

IDENTIFICATION

Product Code: MAINDEC-08-D5BB-D
Product Name: DF32 DISCLESS
Logic Test, MiniDisc
Date Created: November 3, 1967
Maintainer: Diagnostic Group
Author: J. Hittell

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1. ABSTRACT

Discless is a test of the DF32 DISC LOGIC and its computer interface. This Program does not test the disc, nor associated analog interface circuits.

(The disc is not needed for these routines. If it is connected, the disc motor should be turned off. For a complete test of the Disc system use DF32 DISC DATA TEST.)

2. REQUIREMENTS

2.1 Equipment

PDP-8 Standard
DF32 DISC LOGIC
Light Card (for testing track selector)

2.2 Storage

2.2.1 Program Storage - The program uses most of memory from address 100 to 3400 and locations 0, 1 and 2.

3. LOADING PROCEDURES

3.1 Methods

Procedures of normal binary tapes should be followed.

4. STARTING PROCEDURE

4.1 For normal operation all switches should be down.

4.2 Starting Address

The starting address for DF32 DISCLESS is 100. (For PDP-8S SA=77)

	<u>Special Address</u>
76	Start for abnormal Print Out check
101	Start of Register Test
102	Start of shift, interrupt, error
103	DISC Memory Address Test SR=Address

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104	DISC and Computer Extended Address Test SR=Address
105	DISC Data Memory Buffer SR=Data
106	Scope Loop SAD "FF"
107	Scope Loop SAP Pulse
110	Scope Loop ADC "FF"
111	Scope Loop SDP Pulse
112	Scope Loop DEP Pulse
113	Scope Loop TCR "FF"
114	Scope Loop IOT 66XX, SR=XX
115	Scope Loop Light Box AC 8, 9, 10 and 11=Track

4.3 Program and/or Operator Action

Turn Disc Motor off.

Load Discless into memory.

Select EM0 (DISC ZERO). (All other units to off).

Write Inhibit Switches off.

Connect Light Card if tracks are to be tested (not necessary for test). *(LOC A 05*

Set the Switch Register to 100. *SET SWITCH ON LIGHT CARD IN UP POSITION.*

Load Address.

Set the Switch Register to all zero (down).

Press Start.

Program will run; if the light card is used, lights will light from 0 to 17₈ in sequence and the program will loop upon completion.

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

SW0	UP	Delete Print Out
SW1	UP	Halt After Error
SW2	UP	Sub Test Scope Loop
SW3	UP	Do not Exit Section
SW4	UP	Delete Light Box

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5.2 There are three basic sections to loop on INTERFACE Test, Register test, SHIFT and ERRORS test.

5.3 When it is necessary to scope a detected error, place SW1 UP to halt on the error, SW2 UP to loop on it, and SW0 UP to DELETE PRINT OUTS.

6. ERRORS

Logic hardware malfunctions detected by the program result in a type out, and a halt if SW2 is up.

(If the light card is used, operator observance is necessary to detect an error.)

6.1 Error Halts and Description

<u>Address Tag</u>	<u>Function Tested</u>	<u>Good (AC)</u>	<u>Bad (AC)</u>	<u>Corrective Action</u>
603	START KEY CL(TRC)	0000	N/A	A15/B5/B19/B20
611	DSAC, 0 → AC	0000	7777	B18/D22
615	START KEY CL(ADC)	0000	N/A	B16/B5/B19/B18
622	START KEY CL(EMA)	0000	N/A	A21/B5/B19/see 1023
627	START KEY CL(EA)	0000	N/A	A21/B5/B19/see 1027
641	DOES WC BREAK	0000	7777	B29/A13/C15/C16/D22
641	DOES WC BREAK	0000	XXXX	B29/A13
645	DOES CA BREAK	0000	7777	C18 pin K
654	DMAW, 0 → AC	0000	7777	B18
663	DMAR, 0 → AC	0000	7777	B21/D10/D22
670	DMAC NOT SKIP	0000	N/A	B20/B19
676	DMAC, 0 → AC	0000	7777	B21
704	NO DRL STATUS	0000	0004	D20/A13
712	NO NED STATUS	0000	0002	B22/C20/B18/B20/D18/D19
723	NO FLAG AFTER WRITE	0000	N/A	A19/B22
726	NO FLAG AFTER WRITE	0000	N/A	A19/B22/A15
740	ADDRESS ACCEPT CL(DBR)	0000	0001	A13/B29
740	ADDRESS ACCEPT CL(DBR)	0000	XXXX	A13/B29
744	ADDRESS ACCEPT CL(DBR)	0000	XXXX	A13/B29
1010	NO FLAG AFTER READ	0000	N/A	A19
1013	NO FLAG AFTER READ	0000	N/A	A19

