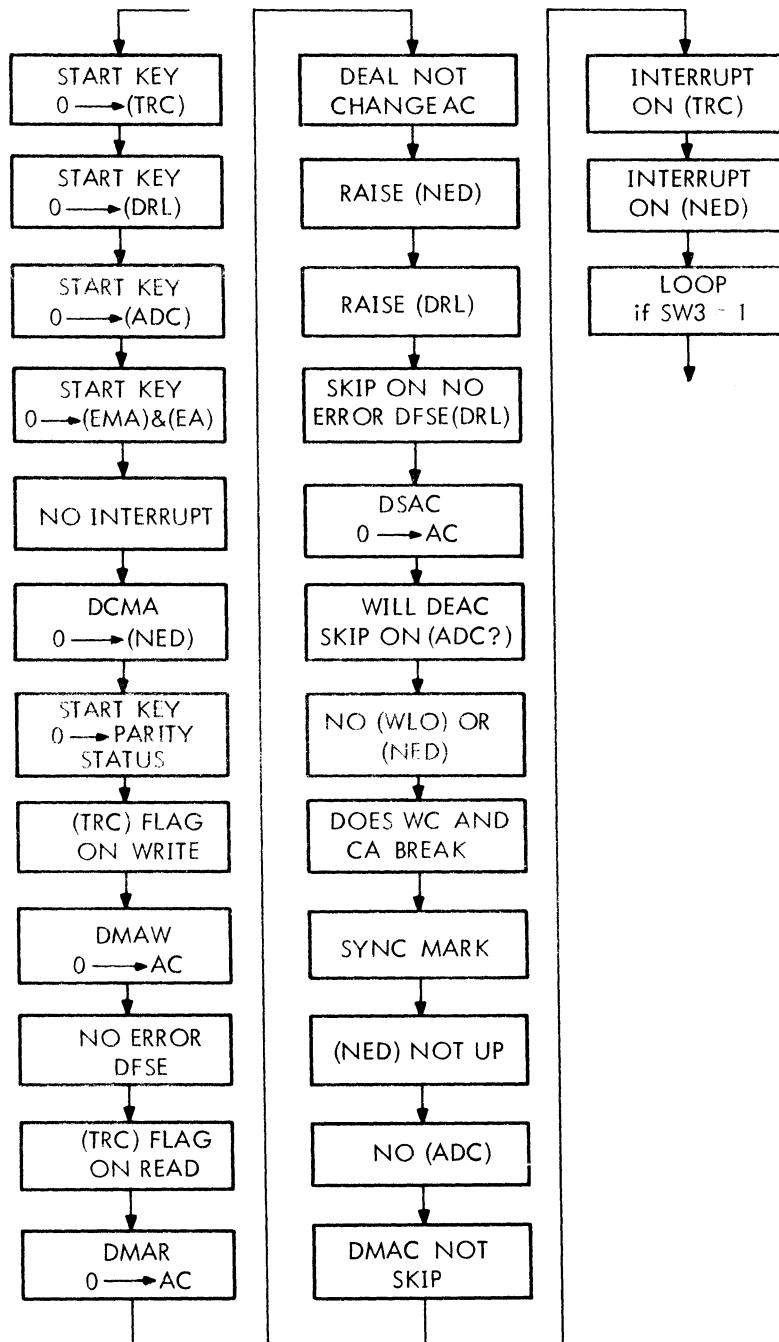
10. LISTINGS

11. 2 FLOW DIAGRAMS

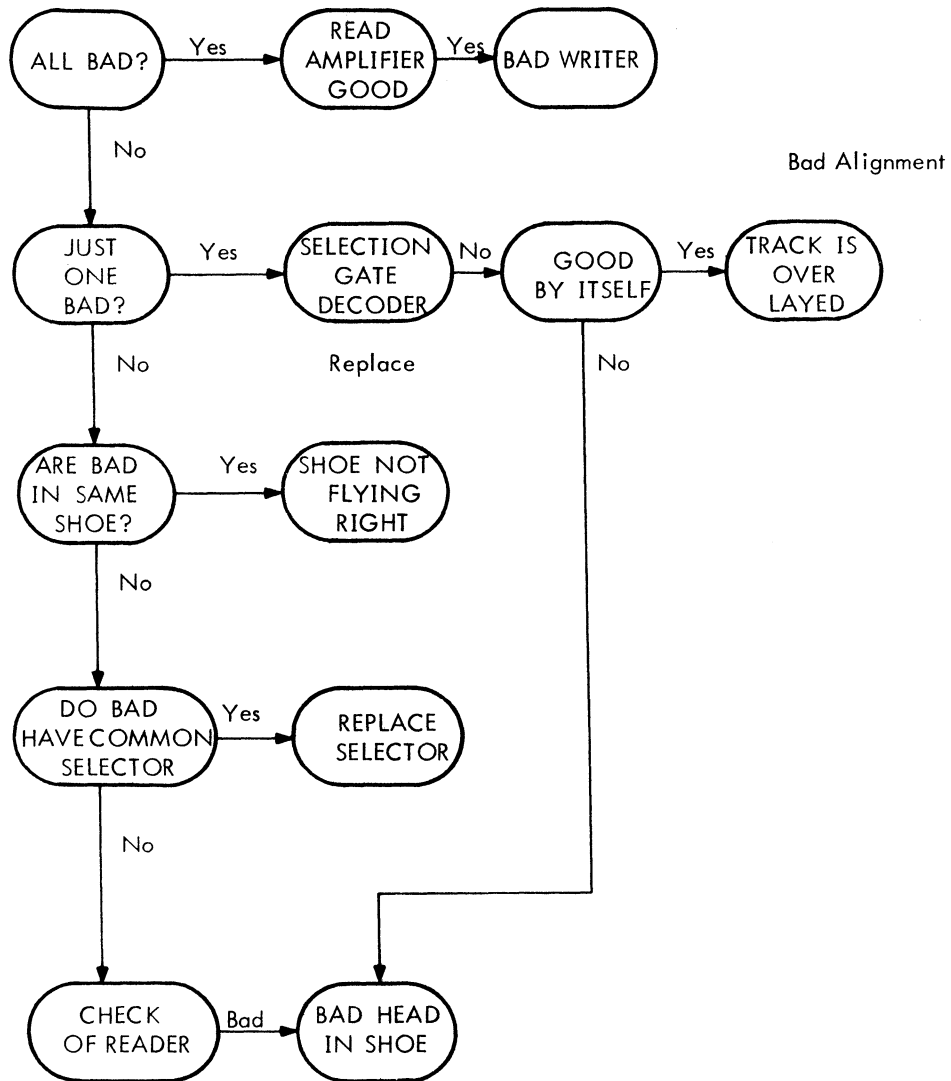
11.1 Basic System Flow



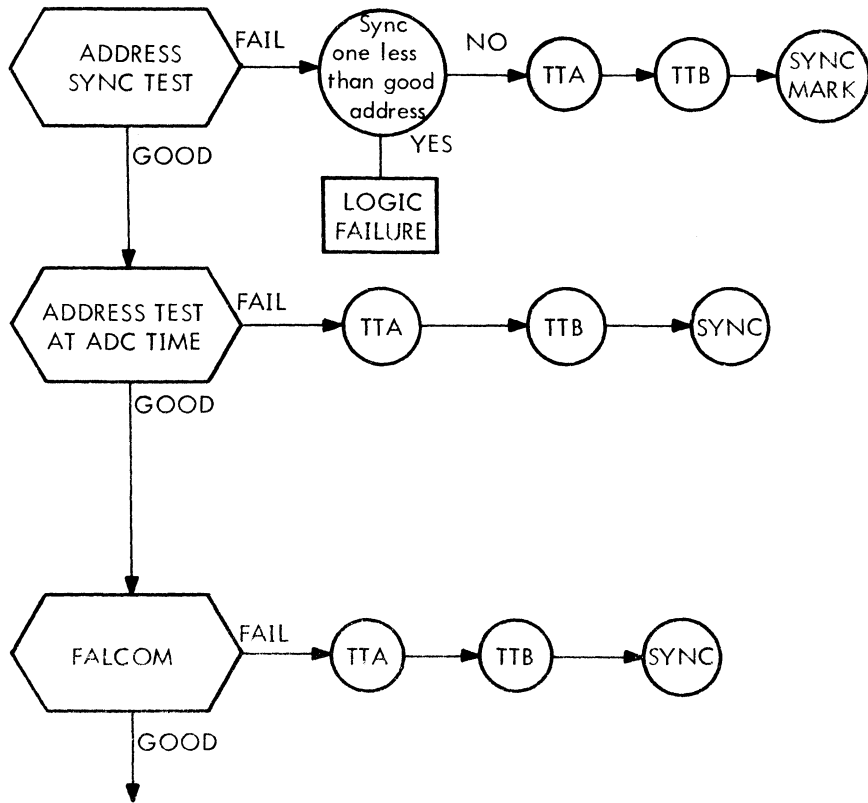
11.3 DF32 Data Disk Interface Flow



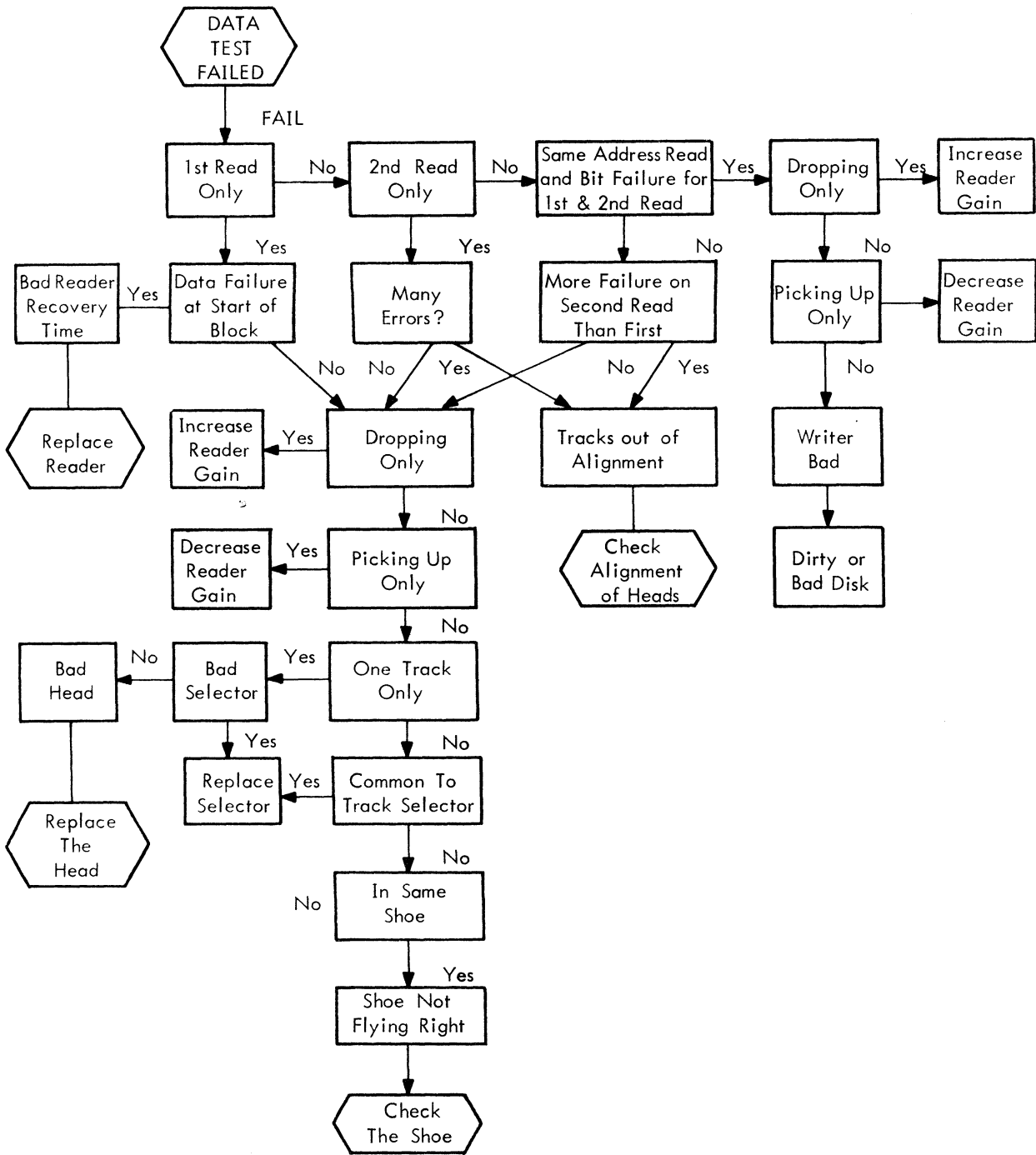
11.4 Track Error Ratio Test Trouble Flow



11.5 Disk Data Test (Address) Trouble Flow



TO TRACK ERROR RATIO TEST



/DF32/DF32D DISK DATA TEST

/ SWITCH CONTROLS
/ SWITCH0=1 - DELETE PRINTOUTS
/ SWITCH1=1 - HALT AFTER ERROR
/ SWITCH2=1 - SUBTEST SCOPE LOOP
/ SWITCH3=1 - DO NOT EXIT SECTION
/ SWITCH11=1 - TRACE (TYPE STARTING ADDRESS OF EACH TEST
AS THE PROGRAM ENTERS IT)

