

IDENTIFICATION

Product Code:     MAINDEC-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-  
0000 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

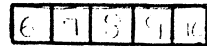
101 Address Test (slow)  
102 Track Decode Test  
103 Track Error Ratio Test  
104 Data Break Test.

- 105 Data Test.
- 106 Read Recovery Time Test. (NOT USED ON FDP-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 PARITYi 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 XXX<sub>8</sub>

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

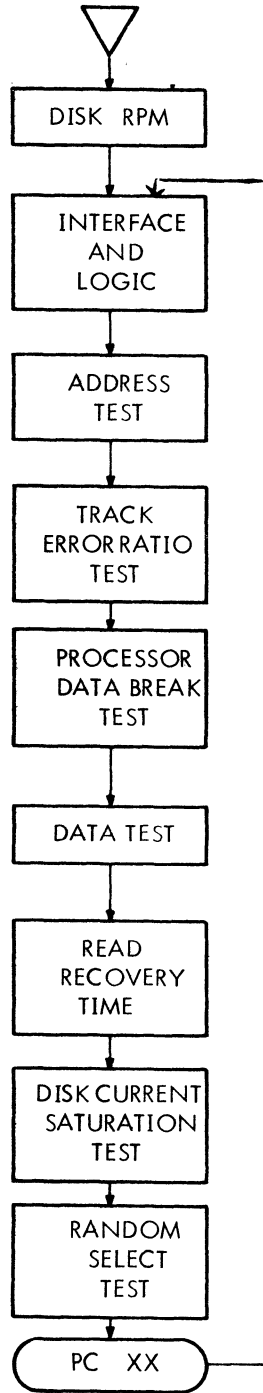
9.1          Discussion

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.