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<u>Address Tag</u>	<u>Function Tested</u>	<u>Good (AC)</u>	<u>Bad (AC)</u>	<u>Corrective Action</u>
1023	DISC EXT. ADDRESS 0	0000	XX00	B4/B1/B2/B3
1027	COMPUTER EXT. ADDRESS = 0	0000	0070	CD/23
1027	COMPUTER EXT. ADDRESS = 0	0000	00X0	B27/D20
1043*	NO SYNC (PSM)	0000	400X	B18/D18/A30 <i>SWITCH ON LIGHT CARD SHOULD BE UP.</i>
1050	NO PARITY STATUS	0000	0001	A12/B15
1205	SEL ERROR STATUS	0000	N/A	B18/D19/D18/C20
1214	NO WLO (LOWER)	0000	N/A	A17/A12/C20/CHECK WLO SWITCHES
1225	NO WLO (UPPER)	0100	N/A	A17/A12/C20/CHECK WLO SWITCHES
1234	EM3 RAISE NEX	3000	N/A	D18/D19/B18/A30
1243	EM2 RAISE NEX	2000	N/A	D19/B2
1252	EM1 RAISE NEX	1000	N/A	D19/B1
1267	DISC EXT. ADDRESS = SEVEN	3700	0000	CD/23
1267	DISC EXT. ADDRESS = SEVEN	3700	XX00	B1/B2/B3/B4
1303	COMPUTER EXT. ADDRESS	0070	0000	CD/23
1303	COMPUTER EXT. ADDRESS	0070	00X0	D20/B27
1310	SKIP ON NO ERROR (READ)	0000	N/A	B20/C20/A20/B15/B26
* 1327	NO INTERRUPT	0000	N/A	D20/B22/A15
1405	SKIP ON NO ERROR (READ)	0000	N/A	DIODE ON EM SELECT SW
1413	SKIP ON NO ERROR (WRITE)	0402	N/A	DIODE ON EM SELECT SW
1420	SKIP ON NO ERROR (WRITE)	0000	N/A	DIODE ON EM SELECT SW
1534	RAISE (NED) STATUS	7002	7000	B22/B18/C20
1522	INTERRUPT ON (NED)	3000	N/A	D20/B22
1534	CL PAR FF	3000	N/A	A20
1551	WILL (NED) SET (TRC)	7002	N/A	A19/A15/B19/B24
1616	DMA TEST	0000	XXXX	CD22/CD24/B5
1616	DMA BITS 0,1			B6/B12
1616	DMA BITS 2,3			B7/B12
1616	DMA BITS 4,5			B8/B12
1616	DMA BITS 6,7			B9/B13
1616	DMA BITS 8,9			B10/B13
1616	DMA BITS 10,11			B11/B13
1636	EMA TEST			

*If light card is used (Sync) switch should be off.

* CHECK IF INTERRUPT LINE D20-V LOGIC CHECK WITH LIGHT CARD IS SET HIGH IF IT IS IT IS VERY LIKELY TO BE CAUSED BY SOME OTHER LINE ON THE INTERRUPT BUS TO REMAIN HIGH. SET INTERRUPT LINE TO LOW TO CLEAR IT.



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<u>Address Tag</u>	<u>Function Tested</u>	<u>Good (AC)</u>	<u>Bad (AC)</u>	<u>Corrective Action</u>
1636	EMA BIT 1	XX00	XX00	B1/B4
1636	EMA BITS 2,3	XX00	XX00	B2/B4
1636	EMA BITS 4,5	XX00	XX00	B3/B4
1636	EMA BITS 6, 7, 8	XX00	XX00	B27/D20
1663	DMB TEST	XXXX	ALL	B19/A17/A22/B17/A21
		XXXX	0 to 5	B23
		XXXX	6 to 11	B24
1663	DMB BITS 0,1	XXXX	XXXX	A23/B23
1663	DMB BITS 2,3	XXXX	XXXX	A24/B23
1663	DMB BITS 4,5	XXXX	XXXX	A25/B23
1663	DMB BITS 6,7	XXXX	XXXX	A26/B24
1663	DMB BITS 8,9	XXXX	XXXX	A27/B24
1663	DMB BITS 10, 11	XXXX	XXXX	A28/B24
2223	SHIFT DMA	1252	2525	A29/B5/B17/A16/A15/B30
2223	SHIFT DMA	1252	XX52	B6/B7/B8
2223	SHIFT DMA	1252	12XX	B9/B10/B11
2244	SHIFT DMA	6525	XXXX	SAME AS 2223
2261	SHIFT DMA	7252	XXXX	SAME AS 2223
2301	SHIFT DMA	5525	XXXX	SAME AS 2223
2310	SKIP ON (ADC)	N/A	N/A	B16/A17/B15/B18
2341	SHIFT DMB	7777	ALL	A18/A21/A17
2341	SHIFT DMB	7777	XX77	A23/A24/A25/B23
2341	SHIFT DMB	7777	77XX	A26/A27/A28/B24
2430	SHIFT DMB	4000	XXXX	SAME AS 2341
2462	SHIFT DMB	5252	XXXX	SAME AS 2341
2515	SHIFT DMB	2525	XXXX	SAME AS 2341
2617	SHIFT DMA	5777	7777	B14/B15
2632	RAISE (DRL) STATUS	0004	0000	D20/A13
2635	SKIP ON DRL	0004	0004	C20
2641	WILL (DEP) SET (TRC)	N/A	N/A	A19
2653	INTERRUPT ON TRC	N/A	N/A	D20
2675	TRACK COUNTER (EMA)	3702	0000	B16/B19/B23
2675	TRACK COUNTER (EMA)	3702	XX00	B1/B2/B3
2705	TRACK COUNTER (EMA)	0000	XX00	