/ STARTING ADDRESSES

/0077 -- 8/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

/7600 -- RESTART BINARY LOADER (BIN)

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0020
0020 2132 /DISPATCH TABLE
0021 4777' DISPAT, DISK7A*53
0022 7604 JMS RDREC
0023 0176 LAS
0024 7640 AND (400)
0025 5021 SZA CLA
0026 7000 JMP , -4
0027 7604 NOP
0030 0176 LAS
0031 7640 AND (400)
0032 5026 SZA CLA
0033 7000 JMP , -4
0034 7604 NOP
0035 0176 LAS
0036 7640 AND (400)
0037 5033 SZA CLA
0040 4775' JMS DKI
0041 7604 LAS
0042 0176 AND (400)
0043 7640 SZA CLA
0044 5040 JMP , -4
0045 4774' JMS RANDSK
0046 2055 ISE , -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
0055 0000 0
0056 7402 RL6,
0057 7106 XX
0060 7006 CLL 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 DETST+5
0070 1170 TAD (CKP)
0071 3767' DCA NOSYNC
0072 5463 JMP I SLOW8

```

/READ RECOVERY TEST

/PDP8 ONLY

/DISC CURRENT SATURATION TEST

/RANDOM SELECTION

/EXIT

```

0077 *77
/JUMP OFF POINT
JMS SLOWB
JMP RPM
JMP ATEST
JMP TKDEC
JMP RATIO
JMP DBTST-6
JMP DISK0
JMP DISPAT+1
JMP DISPAT+20
JMP DISPAT+25

/SPECIAL SCOPE LOOPS
JMP SCOPE
JMP SAND
JMP SARD
JMP DBELL+41
JMP DBELL
JMP FILLX-11
JMP FILLX-6
JMP FILLX+4
JMP RDADJ
JMP WRCX
JMP MARGIN
JMP XBANK

/AUTOMATIC SCOPE SETUP
/WRITE
/READ
/ADDRESS WITH BELL ON ERROR
/DATA SCOPE LOOP
/WRITE TRACK
/READ TRACK
/WRITE/READ TRACK
/READ AMPLIFIER ADJUSTMENT PROGRAM
/ALL DATA PATTERNS ON A PAGE BASIC
/QUICK TEST OF EACH TRACK
/BR 9,10,11=EXT MEMORY BANK

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

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0200 0200 MESSAGE, *200
0201 0240 CLA CMA
0202 1200 TAD MESSAGE
0203 3010 DCA 10
0204 1410 TAD I 10
0205 3216 DCA MSRGHT
0206 1216 TAD MSRGHT
0207 7012 RTR
0210 7012 RTR
0211 7012 RTR
0212 4217 JMS TYPECH
0213 1216 TAD MSRGHT
0214 4217 JMS TYPECH
0215 5204 JMP MESSAGE*4
0216 0000 MSRGT, 0

0217 0000 TYPECH, 0
0220 0250 AND MASK77
0221 7450 SNA
0222 5410 JMP I 10
0223 1251 TAD M40
0224 7500 SMA
0225 5230 JMP *3
0226 1252 TAD C340
0227 5243 JMP MTP
0230 1253 TAD M3
0231 7440 SZA
0232 5235 JMP *3
0233 1254 TAD C212
0234 5243 JMP MTP
0235 1255 TAD M2
0236 7440 SZA
0237 5242 JMP *3
0240 1256 TAD C215
0241 5243 JMP MTP
0242 1257 TAD C245
0243 6046 TLE
0244 6041 TSP
0245 5244 JMP *-1
0246 7200 CLA
0247 5617 JMP I TYPECH

/CONSTANTS
MASK77, 77
M40, -40
C340, 340
M3, -3
C212, 212
M2, -2
C215, 215
C245, 245

/SET C(AC)=1
/ADD LOCATION
/AUTO-INDEX REGISTER
/FETCH FIRST WORD
/SAVE IT
/ROTATE 6 BITS RIGHT
/TYPE IT
/GET DATA AGAIN
/TYPE RIGHT HALF
/CONTINUE
/TEMPORARY STORAGE
/TYPE CHARACTER IN C(AC)6-11
/IS IT END OF MESSAGE?
/YESI EXIT
/SUBTRACT 40
<40?
/NO
/YESI ADD 300
/TO CODES <40
/SUBTRACT 3
/IS IT ZERO?
/NO
/YESI CODE 43 IS
/LINE-FEED (212)
/SUBTRACT 2
/IS IT ZERO?
/NO
/YESI CODE 45 IS
/CARRIAGE-RETURN (215)
/ADD 200 TO OTHERS >40
/TRANSMIT CHARACTER
/WAIT FOR FLAG
/NOT SET YET
/SETI CLEAR C(AC)
/RETURN

```


0250	7402	HLT	SIXTY,						
0251	7000	NOP							/STORE INIT NEXT TIME
0252	7200	NOP							/ADDRESS OF OPERAND
0253	7200	CLA							/ADDRESS OF OPERAND
0254	1660	TAD I ,+4							/ADDRESS OF OPERAND
0255	3267	DCA ,+2							/ADDRESS OF OPERAND
0256	5670	JMP I ,+2							/ADDRESS OF OPERAND
0257	0000	0							/CHANGING REFERENCE (P)
0258	0272	SIXTY+12							/AC (OPERAND)
0259	5263	JMP SIXTY+3							/00X
0260	1667	TAD I SIXTY+7							/AC (OPERAND)
0261	0377	AND (0007)							/00X
0262	3340	DCA MASKA							/AC (OPERAND)
0263	1667	TAD I SIXTY+7							/00X
0264	0376	AND (0070)							/AC (OPERAND)
0265	0376	DCA MASKB							/00X
0266	3341	TAD I SIXTY+7							/AC (OPERAND)
0267	1667	AND (0700)							/X000
0268	0375	DCA MASKC							/X000
0269	3342	TAD I SIXTY+7							/X000
0270	0374	AND (7000)							/X000 RS3 00X0
0271	3343	DCA MASKD							/X0X0
0272	1342	TAD MASKC							/X0X0 RS3 0X0X
0273	7112	RTR CLL							/TEMP STORAGE
0274	7010	RAR							/INCREMENT FOR STORAGE
0275	1343	TAD MASKD							/FIND STORAGE ADDRESS
0276	7012	RTR							/6X0X
0277	7010	RAR							/STORE OPERAND AS SPECIFIED
0278	1344	TAD MASKD+1							/00X0 SL3 0X00
0279	3342	DCA MASKC							/X000+000X=0X0X
0280	2260	ISE SIXTY							/X00X+6060=6X6X
0281	4270	JMS SIXTY+10							/TEMP STORAGE
0282	1342	TAD MASKC							/INCREMENT FOR STORAGE
0283	3567	DCA I SIXTY+7							/FIND STORAGE ADDRESS
0284	1341	TAD MASKB							/6X6X
0285	7004	RAL							/STORE OPERAND AS SPECIFIED
0286	7006	RTL							/00X0
0287	1340	TAD MASKA							/X0X0 SL3 0X00
0288	1344	TAD MASKD+1							/X000+000X=0X0X
0289	3343	DCA MASKD							/X00X+6060=6X6X
0290	2260	ISE SIXTY							/TEMP STORAGE
0291	4270	JMS SIXTY+10							/INCREMENT FOR STORAGE
0292	1343	TAD MASKD							/FIND STORAGE ADDRESS
0293	3567	DCA I SIXTY+7							/6X6X
0294	1373	TAD (SIXTY+12)							/STORE OPERAND AS SPECIFIED
0295	1270	DCA SIXTY+10							/HOUSE KEEPING
0296	2260	ISE SIXTY							/INCREMENT FOR RETURN
0297	5667	JMP I SIXTY							/RETURN
0300	0000	MASKA,							
0301	0000	MASKB,							
0302	0000	MASKC,							
0303	0000	MASKD,							
0304	6060	6060							

/PDP-8 DISK MEMORY INTERFACE TEST

0373	6272
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	TAD (ADDR8177 200 ISZ
0401	1377			DCA ADDINC
0402	3776'			TAD (-23
0403	1375			DCA CTC
0404	3774'			TAD (TABL
0405	1373			DCA ADDR
0406	3772'			JMS SPEED
0407	4771'			JMS SYNC
0410	4770'			JMS CONV
0411	4767'			CLA END
0412	7200			LAS
0413	3766'			AND (400
0414	7604			SZA CLA
0415	0365			JMP RPM
0416	7640			JMP BEGIN+2
0417	5200			
0420	5223			

DEFINE NPAGE
<JMP I (,+20087600)>
DEFINE HALT
<JMS ERADD>

0421 6601 /FLAG TEST (CLEAR)
0422 6611 BEGIN,
0423 4764 DCEA
0424 6622 JMS SCOPE
0425 7410 DFSC
 SKP
 HALT
 /CLEAR MAR, PE DONE, NED
 /CLEAR EXT ADDRESS REGISTER
 /SKIP ON FLAG
 /FLAG SHOULD BEEN CLEARED BY START

JMS ERADD 4763
0427 4764 JMS SCOPE

/TEST NO DRL
0430 6616 DEAC
0431 0362 AND (4
0432 7440 SZA
 HALT

JMS ERADD 4763
0434 4764 JMS SCOPE

/TEST NO ADC
0435 6612 DSAC
0436 7410 SKP
 HALT

/START NOT CL ADC

JMS ERADD 4763
0440 4764 JMS SCOPE

/EXT ADDRESS CL BY START KEY
0441 6616 DEAC
0442 0361 AND (3770
0443 7440 SZA
 HALT

JMS ERADD 4763
0444 4763
0445 4764 JMS SCOPE

/INTERRUPT TEST
0446 4760 JMS CLFLAG
 /CLEAR PD FLAGS

```

0447 6001 /INTERRUPT ON
0450 5253 JMP ,*3
0451 6002 IOF
          HALT
          /INTERRUPT UP
          /INTERRUPT
          /INTERRUPT
0452 4763' JMS ERADD
0453 6002 IOF
0454 4764' JMS SCOPEA
0455 6611 DCEA
          /
          /WILL DCMA CL NED
          DCMA
          DCMA
          DEAC
          NOP
          AND (2
          SZA
          HALT
          /NED OR WLO SET
0463 4763' JMS ERADD
0464 4764' JMS SCOPEA
          /
          /NO PARITY STATUS BIT
          DEAC
          NOP
          AND (1
          SZA
          HALT
          /PARITY STATUS BIT UP
0471 4763' JMS ERADD
0472 4764' JMS SCOPEA
          /
          /DISK MEMORY ADDRESS WRITE
          /
          (DMAW)(DFSC)
          CLA CMA
          DCA IACW
          CLA CMA
          DCA WC
          DMAW
          DFSC
          SKP
          HALT
          /MEMORY LOCATION ZERO
          /AC=7777
          /WORD COUNT=7777
          /START WRITE ONE WORD
          /SKIP ON FLAG
          /FLAG UP TOO SOON
0502 4763' JMS ERADD
0503 7000 NOP
0504 2753' ISZ CYD
0505 5304 JMP ,F1
0506 2753' ISZ CYD
0507 5306 JMP ,F1
0510 2753' ISZ CYD
0511 5310 JMP ,F1
0512 6622 DFSC
          HALT
          /54 MILL SEC
          /SKIP ON FLAG
          /FLAG UP NOT AFTER 54 MILL. SEC.
0513 4763' JMS ERADD
0514 4764' JMS SCOPEA

```

```

0515 7240 /IS AC CLEARED BY DMAW?
0516 3754' CLA CMA /ONE WORD
0517 7240 DCA WC /IOT SHOULD CLEAR AC
0520 6605 DMAW /WAIT FOR FLAG
0521 6622 DFSC /AC NOT CLEARED
0522 5321 JMP ,'-1
0523 7440 SZA
          HALT
0524 4763' JMS ERADD

```

```

0525 4764' /IS ERROR STILL CLEARED?
0526 6621 JMS SCOPEA
          DFSE
          HALT
0527 4763' JMS ERADD
0530 4764' JMS SCOPEA

```

```

0531 7240 /DISK MEMORY ADDRESS READ
0532 3754' CLA CMA /READ ONE WORD
0533 7240 DCA WC /MEMORY LOCATION ZERO
0534 3755' CLA CMA /START READ ONE WORD
0535 6603 DCA IACW /SKIP ON FLAG
0536 6622 DMAR
0537 7410 DFSC
          SKP
          HALT

```

```

0540 4763' JMS ERADD
0541 2753' ISZ CTD
0542 5341 JMP ,'-1 /18 MILL SEC
0543 2753' ISZ CTD /36 MILL SEC
0544 5343 JMP ,'-1 /54 MILL SEC
0545 2753' ISZ CTD /SKIP ON FLAG
0546 5345 JMP ,'-1 /FLAG NOT UP AFTER 54 MILL SEC
0547 6622 DFSC
          HALT
0550 4763' JMS ERADD

```

NPAGE
JMP I (+20087600

0551	5752
0552	0600
0553	6611
0554	7750
0555	7751
0556	0001
0557	0002
0560	4600
0561	3770
0562	0004
0563	5600
0564	5055
0565	2400
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
0603	7240	CLA CMA
0604	6603	DMAR
0605	6622	DFSC
0606	5205	JMP , -1
0607	7440	SZA
		HALT
0610	4775'	JMS ERADD
0611	4777'	JMS SCOPEA

/ONE WORD

/IOT SHOULD CLEAR AC

/WAIT FOR FLAG

/AC NOT CLEARED