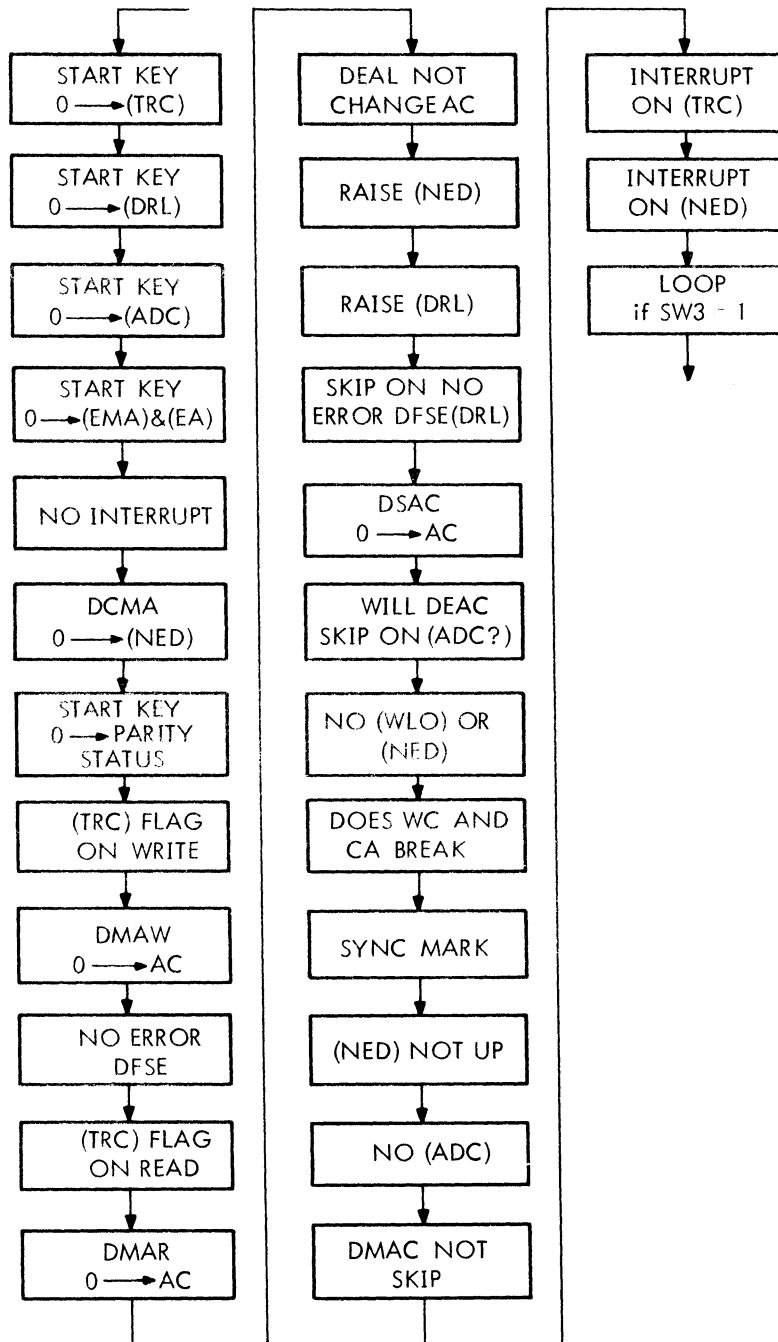
10.          LISTINGS

11. 2 FLOW DIAGRAMS

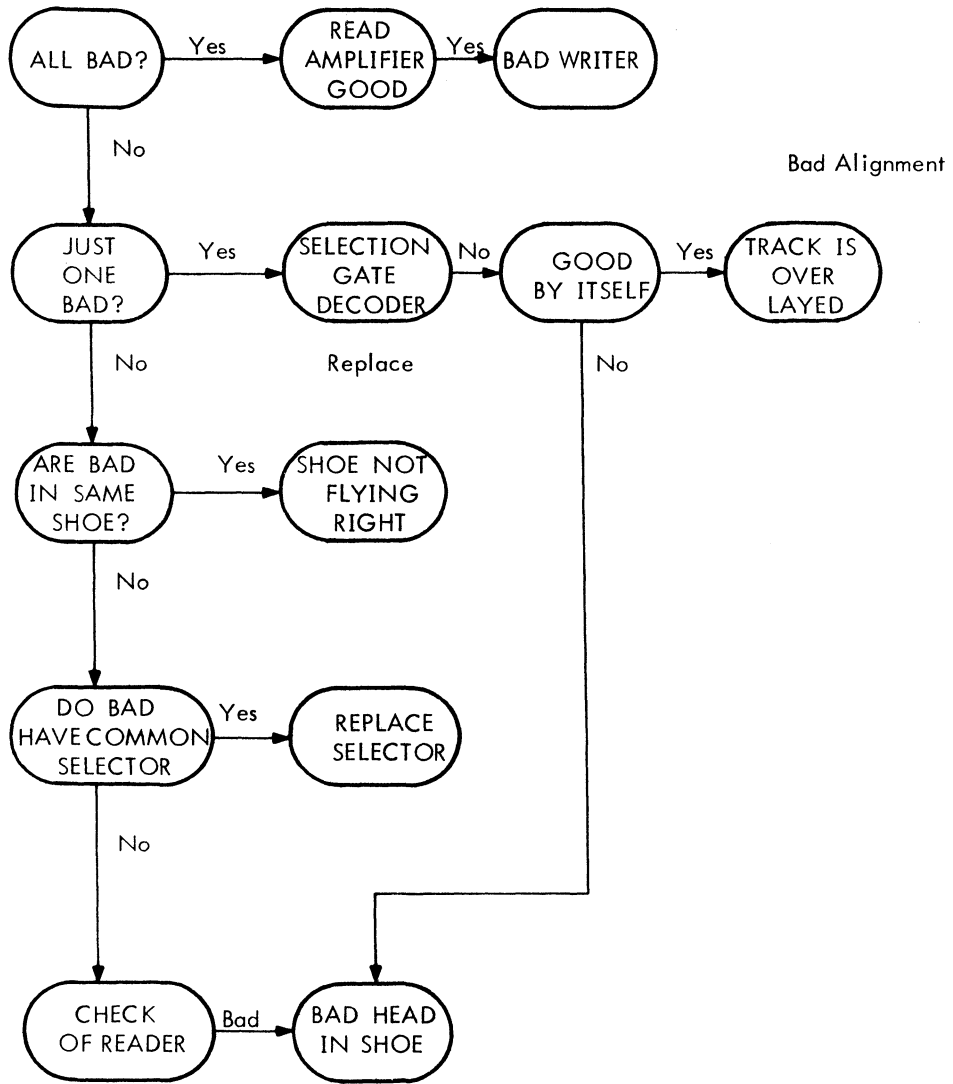
11.1 Basic System Flow



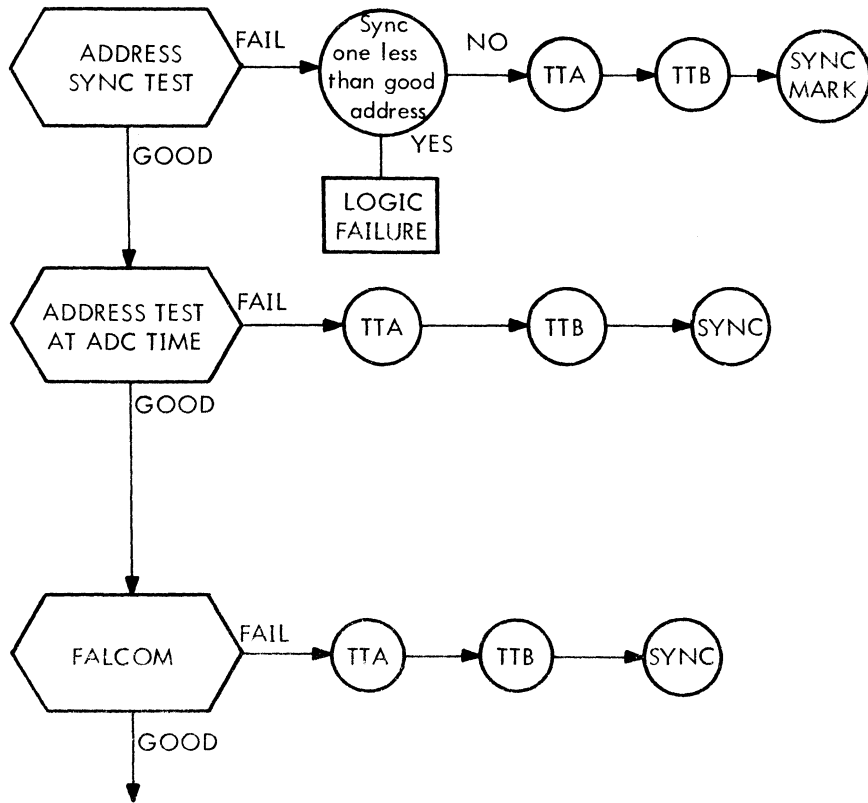
11.3 DF32 Data Disk Interface Flow



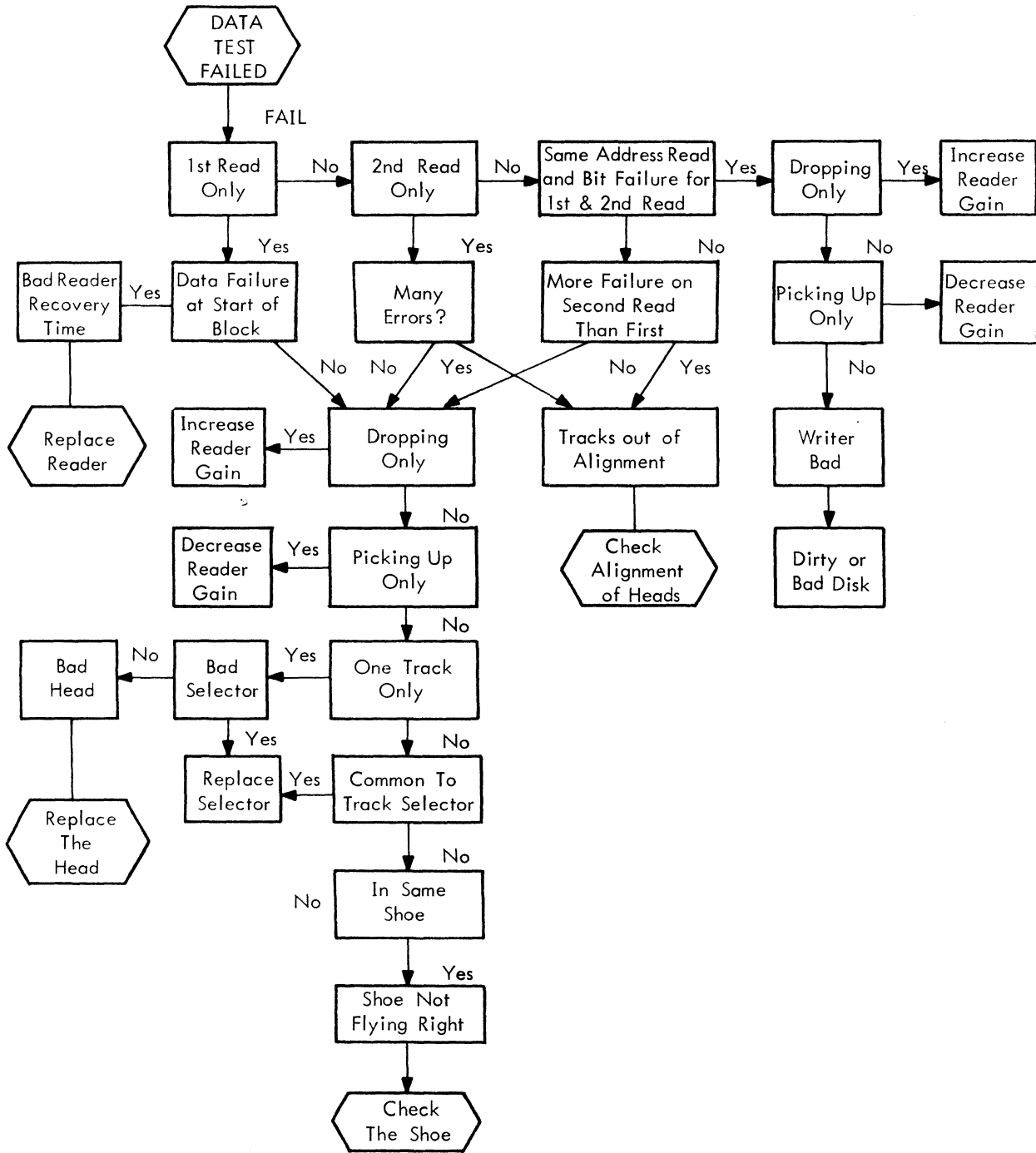




11.5 Disk Data Test (Address) Trouble Flow



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)
/
/
/
```

```

0020      *20
          /DISPATCH TABLE
0020 2132  DISPATCH, 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 OKI      /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 DISPATCH /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 DISPATCH+20
0065 3021  DCA DISPATCH+1
0066 1172  TAD (CLA CMA
0067 3771'  DCA DETST+5
0070 1170  TAD (BKP
0071 3767'  DCA NOSYNC
0072 5463  JMP I SLOW8

```

```

0077      *77
          /JUMP OFF POINT
0077 4063      JMS SLOW8      /BS ENTRANCE ADDRESS
0100 5776'     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 DBTST-6   /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 WRGX      /ALL DATA PATTERNS ON A PAGE BASIC
0123 5747'     JMP MARGIN    /QUICK TEST OF EACH TRACK
0124 5746'     JMP XBANK     /BR 9,10,11=EXT MEMORY BANK

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

```

```

0200 0200 *200
0200 0000 MESSAGE, 0
0201 7240 CLA CMA /SET C(AC)=-1
0202 1200 TAD MESSAGE /ADD LOCATION
0203 3010 DCA 10 /AUTO-INDEX REGISTER
0204 1410 TAD I 10 /FETCH FIRST WORD
0205 3216 DCA MSRGHT /SAVE IT
0206 1216 TAD MSRGHT
0207 7012 RTR
0210 7012 RTR /ROTATE 6 BITS RIGHT
0211 7012 RTR
0212 4217 JMS TYPECH /TYPE IT
0213 1216 TAD MSRGHT /GET DATA AGAIN
0214 4217 JMS TYPECH /TYPE RIGHT HALF
0215 5204 JMP MESSAGE+4 /CONTINUE
0216 0000 MSRGHT, 0 /TEMPORARY STORAGE