Light Card Test

<u>Function Tested</u>	<u>Corrective Action</u>
NO LIGHTS	A6/A7
2nd & 4th FOUR	A6/A20/A19
1st & 3rd FOUR	A6/A20/A17/A21/B21/B25
TK 0, 10	A3
TK 1, 11	A3
TK 2, 12	A3
TK 3, 13	A3
TK 4, 14	A2
TK 5, 15	A2
TK 6, 16	A2
TK 7, 17	A2

Printouts created by abnormal switch conditions.

(This test should not be made until program runs in normal). (Starting Address = 76)

DISK 0 (EM0) SELECTED, EM0 WLO "ON"

<u>Lower Write Lock Switch "ON"</u>			
<u>Address Tag</u>	<u>AC</u>	<u>Function Tested</u>	<u>If No Printout</u>
1214	0000	WRITE LOCK OFF	A17/A12/C20
1301	0000	SKIP ON NO ERROR	C20
<u>Upper Write Lock Switch "ON"</u>			
1225	0100	WRITE LOCK OFF	
1413	0402	SKIP ON NO ERROR	
<u>Sync Switch Light Card "ON"</u>			
1043	4000	NO SYNC, NO DISC	A30

All switches Normal Except

<u>EM OFF</u>	<u>EM 1</u>	<u>EM 2</u>	<u>EM 3</u>	<u>AC</u>	<u>Function Tested</u>	<u>If No Print Out</u>
0712	0712	0712	0712	0002	NO NED STATUS	D19
0723	0723	0723	0723	0000	NO FLAG ON WRITE	A19
0726	0726	0726	0726	0000	NO FLAG ON WRITE	A19
0740	0740	0740	0740	0001	ADDRESS ACCEPT (0 DBR)	A13/B29
0744	0744	0744	0744	0001	ADDRESS ACCEPT (0 DBR)	A13/B29
1043	1043	1043	1043	4002	NO SYNC	UNIT SELECT SW.
1205	1205	1205	1205	1000	SELECT ERROR STATUS	C20/B18
1214	1214	1214	1214	1000	NO WLO	A12/A17/C20

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<u>EM OFF</u>	<u>EM 1</u>	<u>EM 2</u>	<u>EM 3</u>	<u>AC</u>	<u>Function Tested</u>	<u>If No Print Out</u>
1225	1225	1225	1225	1100	NO WLO	A12/A17/C20
			1234	3002	EM3 RAISE NEX	D19
		1243		2002	EM2 RAISE NEX	D19
	1252			1002	EM1 RAISE NEX	D19
1327	1327	1327	1327	0000	NO INTERRUPT	D20
2223	2223	2223	2223	2525	SHIFT DMA	B17/D18
2244	2244	2244	2244	5252	SHIFT DMA	B17/D18
2261	2261	2261	2261	5252	SHIFT DMA	B17/D18
2301	2301	2301	2301	5252	SHIFT DMA	B17/D18
2310	2310	2310	2310	0000	SKIP ON ADC	A17/B18
2430	2430	2430	2430	0000	SHIFT DMB	A17/A21
2462	2462	2462	2462	2525	SHIFT DMB	A17/A21
2617	2617	2617	2617	7777	SHIFT DMB	A17/A21
2632	2632	2632	2632	0000	DRL STATUS	A17/B17/A29
2635	2635	2635	2635	0000	SKIP ON (DRL)	A17/B17/A29
2641	2641	2641	2641	0000	(DEP) SET (TRC)	A19
2675	2675	2675	2675	XXXX	TRACK COUNTER (EMA)	B6
2705	2705	2705	2705	3700	TRACK COUNTER (EMA)	B6
0622	0622	0622	0622	0100	CL STATUS REQ	

6.2 Error Recovery

Press Continue, or Restart at 100.

7. RESTRICTIONS

(None)

8. MISCELLANEOUS

An extra IOT maintenance package has been incorporated in the design of the logic. While this IOT package is not needed for operational use of the disc, it must be in if Discless is to run.