```

0612 6601 /LOAD EXTENDED ADDRESS
0613 6615 /DOES "DEAL" CHANGE THE AC?
0614 7440 DCMA
          DEAL /IOT SHOULD NOT CHANGE AC
          SZA /AC SHOULD BE ZERO
          HALT
JMS ERADD
0615 4775' CLA CMA /AC=7777
0616 7240 DEAL /SHOULD NOT CHANGE AC
0617 6615 CMA
0620 7040 SZA /AC SHOULD BE ZERO
0621 7440 HALT
JMS ERADD JMS SCOPEA
0622 4775' /RAISE NED (NON EXISTANT DISC)
0623 4777' CLA (3000 /EM3
          TAD /SELECT EM3
          DEAL DEAC /NED STATUS
          DEAC AND (2 /EM3 DID NOT RAISE NED
          SNA
          HALT
JMS ERADD JMS SCOPEA
0632 4775'
0633 4777'

```

```

/DOES 6612 CLEAR THE AC? (DSAC)
0634 6611 DCEA
0635 7240 CLA CMA /SET AC TO SEVENS
0636 6612 DSAC
0637 7440 SZA
      HALT /HALT BECAUSE AC NOT ZERO OR ADC UP
JMS ERADD
0640 4775' JMS SCOPEA
0641 4777'

/WILL DEAC SKIP DURING DATA BREAK?
0642 6611 DCEA
0643 3776' DCA WC /ONE WORD
0644 3772' DCA YACW
0645 6605 DMAN
0646 6616 DEAC
0647 7410 SKP
0650 5254 JMP ,+4
0651 6622 DFSC
0652 5246 JMP ,+4 /DID NOT SEE ADC PULSE
      HALT

JMS ERADD
0653 4775' JMS SCOPEA
0654 4777'

/CHECK TO SEE IF WRITE LOCK OR NED = (1)
0655 6611 DCEA
0656 6616 DEAC /READ STATUS
0657 7000 NOP
0660 7006 RTL
0661 7430 SZL /AC1 UP WRITE LOCK OUT SWITCH
      HALT

JMS ERADD
0662 4775' JMS SCOPEA
0663 4777'

/TEST WRITE LOCK OUT
0664 7240 CLA CMA
0665 3776' DCA WC
0666 6605 DMAN
0667 6622 DFSC
0670 5267 JMP ,+1
0671 6616 DEAC
0672 7000 NOP
0673 0373 AND (2)
0674 7440 SZA
      HALT

JMS ERADD
0675 4775' NPAGE
0676 5771 JMP I (+20037600)

```


0771 1000
0772 7751
0773 0002
0774 3000
0775 5600
0776 7750
0777 5055
1000

PAGE

/DOES DISK BREAK TO RIGHT LOC

1000 4777' JMS SCOPEA
1001 6611 DCEA
1002 7240 CLA CMA
1003 3776' DCA MC
1004 7240 CLA CMA
1005 3775' DCA IACW /WRITE ONE WORD
1006 6605 DMAX
1007 6622 DFSC
1010 5207 JMP ,=1
1011 7200 CLA
1012 1776' TAD MC
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 7300 CLA CLL
1023 3773' DCA CTD
1024 6616 DEAC
1025 7000 NOP
1026 7700 SNA CLA /SYNC?
1027 7410 SKP /NO
1030 5234 JMP ,*4 /YES
1031 2773' ISE CTD /LOOP
1032 5224 JMP ,=6 /NO SYNC PULSE
HALT

JMS ERADD TAD CTD
SNA
HALT /SYNC OR NED ALWAYS UP
JMS ERADD 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 I=4	
1050	4777'	JMS SCOPEA	

/CHECK THAT DMAC DOES NOT SKIP ON DONE FLAG

```

1051 6611 DCEA CMA
1052 7240 CLA CMA
1053 3776' DCA WC /ONE WORD
1054 3775' DCA IACH
1055 6605 DMAM
1056 6622 DFSC
1057 5256 JMP ,=1 /FLAG IS SET
1060 6626 DMAC /DMAC SKIPPED
1061 7410 SKP
      HALT

```

JMS ERADD JMS SCOPEA

/WILL THE DISK HONOR AN INTERRUPT ON DONE

```

1064 6611 DCEA
1065 4772' JMS CLFLAG
1066 1371 TAD (JMP I C,+11
1067 3001 DCA 0001
1070 7240 CLA CMA
1071 3776' DCA WC
1072 6605 DMAM
1073 6001 ION
1074 6622 DFSC
1075 5274 JMP ,=1 /DONE FLAG
      HALT

```

JMS ERADD JMS SCOPEA

/INTERRUPT ON NED

```

1100 4772' JMS CLFLAG
1101 1370 TAD (3000
1102 6615 DEAL
1103 7200 CLA
1104 1367 TAD (JMP I C,+5 /INSTRUCTION TO BE EXECUTED ON INTERRUPT
1105 3001 DCA 0001
1106 6001 ION
1107 7000 OPR /NO INTERRUPT ON NED
      HALT

```

JMS ERADD JMS SCOPEA

```

1110 4774' DCEA
1111 4777' DCA IACH
1112 6611 DMAM
1113 6601 DFSC
1114 7604 LAS /SWITCH 3
1115 0366 AND (400
1116 7640 SZA CLA /LOOP ON INTERFACE TEST
1117 5765' JMP BEGIN

```

PAUSE

```

1120 7930
1121 4777'
1122 6611
1123 1364
1124 3763'
1125 7200
1126 1763'
1127 4762'
1130 6616
1131 7900
1132 5330
1133 6626
1134 3761'
1135 1761'
1136 7041
1137 1763'
1140 7450
1141 5347
1142 4760'
1143 7604
1144 0357
1145 7440
1146 5325
1147 2763'
1150 5325
1151 5756

/TAPE 2
/CHECK FOB ALL ADDRESS - SYJC WRITE
/NOT USING DATA BREAK 4000-7777
ATEST, OPR JMS SCOPEA
DCEA JMS SCOPEA
TAD (4000
DCA GA
CLA GA
TAD GA
JMS WONEW7
DEAC
SMA
JMP ,=2
DMAC
DCA BA
TAD BA
CIA GA
TAD GA
SNA
JMP ,=6
JMS ERSYNC
LAS
AND (1000
SEA
JMP ,=21
ISZ GA
JMP ,=23
NPAGE
JMP I (.+20087600

```

/IACW=1

/SYNC PULSE

/NO

/YES - READ MAC

/A=GOOD BA=BAU

1156 1200
1157 1000
1160 6100
1161 6621
1162 5000
1163 6622
1164 4000
1165 0421
1166 0400
1167 5544
1170 3000
1171 5545
1172 4600
1173 6611
1174 5600
1175 7751
1176 7750
1177 5055
1200

PAGE

/CHECK ALL ADDRESS SYNC READ
/NOT USING DATA BREAK 0000 TO 3777

1200	4777'	JMS SCOPEA
1201	6611	DCEA (4000
1202	1376	TAD KA
1203	3775'	DCA KA
1204	3774'	DCA GA
1205	7200	CLA CTC
1206	3773'	DCA GA
1207	1774'	TAD GA
1210	3000	DCA 0000
1211	7240	CLA CMA
1212	3772'	DCA WC
1213	7240	CLA CMA
1214	3771'	DCA IACW
1215	1000	TAD 0000
1216	6603	DMAR
1217	6622	DFSC
1220	7410	SKP
1221	5224	JMP ,+3
1222	2773'	ISE CTC
1223	5217	JMP ,+4
1224	6616	DEAC
1225	7000	OPR
1226	7500	SMA
1227	5224	JMP ,+3
1230	6626	DMAC
1231	3770'	DCA BA
1232	1770'	TAD BA
1233	7041	CIA GA
1234	2774'	ISE GA
1235	1774'	TAD GA
1236	7450	SNA
1237	5252	JMP ,+13

/TIMES COUNTER
/INITIAL ADDRESS=0000
/ADDRESS ON DISK
/STORE IN ZERO
/ONE WORD
/START READ
/SKIP ON FLAG
/NO
/YES
/READ STATUS
/SYNC PULSE
/NO
/YES - READ ADDRESS
/COMPARE WITH GOOD
/NO

1240 4767'
 1241 7604
 1242 0366
 1243 7450
 1244 5252
 1245 7200
 1246 1774'
 1247 1365
 1250 3774'
 1251 5205
 1252 2775'
 1253 5205
 1254 4777'

JMS ERSYNC
 LAS
 AND (1000
 SNA
 JMP ,+6
 CLA
 TAD GA
 TAD (=1
 DCA GA
 JMP ,+44
 ISZ KA
 JMP ,+46
 JMS SCOPEA

/YES - HAVE WE CHECKED ALL
 /NO - LOOP
 /YES

/CHECK FOR ALL ADDRESS INCREMENTS USING DATA BREAK
/TRACKS 0000 TO 7777

1255	6601	DCMA	/CLEAR DISC ADDRESS AND FLAGS
1256	6611	DCEA	/CLEAR DISC EXTENDED ADDRESS
1257	7200	CLA	/SET ADDRESS TO 0
1260	3774'	DCA GA	/WORD COUNT=2
1261	7200	CLA	/FETCH DISC ADDRESS
1262	1364	TAD (-2	/WRITE 2 WORDS
1263	3772'	DCA WC	/WRITE COMPLETE?
1264	3771'	DCA IACW	/NO WAIT
1265	1774'	TAD GA	/INCREMENT GOOD ADDRESS FOR COMPARE
1266	6605	DMAW	
1267	6622	DFSC	
1270	5267	JMP :=1	
1271	2774'	ISZ GA	
1272	7000	NOP	
1273	6626	DMAC	/READ DISC ADDRESS
1274	3770'	DCA BA	/SAVE DISC ADDRESS
1275	1770'	TAD BA	/BRING UP DISC ADDRESS
1276	7041	CIA	
1277	1774'	TAD GA	
1300	7450	SNA	/SUBTRACT DISC ADDRESS FROM GOOD ADDRESS
1301	5314	JMP :=13	/DO ADDRESSES COMPARE
1302	4763'	JMS BADADD	/NO, GO TO ERROR
1303	7604	LAS	
1304	2366	AND (1000	
1305	7450	SNA	
1306	5314	JMP :=6	
1307	7200	CLA GA	/YES, LOAD ADDRESS
1310	1774'	TAD GA	/END?
1311	1365	TAD (=1	/NO, RETURN
1312	3774'	DCA GA	/YES, EXIT
1313	5261	JMP :=32	
1314	1774'	TAD GA	
1315	7440	SZA	
1316	5261	JMP :=35	
1317	4777'	JMS SCOPEA	

NPAGE
JMP I (,+200&7600

1320	5762
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	5055
	1400

PAGE

/TRACK INCREMENT ADDRESS TEST

1400	4777	JMS SCOPEA
1401	7000	NOP
1402	6611	DCEA
1403	7200	CLA
1404	1376	TAD (7
1405	3775	DCA GTA
1406	3774	DCA GT
1407	7200	CLA GT
1410	1774	TAD GT
1411	6615	DEAL
1412	7240	CLA CMA
1413	4773	JMS WONEW7
1414	6616	DEAC
1415	0372	AND (3700
1416	3771	DCA BT
1417	1771	TAD BY
1420	7041	CIA GT
1421	1774	TAD GT
1422	7640	SZA CLA
1423	4770	JMS ETRACK
1424	1774	TAD GT
1425	1367	TAD (100
1426	2775	ISE GTA
1427	5206	JMP TKING+5
1430	4777	JMS SCOPEA
		/GOOD TRACK
		/LOAD TRACK ADDRESS
		/WRITE ONE WORD
		/READ TRACK ADDRESS
		/TRACK MASK
		/BAD TRACK
		/COMPARISON ERROR
		/LOOP TILL DONE

/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	/SET TRACK COUNT
1434	3775'		DCA CTA	/FIRST DATA WORD=0
1435	3765'		DCA OUTBUF	/SECOND DATA WORD=1
1436	7001		IAC	
1437	3764'		DCA OUTBUF+1	
1440	1363	TKWT,	TAD (-2	/SET WORD COUNT FOR 2 WORDS
1441	3762'		DCA WC	/SET BEGINNING ADDRESS
1442	1361		TAD (OUTBUF-1	/BRING IN DISC ADDRESS AND MODIFY
1443	3760'		DCA IACW	/WRITE THE LAST WORD OF
1444	6626		DMAC	/ONE TRACK AND THE FIRST
1445	1357		TAD (3777	/WORD OF THE NEXT TRACK
1446	6605		DMAM	/INCREMENT DATA
1447	6622		DFSC	/INCREMENT TRACK COUNTER
1450	5247		JMP *-1	/CLEAR TRACK ADDRESS
1451	2765'		ISZ OUTBUF	/SET TRACK COUNT
1452	2764'		ISZ OUTBUF+1	/SET COMPARE WORD=0
1453	2775'		ISZ CTA	/CLEAR DISC ADDRESS
1454	5240		JMP TKWT	
1455	6611		DCEA	
1456	1366		TAD (-20	
1457	3775'		DCA CTA	
1460	3774'		DCA GT	
1461	6601		DCMA	
1462	7300		CLA GLL	
1463	3756'		DCA CTADC	

1464	2756	TKRD,	ISZ CTADC
1465	7200		CLA CTADC
1466	1756		TAD CTADC
1467	7420		SNL (3776
1470	1355		TAD CTADC
1471	3756		OCA 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 GT
1506	1774		TAD GT
1507	7440		SEA TKERR
1510	5323		JMP TKERR
1511	7300		CLA CLL
1512	1754		TAD CTB
1513	7004		RAL
1514	7020		CML
1515	7420		SNL TKRD
1516	5264		JMP TKRD
1517	2774		ISZ GT
1520	2775		ISZ CTA
1521	5264		JMP TKRD
1522	5330		JMP , +6
1523	7200		CLA TAD OUTBUF
1524	1765		DCA BY
1525	3771		JMS ETRACK
1526	4770		JMP , -15
1527	5312		NPAGE
1530	5753	JMP I (,+2003,000	

1553 1600
 1554 3661
 1555 3776
 1556 6627
 1557 3777
 1558 7751
 1559 6777
 1560 7750
 1561 7776
 1562 7001
 1563 7000
 1564 7760
 1565 0100
 1566 6000
 1567 6624
 1568 3700
 1569 5000
 1570 6623
 1571 6610
 1572 7771
 1573 5055
 1574 1600

PAGE

/CHECK FOR NO MORE THAN ONE ADC PER REV
 /DETECT FALSE ADDRESS COMPARE
 /THIS ROUTINE FINDS ITS OWN ISZ TIME AND SHOULD WORK IN ANY MACHINE

1575 4777' JMS SCOPEA
 1576 7000' FCOM, NOP
 1577 6611' DCEA
 1578 7200' CLA
 1579 3776' DCA GA
 1580 7200' CLA GA
 1581 1776' TAD GA
 1582 4775' JMS WONE
 1583 6622' DFSC
 1584 5210' JMP 1-1
 1585 7200' CLA
 1586 1776' TAD GA
 1587 4775' JMS WONE
 1588 6622' DFSC
 1589 5210' JMP 1-1
 1590 7200' CLA
 1591 1776' TAD GA
 1592 4775' JMS WONE
 1593 7200' CLA
 1594 3774' DCA CTC
 1595 6622' DFSC
 1596 7410' SKP
 1597 5225' JMP 1+4
 1598 2774' ISZ CTC
 1599 5217' JMP 1-4
 1600 4773' HALT
 1601 7200' JMS ERADD
 1602 1774' CLA
 1603 7040' TAD CTC
 1604 1372' CMA
 1605 3371' TAD (6
 1606 3371' DCA (XX

/SET UP TO FIND ISZ
 /TIME
 /START-REFERENCE
 /DONE FLAG
 /FOUND REFERENCE
 /LOOK AGAIN
 /CTC=HOW LONG
 /FOUND SECOND TIME
 /TOOK OVER 40 MILLISEC /REF
 /HOW LONG
 /ADD
 /TEM STORAGE