0217 0000 TYPECH, 0 /TYPE CHARACTER IN C(AC)6-11
0220 0250 AND MASK77
0221 7450 SNA /IS IT END OF MESSAGE?
0222 5410 JMP I 10 /YES! EXIT
0223 1251 TAD M40 /SUBTRACT 40
0224 7500 SMA /<40?
0225 5230 JMP ,+3 /NO
0226 1252 TAD C340 /YES! ADD 300
0227 5243 JMP MTP /TO CODES <40
0230 1253 TAD M3 /SUBTRACT 3
0231 7440 SZA /IS IT ZERO?
0232 5235 JMP ,+3 /NO
0233 1254 TAD C212 /YES! CODE 43 IS
0234 5243 JMP MTP /LINE-FEED (212)
0235 1255 TAD M2 /SUBTRACT 2
0236 7440 SZA /IS IT ZERO?
0237 5242 JMP ,+3 /NO
0240 1256 TAD C215 /YES! CODE 45 IS
0241 5243 JMP MTP /CARRIAGE-RETURN (215)
0242 1257 TAD C245 /ADD 200 TO OTHERS >40
0243 6046 MTP, TLR /TRANSMIT CHARACTER
0244 6041 TSP /WAIT FOR FLAG
0245 5244 JMC -1 /NOT SET YET
0246 7200 CLA /SET! CLEAR C(AC)
0247 5617 JMP I TYPECH /RETURN

/CONSTANTS
0250 0077 MASK77, 77
0251 7740 M40, -40
0252 0340 C340, 340
0253 7775 M3, -3
0254 0212 C212, 212
0255 7776 M2, -2
0256 0215 C215, 215
0257 0245 C245, 245

```



0200	7402	SIXTY,	HLT	
0201	7000		NOP	
0202	7000		NOP	/STORE INIT NEXT TIME
0203	7200		CLA	
0204	1660		TAD I ,-4	/ADDRESS OF OPERAND
0205	3267		DCA ,+2	
0206	5670		JMP I ,+2	
0207	0000		0	/ADDRESS OF OPERAND
0208	0272		SIXTY+12	/CHANGING REFERENCE (P)
0209	5263		JMP SIXTY+3	
0210	1667		TAD I SIXTY+7	/AC (OPERAND)
0211	0377		AND (0007	
0212	3340		DCA MASKA	/000X
0213	1667		TAD I SIXTY+7	/AC (OPERAND)
0214	0376		AND (0070	
0215	3341		DCA MASKB	/00X0
0216	1667		TAD I SIXTY+7	/AC (OPERAND)
0217	0375		AND (0700	
0218	3342		DCA MASKC	/0X00
0219	1667		TAD I SIXTY+7	/AC (OPERAND)
0220	0374		AND (7000	
0221	3343		DCA MASKD	/X000
0222	1342		TAD MASKC	/0X00
0223	7112		RTR CLL	
0224	7010		RAR	/0X00 RS3 00X0
0225	1343		TAD MASKD	/X0X0
0226	7012		RTR	
0227	7010		RAR	
0228	1344		TAD MASKD+1	/X0X0 RS3 0X0X
0229	3342		DCA MASKC	/TEMP STORAGE
0230	2260		ISZ SIXTY	/INCREMENT FOR STORAGE
0231	4270		JMS SIXTY+10	/FIND STORAGE ADDRESS
0232	1342		TAD MASKC	/6X6X
0233	3667		DCA I SIXTY+7	/STORE OPERAND AS SPECIFIED
0234	1341		TAD MASKB	/00X0
0235	7004		RAL	
0236	7006		RTL	/00X0 SL3 0X00
0237	1340		TAD MASKA	/0X00+000X=0X0X
0238	1344		TAD MASKD+1	/0X0X+6060=6X6X
0239	3343		DCA MASKD	/TEMP STORAGE
0240	2260		ISZ SIXTY	/INCREMENT FOR STORAGE
0241	4270		JMS SIXTY+10	/FIND STORAGE ADDRESS
0242	1343		TAD MASKD	/6X6X
0243	3667		DCA I SIXTY+7	/STORE OPERAND AS SPECIFIED
0244	1373		TAD (SIXTY+12	/HOUSE KEEPING
0245	3270		DCA SIXTY+10	
0246	2260		ISZ SIXTY	/INCREMENT FOR RETURN
0247	5667		JMP I SIXTY	/RETURN
0248	0000	MASKA,	0	
0249	0000	MASKB,	0	
0250	0000	MASKC,	0	
0251	0000	MASKD,	0	
0252	6060		6060	

/PDP-B DISK MEMORY INTERFACE TEST

0373 1272  
 0374 7200  
 0375 2700  
 0376 2070  
 0377 2007  
 0400

PAGE  
 /RMX5 DISC TEST  
 /DISK MOTOR SPEED CHECK USING SYNC MARK  
 /DISK RPM XXXX RMX5 3/31/67

0400 7200  
 0401 1377  
 0402 3776  
 0403 1375  
 0404 3774  
 0405 1373  
 0406 3772  
 0407 4771  
 0410 4770  
 0411 4767  
 0412 7200  
 0413 3766  
 0414 7604  
 0415 2365  
 0416 7640  
 0417 5200  
 0420 5223

RPM,    CLA  
           TAD (ADDR&177 200 ISZ  
           DCA ADDINC  
           TAD (-23  
           DCA CTC  
           TAD (TABL  
           DCA ADDR  
           JMS SPEED  
           JMS SYNCT  
           JMS CONV  
           CLA  
           DCA END  
           LAS  
           AND (400  
           SZA CLA  
           JMP RPM  
           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 4760 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 0356          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 CYD
0505 5304          JMP ,=-1          /18 MILL SEC
0506 2753'        ISZ CTD
0507 5306          JMP ,=-1          /36 MILL SEC
0510 2753'        ISZ CYD
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
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

```

0551 5752 NPAGE  
 0552 0600 JMP I (+20087600)  
 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  
 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 6601          DCMA
0613 6615          DEAL          /IOT SHOULD NOT CHANGE AC
0614 7440          SZA
                                /AC SHOULD BE ZERO
                                HALT
0615 4775'        JMS ERADD
0616 7240          CLA CMA          /AC=7777
0617 6615          DEAL          /SHOULD NOT CHANGE AC
0620 7040          CMA
0621 7440          SZA
                                /AC SHOULD BE ZERO
                                HALT
0622 4775'        JMS ERADD
0623 4777'        JMS SCOPEA
/
/RAISE NED (NON EXISTANT DISC)
0624 7200          CLA
0625 1374          TAD (3000)      /EM3
0626 6615          DEAL          /SELECT EM3
0627 6616          DEAC
0630 0373          AND (2)        /NED STATUS
0631 7450          SNA
                                /EM3 DID NOT RAISE NED
                                HALT
0632 4775'        JMS ERADD
0633 4777'        JMS SCOPEA
/

```

```

/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
0640 4775 JMS ERADD
0641 4777 JMS SCOPEA
/
/WILL DEAC SKIP DURING DATA BREAK?
0642 6611 DCEA
0643 3776 DCA WC
0644 3772 DCA IACW /ONE WORD
0645 6605 DMAW
0646 6616 DEAC
0647 7410 SKP
0650 5254 JMP ,+4
0651 6622 DFSC
0652 5246 JMP ,-4 /DID NOT SEE ADC PULSE
HALT
0653 4775 JMS ERADD
0654 4777 JMS SCOPEA
/
/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
HALT /AC1 UP WRITE LOCK OUT SWITCH
0662 4775 JMS ERADD
0663 4777 JMS SCOPEA
/
/TEST WRITE LOCK OUT
0664 7240 CLA CMA
0665 3776 DCA WC
0666 6605 DMAW
0667 6622 DFSC
0670 5267 JMP ,+1
0671 6616 DEAC
0672 7000 NOP
0673 0373 AND (2
0674 7440 SZA
HALT
0675 4775 JMS ERADD
NPAGE
0676 5771 JMP I (,+20087600

```



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 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 7300 CLA CLL  
 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

1045 4774'

JMS ERADD

HALT

/ADC PULSE

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 C,+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 C,+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 - SYJC WRITE
/NOT USING DATA BREAK 4000-7777
ATEST, OPR
1120 7000 JMS SCOPEA
1121 4777 DCEA
1122 6611 TAD (4000
1123 1364 DCA GA
1124 3763 CLA
1125 7200 TAD GA /IACW=1
1126 1763 JMS WONEW7
1127 4762 DEAC
1130 6616 SMA /SYNC PULSE
1131 7500 JMP ,-2 /NO
1132 5330 DMAC /YES - READ MAC
1133 6626 DCA BA
1134 3761 TAD BA
1135 1761 CIA
1136 7041 TAD GA
1137 1763 SNA
1140 7450 JMP ,+6
1141 5347 JMS ERSYNC /A=GOOD BA=BAU
1142 4760 LAS
1143 7604 AND (1000
1144 0357 SZA
1145 7440 JMP ,-21
1146 5325 ISZ GA
1147 2763 JMP ,-23
1150 5325 NPAGE
1151 5756 JMP I (,+20087600