(Coded to 663X)

6631=TAS=TTA

6632=TTB

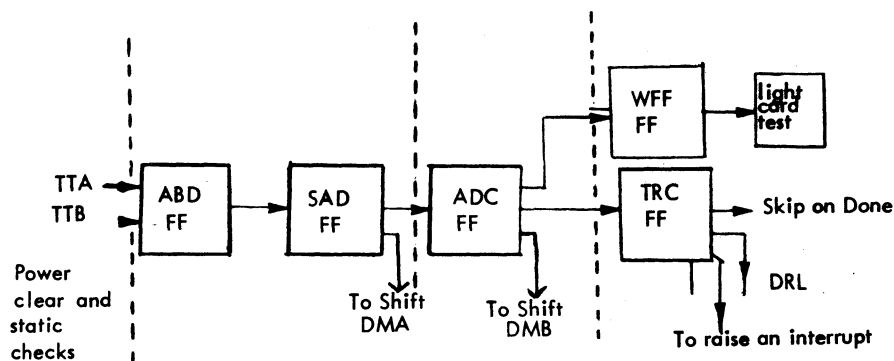
6634=DBR

9. PROGRAM DESCRIPTION

9.1 Discussion

Discless is an incremental test of the DF32 DISC LOGIC. Starting with basic conditions, such as, does start key clear the error and done logic? Can all control flip-flops be set and cleared and can all registers be set and cleared? Will the track counter increment, will all register shift data? Does the Data break work, can we raise an interrupt, check for all status butts, such as write lock out and non-existent disc? With the use of the light card test for correct track selection.

There is a chain of flip-flops which must be working if these tests are to pass.



Each disc has $16_{(10)}$ tracks, in order to verify the correct track selection a light card indicator is needed. This card is inserted into location A5. With the program running, the lights or the card should rotate from 0 to $16_{(10)}$ each pass of the program. (If the light card is not used it will not affect the operation of the test. There is a switch on the card that simulates the photo cell on Disc.)

If this test runs and the "abnormal" switch settings on the Disc hardware are used to create printouts and the proper one occurs, any failure that occurs using the DF32 DATA DISC TEST should be location on the heads, R/W Amplifiers, the Disc or associated analog circuits.

10. LISTINGS

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EXPUNGE
/MEMORY REFERENCE INSTRUCTIONS
AND=6000
TAU=1000
ISL=2000
UCA=3000
JMS=4000
JMP=5000
IOT=6000
OPR=7000
/MICROINSTRUCTIONS
NOP=7000
CLA=7200
CLL=7100
CMA=7040
CML=7020
RAH=7010
RTR=7012
HAL=7004
RIL=7006
IAC=7001
SMA=7500
SEA=7440
SPA=7510
SNA=7450
SINL=7420
SEL=7430
SKP=7410
OSH=7404
HLT=7402
/COMBINED MICROINSTRUCTIONS
CIA=7041
LAS=7604
SIA=7240
SIL=7120
GLK=7204
/PROGRAM INTERRUPT
ION=6001
IOF=6002
POF=6022
RRB=6012
/TELETYPE KEYBOARD/READER
KSF=6031
KCC=6032
KRS=6034
KRB=6036
/TELETYPE TELEPRINTER/PUNCH
TSF=6041
TCF=6042
TPC=6044
TLS=6046
FIXTAB
PAUSE
/DIGITAL 8-18-U
/MESSAGE TYPE-OUT
/CALL WITH A JMS MESSAGE
/WITH DATA FOLLOWING
/RETURN FOLLOWING END OF MESSAGE

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/COE(00)
*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 SNA /<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 43 IS
0241 5243 JMP MTP /CARRIAGE-RETURN (215)
0242 1257 TAD C245 /ADD 200 TO OTHERS >40
0243 6046 MTP, TLS /TRANSMIT CHARACTER
0244 6041 TSF /WAIT FOR FLAG
0245 5244 JMP ,-1 /NOT SET YET
0246 7200 CLA /SET: CLEAR C(AC)
0247 5617 JMP I TYPECH /RETURN

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          /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
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0260 7402 SIXTY, HLT
0261 7000 NOP
0262 7000 NOP /STORE INIT NEXT TIME
0263 7200 CLA
0264 1660 TAD I ,-4 /ADDRESS OF OPERAND
0265 3267 DCA ,+2
0266 5670 JMP I ,+2
0267 0000 0 /ADDRESS OF OPERAND
0270 0272 SIXTY+12 /CHANGING REFERENCE (P)
0271 5263 JMP SIXTY+3
0272 1667 TAD I SIXTY+7 /AC (OPERAND)
0273 0377 AND (0007
0274 3340 DCA MASKA /000X
0275 1667 TAD I SIXTY+7 /AC (OPERAND)
0276 0376 AND (0070
0277 3341 DCA MASKB /00X0
0300 1667 TAD I SIXTY+7 /AC (OPERAND)
0301 0375 AND (0700
0302 3342 DCA MASKC /0X00
0303 1667 TAD I SIXTY+7 /AC (OPERAND)
0304 0374 AND (7000
0305 3343 DCA MASKD /X000
0306 1342 TAD MASKD /0X00
0307 7112 RTR:CLL
0310 7010 RAR /0X00 RS3 00X0
0311 1343 TAD MASKD /X0X0
0312 7012 RTR
0313 7010 RAR
0314 1344 TAD MASKD+1 /X0X0 RS3 0X0X
0315 3342 DCA MASKC /TEMP STORAGE
0316 2260 ISZ SIXTY /INCREMENT FOR STORAGE
0317 4270 JMS SIXTY+10 /FIND STORAGE ADDRESS
0320 1342 TAD MASKC /6X6X
0321 3667 DCA I SIXTY+7 /STORE OPERAND AS SPECIFIED
0322 1341 TAD MASKB /00X0
0323 7004 RAL
0324 7006 RTL /00X0 SL3 0X00
0325 1340 TAD MASKA /0X00+000X=0X0X
0326 1344 TAD MASKD+1 /0X0X+6060=6X6X
0327 3343 DCA MASKD /TEMP STORAGE
0330 2260 ISZ SIXTY /INCREMENT FOR STORAGE
0331 4270 JMS SIXTY+10 /FIND STORAGE ADDRESS
0332 1343 TAD MASKD /6X6X
0333 3667 DCA I SIXTY+7 /STORE OPERAND AS SPECIFIED
0334 1373 TAD (SIXTY+12 /HOUSE KEEPING
0335 3270 DCA SIXTY+10
0336 2260 ISZ SIXTY /INCREMENT FOR RETURN
0337 5660 JMP I SIXTY /RETURN
0340 0000 MASKA, 0
0341 0000 MASKB, 0
0342 0000 MASKC, 0
0343 0000 MASKD, 0
0344 6060 6060
PAUSE
0373 0272 PAGE
0374 7000
0375 0700
0376 0070
0377 0007