```

1632 7200 FALCOM, CLA
1633 1776' TAD GA
1634 4775' JMS WONE
1635 6622 DFSC
1636 5235 JMP , -1
1637 7200 CLA
1640 1776' TAD GA
1641 4775' JMS WONE
1642 1371 TAD (XX
1643 3774' DCA CTC
1644 6622 DFSC
1645 5250 JMP , 3
1646 4770' JMS TEXTE
1647 5232 JMP FALCOM
1650 2774' ISZ CTC
1651 5244 JMP , 75
1652 6622 DFSC
1653 5252 JMP , -1
1654 2776' ISZ GA
1655 5232 JMP FALCOM
1656 7604 LAS (400
1657 0367 AND
1660 7640 SEA CLA
1661 5766' JMP ATEST

```

/ADDRESS

/WRITE IN

/FLAG = DID IT

/DO IT AGAIN

/FALSE COMPARE; FLAG BEFORE ISZ OUT

/ISZ AND CHECK FOR FLAG

/INCREMENT ADDRESS

/TRY ALL ADDRESS

/LOOP ON ADDRESS TEST

NPAGE
JMP I (,+20087600

1662 5765
1765 2000
1766 1120
1767 0400
1770 6130
1771 7402
1772 0006
1773 5600
1774 6603
1775 2665
1776 6622
1777 5055
2000

PAGE
/ROUTINE TO DETECT TRACK WITH HIGH ERROR RATIO

```

RATIO'   JMS SCOPEA
2000 4777'
2001 7200
2002 1376
2003 3775'
2004 1374
2005 3773'
2006 1372
2007 3771'
2010 1370
2011 3767'
2012 1366
2013 3000
2014 3765'
2015 3764'
2016 7240
2017 4763'
2020 7777
2021 4762'
2022 4761'
2023 1360
2024 3773'
2025 1357
2026 3767'
2027 1356
2030 3771'
2031 1355
2032 3775'
2033 4777'
2034 7604
2035 0354
2036 7640
2037 5200
2040 4753'
2041 7604
2042 0354
2043 7640

CLA (RPAGE+12&377 200 JMP /EQUAL TO (JMP RPAGE+12=JMP ,-1)
DCA RPAGE+13 /SKIP ON DONE
TAD (JMS I 0000 /TO CORRECT TRACK COUNT ON NO ERRORS
DCA RPAGE+11 /READ ROUTINE
TAD (ISE I [KA /INS ERROR CT
DCA COMA+11 /COMPARE ROUTINE
TAD (NOP
DCA RPAGE+10 /INCREMENT KA ON ERROR
TAD (TKTST
DCA 0000
DCA ERRTK /TRACK COUNTER
DCA KA /ERROR COUNT PER TRACK
CLA CMA
JMS FILL
7777
JMS WDISK /WRITE THE DISC
JMS CKRDOI /READ AND INCREMENT ON ERROR
TAD (JMS I [STATUS /RESTORE
DCA RPAGE+11
TAD (DFSE
DCA RPAGE+10
TAD (JMS I [ERRCOM /RESTORE
DCA COMA+11 /RESTORE /JMP ,-3
TAD (RPAGE+10&377 200 JMP
DCA RPAGE+13
JMS SCOPEA
LAS
AND (400 /SW3
SZA CLA /LOOP ON RATIO TEST
JMP RATIO /3 CYCLE BREAK TEST
JMS DBTST
LAS
AND (400
SZA CLA

```

2044 5240 JMP 004 /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
2110	4777		JMS SCOPEA
2111	1350		TAD (3776
2112	4763		JMS FILL
2113	4001		4001
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		ISE (XX
2124	5321		JMP +3
2125	7604		LAS
2126	0354		AND (400
2127	7440		SEA
2130	5245		JMP DISK0
2131	4020		JMS DISPAT
2132	4744		JMS ENDCT
2133	2743		ISE END
2134	6611		DCEA
2135	6601		DCMA
2136	5742		JMP BEGIN

/LOOP ON DATA TEST

/COMPLETED DISK TEST

/DF32/DF32D DISK DATA TEST

2137	7000
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	5100
2163	5033
2164	6600
2165	6606
2166	4504
2167	3625
2170	7000
2171	3655
2172	2543
2173	3626
2174	4400
2175	3630
2176	5227
2177	5055
	2200

PAGE

2200 7000 NOP
 2201 4777 JMS DMRCOI /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 /SET FLAG
 2210 4774 JMS WONEW7 /CLA CMA FOR PDP8S
 2211 7200 CLA
 2212 1973 TAD (7760
 2213 3772 DCA KA
 2214 1371 TAD (JMS I CWRK
 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 I-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 TEMP5
2247 3762' DCA TEMP2
2250 3761' DCA TEMP1
2251 3760' DCA TEMP1
2252 2760' ISZ TEMP2
2253 2761' ISZ TEMP2
2254 5252 JMP I-2
2255 1761' TAD TEMP2
2256 7440 SEA
2257 7402 HLT /COMPUTER BAD
2260 7240 CLA CMA
2261 1760' TAD TEMP1
2262 7440 SEA
2263 7402 HLT /COMPUTER BAD
2264 2762' ISZ TEMP5
2265 7410 SKP ISZTST*4
2266 5251 JMP I ISZTST
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 5000
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 SEA
24 7602 HLT /COMPUTER BAD
24 2777' ISZ TEMP2
  
```

2413 5201
2414 7200
2415 5600

JMP ROT1TS+1
CLA
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 IAC
2424	7041	CMA IAC
2425	1777'	TAD TEMP2
2426	7440	SZA
2427	7402	HLT
2430	2777'	ISZ TEMP2
2431	5217	JMP ROT2TS*1
2432	7200	CLA
2433	5016	JMP I ROT2TS

/COMPUTER BAD

/COMPUTER BAD

/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
2456	2773'	ISZ TEMP4
2457	7000	NOP
2460	2776'	ISZ TEMP3
2461	5250	JMP 1051
2462	7200	CLA
2463	5634	JMP I TADTST

/COMPUTER BAD

Address	Instruction	CTA,9=NO, OF CYCLES	GET CYCLE TIME	MSH	LSH	NO, OF CYCLES,CYCLE TIME
2464	7200					
2465	1372					
2466	3771					
2467	1770					
2470	2771					
2471	5267					
2472	3770					
2473	4767					
2474	3771					
2475	3766					
2476	3765					
2477	1770					
2500	7041					
2501	3770					
2502	7100					
2503	1771					
2504	7430					
2505	2766					
2506	2770					
2507	5302					
2510	3765					
2511	7300					
2512	1765					
2513	1364					
2514	3765					
2515	1766					
2516	7430					
2517	7001					
2520	7100					
2521	1363					
2522	3766					
2523	7420					
2524	5327					
2525	2770					
2526	5311					
2527	5762					

NOTE,

CLA
 TAD (-11
 DCA CTD
 TAD CTA
 ISZ CTD
 JMP -2
 DCA CTA
 JMS CTIME
 DCA CTD
 DCA BD
 DCA GD
 TAD CTA
 CIA CTA
 DCA CTA
 CLL CTD
 TAD CTD
 SZL BD
 ISZ CTA
 ISZ -5
 JMP GD
 DCA GD
 CLA CLL
 TAD GD
 DCA (-144
 TAD GD
 TAD BD
 SZL
 IAC
 CLL
 TAD (-1
 DCA BD
 SNL +3
 JMP CTA
 ISZ -715
 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
 JMSTST, XX

2600 7402 /NUMBER OF LOOPS
 2601 1377 /230 LOCATIONS
 2602 3241 /STARTING LOCATION
 2603 1376 /JMS INSTRUCTION
 2604 3242 /STORE 128 JMS ,
 2605 1375 /STARTING AT ADDRESS
 2606 3243 /6000
 2607 1374 /STORE JMP I RETUJM
 2610 3244 /TO RETURN FROM JMS
 2611 1244 /EXECUTE 128 JMS
 2612 3643 /RETURN FROM EXECUTE
 2613 2244 /COMPARE ADDRESSES
 2614 2243 /FOR I+1
 2615 2242 /PROCESSOR BAD
 2616 5211 /INC COMP AND FETCH
 2617 1373 /DONE 128 YET
 2620 3643
 2621 4775
 2622 1372
 2623 3242
 2624 1371
 2625 3243
 2626 1243
 2627 7040
 2630 1643
 2631 7440
 2632 7402
 2633 2242
 2634 2242
 2635 5226
 2636 2241
 2637 5203
 2640 5602

TEMP1: 0
 TEMP2: 0

/DF32/F 3D DISK DATA TEST

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

/

2451	7402	WTRK,	
2452	6622	XX	
2453	7402	DFSC	
2454	3770	HLT	/SKIP ON DONE FLAG
2455	6611	DCA AC	/PARITY ERROR GEN INTERRUPT
2456	7200	DCEA	/SAVE AC
2457	3767	CLA	/TRACK ZERO
2458	3766	DCA WC	
2459	6605	DCA IACW	
2460	0001	DMAN	
2461	1770	ION	
2462		TAD AC	/RESTORE AC
2463	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	IACH
2673	1000	TAD	0000
2674	6605	DMAH	
2675	5665	JMP I	WONE

/START WRITE

/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	IACH
2704	1000	TAD	0000
2705	6603	DMAR	
2706	5676	JMP I	RONE

/START READ

/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	ISE	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	ISE	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								
2724	7200	ROADJ,	0	CLA	BT			/COUNTER	
2725	3764'		DCA	TKCAL				/TRACK ADDRESS	
2726	4763'		JMS	RL5				/WRITE TRACKS	
2727	1362		TAD	(=5				/READ EACH TRACK 5 TIMES	
2730	3323		DCA	ROADJ-1					
2731	1764'		TAD	BT					
2732	7010		RAR	CLA				/ODD OR EVEN?	
2733	7630		SZL	CLA				/ODD	
2734	5341		JMP	+5				/EVEN	
2735	1764'		TAD	BT					
2736	4761'		JMS	RL5					
2737	4760'		JMS	RDLO					
2740	5344		JMP	+4					
2741	1764'		TAD	BT					
2742	4761'		JMS	RL5					
2743	4757'		JMS	ROMI					
2744	2323		ISZ	ROADJ-1				/READ 5 TIMES	
2745	5331		JMP	ROADJ+5				/NO	
2746	1356		TAD	(=17				/YES	
2747	1764'		TAD	BT					
2750	7630		SNA	CLA				/ALL TRACKS	
2751	5324		JMP	ROADJ				/YES --- START OVER	
2752	2764'		ISZ	BT				/NO --- INCREMENT TRACK	
2753	5327		JMP	ROADJ+3					
2755	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	7003								
2776	7601								
2777	7763								
2778	3000								