```

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	
1202	1376	TAD (4000	
1203	3775'	DCA KA	/TIMES COUNTER
1204	3774'	DCA GA	/INITIAL ADDRESS=0000
1205	7200	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	DFSC	/SKIP ON FLAG
1220	7410	SKP	/NO
1221	5224	JMP ,+3	/YES
1222	2773'	ISZ CTC	
1223	5217	JMP , -4	
1224	6616	DEAC	/READ STATUS
1225	7000	OPR	
1226	7500	SMA	/SYNC PULSE
1227	5224	JMP , -3	/NO
1230	6626	DMAC	/YES - READ ADDRESS
1231	3770'	DCA BA	
1232	1770'	TAD BA	
1233	7041	CIA	
1234	2774'	ISZ GA	
1235	1774'	TAD GA	
1236	7450	SNA	/COMPARE WITH GOOD
1237	5252	JMP ,+13	/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	
1260	3774'	DCA GA	/SET ADDRESS TO 0
1261	7200	CLA	
1262	1364	TAD (-2	
1263	3772'	DCA WC	/WORD COUNT=2
1264	3771'	DCA IACW	
1265	1774'	TAD GA	/FETCH DISC ADDRESS
1266	6605	DMAW	/WRITE 2 WORDS
1267	6622	DFSC	/WRITE COMPLETE?
1270	5267	JMP , -1	/NO WAIT
1271	2774'	ISZ GA	/INCREMENT GOOD ADDRESS FOR COMPARE
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	/SUBTRACT DISC ADDRESS FROM GOOD ADDRESS
1300	7450	SNA	/DO ADDRESSES COMPARE
1301	5314	JMP , +13	/NO, GO TO ERROR
1302	4763'	JMS BADADD	
1303	7604	LAS	
1304	8366	AND (1000	
1305	7450	SNA	
1306	5314	JMP , +6	
1307	7200	CLA	
1310	1774'	TAD GA	
1311	1365	TAD (-1	
1312	3774'	DCA GA	
1313	5261	JMP , -32	
1314	1774'	TAD GA	/YES, LOAD ADDRESS
1315	7440	SZA	/END?
1316	5261	JMP , =35	/NO, RETURN
1317	4777'	JMS SCOPEA	/YES, EXIT

```

NPAGE
1320 5762 JMP I (+20087600
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

```

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 BY
1526	4770'		JMS ETRACK
1527	5312		JMP , -15
			NPAGE
1530	5753	JMP 1 ( , +20037000	

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 6000  
 1571 6624  
 1572 3700  
 1573 5000  
 1574 6623  
 1575 6610  
 1576 7771  
 1577 5055  
 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

1600	4777'	JMS SCOPEA	
1601	7000	FCOM, NOP	
1602	6611	DCEA	
1603	7200	CLA	/SET UP TO FIND ISZ
1604	3776'	DCA GA	/TIME
1605	7200	CLA	
1606	1776'	TAD GA	
1607	4775'	JMS WONE	/START-REFERENCE
1610	6622	DFSC	/DONE FLAG
1611	5210	JMP ,-1	/FOUND REFERENCE
1612	7200	CLA	
1613	1776'	TAD GA	
1614	4775'	JMS WONE	/LOOK AGAIN
1615	7200	CLA	
1616	3774'	DCA CTC	/CTC=HOW LONG
1617	6622	DFSC	
1620	7410	SKP	
1621	5225	JMP ,+4	/FOUND SECOND TIME
1622	2774'	ISZ CTC	
1623	5217	JMP ,-4	
		HALT	/TOOK OVER 40 MILLISEC /REF
1624	4773'	JMS ERADD	
1625	7200	CLA	
1626	1774'	TAD CTC	/HOW LONG
1627	7040	CMA	
1630	1372	TAD (6	/ADD
1631	3371	DCA (XX	/TEM STORAGE

1632	7200	FALCOM, CLA	
1633	1776'	TAD GA	/ADDRESS
1634	4775'	JMS WONE	/WRITE IN
1635	6622	DFSC	
1636	5235	JMP ,-1	/FLAG - DID IT
1637	7200	CLA	
1640	1776'	TAD GA	
1641	4775'	JMS WONE	/DO IT AGAIN
1642	1371	TAD (XX	
1643	3774'	DCA CTC	
1644	6622	DFSC	
1645	5250	JMP ,+3	
1646	4770'	JMS TEXTE	/FALSE COMPARE; FLAG BEFORE ISZ OUT
1647	5232	JMP FALCOM	
1650	2774'	ISZ CTC	
1651	5244	JMP ,-5	/ISZ AND CHECK FOR FLAG
1652	6622	DFSC	
1653	5252	JMP ,-1	
1654	2776'	ISZ GA	/INCREMENT ADDRESS
1655	5232	JMP FALCOM	/TRY ALL ADDRESS
1656	7604	LAS	
1657	0367	AND (400	
1660	7640	SZA CLA	
1661	5766'	JMP ATEST	/LOOP ON ADDRESS TEST

```

1662 5765 NPAGE
      JMP I (,+20087600

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' CLA
2001 7200 TAD (RPAGE+12&377 200 JMP /EQUAL TO (JMP RPAGE+12=JMP ,-1)
2002 1376 DCA RPAGE+13 /SKIP ON DONE
2003 3775' TAD (JMS I 0000 /TO CORRECT TRACK COUNT ON NO ERRORS
2004 1374 DCA RPAGE+11 /READ ROUTINE
2005 3773' TAD (ISZ I [KA /INS ERROR CT
2006 1372 DCA COMA+11 /COMPARE ROUTINE
2007 3771' TAD (NOP
2010 1370 DCA RPAGE+10
2011 3767' TAD (TKTST /INCREMENT KA ON ERROR
2012 1366 DCA 0000
2013 3000 DCA ERRTK /TRACK COUNTER
2014 3765' DCA KA /ERROR COUNT PER TRACK
2015 3764' CLA CMA
2016 7240 JMS FILL
2017 4763' 7777
2020 7777 JMS WDISK /WRITE THE DISC
2021 4762' JMS CKRDOI /READ AND INCREMENT ON ERROR
2022 4761' TAD (JMS I [STATUS
2023 1360 DCA RPAGE+11 /RESTORE
2024 3773' TAD (DFSE
2025 1357 DCA RPAGE+10
2026 3767' TAD (JMS I [ERRCOM
2027 1356 DCA COMA+11 /RESTORE
2030 3771' TAD (RPAGE+10&377 200 JMP /JMP ,-3
2031 1355 DCA RPAGE+13
2032 3775' JMS SCOPEA
2033 4777' LAS
2034 7604 AND (400 /SW3
2035 0354 SZA CLA
2036 7640 JMP RATIO /LOOP ON RATIO TEST
2037 5200 JMS DBTST /3 CYCLE BREAK TEST
2040 4753' LAS
2041 7604 AND (400
2042 0354 SZA CLA
2043 7640