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/PRINT OUT ROUTINES
/ROUTINE TO PRINT OUT FAILING TEST ADDRESS
/AND CONTENTS OF AC
/XXXX XXXX ---- ADDRESS (AC)
0400 7402 ERADD, XX
0401 4777 JMS IPRINT
0402 6002 IOF
0403 4776 JMS SIXTY
0404 0400 ERADD
0405 0411 ,+4
0406 0412 ,+4
0407 4775 JMS MESSAGE /ADDRESS
0410 4543 4543
0411 6060 6060
0412 6060 6060
0413 4000 4000
0414 4776 JMS SIXTY
0415 3404 AC
0416 0422 ,+4
0417 0423 ,+4
0420 4775 JMS MESSAGE /CONTENTS OF AC
0421 4040 4040
0422 6060 6060
0423 6060 6060
0424 0000 0000
0425 7604 LAS
0426 0374 AND (2000
0427 7650 SNA:CLA
0430 5600 JMP I ERADD
0431 1773 TAD AC /AC
0432 7402 HLT
0433 5600 JMP I ERADD

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/COMPARISON ERROR PRINT OUT
/GDXXXX BDXXXX
0434 7402 BADCOM, XX
0435 4777 JMS IPRINT
0436 4776 JMS SIXTY
0437 0434 BADCOM
0440 0444 ,+4
0441 0445 ,+4
0442 4775 JMS MESSAGE
0443 4543 4543
0444 6060 6060
0445 6060 6060
0446 0000 0000
0447 4776 JMS SIXTY
0450 3420 GD /GOOD
0451 0463 ,+12
0452 0464 ,+12
0453 4776 JMS SIXTY
0454 3417 BD /BAD
0455 0467 ,+12
0456 0470 ,+12
0457 4775 JMS MESSAGE
0460 4040 4040 /CRLF
0461 0704 0704 /GOOD DATA
0462 4040 4040
0463 6060 6060
0464 6060 6060
0465 4002 4002
0466 0440 0440 /BAD UATA
0467 6060 6060
0470 6060 6060
0471 0000 0000
0472 7604 LAS
0473 0374 AND (2000
0474 7650 SNA:CLA
0475 7410 SKP
0476 7402 HLT
0477 5634 JMP I BADCOM /EXIT

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0500	7402	BADADD,	XX
0501	4777	JMS IPRINT	
0502	4776	JMS SIXTY	
0503	0500	BADADD	
0504	0510	.,+4	
0505	0511	.,+4	
0506	4775	JMS MESSAGE	
0507	4543	4543	
0510	6060	6060	
0511	6060	6060	
0512	0000	0000	
0513	4776	JMS SIXTY	
0514	3416	GA	
0515	0527	.,+12	
0516	0530	.,+12	
0517	4776	JMS SIXTY	
0520	3415	BA	
0521	0533	.,+12	
0522	0534	.,+12	
0523	4775	JMS MESSAGE	
0524	4040	4040	
0525	0701	0701	
0526	4040	4040	
0527	6060	6060	
0530	6060	6060	
0531	4002	4002	
0532	0140	0140	
0533	6060	6060	
0534	6060	6060	
0535	0000	0000	
0536	7604	LAS	
0537	0374	AND (2000	
0540	7650	SNA:CLA	
0541	7410	SKP	
0542	7402	HLT	
0543	5700	JMP I BADADD	

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0544 0000 PAUSE0
      /POP-8 INTERFACE TEST NO DISC RMX5 3/6/6/
      /EM0 SHOULD BE SELECTED
0573 3404 PAGE 3
0574 2000
0575 0200
0576 0260
0577 3124