Address	Instruction	Comments
3000	0000	
3001	6032	KCC
3002	6042	TCF
3003	7300	CLA CLL
3004	1377	TAD (JMP I 2
3005	3001	DCA 1
3006	1376	TAD (CTIMEA
3007	3002	DCA 2
3010	3345	DCA CTIMEX
3011	3346	DCA CTIMEY
3012	6046	TLS
3013	6041	TSF
3014	5213	JMP
3015	6046	TLS
3016	6001	ION
3017	2345	ISZ
3020	5217	JMP CTIMEX
3021	2346	ISZ
3022	5217	JMP CTIMEY
3023	7402	HLT
3024	6041	TSF
3025	5336	JMP CTIMEB
3026	7200	CLA
3027	1375	TAD (=3
3030	3350	DCA CMPYR
3031	3351	DCA X
3032	7100	CLL
3033	1345	TAD CTIMEX
3034	7430	SEL
3035	2351	ISZ X
3036	2350	ISZ CMPYR
3037	5232	JMP
3042	3352	DCA X+1
3041	1346	TAD CTIMEY
3042	7041	CIA
3043	3350	DCA CMPYR
3044	3353	DCA Y
3045	3354	DCA Y+1
3046	7300	CLA CLL
3047	1353	TAD Y
3050	1374	TAD (3
3051	3353	DCA Y
3052	7300	CLA CLL
3053	1354	TAD Y+1
3054	1374	TAD (3
3055	3354	DCA Y+1
3056	7430	SEL
3057	2353	ISZ Y
3260	2350	ISZ CMPYR
3261	5246	JMP
3262	7200	CLA
3263	1351	TAD X
3064	1353	TAD Y
3065	3353	DCA Y

/COMPUTE CYCLE TIME
 /SET UP FOR INTERRUPT
 /SET TTY PRINTER FLAG
 /START TTY FOR 100 MS TIME DELAY
 /COUNT NO. OF CYCLES
 /IN 100 MSECS
 /NO INTERRUPT FROM TTY
 /WRONG INTERRUPT
 /MPY CTIMEX TIMES 3
 /ADD LEAST SIG HALF
 /OVERFLOW?
 /YES, INCREMENT MOST SIG HALF
 /INCREMENT MULTIPLIER
 /STORE LEAST SIG HALF
 /MULTIPLIER=-Y
 /MPY CTIMEY TIMES 12291
 /ADD MSH
 /ADD LSH
 /OVERFLOW?
 /YES, INCREMENT MSH
 /INCREMENT MULTIPLIER
 /(Y,12291)+(X,3)
 /ANSWER IN Y AND Y+1

/DF32/DF32D DISK DATA TEST

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3066 7200
3067 7100

CLA
CLL

```

3070 1352 TAD X+1
3071 1354 TAD Y+1
3072 3354 DCA Y+1
3073 7430 SZL
3074 2353 ISZ
3075 7200 CLA
3076 3347 DCA CYCLE
3077 1353 TAD Y
3100 7040 CMA
3101 3353 DCA Y
3102 7300 CLA CLL Y+1
3103 1354 TAD
3104 7041 CIA
3105 3354 DCA Y+1
3106 7430 SZL Y
3107 2353 ISZ
3110 7200 CLA
3111 1355 TAD C4611
3112 3351 DCA X
3113 1356 TAD C3200
3114 3352 DCA X+1
3115 7300 CLA CLL
3116 1352 TAD X+1
3117 1354 TAD Y+1
3120 3352 DCA X+1
3121 1351 TAD X
3122 7430 SZL
3123 7001 IAC
3124 7100 CLL
3125 1353 TAD
3126 3351 DCA
3127 7420 SNL
3130 5333 JMP
3131 2347 ISZ
3132 5315 JMP
3133 7200 CLA
3134 1347 TAD
3135 5600 JMP I
3136 6032 KCC
3137 1345 TAD
3140 1373 TAD
3141 3345 DCA
3142 7430 SZL
3143 2346 ISZ
3144 5400 JMP I
3145 0000 CTIMEX, 0
3146 0000 CTIMEX, 0
3147 0000 CTIMEX, 0
3150 0000 CYCLE, 0
3151 0000 CMPYR, 0
3152 0000 X, 0
3153 0000 Y, 0
3154 0000
3155 4611 C4611, 4611

```

```

/OVERFLOW?
/YES, INCREMENT MSH
/1,10**7/Y=CYCLE TIME,100
/Y=-Y

```

```

/MOST SIG HALF OF 10**7
/LEAST SIG HALF OF 10**7

```

```

/X=Y LSH
/X-Y MSH

```

```

/WRONG INTERRUPT

```

3156 3200 C3200, 3200

3173 0007
3174 0003
3175 7775
3176 3024
3177 5402
3200

PAGE /TRACK WRITERS FOR DISC CALIBRATION
TKCAL' XX

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

/DF32/DF32D DISK DATA TEST

3257 4775'

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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 WRLO
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 WRLO
3304	1351	TAD (15
3305	4776'	JMS FILL
3306	0015	15
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 WRLO
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

3431 4773'
3432 1370
3433 4776'
3434 1370
3435 4775'
3436 1370
3437 4774'
3440 1370
3441 4773'
3442 1367
3443 4776'
3444 1367
3445 4775'
3446 1367
3447 4774'

JMS RDHI
TAD (300
JMS WRTLO
TAD (300
JMS RDLO
TAD (300
JMS WRTHI
TAD (300
JMS RDHI
TAD (400
JMS WRTLO
TAD (400
JMS RDLO
TAD (400
JMS WRTHI

/TRACK 6

/TRACK 7

/TRACK 8

/TRACK 9

3450 1367
 3451 4773'
 3452 1366
 3453 4776'
 3454 1366
 3455 4775'
 3456 1366
 3457 4774'
 3460 1366
 3461 4773'
 3462 1365
 3463 4776'
 3464 1365
 3465 4775'
 3466 1365
 3467 4774'
 3470 1365
 3471 4773'
 3472 1364
 3473 4776'
 3474 1364
 3475 4775'
 3476 1364
 3477 4774'
 3500 1364
 3501 4773'
 3502 7000
 3503 5600

TAD (400
 JMS RDHI
 TAD (500
 JMS WRTLO
 TAD (500
 JMS RDLO
 TAD (500
 JMS WRTHI
 TAD (500
 JMS RDHI
 TAD (600
 JMS WRTLO
 TAD (600
 JMS RDLO
 TAD (600
 JMS WRTHI
 TAD (600
 JMS RDHI
 TAD (700
 JMS WRTLO
 TAD (700
 JMS RDLO
 TAD (700
 JMS WRTHI
 TAD (700
 JMS RDHI
 NOP
 JMP I DWRC01

/TRACK 10

/TRACK 11

/TRACK 12

/TRACK 13

/TRACK 14

/TRACK 15

/DISK CHECK READ (OUT TO IN)

3504 7000
 3505 7200
 3506 4775'
 3507 1377
 3510 4773'
 3511 1372
 3512 4775'
 3513 1372
 3514 4773'
 3515 1371
 3516 4775'
 3517 1371
 3520 4773'
 3521 1370
 3522 4775'
 3523 1370
 3524 4773'
 3525 1367
 3526 4775'
 3527 1367
 3530 4773'
 3531 1366
 3532 4775'
 3533 1366
 3534 4773'
 3535 1365
 3536 4775'
 3537 1365
 3540 4773'
 3541 1364
 3542 4775'
 3543 1364
 3544 4773'
 3545 5704

CKRDOI, NOP

CLA
 JMS RDLO
 TAD (0)
 JMS RDHI
 TAD (100)
 JMS RDLO
 TAD (100)
 JMS RDHI
 TAD (200)
 JMS RDLO
 TAD (200)
 JMS RDHI
 TAD (300)
 JMS RDLO
 TAD (300)
 JMS RDHI
 TAD (400)
 JMS RDLO
 TAD (400)
 JMS RDHI
 TAD (500)
 JMS RDLO
 TAD (500)
 JMS RDHI
 TAD (600)
 JMS RDLO
 TAD (600)
 JMS RDHI
 TAD (700)
 JMS RDLO
 TAD (700)
 JMS RDHI
 JMP I CKRDOI

/EXECUTE WRITE READ DISK

3546 4200
 3547 4304
 3550 5346

JMS DWRCOI
 JMS CKRDOI
 JMP .-2

/TRACK 1ST
 /TRACK 2ND
 /TRACK 3RD
 /TRACK 4TH
 /TRACK 5TH
 /TRACK 6TH
 /TRACK 7TH
 /TRACK 8TH
 /TRACK 9TH
 /TRACK 10TH
 /TRACK 11TH
 /TRACK 12TH
 /TRACK 13TH
 /TRACK 14TH
 /TRACK 15TH
 /TRACK 16TH
 /EXIT

3564 0700
 3565 0600
 3566 0500
 3567 0400
 3570 0300
 3571 0200
 3572 0100
 3573 4121
 3574 4067
 3575 4104
 3576 4053
 3577 0000
 3600

PAGE
 /WRITE ONE PAGE
 /JMS ... WITH DISK ADDRESS IN AC
 /PAGE, NOP /DISK ADDRESS
 DCA WADD /WORD COUNT
 TAD (-200 /INITIAL ADDRESS
 DCA WC /DISK ADDRESS
 TAD (OUTBUF-1 /LOAD DISK - WRITE
 DCA IACH /WAIT FOR FLAG
 TAD WADD
 DMAW
 DFSE
 JMS STATUS
 DFSC
 JMP I-3
 JMP I WPAGE /EXIT

3600 7000
 3601 3771
 3602 1376
 3603 3775
 3604 1374
 3605 3773
 3606 1777
 3607 6605
 3610 6621
 3611 4772
 3612 6622
 3613 5210
 3614 5600

/READ ONE PAGE
 /JMS ... WITH DISK ADDRESS IN AC

3615 7000
 3616 3771
 3617 1376
 3620 3775
 3621 1370
 3622 3773
 3623 1771
 3624 6603
 3625 6621
 3626 4772
 3627 6622
 3630 5225
 3631 5615

RPAGE, NOP /DISK ADDRESS
 DCA RADD /WORD COUNT
 TAD (-200 /INITIAL ADDRESS
 DCA WC /DISK ADDRESS
 TAD (INBUF-1 /LOAD DISK ... READ
 DCA IACH /WAIT FOR FLAG
 TAD RADD
 DMAW
 DFSE
 JMS STATUS
 DFSC
 JMP I-3
 JMP I RPAGE /EXIT

```

3632 5232 /COMPARE OUTBUFFER WITH INBUFFER
3633 7200 COMPARE, CLA
3634 1367 TAD (-10
3635 3766' DCA ERCT /ERROR COUNT
3636 1370 TAD (INBUF-1 /INBUFFER - IAW
3637 3011 DCA 11 /OUTBUFFER - IAW
3640 1374 TAD (OUTBUF-1 /LOOP COUNTER
3641 3012 DCA 12 /DATA THAT WAS READ
3642 1376 TAD (-200 /DATA THAT WAS WRITTEN
3643 3261 DCA CTB
3644 7200 COMA,
3645 1411 TAD I 11
3646 3765' DCA BD
3647 1412 TAD I 12
3650 3764' DCA GD
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
PWRC,      NOP
           CLA          PWRC
           TAD          RDLO
           DCA (3700
           JMS WPAGE
           JMS FLUSH
           TAD (3700
           JMS RPAGE
           JMS COMPARE
           JMP I PWRC
3662 7000
3663 7200
3664 1262
3665 3762'
3666 1361
3667 4200
3670 4760'
3671 1361
3672 4215
3673 4232
3674 5662
    
```

```

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

/0000

```

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

/7777
/7777

```

3755 7777
3756 5033
3757 0000
3760 5020
3761 3700
3762 4104
3763 6202
3764 6626
3765 6625
3766 6612
3767 7770
3770 7177
3771 6602
3772 6403
3773 7751
3774 6777
3775 7750
3776 7602
3777 6601
4000 4000
    
```


/OO WRC OF DIFFERENT NUMBER - PAGE BASIC

WRCX:	NO	WRCX:	NO
4000	7000	NOP	
4001	7200	CLA	
4002	6615	DEAL	
4003	7200	CLA	
4004	1377	TAD (7777	/7777
4005	4776	JMS FILL	
4006	4000	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	
4047	4776	JMS FILL	
4050	4001	4001	
4051	4775	JMS PWRC	
4052	5200	JMP WRCX	

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

4053	5253	WRTLO, JMP ,	
4054	0364	AND (3700	/TRACK ADDRESS
4055	3763'	DCA TKADD	
4056	1763'	TAD TKADD	
4057	6615	DEAL	/LOAD TRACK ADDRESS
4060	7200	CLA	
4061	4762'	JMS WPAGE	/WRITE A PAGE
4062	4761'	JMS WSYNC	/RETURN WITH MAC I N AC
4063	7500	SMA	/SAME TRACK
4064	5261	JMP ,=3	/YES
4065	7200	CLA	
4066	5653	JMP I WRTLO	/NO DONE EXIT