```

```
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
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		ISZ (XX
2124	5321		JMP , -3
2125	7604		LAS
2126	0354		AND (400
2127	7440		SZA
2130	5245		JMP DISK0
2131	4020		JMS DISPAT
2132	4744'		JMS ENDOCT
2133	2743'		ISZ END
2134	6611		DCEA
2135	6601		DCEA
2136	5742'		JMP BEGIN

/LOOP ON 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 5053  
2200

NOP

/COMPLETED DISK TEST

PAGE



2200	7000	DISK,	NOP	
2201	4777'		JMS DWRDOI	/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  
ISZTST, XX

2245	7402		
2246	7040	CMA	
2247	3762'	DCA	TEMP5
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	TEMP5
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	5000		
2375	4600		
2376	3504		
2377	3400		
	2400		

PAGE

/ROTATE 1 TEST ABOUT 67 MILLISECONDS  
ROT1TS, XX

2400	7402		
2401	1777'	TAD	TEMP2
2402	7130	STL	RAR
2403	7004	RAL	
2404	7420	SNL	
2405	7402	HLT	/COMPUTER BAD
2406	7041	CMA	TAD
2407	1777'	TAD	TEMP2
2410	7440	SZA	
24	7402	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	/COMPUTER BAD
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 I*1	
2462	7200	CLA	
2463	5634	JMP I TADTST	

2464	7200	NOTE,	CLA		
2465	1372		TAD	(=11	/CTA,9=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  
 JMSTST, XX

2600 7402  
 2601 1377  
 2602 3241  
 2603 1376  
 2604 3242  
 2605 1375  
 2606 3243  
 2607 1374  
 2610 3244  
 2611 1244  
 2612 3643  
 2613 2244  
 2614 2243  
 2615 2242  
 2616 5211  
 2617 1373  
 2620 3643  
 2621 4775  
 2622 1372  
 2623 3242  
 2624 1371  
 2625 3243  
 2626 1243  
 2627 7040  
 2630 1643  
 2631 7440  
 2632 7402  
 2633 2243  
 2634 2242  
 2635 5226  
 2636 2241  
 2637 5203  
 2640 5602

TAD (7763 /NUMBER OF LOOPS  
 DCA TEMP1  
 TAD (7601 /200 LOCATIONS  
 DCA TEMP2  
 TAD (OUTBUF /STARTING LOCATION  
 DCA TEMP3  
 TAD (4200 /JMS INSTRUCTION  
 DCA TEMP4  
 TAD TEMP4 /STORE 128 JMS ,  
 DCA I TEMP3 /STARTING AT ADDRESS  
 ISZ TEMP4 /6000  
 ISZ TEMP3  
 ISZ TEMP2  
 JMP , -5  
 TAD (5600 /STORE JMP I RETUJM  
 DCA I TEMP3 /TO RETURN FROM JMS  
 JMS OUTBUF /EXECUTE 128 JMS  
 JMRETU, TAD (7603 /RETURN FROM EXECUTE  
 DCA TEMP2  
 TAD (OUTBUF+2  
 DCA TEMP3 /COMPARE ADDRESSES  
 TAD TEMP3 /FOR I+1  
 CMA  
 TAD I TEMP3  
 SZA  
 HLT /PROCESSOR BAD  
 ISZ TEMP3 /END COMP AND FETCH  
 ISZ TEMP2 /DONE 128 YET  
 JMP JMRETU+4  
 ISZ TEMP1  
 JMP JMSTST+3  
 JMP I JMSTST

TEMP1, 0  
 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

/

2451	7402	WTRK,	XX	
2452	6622		DFSC	/SKIP ON DONE FLAG
2453	7402		HLT	/PARITY ERROR GEN INTERRUPT
2454	3770'		DCA AC	/SAVE AC
2455	6611		DCEA	/TRACK ZERO
2456	7200		CLA	
2457	3767'		DCA WC	
2458	3766'		DCA IACW	
2459	6605		DMAW	
2460	6001		ION	
2463	1770'		TAD AC	/RESTORE AC
2464	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
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	0200			/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 RDLO	
2740	5344		JMP ,+4	
2741	1764		TAD BT	
2742	4761		JMS RL5	
2743	4757		JMS R0HI	
2744	2323		ISZ RDADJ-1	/READ 5 TIMES
2745	5331		JMP RDADJ+5	/NO
2746	1356		TAD (-17	/YES
2747	1764		TAD BT	
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			
	3700			

```

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
3013 6041      TSF      /SET TTY PRINTER FLAG
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
3024 6041      CTIMEA, TSF      /NO INTERRUPT FROM TTY
3025 5336      JMP      CTIMEB      /WRONG INTERRUPT
3026 7200      CLA
3027 1375      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
3036 2350      ISZ      CMPYR      /INCREMENT MULTIPLIER
3037 5232      JMP      ,-5
3042 3352      DCA      X+1      /STORE LEAST SIG HALF
3041 1346      TAD      CTIMEY
3042 7041      CIA
3043 3350      DCA      CMPYR      /MULTIPLIER=-Y
3044 3353      DCA      Y
3045 3354      DCA      Y+1
3046 7300      CLA CLL      /MPY CTIMEY TIMES 12291
3047 1353      TAD      Y      /ADD MSH
3050 1374      TAD      (3
3051 3353      DCA      Y
3052 7300      CLA CLL
3053 1354      TAD      Y+1      /ADD LSH
3054 1374      TAD      (3
3055 3354      DCA      Y+1
3056 7430      SZL      /OVERFLOW?
3057 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
3064 1353      TAD      Y
3065 3353      DCA      Y
    
```

/DF32/DF32D DISK DATA TEST

3066 7200  
3067 7100

PAL10

CLA  
CLL

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3070	1352	TAD	X+1	
3071	1354	TAD	Y+1	
3072	3354	DCA	Y+1	
3073	7430	SZL		/OVERFLOW?
3074	2353	ISZ	Y	/YES, INCREMENT MSH
3075	7200	CLA		/1,10**7/Y=CYLE TIME,100
3076	3347	DCA	CYCLE	
3077	1353	TAD	Y	/Y=-Y
3100	7040	CMA		
3101	3353	DCA	Y	
3102	7300	CLA	CLL	
3103	1354	TAD	Y+1	
3104	7041	CIA		
3105	3354	DCA	Y+1	
3106	7430	SZL		
3107	2353	ISZ	Y	
3110	7200	CLA		
3111	1355	TAD	C4611	/MOST SIG HALF OF 10**7
3112	3351	DCA	X	
3113	1356	TAD	C3200	/LEAST SIG HALF OF 10**7
3114	3352	DCA	X+1	
3115	7300	CLA	CLL	
3116	1352	TAD	X+1	/X-Y LSH
3117	1354	TAD	Y+1	
3120	3352	DCA	X+1	
3121	1351	TAD	X	/X-Y MSH
3122	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	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

3200 7402  
 3201 6611  
 3202 7200  
 3203 1377  
 3204 4776'  
 3205 0000  
 3206 1377  
 3207 4775'  
 3210 1374  
 3211 4776'  
 3212 0001  
 3213 1377  
 3214 4773'  
 3215 1372  
 3216 4776'  
 3217 0002  
 3220 1371  
 3221 4775'  
 3222 1370  
 3223 4776'  
 3224 0003  
 3225 1371  
 3226 4773'  
 3227 1367  
 3230 4776'  
 3231 0004  
 3232 1366  
 3233 4775'  
 3234 1365  
 3235 4776'  
 3236 0005  
 3237 1366  
 3240 4773'  
 3241 1364  
 3242 4776'  
 3243 0006  
 3244 1363  
 3245 4775'  
 3246 1362  
 3247 4776'  
 3250 0007  
 3251 1363  
 3252 4773'  
 3253 1361  
 3254 4776'  
 3255 0010  
 3256 1360

PAGE  
 /TRACK WRITERS FOR DISC CALIBRATION

TKCAL. XX  
 DCEA  
 CLA  
 TAD (0000  
 JMS FILL  
 0000  
 TAD (0  
 JMS WRTLO  
 TAD (1  
 JMS FILL  
 1  
 TAD (0  
 JMS WRTHI  
 TAD (2  
 JMS FILL  
 2  
 TAD (100  
 JMS WRTLO  
 TAD (3  
 JMS FILL  
 3  
 TAD (100  
 JMS WRTHI  
 TAD (4  
 JMS FILL  
 4  
 TAD (200  
 JMS WRTLO  
 TAD (5  
 JMS FILL  
 5  
 TAD (200  
 JMS WRTHI  
 TAD (6  
 JMS FILL  
 6  
 TAD (300  
 JMS WRTLO  
 TAD (7  
 JMS FILL  
 7  
 TAD (300  
 JMS WRTHI  
 TAD (10  
 JMS FILL  
 10  
 TAD (400

/DF32/DF32D DISK DATA TEST

3257 4775'

PAL10 V141

JMS WRTLO

11-AUG-70

2119

PAGE 35-1



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
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 5033  
 3377 0000  
 3400

PAGE  
 /DATA TEST = TAPE 3  
 /WRITE READ DISK COMPAR (OUT TO IN)  
 DWRCOI, NOP

3400	7000		
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 ROMI	
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 ROMI	
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	
3428	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	
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 QWRCOI	