DEFINE SCOPE
      <JMS SCOPEA>
DEFINE HALT
      <JMS ERADD>
DEFINE NPAGE
      <JMP I (+200&7600)>
      /FLAG TEST (CLEAR)
0600 6622 BEGIN, DFSC /SKIP ON FLAG
0601 7410 SKP
0602 4777 HALT /FLAG SHOULD HAVE BEEN CLEARED BY START
0603 4776 SCOPE
      /DOES 6612 CLEAR THE AC? (DSAC)
0604 7240 CLA CMA /AC SET TO SEVENS
0605 6612 DSAC
0606 7000 NOP
0607 7440 SZA
0610 4777 HALT /HALT BECAUSE AC NOT ZERO
0611 4776 SCOPE
      /WAS ADC "FF" CLEARED BY START KEY
0612 6612 DSAC /SKIP ON ADC
0613 7410 SKP
0614 4777 HALT /ADC SET ... START SHOULD CL ADC "FF"
0615 4776 SCOPE
/
      /DOES START CLEAR THE DISK EXT ADDRESS
0616 6614 DEAC-2 /READ STATUS REGISTER
0617 0375 AND (3700 /MASK DISC EXT ADDRESS
0620 7440 SZA
0621 4777 HALT /START KEY DID NOT CLEAR EMA
0622 4776 SCOPE
/
      /DOES TART CLEAR THE COMPUTER EXT ADDRESS REGISTER
0623 6614 DEAC-2
0624 0374 AND (0070 /MASK FOR COMPUTER EXT ADDRESS
0625 7440 SZA
0626 4777 HALT /START KEY DID NOT CLEAR EA
0627 4776 SCOPE

```

```

/DOES DISK BREAK TO RIGHT LOC
0630 7240 CLA CMA
0631 3773 DCA WC
0632 7240 CLA CMA
0633 3772 DCA IACW /WRITE ONE WORD
0634 6605 DMAW
0635 7200 CLA
0636 1773 TAD WC
0637 7440 SZA
0640 4777 HALT /WORD COUNT NOT CORRECT
0641 7200 CLA
0642 1772 TAD IACW
0643 7440 SZA
0644 4777 HALT /ADDRESS CONTROL WORD NOT CORRECT
0645 4776 SCOPE
/IS AC CLEARED BY DMAW?
0646 7240 CLA CMA
0647 3773 DCA WC /ONE WORD
0650 7240 CLA CMA
0651 6603 DMAW /IOT SHOULD CLEAR AC
0652 7440 SZA
0653 4777 HALT /AC NOT CLEARED
0654 4776 SCOPE
/IS AC CLEARED BY DMAR
0655 7240 CLA CMA
0656 3773 DCA WC /ONE WORD
0657 7240 CLA CMA
0660 6603 DMAR /IOT SHOULD CLEAR AC
0661 7440 SZA
0662 4777 HALT /AC NOT CLEARED
0663 4776 SCOPE

```

```

/UMAC SHOULD NOT SKIP
0664 6611 DCEA
0665 6626 DMAC
0666 7410 SKP
0667 4777 HALT /UMAC SKIPPED
0670 4776 SCOPE
/
/WILL DMAC CLEAR AC
0671 6601 DCMA /CLEAR DMAR
0672 7240 CLA:DMA
0673 6626 DMAC
0674 7440 SZA /MAR IO AC
0675 4777 HALT /AC NOT CLEARED BY USAC
0676 4776 SCOPE
/
/STATUS REGISTER TEST (NO DRL)
0677 6611 DCEA
0700 6616 DEAC /EM0
0701 0371 AND (4 /MASK FOR DRL
0702 7440 SZA
0703 4777 HALT /DRL UP
0704 4776 SCOPE
/
/STATUS REGISTER TEST (NO NED FF)
0705 6611 DCEA /EM0
0706 6616 DEAC
0707 0370 AND (2
0710 7440 SZA
0711 4777 HALT /WRITE LOOK OUT OR NED SET
0712 4776 SCOPE
/

```

```

/
/CHECK FOR NO FLAG AFTER WRITE
(DMAW) (DFSC)
0713 7240 CLA CMA
0714 3772 DCA IACW /MEMORY LOCATION ZERO
0715 7240 CLA CMA /AC*7777
0716 3773 DCA WC /WORD COUNT*7777
0717 6605 DMAW /START WRITE ONE WORD
0720 6622 DFSC /SKIP ON FLAG
0721 7410 SKP
0722 4777 HALT /FLAG UP
0723 6622 DFSC /SKIP ON FLAG
0724 7410 SKP
0725 4777 HALT /FLAG UP
0726 4776 SCOPE

/WILL ADDRESS ACCEPT CLEAR DATA BREAK REQUEST FF?
0727 6605 DMAW /WRITE SET OBR FF
0730 7200 CLA
0731 3773 DCA WC
0732 3772 DCA IACW
0733 6603 DMAR /SHOULD NOT SET OBR "FF"
0734 7000 NOP
0735 1773 TAD WC
0736 7440 SZA
0737 4777 HALT /WORD COUNT SHOULD BE ZERO
0740 7200 CLA
0741 1772 TAD IACW
0742 7440 SZA
0743 4777 HALT /IACW SHOULD BE ZERO
0744 4776 SCOPE
0745 5767 NPAGE

```