/ROUTINE TO WRITE ODD TRACKS
 /JMS WRTLO ... WITH TRACK ADDRESS IN AC

4067	5267	WRTHI, JMP ,	
4070	0364	AND (3700	/STORE TRACK ADDRESS
4071	3763'	DCA TKADD	
4072	1763'	TAD TKADD	
4073	6615	DEAL	/LOAD EXTENDED ADDRESS
4074	7200	CLA	
4075	1360	TAD (4000	/2048 TO 4095
4076	4762'	JMS WPAGE	/WRITE A PAGE
4077	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 2364 AND (3700)
4106 3763' DCA TKADD /TRACK ADDRESS
4107 1763' TAD TKADD /LOAD TRACK ADDRESS
4110 6615 DEAL
4111 7200 CLA RPAGE /READ A PAGE
4112 4757' JMS COMPARE /COMPARE
4113 4756' JMS SYNC /RETURN WITH MAC IN AC
4114 4755' SMA /SAME TRACK
4115 7500 JMP ,--4 /YES
4116 5312 CLA /NO DONE - EXIT
4117 7200 JMP I RDLO
4120 5704

```

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

```

4121 5321 RDHI, JMP ,
4122 2364 AND (3700)
4123 3763' DCA TKADD /TRACK ADDRESS
4124 1763' TAD TKADD /LOAD TRACK ADDRESS
4125 6615 DEAL
4126 7200 CLA (4000)
4127 1360 TAD (4000) /READ A PAGE
4130 4757' JMS RPAGE /COMPARE
4131 4756' JMS COMPARE /RETURN WITH MAC IN AC
4132 4755' JMS SYNC /SAME TRACK
4133 7510 SPA /YES
4134 5330 JMP ,--4 /NO - DONE - EXIT
4135 7200 CLA
4136 5721 JMP I RDHI

```

4155	4472
4156	3632
4157	3615
4160	4000
4161	4500
4162	3600
4163	6604
4164	3700
4165	3776
4166	4627
4167	7474
4170	4303
4171	0123
4172	5252
4173	0707
4174	7070
4175	3662
4176	5033
4177	7777
	4200

PAGE

/QUICK TEST OF EACH TRACK

4200	0000		/TRACK STORAGE
4201	0000		/COUNTER
4202	4777	MARGIN, JMS RANFIL	/RANDOM FILL
4203	1376	TAD (-7	
4204	3201	DCA MARGIN-1	/COUNTER
4205	7200	CLA	/TRACK
4206	3200	DCA MARGIN-2	
4207	1200	TAD MARGIN-2	
4210	3200	DCA MARGIN-2	
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	/DISC ADDRESS
4223	3773	DCA WADD	/WORD COUNT
4224	1372	TAD (-200	
4225	3771	DCA WC	/CURRENT ADDRESS
4226	1370	TAD (INBUF-1	/WRITE
4227	3767	DCA IACW	/SKIP ON DONE
4230	1773	TAD WADD	/EXIT
4231	6605	DMAW	
4232	6622	DFSC	
4233	5232	JMP , -1	
4234	5622	JMP I WPAGEX	

4235	0000	SYNCT,	0	CLA	CTA
4236	7200			DCA	CTA
4237	3766'			TAD	(-6660
4240	1365			DCA	CTC
4241	3764'			TAD	CTC
4242	1764'			DCA	CTD
4243	3763'			DEAC	
4244	6616			NOB	
4245	7000			SMA	
4246	7503			JMP	*4
4247	5253			ISZ	CTC
4250	2764'			JMP	*5
4251	5244			JMP	I SYNCT
4252	5635			DEAC	
4253	6616			NOB	
4254	7000			SPA	*10
4255	7510			JMP	*10
4256	5266			ISZ	CTD
4257	2763'			JMP	*5
4260	5253			JMP	I SYNCT
4261	5635			DEAC	
4262	6616			NOB	
4263	7000			SMA	
4264	7500			JMP	I SYNCT
4265	5635			ISZ	CTA
4266	2766'			JMP	*5
4267	5262			JMP	I SYNCT
4270	5635				
4271	0000	CONV,	0	CLA	
4272	7200			TAD	(-6
4273	1362			DCA	CTD
4274	3763'			TAD	CTB
4275	1761'			ISZ	CTD
4276	2763'			JMP	*2
4277	5275			DCA	CTB
4300	3761'			CLA	ALL CML RAR
4301	7330			7002	
4303	7710			SPA	CLA
4304	5760'			JMP	NOTE8
4305	1357			TAD	(12
4306	7241			CLA	CTD
4307	3763'			DCA	CTA
4310	1766'			TAD	CTD
4311	2763'			ISZ	CTD
4312	5310			JMP	*2
4313	3766'			DCA	CTA
4314	7200	CONVB,		CLA	CTB
4315	1761'			TAD	CTB
4316	4756'			JMS	DEC
4317	4333			RCT	
4318	7200			CLA	CTA
4319	1766'			TAD	CTA

4322	4756	NOSYNC,	JMS DEC
4323	4343	SCT	
4324	6046	TLS	
4325	6041	TSP	
4326	5325	JMP	1
4327	4755	JMS MESSAGE	
4330	4543		
4331	2220		
4332	1540		
4333	0000	RCT,	
4334	0000		
4335	4023		
4336	3116		
4337	0340		
4340	2411		
4341	1505		
4342	7540		
4343	7777	SCT,	
4344	7777		
4345	4015		
4346	1103		
4347	2217		
4350	4023		
4351	0503		
4352	2300		
4353	5671	JMP I CONV	

4355 0200
 4356 6634
 4357 1012
 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 0100
 4375 3662
 4376 7771
 4377 4627
 4400

PAGE WRITE CURRENT TEST
 /DISK WRITE CURRENT TEST
 DK1,

XX
 CLA (7777
 TAD (7777
 JMS FILL
 7777
 JMS WDISK
 JMS WDISK
 JMS WDISK
 TAD (3777
 JMS FILL
 3777
 JMS WDISK
 JMS CKR001
 JMS WDISK
 JMS WDISK
 TAD (7777
 JMS FILL
 7777
 JMS WDISK
 JMS CKR001
 JMS WDISK
 JMS WDISK

/FILL WITH SEVENS
 /MAKE SURE DISC IS SATURATED
 /WRITE COMPLIMENT
 /READ COMPARE
 /WRITE NEW PATTERN
 /TO SATURATE DISK
 /COMPLIMENTED DATA
 /WRITE COMPLIMENT
 /READ COMPARE

4400 7402
 4401 7200
 4402 1377
 4403 4776
 4404 7777
 4405 4775
 4406 4775
 4407 4775
 4410 1374
 4411 4776
 4412 3777
 4413 4775
 4414 4773
 4415 4775
 4416 4775
 4417 1377
 4420 4776
 4421 7777
 4422 4775
 4423 4773
 4424 5600

/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	/BANK "X"
4432	3771		DCA BX	
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	/DISC TO BANK 0
4460	4766		JMS RPAGE	
4461	7240		CLA CMA	
4462	4776		JMS FILL	
4463	7777		7777	
4464	4763		JMS COMPAR	
4465	5226		JMP XBANK*1	

/GROUP OF SUBROUTINES

4466 5266 /WAIT FOR FLAG
4467 6022 FLAG,
4470 5267 JMP,
4471 5666 DFSC /FLAG
/NO
/YES EXIT

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

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

/EXIT WITH DMAC PLUS ONE IN AC

4500 5300 WSYNC,
4501 4272 JMP SYNC
4502 1362 TAD (1)
4503 5702 JMP I WSYNC /EXIT

/SUBROUTINE TO INCREMENT ON TRACK ERROR

```

4504 7402 /TKTST, XX
4505 2761' ISZ KA
4506 4272 JMS SYNC
4507 0360 AND (-3776
4510 7640 SZA CLA
4511 5704 JMP I TKTST
4512 1761' TAD KA
4513 0357 AND (-7300
4514 7640 SZA CLA
4515 4756' JMS ERTK
4516 2755' ISZ ERTK
4517 3761' DCA KA
4520 5704 JMP I TKTST

```

```

/DMA IN AC
/NEW TRACK
/NO
/ERROR PER TRACK
/LESS THAN 400
/NO
/YES --- TRACK BEING TESTED
/CLEAR FOR NEXT TRACK

```

/INHIBIT PRINT OUT WHEN SW0 = 1

```

4521 7402 /IPRINT, XX
4522 3754' DCA AC
4523 7604 LAS
4524 7700 SMA CLA
4525 5333 JMP ,*6
4526 1321 TAD IPRINT
4527 1353 TAD (-2
4530 3321 DCA IPRINT
4531 1721 TAD I IPRINT
4532 3321 DCA IPRINT
4533 1754' TAD AC
4534 5721 JMP I IPRINT

```

```

/CHECK SWITCH
/SW0 = 1
/NO --- PRINTOUT
/YES --- SET UP RETURN TO
/SKIP PRINT ROUTINE

```

/WRITE MEMORY IN FIRST TWO TRACKS

```

4535 5335 WALL, JMP ,
4536 6611 OCEA
4537 3752' DCA WC
4540 3751' DCA IACW
4541 6605 DMAN
4542 5735 JMP I WALL

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

```

```

/TRACK ZERO
/4096 WORDS
/0000
/LOAD MAC, WRITE
/EXIT

```

4551 7751
 4552 7750
 4553 7776
 4554 6614
 4555 6606
 4556 5632
 4557 7300
 4560 3776
 4561 6600
 4562 4001
 4563 3632
 4564 4222
 4565 3675
 4566 3615
 4567 3700
 4570 3705
 4571 6613
 4572 4070
 4573 3504
 4574 3777
 4575 5100
 4576 5033
 4577 7777
 4600 4600

/ROUTINE TO CLEAR FLAG AND SETUP INTERRUPT

4600 7000
 4601 7200
 4602 1377
 4603 3001
 4604 6002
 4605 6022
 4606 6042
 4607 6012
 4610 6072
 4611 7000
 4612 6032
 4613 7000
 4614 6104
 4615 6601
 4616 5600

CLFLAG, NOP
 CLA
 TAD (JMP I 0000
 DCA 0001
 IOF
 PCF
 TCF
 RRB
 6072
 NOP
 KCC
 NOP
 6104
 DCMA
 JMP I CLFLAG

4617 5217
 4620 1776
 4621 7104
 4622 7430
 4623 1375
 4624 3776
 4625 1776
 4626 5617

RANDOM, JMP
 TAD NUM
 RAL CLL
 SZL
 TAD 13
 DCA NUM
 TAD NUM
 JMP I RANDOM

4627 7402
 4628 7200
 4629 1374

RANFIL, HLT
 CLA
 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'	ISE 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 I-1 //
4647 4305 JMS RDX /READ A TRACK
4650 5247 JMP I-1 //
4651 4255 JMS FILLX /WRITE/READ A TRACK
4652 4266 JMS WRTX
4653 4305 JMS RDX
4654 5252 JMP I-2
4655 7402 XX /FILL OUT BUFFER
4656 7402 HLT
4657 7604 LAS
4660 3263 DCA I*3
4661 1263 TAD I*2
4662 4770 JMS FILL
4663 7402 XX
4664 7402 HLT
4665 5655 JMP I FILLX
4666 7402 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 I*5
4675 1767 TAD TKADD
4676 4324 JMS RLS
4677 4766 JMS WRTLO
4700 5666 JMP I WRTX
4701 1767 TAD TKADD
4702 4324 JMS RLS
4703 4765 JMS WRTHI
4704 5666 JMP I WRTX
4705 7402 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 I*5
4714 1767 TAD TKADD
4715 4324 JMS RLS
4716 4764 JMS RLO
4717 5705 JMP I RDX
4720 1767 TAD TKADD
4721 4324 JMS RLS
4722 4763 JMS RDI

```

```

4723 5705 JMP I RDX
          /ROTATE LEFT 5 AND CLEAR LINK
          RL5,
          XX
          CLL RTL
          RTL
          RAL
          JMP I RL5
4724 7402
4725 7106
4726 7006
4727 7004
4730 5724

```

4763 4121
 4764 4104
 4765 4067
 4766 4053
 4767 6604
 4770 5033
 4771 5020
 4772 6777
 4773 6610
 4774 7600
 4775 0003
 4776 6607
 4777 5400
 5000

PAGE
 /SUB ROUTINES
 /WRITE ONE WORD OF 7777 AT SPECIFIED ADDRESS
 /JMS W0NEW7
 /AC=ADDRESS OF WHERE TO BE WRITTEN

W0NEW7, JMP , /ST
 DCA 0000
 DCA CTC
 CLA CMA
 DCA WC /ONE WORD
 CLA CMA /((IACW) = 0000 -1
 DCA IACW
 TAD 0000
 DMAW
 DFSC /WAIT 36 MILL SEC
 SKP
 JMP ,+3
 ISZ CTC
 JMP ,+4
 JMP I W0NEW7
 0

/CLEAR INBUF TO ALL ZEROS

FLUSH, JMP ,
 CLA (-220
 DCA CTA /IACW OF INBUF
 TAD (INBUF-1
 DCA 11
 CLA /DEPOSIT ZERO
 DCA I 11 /NONE
 ISZ CTA /NO LOOP
 JMP ,+3 /YES EXIT
 JMP I FLUSH