```

/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
/EXECUTE 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  
 3571 0200  
 3572 0100  
 3573 4121  
 3574 4067  
 3575 4104  
 3576 4053  
 3577 0000  
 3600

3600 7000  
 3601 3777  
 3602 1376  
 3603 3775  
 3604 1374  
 3605 3773  
 3606 1777  
 3607 6605  
 3610 6621  
 3611 4772  
 3612 6622  
 3613 5210  
 3614 5600

PAGE

/WRITE ONE PAGE

/JMS ... WITH DISK ADDRESS IN AC

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

/

/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  
 DCA RADD /DISK ADDRESS  
 TAD (-200  
 DCA WC /WORD COUNT  
 TAD (INBUF-1  
 DCA IACW /INITIAL ADDRESS  
 TAD RADD /DISK ADDRESS  
 DMAR /LOAD DISK ... READ  
 DFSE /WAIT FOR FLAG  
 JMS STATUS  
 DFSC  
 JMP ,-3  
 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
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	5033
3757	0000
3760	5020
3761	3700
3762	4104
3763	6200
3764	6626
3765	6625
3766	6612
3767	7770
3770	7177
3771	6602
3772	6400
3773	7751
3774	6777
3775	7750
3776	7600
3777	6601
	4000



## /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	
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	
4055	3763'		DCA TKADD	/TRACK ADDRESS
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 WRTHI ,... WITH TRACK ADDRESS IN AC

4067	5267	WRTHI:	JMP ,	
4070	0364		AND (3700	
4071	3763'		DCA TKADD	/STORE TRACK ADDRESS
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

4124	5324	RDLO,	JMP ,	
4125	2364		AND (3700	
4126	3763'		DCA TKADD	/TRACK ADDRESS
4127	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	
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	2364		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 4303  
4171 0123  
4172 5252  
4173 0707  
4174 7070  
4175 3662  
4176 5033  
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	
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 CML CML RAR
4302	7002		7002
4303	7710		SPA CLA
4304	5760		JMP NOTBE
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
4318	7200		CLA
4319	1766		TAD CTA

4322	4756'	NOSYNC,	JMS DEC
4323	4343		SCT
4324	6046		TLS
4325	6041		TSF
4326	5325		JMP ,=-1
4327	4755'		JMS MESSAGE
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

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  
 /DISK WRITE CURRENT TEST  
 DK1, XX

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

CLA  
 TAD (7777  
 JMS FILL  
 7777  
 JMS WDISK  
 JMS WDISK  
 JMS WDISK  
 TAD (3777  
 JMS FILL  
 3777  
 JMS WDISK  
 JMS CKRDOI  
 JMS WDISK  
 JMS WDISK  
 TAD (7777  
 JMS FILL  
 7777  
 JMS WDISK  
 JMS CKRDOI  
 JMP I DK1

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



/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	4776'		JMS FILL	
4463	7777		7777	
4464	4763'		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 1362          TAD (1)
4503 5700          JMP I WSYNC   /EXIT
```

/SUBROUTINE TO INCREMENT ON TRACK ERROR

```

/
4504 7402  TKTST, XX
4505 2761'  ISZ KA
4506 4272  JMS SYNC /DMA IN AC
4507 0360  AND (3776
4510 7640  SZA CLA /NEW TRACK
4511 5704  JMP I TKTST /NO
4512 1761'  TAD KA /ERROR PER TRACK
4513 0357  AND (7300
4514 7640  SZA CLA /LESS THAN 400
4515 4756'  JMS ERTK /NO
4516 2755'  ISZ ERRTK /YES --- TRACK BEING TESTED
4517 3761'  DCA KA /CLEAR FOR NEXT TRACK
4520 5704  JMP I TKTST
    
```

/INHIBIT PRINT OUT WHEN SW0 = 1

```

/
4521 7402  IPRINT, XX
4522 3754'  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 1353  TAD (-2 /SKIP PRINT ROUTINE
4530 3321  DCA IPRINT
4531 1721  TAD I IPRINT
4532 3321  DCA IPRINT
4533 1754'  TAD AC
4534 5721  JMP I IPRINT
    
```

/WRITE MEMORY IN FIRST TWO TRACKS

```

4535 5335  WALL, JMP ,
4536 6611  DCEA /TRACK ZERO
4537 3752'  DCA WC /4096 WORDS
4540 3751'  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
    
```

4551 7751  
 4552 7750  
 4553 7776  
 4554 6614  
 4555 6606  
 4556 5632  
 4557 7300  
 4560 3776  
 4561 6600  
 4562 0001  
 4563 3632  
 4564 4222  
 4565 3675  
 4566 3615  
 4567 3700  
 4570 3705  
 4571 6613  
 4572 0070  
 4573 3504  
 4574 3777  
 4575 5100  
 4576 5033  
 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  
 4 7200 CLA  
 4 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 RDOLO	
4717	5705	JMP I RDX	
4720	1767	TAD TKADD	
4721	4324	JMS RL5	
4722	4763	JMS RDHI	

4723 5705

JMP I RDX

4724 7402  
4725 7106  
4726 7006  
4727 7004  
4730 5724

/ROTATE LEFT 5 AND CLEAR LINK  
RL5, XX  
CLL RTL  
RTL  
RAL  
JMP I RL5

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 WONEW7

/AC=ADDRESS OF WHERE TO BE WRITTEN

5000 5200 WONEW7, JMP ,  
 5001 3000 DCA 0000 /ST  
 5002 3777 DCA CTC  
 5003 7240 CLA CMA  
 5004 3776 DCA WC /ONE WORD  
 5005 7240 CLA CMA  
 5006 3775 DCA IACW /((IACW) = 0000 -1  
 5007 1000 TAD 0000  
 5010 6605 DMAW  
 5011 6622 DFSC /WAIT 36 MILL SEC  
 5012 7410 SKP  
 5013 5216 JMP ,+3  
 5014 2777 ISZ CTC  
 5015 5211 JMP ,-4  
 5016 5600 JMP I WONEW7  
 5017 0000 0

/CLEAR INBUF TO ALL ZEROS

5020 5220 FLUSH, JMP ,  
 5021 7200 CLA  
 5022 1374 TAD (-200  
 5023 3773 DCA CTA  
 5024 1372 TAD (INBUF-1 /IACW OF INBUF  
 5025 3011 DCA 11  
 5026 7200 CLA  
 5027 3411 DCA I 11 /DEPOSIT ZERO  
 5030 2773 ISZ CTA /DONE  
 5031 5226 JMP ,-3 /NO LOOP  
 5032 5620 JMP I FLUSH /YES EXIT

/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	ISZ FILL	
5040	1367	TAD (-100	
5041	3773'	DCA CTA	
5042	1366	TAD (OUTBUF-1	/IACW 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'	ISZ CTA	/DONE
5052	5244	JMP ,=6	/NO ... LOOP
5053	4220	JMS FLUSH	
5054	5633	JMP I FILL	/YES ... EXIT

```

/SCOPE LOOP SET UP
5055 7402 SCOPEA, XX
5056 4765 JMS TRACE
5057 7604 LAS /LOAD ADDRESS SWITCH
5060 1364 AND (1000 /AND FOR SCOPE LOOP
5061 7640 SZA CLA /SCOPE LOOP
5062 5666 JMP I RETURN /YES
5063 1255 TAD SCOPEA /NO-SETUP REFERENCE
5064 3266 DCA RETURN
5065 5655 JMP I SCOPEA
/POINTER FOR SCOPE LOOP