```

0767 1000 PAGE
0770 0002
0771 0004
0772 7751
0773 7750
0774 0070
0775 3700
0776 3242
0777 0400

/DISK MEMORY ADDRESS READ
1000 7240 CLA CMA
1001 3777 DCA WC /READ ONE WORD
1002 7240 CLA CMA
1003 3776 DCA IACW /MEMORY LOCATION ZERO
1004 6603 DMAR /START READ ONE WORD
1005 6622 DFSC /SKIP ON FLAG
1006 7410 SKP
1007 4775 HALT /FLAG UP
1010 6622 DFSC /SKIP ON FLAG
1011 7410 SKP
1012 4775 HALT /FLAG UP
1013 4774 SCOPE

/STATUS REGISTER CHECK EXTENDED ADDRESS
1014 7200 CLA
1015 6615 DEAC
1016 7200 CLA /LOAD EXTENDED ADDRESS WITH ZEROS
1017 6616 DEAC
1020 0373 AND (3700)
1021 7440 SZA
1022 4775 HALT /DISC EXTENDED ADDRESS NOT CLEAR
1023 6616 DEAC
1024 0372 AND (0070)
1025 7440 SZA
1026 4775 HALT /COMPUTER EXTENDED ADDRESS NOT CLEAR
1027 4774 SCOPE

```

```

/
/DEAC READ DISK EXTENDED ADDRESS
/CHECK FOR NO SYNC MARK
1030 7300   CLA CLL
1031 3771   DCA CTD
1032 6616   DEAC
1033 7000   NOP
1034 7500   SMA           /SYNC
1035 7410   SKP           /NO
1036 5242   JMP .+4       /YES
1037 2771   ISZ CTD      /LOOP
1040 5232   JMP .-6
1041 7410   SKP           /NO SYNC PULSE OR NO DISC SELECTED
1042 4775   HALT         /FOUND SYNC PULSE
1043 4774   SCOPE

/
/PARITY STATUS BIT TEST
1044 6616   DEAC
1045 0370   AND (0001           /MASK FOR PARITY STATUS
1046 7440   SZA
1047 4775   HALT           /PARITY STATUS UP
1050 4774   SCOPE

/
1051 5767   NPAGE

```

```

1167 1200 PAGE
1170 0001
1171 3412
1172 0070
1173 3700
1174 3242
1175 0400
1176 7751
1177 7750

1200 6602 /TEST WRITE LOCK OUT SWITCH OR NO DISC
1201 6616 DEAC /READ MODE INHIBIT WRITE LOCK OUT SWITCHES
1202 7012 RTR
1203 7430 SZL
1204 4777 HALT /NO DISC NED SET
1205 4776 SCOPE

/
1206 6604 /CHECK TO SEE IF WRITE LOCK OUT SWITCHES OFF (LOWER)
1207 6616 DEAC /WRITE MODE
1210 7000 NOP /READ STATUS
1211 7012 RTR /AC10 TO LINK
1212 7430 SZL
1213 4777 HALT /AC1 UP WRITE LOCK OUT SWITCH
1214 4776 SCOPE

/
1215 1377 /CHECK TO SEE IF WRITE LOCK SWITCH OFF (UPPER)
1216 6615 TAD (0400) /UPPER TRACK
1217 6604 DEAL
1220 6616 DMAW-1 /WRITE MODE
1221 7000 NOP
1222 7012 RTR /AC10 TO LINK
1223 7430 SZL
1224 4777 HALT /AC1 UP WRITE LOCK OUT SWITCH
1225 4776 SCOPE

/
1226 1375 /RAISE STATUS BIT AC0/NEX
1227 6615 TAD (3000) /EM3 SHOULD NOT BE SELECTED
1230 6616 DEAL /SELECT DISC/EMS
1231 7000 DEAC /READ STATUS
1232 7500 SMA
1233 4777 HALT /NEX UID NOT RAISE PSM
1234 4776 SCOPE /DISC 0

```



```

      /EM2 SHOULD NOT BE SELECTED
      /
1235 1374 TAD (2000 /SELECT EM1
1236 6615 DEAL
1237 6616 DEAC
1240 7000 NOP
1241 7500 SMA
1242 4777 HALT /NEX NOT UP
1243 4776 SCOPE
      /
      /EM1 SHOULD NOT BE SELECTED
      /
1244 1373 TAD (1000 /SELECT EM1
1245 6615 DEAL
1246 6616 DEAC
1247 7000 NOP
1250 7500 SMA
1251 4777 HALT /NEX NOT UP
1252 4776 SCOPE
1253 6611 DCEA

```