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

33 5233
 FILL, JMP ,

5034	3771'	DCA WORD1	/FIRST WORD
5035	1633	TAD I FILL	
5036	3770'	DCA WORD2	/SECOND WORD
5037	2233	ISE FILL	
5040	1367	TAD (-100	
5041	3773'	DCA CTA	
5042	1366	TAD (OUTBUF-1	/IACH OF OUTBUFFER
5043	3011	DCA 11	
5044	7200	CLA	
5045	1771'	TAD WORD1	/DEPOSIT FIRST WORD
5046	3411	DCA I 11	
5047	1770'	TAD WORD2	/DEPOSIT SECOND WORD
5050	3411	DCA I 11	
5051	2773'	ISE CTA	/DONE
5052	5244	JMP 76	/NO ... LOOP
5053	4220	JMS FLUSH	
5054	5633	JMP I FILL	/YES ... EXIT

```

5055 7402 /SCOPE LOOP SET UP
5056 4765 SCOPE, XX
5057 7604 JMS TRACE
5060 1364 LAS
5061 7640 AND (1000)
5062 5666 SZA CLA
5063 1255 JMP I RETURN
5064 3266 TAD SCOPEA
5065 5655 DCA RETURN
        JMP I SCOPEA
        /POINTER FOR SCOPE LOOP

5066 5163 RETURN, (BEGIN
5067 5666 JMP I *-1

5070 7402 /ROUTINE TO RING BELL
5071 7200 BELL, XX
5072 1362 CLA
5073 6046 TAD (207)
5074 6041 TLS
5075 5274 TSF
5076 5670 JMP I *-1
5077 7000 JMP I BELL
        NOP

5100 7402 /ROUTINE TO WRITE DISK (ANY NUMBER OF DISKS)
5101 6611 WDISK, XX
5102 7200 DCEA
5103 3761 CLA GA
5104 3760 DCA TKADD
5105 1357 TAD (-10)
5106 3773 DCA CTA
5107 1356 TAD (-40)
5110 3355 DCA (XX)
5111 4754 JMS WPAGE
5112 1353 TAD (200)
5113 1761 TAD GA
5114 3761 DCA GA
5115 1761 TAD GA
5116 2355 ISZ (XX)
5117 5311 JMP I -6
5120 7200 CLA
5121 1352 TAD (100)
5122 1760 TAD TKADD
5123 6615 DEAL
5124 3760 DCA TKADD
5125 2773 ISZ CTA
5126 5307 JMP WDISK*7
5127 6611 DCEA
5130 5700 JMP I WDISK

```

```

/LOAD ADDRESS SWITCH
/AND FOR SCOPE LOOP
/SCOPE LOOP
/YES
/NO-SETUP REFERENCE

/TRACK ZERO
/DISC ADDRESS ZERO
/TRACK ZERO
/TRACK COUNTER
/PAGE COUNTER
/WRITE
/INCREMENT BY
/PREVIOUS INITIAL ADDRESS
/STORE
/LOAD FOR WRITE
/ALL PAGES
/NO
/YES
/INCREMENT TRACKS
/LOAD TRACK
/STORE TRACK
/ALL TRACKS
/NO
/YES
/EXIT

```

/ROUTINE OF DISK CAN NUMBER OF DISK1

5131	7402	RDISK,	XX	
5132	7200	CLA		/NUMBER OF TRACKS
5133	1351	TAD	(-377	
5134	3355	DCA	(XX	
5135	6615	DEAL		
5136	7200	CLA		/READ
5137	4750	JMS	RPAGE	/FIND NEXT ADDRESS
5140	4747	JMS	SYNC	
5141	2355	ISZ	(XX	
5142	5337	JMP	I=3	
5143	7200	CLA		
5144	5731	JMP	I RDISK	

5147 4472
 5150 3615
 5151 7401
 5152 7100
 5153 3200
 5154 3600
 5155 7402
 5156 7740
 5157 7770
 5160 6604
 5161 6622
 5162 7207
 5163 7421
 5164 1000
 5165 5327
 5166 6777
 5167 7700
 5170 6616
 5171 6615
 5172 7177
 5173 6610
 5174 7600
 5175 7751
 5176 7750
 5177 6603
 5200

PAGE
 /READ RECOVERY TIME
 /WRITE 200 TO 377
 /READ 400 TO 577
 /TIME FROM WRITE TO READ 16.5 - 21 MICROSECONDS
 RDREC, XX
 CLA CMA
 JMS FILL
 7777 /OUTPUT=7777
 CLA (RDREC
 TAD (RDLO
 DCA RDLO
 JMS RDISK
 DCEA
 TAD (200
 TAD (-1
 DCA WADD
 TAD (-200
 DCA WC
 TAD (OUTBUF-1
 DCA IACK
 TAD WADD
 DCA W
 TAD (401
 TAD (-1
 DCA RADD
 TAD (-200
 DFSC
 JMP 1-1
 /TAG FOR PRINTOUT
 /WRITE THE DISC
 /REWRITE 200 TO 377
 /READ
 /NO

5200 7402
 5201 7242
 5202 4777
 5203 7777
 5204 7200
 5205 1376
 5206 3775
 5207 4774
 5210 6611
 5211 1373
 5212 1372
 5213 3771
 5214 1370
 5215 3767
 5216 1366
 5217 3765
 5220 1771
 5221 6605
 5222 1364
 5223 1372
 5224 3763
 5225 1370
 5226 6622
 5227 1377

5230 37671
 5231 1362
 5232 37651
 5233 17631
 5234 6603
 5235 47611
 5236 6621
 5237 47601
 5240 47571
 5241 5600

DCA WC
 TAD (INBUF-1
 DCA IACW
 TAD RADD
 DMAR
 JMS FLAG
 DFSE
 JMS STATUS
 JMS COMPAR
 JMP I ROREC

/READ 401 TO 600

PAUSE

```

5242 7002 /TAPE 4
5243 7200 /RANDOM
5244 6601 RANDSK,
5245 4756' CLA
5246 0355 DCMA
5247 3323 JMS RANDOM
5250 4756' AND (0700)
5251 3324 DCA RANTK
5252 4756' JMS RANDOM
5253 3325 DCA RANAD
5254 7240 CLA CMA
5255 3767' DCA WC
5256 7200 CLA (RANWD=1)
5257 1354 TAD IACW
5260 3765' TAD RANTK
5261 1323 DEAL
5262 6615 CLA
5263 7200 TAD RANAD
5264 1324 DMAM
5265 6605 JMS FLAG
5266 4761' CLA CMA
5267 7240 DCA WC
5270 3767' TAD (RANWD
5271 1353

/WORD ADDRESS AND TRACK TEST
/TRACK ADDRESS
/MEMORY ADDRESS COUNTER
/WORD
/WORD CY=7777
/LOAD TRACK ADDRESS
/LOAD MAC WRITE
/ONE WORD
/ONE GREATER THAN READ

```

5272	3765'	DCA IACH	/LOAD TRACK
5273	1323	TAD RANTK	
5274	6615	DEAL	
5275	7200	CLA	
5276	1324	TAD RANAD	/LOAD MAC READ
5277	6603	DMAR	
5300	4761'	JMS FLAG	/PARITY ERROR
5301	6621	DFSE	/YES
5302	4752'	JMS ERADD	/NO
5303	7200	CLA	/WRITE
5304	1325	TAD RANWD	
5305	7041	CIA	/READ FROM DISK
5306	1326	TAD RANWD+1	/READ FROM DISK
5307	7650	SNA CLA	
5310	5642	JMP I RANDSK	/READ STATUS
5311	6616	DEAC	
5312	7112	OLL RTR	/WRITE LOCK OR NO DISK
5313	7630	SZL CLA	
5314	5642	JMP I RANDSK	
5315	1326	TAD RANWD+1	
5316	3751'	DCA BD	
5317	1325	TAD RANWD	
5320	3750'	DCA GD	/GOOD DATA
5321	4747'	JMS BADCOM	
5322	5642	JMP I RANDSK	
5323	0000	RANTK'	/RANDOM TRACK ADDRESS
5324	7402	RANAD'	/RANDOM DISK MEMORY ADDRESS COUNTER
5325	0000	RANWD'	/RANDOM DATA WORD TO BE WRITTEN
5326	0000	TRACE'	/RANDOM DATA WORD READ BACK
5327	0000		
5330	7604	LAS	
5331	7010	RAR	
5332	7420	SNL	
5333	5727	JMP I TRACE	
5334	4746'	JMS SIXTY	
5335	5055	SCOPEA	
5336	5342	.+4	
5337	5343	.+4	
5340	4773'	JMS MESSAGE	
5341	4543	4543	
5342	6060	6060	
5343	6060	6060	
5344	0000	0000	
5345	5727	JMP I TRACE	

5346 0260
 5347 6040
 5350 6626
 5351 6625
 5352 5600
 5353 5325
 5354 5324
 5355 0700
 5356 4617
 5357 3632
 5360 6400
 5361 4466
 5362 7177
 5363 6602
 5364 0401
 5365 7751
 5366 6777
 5367 7750
 5370 7600
 5371 6601
 5372 7777
 5373 0200
 5374 5100
 5375 4104
 5376 5200
 5377 5033
 5400

PAGE /SCOPE LOOP FOR FAILING DATA LOCATION
 /THIS ROUTINE USES THE RESULTS OF ERRCOM
 TAD (NOP /HOUSEKEEPING
 SCOPE, CLA ERRDSK /EQUAL TO ZERO
 TAD ERRDSK /YES
 SNA /NO
 JMP SCOPE1 /EQUAL TO 0XXX
 AND (7000 /NO
 SNA /EQUAL TO (1XX) (XXX) (XXX) (XXX)
 JMP SCOPE2 /YES
 AND (4000 /NO
 SZA CLA /SUBTRACT 1000 FROM DISK ADDRESS
 JMP SCOPE3 /CORRECT LOW TRACK
 TAD ERRDSK /CORRECT HIGH TRACK
 TAD (2777
 DCA ERRDSK
 JMP SCOPE4
 SCOPE2, CLA ERRDSK
 TAD ERRDSK
 TAD (2777
 DCA ERRDSK
 JMP SCOPE4
 SCOPE3, CLA ERRDSK
 TAD ERRDSK
 TAD (3777
 TAD (4000

5400 1377
 5401 7200
 5402 1776
 5403 7450
 5404 5232
 5405 0377
 5406 7450
 5407 5217
 5410 0375
 5411 7640
 5412 5224
 5413 1776
 5414 1377
 5415 3776
 5416 5236
 5417 7200
 5420 1776
 5421 1374
 5422 3776
 5423 5236
 5424 7200
 5425 1776
 5426 1373
 5427 1375

5430	3776'				
5431	5236				
5432	7200	SCOPE1,	CLA		/CORRECT ZERO CASE
5433	1373		TAD (3777		
5434	1776'		TAD ERRDSK		
5435	3776'		OCA ERRDSK		
5436	7000	SCOPE4,	OPR		
/WRITE 1 WORD AT LOCATION BEFORE FAILING LOCATION,					
5437	7240		CLA CMA		
5440	3772'		OCA WC		/ONE WORD
5441	1371		TAD (GD-1		/GOOD DATA - WRITE
5442	3770'		OCA IACW		/TRACK ADDRESS
5443	1767'		TAD ERRTK		/LOAD TRACK
5444	6615		DEAL		/LOAD DISK ADDRESS START WRITE
5445	1776'		TAD ERRDSK		
5446	6605		DMAW		/DONE?
5447	6622		DFSC		/NO
5450	5247		JMP , -1		
5451	7000		OPR		

```

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

/READ ONE WORD
5466 7402 /DATA TONE LOOP WITH BELL ON ERROR
5467 7604 DBELL, HLT
5470 0365 LAS
5471 4764' AND (76
5472 6615 JMS RLS
5473 7402 DEAL
5474 7604 HLT
5475 3763' DCA GA /LOAD TRACK AND DISC
5476 7402 HLT /LOAD ADDRESS
5477 7604 LAS /LOAD DATA
5500 3762' DCA GD /ONE WORD
5501 7240 CLA CMA
5502 3772' DCA WC /WRITE
5503 1371 TAD (GD-1) /ONE WORD
5504 3770' DCA IACW
5505 1763' TAD GA
5506 6605 DMAR
5507 4761' JMS FLAG
5510 7240 CLA CMA
5511 3772' DCA WC /READ
5512 1366 TAD (BD-1)
5513 3770' DCA IACW
5514 1763' TAD GA
5515 6603 DMAR
5516 4761' JMS FLAG
5517 7200 CLA
5520 1762' TAD BD
5521 7041 CIA
5522 1771' TAD BD
5523 7440 SZA
5524 4761' JMS BELL
5525 5276 JMP DBELL+10

```

/ADDRESS SCOPE LOOP WITH BELL ON ERROR

```

5526 4757' JMS ERADD
5527 7604 HALT
5530 3763' LAS
5531 1763' DCA GA
5532 4756' TAD GA
5533 4755' JMS WONEW7 /AC=ADDRESS
5534 7041 JMS SYNC /ADDRESS+1 IN AC
5535 1763' CIA
5536 7440 TAD GA /TEST GOOD
5537 4760' SZA /NO
5540 5327 JMS BELL /YES
JMP ."11

```

/PDP 8 DISC

5555 4472
 5556 5000
 5557 5600
 5560 5070
 5561 4466
 5562 6626
 5563 6622
 5564 4724
 5565 0076
 5566 6624
 5567 6006
 5570 7751
 5571 6625
 5572 7750
 5573 3777
 5574 2777
 5575 4000
 5576 6005
 5577 7000
 5600