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

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

/ROUTINE TO WRITE DISK (ANY NUMBER OF DISKS)
5100 7402 WDISK, XX
5101 6611 DCEA /TRACK ZERO
5102 7200 CLA
5103 3761 DCA GA /DISC ADDRESS ZERO
5104 3760 DCA TKADD /TRACK ZERO
5105 1357 TAD (-10
5106 3773 DCA CTA /TRACK COUNTER
5107 1356 TAD (-40
5110 3355 DCA (XX /PAGE COUNTER
5111 4754 JMS WPAGE /WRITE
5112 1353 TAD (200 /INCREMENT BY
5113 1761 TAD GA /PREVIOUS INITIAL ADDRESS
5114 3761 DCA GA /STORE
5115 1761 TAC GA /LOAD FOR WRITE
5116 2355 ISZ (XX /ALL PAGES
5117 5311 JMP ,-6 /NO
5120 7200 CLA /YES
5121 1352 TAD (100 /INCREMENT TRACKS
5122 1760 TAC TKADD
5123 6615 DEAL /LOAD TRACK
5124 3761 DCA TKADD /STORE TRACK
5125 2773 ISZ CTA /ALL TRACKS
5126 5307 JMP WDISK+7 /NO
5127 6611 DCEA /YES
5130 5700 JMP I WDISK /EXIT

```

```

/ROUTINE OF DISK CAN NUMBER OF DISK1
RDISK,  XX
5131  7402      CLA
5132  7200      TAD (-377      /NUMBER OF TRACKS
5133  1351      DCA (XX
5134  3355      DEAL
5135  6615      CLA
5136  7200      JMS RPAGE      /READ
5137  4750      JMS SYNC      /FIND NEXT ADDRESS
5140  4747      ISZ (XX
5141  2355      JMP ,=3
5142  5337      CLA
5143  7200      JMP I RDISK
5144  5731
```

5147 4472  
5150 3615  
5151 7401  
5152 5100  
5153 4200  
5154 3600  
5155 7402  
5156 7740  
5157 7770  
5160 6604  
5161 6622  
5162 5207  
5163 0421  
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,

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 1373  
5215 3767  
5216 1366  
5217 3765  
5227 1771  
5221 6605  
5222 1364  
5223 1372  
5224 3763  
5225 1370  
5226 6622  
5227 5226

XX  
CLA CMA  
JMS FILL /OUTPUT=7777  
7777  
CLA  
TAD (RDREC  
DCA RDLO /TAG FOR PRINTOUT  
JMS WDISK /WRITE THE DISC  
DCEA  
TAD (200  
TAD (-1  
DCA WADD  
TAD (-200  
DCA WC  
TAD (OUTBUF-1  
DCA IACH  
TAD WADD  
DMAW /RWRITE 200 TO 377  
TAD (401  
TAD (-1  
DCA RADD  
TAD (-200  
DFSC /READ  
JMP (-1 /NO

5230 3767'  
5231 1362  
5232 3765'  
5233 1763'  
5234 6603  
5235 4761'  
5236 6621  
5237 4760'  
5240 4757'  
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

```

/TAPE 4
/RANDOM WORD ADDRESS AND TRACK TEST
RANDSK, NOP
5242 7000 CLA
5243 7200 DCMA
5244 6601 JMS RANDOM
5245 4756' AND (0700
5246 0355 DCA RANTK /TRACK ADDRESS
5247 3323 JMS RANDOM
5250 4756' DCA RANAD /MEMORY ADDRESS COUNTER
5251 3324 JMS RANDOM
5252 4756' DCA RANWD /WORD
5253 3325 CLA CMA
5254 7240 DCA WC /WORD CY=7777
5255 3767' CLA
5256 7200 TAD (RANWD=1
5257 1354 DCA IACW
5260 3765' TAD RANTK
5261 1323 DEAL /LOAD TRACK ADDRESS
5262 6615 CLA
5263 7200 TAD RANAD
5264 1324 DMAW /LOAD MAC WRITE
5265 6605 JMS FLAG
5266 4761' CLA CMA
5267 7240 DCA WC /ONE WORD
5270 3767' TAD (RANWD /ONE GREATER THAN READ
5271 1353

```

5272	3765'	DCA IACH	
5273	1323	TAD RANTK	
5274	6615	DEAL	/LOAD TRACK
5275	7200	CLA	
5276	1324	TAD RANAD	
5277	6603	DMAR	/LOAD MAC READ
5300	4761'	JMS FLAG	
5301	6621	DFSE	/PARITY ERROR
5302	4752'	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	3751'	DCA BD	
5317	1325	TAD RANWD	
5320	3750'	DCA GD	
5321	4747'	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	7210	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

```

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
5         1373          TAD (3777
5         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	OFSC		/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
DBELL, HLT
5466 7402      HLT
5467 7604      LAS
5470 8365      AND          (76
5471 4764'    JMS RL5
5472 6615      DEAL          /LOAD TRACK AND DISC
5473 7402      HLT
5474 7604      LAS          /LOAD ADDRESS
5475 3763'    DCA GA
5476 7402      HLT
5477 7604      LAS          /LOAD DATA
5500 3762'    DCA GD
5501 7240'    CLA CMA
5502 3772'    DCA WC          /ONE WORD
5503 1371      TAD (GD-1
5504 3770'    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 4761'    JMS BELL      /ERROR
5525 5276      JMP DBELL+10

```

/ADDRESS SCOPE LOOP WITH BELL ON ERROR

```

                    HALT
5526 4757' JMS ERAOD
5527 7604   LAS
5530 3763' DCA GA
5531 1763' TAD GA
5532 4756' JMS WONEW7      /AC=ADDRESS
5533 4755' JMS SYNC      /ADDRESS+1 IN AC
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 5000  
 5557 5600  
 5560 5070  
 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  
 5601 4777  
 5602 6002  
 5603 4776  
 5604 5600

ERADD, XX

JMS IPRINT  
 IOF  
 JMS SIXTY  
 ERADD

5605 5611  
 5606 5612  
 5607 4775  
 5610 4543  
 5611 6060  
 5612 6060  
 5613 4000  
 5614 4776  
 5615 6614  
 5616 5622  
 5617 5623  
 5620 4775  
 5621 4040  
 5622 6060  
 5623 6060  
 5624 0000  
 5625 7604  
 5626 0374  
 5627 7640  
 5630 7432  
 5631 5600

,+4  
 ,+4  
 JMS MESSAGE  
 4543  
 6060  
 6060  
 4000  
 JMS SIXTY  
 AC  
 ,+4  
 ,+4  
 JMS MESSAGE  
 4040  
 6060  
 6060  
 0000  
 LAS  
 AND (2000  
 SZA CLA  
 HLT  
 JMP I ERADD

/TEST FOR HALT

/HALT IF SW1 = ONE

/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 MESSAGE
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
5660	4776
5661	6617
5662	5667
5663	5667
5664	4775
5665	4543
5666	2003
5667	6060
5670	0000
5671	5657

ENDCT	XX
	JMS SIXTY
	END
	.+5
	.+4
	JMS MESSAGE
	4543
	2003
	6060
	0
	JMP I ENDCT

/NUMBER OF PASS COMPLETED

5672	7402	STOP,	XX
5673	7604		LAS
5674	2374		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 0200  
 5776 0260  
 5777 4521  
 6000

PAGE  
 /PRINT OUT ROUTINE FOR BAD TRACK  
 ETRACK, XX

6000	7402		
6001	4777	JMS IPRINT	
6002	4776	JMS SIXTY	
6003	6000	.-3	
6004	6010	.*4	
6005	6011	.*4	
6006	4775	JMS MESSAGE	
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 MESSAGE	
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

BADCOM, XX

6040	7402		
6041	4777'	JMS IPRINT	
6042	4776'	JMS SIXTY	
6043	6040	,=3	
6044	6050	,+4	
6045	6051	,+4	
6046	4775'	JMS MESSAGE	
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 MESSAGE	
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

ERSYNC, XX

6100	7402		
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'	JMS MESSAGE	
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  
6122 0340  
6123 6060  
6124 6060  
6125 0000  
6126 4774'  
6127 5700

3116  
0340  
6060  
6060  
0000  
JMS STOP  
JMP I ERSYNC

/BAD ADDRESS

```

/FAISE COMPARE AT ADDRESS XXXX
/FALCOM XXXX
TEXTE' XX
6130 7402
6131 4777' JMS IPRINT
6132 4776' JMS SIXTY
6133 6622 GA /FROM
6134 6144 ,+10 /TO
6135 6145 ,+10 /TO
6136 4775' JMS MESSAGE
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 0200
6176 0260
6177 4521
6200 PAGE

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/COMPARISON ERROR PRINTOUT
ERRCOM, XX
6200 7402
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 ROLD
6244 6250 ,+4
6245 6251 ,+4
6246 4762' JMS MESSAGE
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 6026 GO /GOOD

```

6265	6305	,+20	
6266	6306	,+20	
6267	4763'	JMS SIXTY	
6270	6625	BD	/BAD DATA
6271	6311	,+20	
6272	6312	,+20	
6273	4762'	JMS MESSAGE	
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	5000	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 MESSAGE
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 MESSAGE
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 0200
6363 0260
6364 6632
6365 6606
6366 0700
6367 4472
6370 6605
6371 0001
6372 6602
6373 0177
6374 3661
6375 3660
6376 6612
6377 4521
6423 PAGE
```

6400	0000	STATUS, 0	
6401	4777'	JMS IPRINT	
6402	6616	DEAC	
6403	3776'	DCA SR	
6404	4775'	JMS MESSAGE	
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	SEA	
6421	5227	JMP ,+6	
6422	4775'	JMS MESSAGE	
6423	2722	2722	/WR
6424	1124	1124	/IT
6425	0500	0500	/E
6426	5233	JMP ,+5	
6427	4775'	JMS MESSAGE	
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 MESSAGE	
6464	4040	4040	
6465	2301	2301	/SA
6466	7540	7540	/B
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 MESSAGE	
6504	4543	4543	
6505	2005	2005	/PE
6506	6060	6060	
6507	0000	0000	
6510	7200	CLA	
6511	1765	TAD STAYSV	
6512	4341	JMS STAT	
6513	3323	DCA ,+10	
6514	4775	JMS MESSAGE	
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 MESSAGE
6532	4040	4040
6533	0422	0422
6534	1440	1440
6535	6060	6060
6536	4300	4300
6537	4764'	JMS STOP
6540	5600	JMP I STATUS
6541	0000	STAT, 0
6542	7100	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	5672	
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

```

/CONSTANTS
6611 DCEA=6611 /CL EXT ADDRESS REGISTER
6601 DCMA=6601 /CLEAR MAR, PE, DONE
6612 DSAC=6612 /CLEAR AC SKIP ON ADD
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 CTADD, 0
6630 0000 0
6631 0000 0
6632 0000 LINKA, 0
6633 0000 STATSV, 0
6634 0000 DEC, 0
6635 0000 DCA DECA
6636 0000 TCA THOU
6637 0000 HCA HUND
6640 0000 TCA TENS
6641 0000 UCA UNIT
6642 0000 TAD DECA
6643 0000 SNA
66 0000 JMP PACK

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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	0313		313
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		
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

	7600	*7600	
7600	1205		TAD 7605
7601	3350		DCA 7750
7602	1206		TAD 7606
7603	3351		DCA 7751
7604	5377		JMP 7777
7605	1355		1355
7606	5743		5743

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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	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

0200	02000000	00000000	11111111	11111111	11111111	11111111	11111111	11111111
0100	11111111	11111111	11111000	00000000	11111111	11111111	11111111	11111111
0200	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
0300	11111111	11111111	11111111	11111111	11111111	00000000	00000000	00011111
0400	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
0500	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
0600	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111110
0700	00000000	00000000	00000000	00000000	00000000	00000000	00000000	01111111
1000	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
1100	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
1200	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
1300	11111111	11111111	10000000	00000000	00000000	00000000	00111111	11111111
1400	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
1500	11111111	11111111	11111111	10000000	00000000	00000000	11111111	11111111
1600	11111111	11111111	11111111	11111111	11111111	11111111	11000000	00000000
1700	00000000	00000000	00000000	00000000	00000000	00000000	00000111	11111111
2000	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
2100	11111111	11111111	11111111	11111111	00111111	11111111	11111111	11111111
2200	11111111	11111111	11111111	11111111	11111111	11111111	11111111	00000000
2300	00000000	00000000	00000000	00000000	00000000	00000000	11111111	11111111
2400	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
2500	11111111	11111111	11111111	00000000	00000000	00000000	00111111	11111111
2600	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
2700	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
3000	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
3100	11111111	11111111	11111111	11111111	11111111	11111111	00000000	00000000
3200	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
3300	11111111	11111111	11111111	00000000	00000000	00000000	11111111	11111111
3400	11111111	11111111	11111111	00000000	11111111	11111111	11111111	11111111
3500	11111111	11111111	11111111	11111111	11111111	11111111	00000000	11111111
3600	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
3700	11111111	11111111	11111111	00000000	00000000	00000000	11111111	11111111



AC 2614  
 ACSAM 3757  
 ADDRESS 5744  
 ADDR 0704  
 ATEST 1120  
 BA 6621  
 BADDADD 6316  
 BADC0M 6040  
 BO 6625  
 BEGIN 0421  
 BELL 5070  
 BT 6624  
 BX 6613  
 C212 0254  
 C215 0256  
 C245 0257  
 C3200 3156  
 C340 0252  
 C4611 3155  
 CACW 7751  
 CKRDOI 3504  
 CLFLAG 4600  
 CMPYR 3150  
 COMA 3644  
 COMPAR 3632  
 CONV 4271  
 CONVB 4314  
 CTA 6610  
 CTADC 6627  
 CTB 3661  
 CTC 6603  
 CTD 6611  
 CTIME 3000  
 CTIMEA 3024  
 CTIMEB 3136  
 CTIMEX 3145  
 CTIMEY 3146  
 CYCLE 3147  
 DBELL 5466  
 DBTST 2205  
 DGEA 6611  
 DCOMA 6601  
 DEAC 6616  
 DEAL 6615  
 DEC 4634  
 DECA 0726  
 DFSC 6626  
 DFSE 6621  
 DEX 1200  
 DISK0 6648  
 DISK1 6647  
 DISK2 6647

DIFRA 6627  
 DKY 4480  
 DMAD 6624  
 DMAY 6620  
 DMAX 6620  
 DSAD 6610  
 DNRDOI 3400  
 END 6617  
 ENDOF 6657  
 ERAUD 5620  
 EROT 6610  
 ERROOF 6200  
 ERROSA 6600  
 ERATK 6606  
 ERSYN 6100  
 ERTK 5632  
 ETRACK 6000  
 EXSH 4543  
 FALCOM 1632  
 FCOM 1601  
 FILL 5033  
 FILLX 4655  
 FLAG 4466  
 FLUSH 5020  
 GA 6622  
 GD 6626  
 GT 6623  
 HUND 6730  
 IACW 7751  
 INBUF 7200  
 IPRINT 4521  
 ISZTST 2240  
 JMRETU 2622  
 JMSZTST 2620  
 KA 6600  
 LINKA 6600  
 M2 0250  
 M3 0253  
 M40 0251  
 MARDIT 4200  
 MAST01 0250  
 MAST02 0340  
 MAST03 0341  
 MAST04 0340  
 MAST05 2041  
 MESSAGE 0200  
 MSH01 0251  
 MSH02 0251  
 MSH03 4020  
 MSH04 2400  
 MSH05 6601  
 MSH06 7000

P001 4001  
 P002 4000  
 P003 4001  
 P004 4001  
 P005 4001  
 P006 4001  
 P007 4001  
 P008 4001  
 P009 4001  
 P010 4001  
 P011 4001  
 P012 4001  
 P013 4001  
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 P043 4001  
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HPM 1488 SYNC TIME= 0201 MICRO SECS

0424  
0430 ELAPSED TIME IN  
0435 MINUTES FROM  
0441 START

0441

0446

0455

0465

0473

0515

0526

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 PASS B 36 MINUTES.

0424

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0435

0441

0446

0455

0465

0473

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1

TYPE OUTS 0424 THRU 2121  
ONLY OCCUR IF PROGRAM TRACE  
IS REQUESTED BY SETTING  
SW 11.