PAGE
 /PRINT OUT ROUTINES
 /ROUTINE TO PRINT OUT FAILING TEST ADDRESS
 ERADD, XX

5600 7402
 5601 4777, JMS IPRINT
 5602 6002 IOF
 5603 4776, JMS SIXTY
 5604 5600 ERADD

5605 5611 .+4
 5606 5612 .+4
 5607 4775, JMS MESSAGE
 5610 4543
 5611 6060
 5612 6060
 5613 4000
 5614 4776, JMS SIXTY
 5615 6614 AC
 5616 5622 .+4
 5617 5623 .+4
 5622 4775, JMS MESSAGE
 5621 4340
 5622 6060
 5623 6060
 5624 0000

/TEST FOR HALT

5625 7604 LMS (2000)
 5626 3374 SZA CLA
 5627 7640 HLT
 5630 7402 JMS I ERADD
 5631 5600

/HALT IF SW1 = ONE

/TRACK ERROR RATIO PRINT OUT
/TKXX BAD XXXX ----- LESS THAN 200 NOT PRINTED

	ERTK,	XX	JMS IPRINT		/TRACK NUMBER
5632	7402	JMS IPRINT			
5633	4777	JMS SIXTY			
5634	4776	ERRTK			
5635	6006	.+11			
5636	5647	.+10			
5637	5647	JMS SIXTY			
5640	4776	KA			/NUMBER OF ERRORS
5641	6000	.+11			
5642	5653	.+11			
5643	5654	JMS MESSAGE			
5644	4775	4543			
5645	4543	2413			
5646	2413	6060			
5647	6060	4040			
5650	4040	0201			
5651	0201	0440			
5652	0440	6060			
5653	6060	6060			
5654	6060	0			
5655	0000	JMP I ERTK			
5656	5632				

/PRINT OUT NUMBER OF PASSES

5657	7402	XX	
5660	4776	JMS SIXTY	
5661	6617	END	
5662	5667	.+5	
5663	5667	.+4	
5664	4775	JMS MESSAGE	
5665	4543	4543	
5666	2003	2003	
5667	6060	6060	
5670	0000	0	
5671	5657	JMP I ENDCT	/NUMBER OF PASS COMPLETED

5672	7402	STOP,	XX	LAS
5673	7604			AND (2000
5674	2374			SNA CLA
5675	7650			SKP
5676	7410			HLT
5677	7402			JMP I STOP
5700	5672		0	
5701	0000	SPEED,		KCC
5702	6032			TCF
5703	6042			TAD (-143
5704	1373			DCA CTA
5705	3772,			DCA CTB
5706	3771,			CLA
5707	7200			TAD (RINT
5710	1370			DCA 2
5711	3002			TAD (JMP I 2
5712	1367			DCA 1
5713	3001			CLA
5714	7200			TLS
5715	6046			ION
5716	6001			DEAC
5717	6616			NOP
5720	7000			SMA CLA
5721	7700			JMP I-3
5722	5317			DEAC
5723	6616			NOP
5724	7000			SPA CLA
5725	7710			JMP I-3
5726	5323			ISZ CTB
5727	2771,			NOP
5730	7000			JMP I-12
5731	5317			TSF
5732	6041	RINT,		JMP ADDR+1
5733	5355			TCF
5734	6042			DCA ACSAV
5735	3357			TAD I ADDR
5736	1754			TLS
5737	6046			ION
5740	6001			CLA
5741	7200			ISZ CTC
5742	2766,			JMP I+3
5743	5346			TAD (NOP
5744	1365			DCA I+1
5745	3346			ISZ ADDR
5746	2354	ADDING,		TAD ACSAV
5747	1357			ISZ CTA
5750	2772,			JMP I 0
5751	5400			IOF
5752	6002			JMP I SPEED
5753	5701			0
5754	2000	ADDR,		ION
5755	6001			JMP I 0
5756	5400			0
5757	0000	ACSAV,		

5765 7000
 5766 6003
 5767 5402
 5770 5732
 5771 3661
 5772 6610
 5773 7635
 5774 2000
 5775 0200
 5776 0260
 5777 4521
 6000

PAGE
 /PRINT OUT ROUTINE FOR BAD TRACK

ETRACK, XX
 JMS IPRINT
 JMS SIXTY

.*3
 .*4
 .*4
 JMS MESSAGE

4543
 6060
 6060
 0000

JMS SIXTY
 GT

/GOOD TRACK

.*12
 .*12
 JMS SIXTY
 BT

/BAD TRACK

.*12
 .*12
 JMS MESSAGE

4040
 0724
 4040
 6060
 6060

4002
 2440
 6060
 6060

6030 6060
 6031 4002
 6032 2440
 6033 6060
 6034 6060
 6035 0000
 6036 4774
 6037 5600

JMS STOP
 JMP I ETRACK

6121 3116
6122 0340
6123 6060
6124 6060
6125 0000
6126 4774
6127 5700

3116
0340
6060
6060
0000
JMS STOP
JMP I ERSYNC

/BAD ADDRESS

/FALSE COMPARE AT ADDRESS XXXX

/FALCOM XXXX
TEXTE, XX

6130	7402
6131	47771
6132	47761
6133	6622
6134	6144
6135	6145
6136	47751
6137	4543
6140	0601
6141	1403
6142	1715
6143	4040
6144	6060
6145	6060
6146	0000
6147	47741
6150	5730
6174	5672
6175	0200
6176	0260
6177	4521
	6200

JMS IPRINT
 JMS SIXTY
 GA
 ,*10
 ,*10
 JMS MESSAGE
 4543
 0601
 1403
 1715
 4040
 6060
 6060
 0000
 JMS STOP
 JMP I TEXTE

/FROM
 /TO
 /TO
 /FALCOM XXXX

PAGE

6265 6305
6266 6306
6267 4763'
6270 6625
6271 6311
6272 6312
6273 4762'
6274 4024
6275 1340
6276 6060
6277 4004
6300 0140
6301 6060
6302 6060
6303 4007
6304 0440
6305 6060
6306 6060
6307 4002
6310 0440
6311 6060
6312 6060
6313 0000
6314 4761'
6315 5000

.+20
.+20
JMS SIXTY
BD
.+20
.+20
JMS MESSAGE
4024
1340
6060
4004
0140
6060
6060
4007
0440
6060
6060
4002
0440
6060
6060
0000
JMS STOP
JMP I ERRCOM

/BAD DATA

/DSK ADDRESS

/GOOD DATA

/BAD DATA

6316	7402	BADADD, XX	JMS IPRINT	/INHIBIT PRINTOUT
6317	4777	JMS SIXTY	JMS SIXTY	
6320	4763			
6321	6316			
6322	6326			
6323	6327			
6324	4762	JMS MESSAGE		
6325	4543			
6326	6060			
6327	6060			
6330	0000			
6331	4763	JMS SIXTY		
6332	6622	GA		
6333	6345			
6334	6346			
6335	4763	JMS SIXTY		
6336	6621	BA		
6337	6351			
6340	6352			
6341	4762	JMS MESSAGE		
6342	4040			
6343	0701			
6344	4040			
6345	6060			
6346	6060			
6347	4002			
6350	0140			
6351	6060			
6352	6060			
6353	0000			
6354	4761	JMS STOP		
6355	5716	JMP I BADADD		
6361	5672			
6362	0200			
6363	0260			
6364	6632			
6365	6606			
6366	2700			
6367	4472			
6370	6605			
6371	0001			
6372	6602			
6373	3177			
6374	3661			
6375	3660			
6376	5612			
6377	4521			
	5400			

6400	0000	STATUS, 0	
6401	4777	JMS IPRINT	
6402	6616	DEAC	
6403	3776	DCA SR	
6404	4775	JMS MESSAGE	
6405	4543		/ST
6406	2324		/AT
6407	0124		/E
6410	4005		/RR
6411	2222		
6412	4040		
6413	0000		
6414	7200	CLA STATUS	
6415	1200	TAD STATUS	
6416	7041	CIA	
6417	1374	TAD (WPAGE*12	
6420	7440	SEA	
6421	5227	JMP *6	
6422	4775	JMS MESSAGE	/WR
6423	2722		/IT
6424	1124		/E
6425	0500		
6426	5233	JMP *5	
6427	4775	JMS MESSAGE	/RE
6430	2205		/AD
6431	0104		
6432	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	605	ERRDSK	
6461	6474	*13	
6462	6475	*13	
6463	4775	JMS MESSAGE	
6464	4040	4040	/SA
6465	2301	2301	/B
6466	7540	7540	/T
6467	4024	4024	/K
6470	1340	1340	/D
6471	6060	6060	/A
6472	4004	4004	
6473	0140	0140	
6474	6060	6060	
6475	6060	6060	
6476	0000	0000	
6477	7200	CLA SR	
6500	1776	TAD STAT	
6501	4341	JMS STAT	
6502	3306	DCA *4	
6503	4775	JMS MESSAGE	
6504	4543	4543	/PE
6505	2005	2005	
6506	6060	6060	
6507	0000	0000	
6510	7200	CLA STATSV	
6511	1765	TAD STAT	
6512	4341	JMS STAT	
6513	3323	DCA *10	
6514	4775	JMS MESSAGE	
6515	4040	4040	/NE
6516	1605	1605	/D
6517	0440	0440	/OR
6520	1722	1722	/W
6521	4027	4027	/LO
6522	1417	1417	

6523	6060	
6524	0000	
6525	7200	CLA
6526	1765	TAD STATSV
6527	4341	JMS STAT
6530	3335	DCA I*5
6531	4775	JMS MESSAGE
6532	4040	0422
6533	0422	1440
6534	1440	6060
6535	6060	4300
6536	4300	JMS STOP
6537	4764	JMP I STATUS
6540	5600	0
6541	0000	CLL
6542	7100	RAR
6543	7010	DCA STATSV
6544	3765	SZL
6545	7430	JMP I*3
6546	5351	TAD STAT0
6547	1353	JMP I STAT
6550	5741	TAD STAT1
6551	1354	JMP I STAT
6552	5741	TAD STAT1
6553	7560	JMP I STAT
6554	7561	STAT0, 7560
6564	5672	STAT1, 7561
6565	6633	
6566	0260	
6567	6605	
6570	6602	
6571	6606	
6572	0700	
6573	6604	
6574	3612	
6575	0200	
6576	6620	
6577	4521	
	6600	PAGE

/DR
/L

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 PACK	
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 PACK	
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 PACK	
6675	5302	JMP PACK	
6676	1371	TAD (-1)	
6677	2332	ISZ UNIT	
6700	7440	SZA	
6701	5276	JMP *3	
6702	7200	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	

PACK,

6723	1370	TAD (6060	215
6724	3726	DCA I DECA	212
6725	5634	JMP I DEC	304
6726	0000	0	311
6727	0000	0	323
6730	0000	0	313
6731	0000	0	240
6732	0000	0	304
6733	0215	TABL,	301
6734	0212		301
6735	0304		324
6736	0311		305
6737	0323		323
6740	0313		324
6741	0240		215
6742	0304		212
6743	0301		252
6744	0324		
6745	0301		
6746	0240		
6747	0324		
6750	0305		
6751	0323		
6752	0324		
6753	0215		
6754	0212		
6755	0252		
6770	6060		
6771	7777		
6772	0012		
6773	7766		
6774	0144		
6775	7634		
6776	1750		
6777	6030		
7000	7000	PAGE	
0000	0000	OUTBUF, 0	
7200	7200	PAGE	
0000	0000	INBUF, 0	

PAGE
OUTBUF, 0
PAGE
INBUF, 0

7600
 1205
 7601 3350
 7602 1206
 7603 3351
 7604 5377
 7605 1355
 7606 5743

*7600

\$

0140 2651
 0141 6200
 0142 6400
 0143 6600
 0144 1111
 0145 1077
 0146 4425
 0147 4202
 0150 4000
 0151 2724
 0152 4691
 0153 4647
 0154 4644
 0155 5466
 0156 5527
 0157 2715
 0160 2707
 0161 5401
 0162 2045
 0163 2177
 0164 2000
 0165 1431
 0166 1120
 0167 4322
 0170 7410
 0171 2212
 0172 7240
 0173 5040
 0174 5242
 0175 4400
 0176 4400
 0177 5200

TAD 7605
 DCA 7750
 TAD 7606
 DCA 7751
 JMP 7777
 1355
 5743

HPM 1488 SYNC TIME= 0201 MICRO SECS

0424

ELAPSED TIME IN
MINUTES FROM
START

0430

0435

0441

0446

0455

0465

0473

0515

TYPE OUTS 0424 THRU 2121

0526

ONLY OCCUR IF PROGRAM TRACE
IS REQUESTED BY SETTING
SW 11.

0531

0601

0612

0624

0634

0642

0655

0664

1001

1021

1040

1051

1064

1100

1112

1122 — APPROX 1 MINUTE TO HERE

1201 2 MINS

1255 3 "

1320 } 6 "

1401 }

1431 }

1601 }

2001 11 "

2034 12 "

2046 12.5 "

2053 13

2060 14

2065 14.5

2072 15

2077 16

2104 16.5

2111 17.5

2116 } 18

2121 }

PC00 — END OF PHASE D 36 MINUTES.

0424

0430

0435

0441

0446

0455

0465

0473

0515

0526

0531

0601

0612

0624

0634

0642

0655

0664

1001

1021

1