```

/WILL EXTENDED ADDRESS HOLD SEVENS
1254 7240 CLA:CMA
1255 6615 DEAL
1256 0372 AND (3700 /DISC EXT ADDRESS MASK
1257 3771 DCA BA
1260 1771 TAD BA /STORE BA
1261 7041 CIA
1262 1372 TAD (3700
1263 7650 SNA:CLA /TEST
1264 5267 JMP ,+3 /GOOD
1265 1771 TAD BA /BAD
1266 4777 HALT /AC SHOULD =3700
1267 7000 NOP
1270 7240 CLA:CMA
1271 6615 DEAL
1272 0370 AND (0070 /COMPUTER EXT ADDRESS
1273 3771 DCA BA /STORE
1274 1771 TAD BA
1275 7041 CIA
1276 1370 TAD (0070
1277 7650 SNA:CLA /TEST
1300 5303 JMP ,+3 /GOOD
1301 1771 TAD BA /BAD
1302 4777 HALT /AC SHOULD=0070
1303 4776 SCOPE
/
/SKIP ON NO ERROR DFSE
1304 6611 DCEA
1305 6603 DMAR /READ STATE
1306 6621 DFSE /SKIP ON NO ERROR
1307 4777 HALT /DATA REQUEST LATE, PARITY OR NO DISK SET
1310 4776 SCOPE

```

```

/WILL THE DISK HONCR AN INTERRUPT
1311 4340 JMS CLFLAG
1312 7200 CLA /SET UP FOR INTERRUPT
1313 1367 TAD (IOF
1314 3001 DCA 0001
1315 1366 TAD (JMP I 0003
1316 3002 DCA 0002
1317 1365 TAD (.+7
1320 3003 DCA 0003
1321 7240 CLA CMA
1322 3764 DCA WC
1323 6605 DMAW
1324 6001 ION /DID NOT INTERRUPT
1325 7410 SKP
1326 4777 HALT /INTERRUPT UP OR NO DISC
1327 6002 IOF
1330 4776 SCOPE
1331 6611 DCEA
1332 6601 DCMA
1333 7604 LAS
1334 0377 AND (400
1335 7440 SZA /LOOP ON STATIC TEST
1336 5763 JMP BEGIN
1337 5762 NPAGE
/Routine TO CLEAR FLAGS
1340 7402 CLFLAG, XX
1341 6601 6601
1342 6002 6002
1343 6022 6022
1344 6042 6042
1345 6012 6012
1346 6072 6072
1347 6502 6502
1350 6032 6032
1351 6762 6762
1352 5740 JMP I CLFLAG
1353 7402 RANDOM, XX
1354 2761 ISZ CTD
1355 7200 CLA
1356 1761 TAD CTD
1357 5753 JMP I RANDOM

```

1361 3412 PAGE
 1362 1400
 1363 0600
 1364 7750
 1365 1326
 1366 5403
 1367 6002
 1370 0070
 1371 3415
 1372 3700
 1373 1000
 1374 2000
 1375 3000
 1376 3242
 1377 0400

/
 /SKIP ON NO ERROR WLO UPPER (READ)
 1400 6603 DMAR /READ STATE
 1401 1377 TAD (400 /UPPER HALF
 1402 6615 DEAL
 1403 6621 DFSE /SKIP ON NO ERROR
 1404 4777 HALT
 1405 4776 SCOPE

/
 /SKIP ON NO ERROR (WRITE) WLO (UPPER)
 1406 6605 DMAW /WRITE STATE
 1407 1377 TAD (400
 1410 6615 DEAL
 1411 6621 DFSE /SKIP ON NO ERROR
 1412 4777 HALT /WIRE LOCK OUT ON
 1413 4776 SCOPE

/
 /SKIP ON NO ERROR (WRITE) WLO LOWER
 1414 6611 DCEA /LOWER
 1415 6605 DMAW /WRITE STATE
 1416 6621 DFSE /SKIP ON NO ERROR
 1417 4777 HALT /WRITE LOCK OUT ON
 1420 4776 SCOPE

```

/EXECUTE DMA TEST
1421 7200 RTEST,   CLA
1422 6002      IOF
1423 3775      DCA CTA
1424 4774      JMS DMA
1425 7240      CLA!CMA
1426 4774      JMS DMA
1427 4773      JMS RANDOM
1430 4774      JMS DMA
1431 2775      ISZ CTA
1432 5227      JMP ,-3
1433 4776      SCOPE

```

```

/EXECUTE EMA TEST
1434 7240      CLA!CMA
1435 6615      DEAL
1436 7000      NOP
1437 7000      NOP
1440 7000      NOP
1441 7200      CLA
1442 3775      DCA CTA
1443 4772      JMS EMA
1444 7240      CLA!CMA
1445 4772      JMS EMA
1446 4773      JMS RANDOM
1447 2775      ISZ CTA
1450 5245      JMP ,-3
1451 4776      SCOPE

```

```

/EXECUTE DMB TEST
1452 7200      CLA
1453 6611      DCEA
1454 3775      DCA CTA
1455 4771      JMS DMB
1456 7240      CLA!CMA
1457 4771      JMS DMB
1460 4773      JMS RANDOM
1461 4771      JMS DMB
1462 2775      ISZ CTA
1463 5260      JMP ,-3
1464 4776      SCOPE
1465 7604      LAS
1466 0377      AND (400
1467 7440      SZA
1470 5221      JMP RTEST

```

```

/
/RAISE STATUS BIT AC 10
/EM3 SHOULD NOT BE SELECTED
1471 7200 OYA, CLA
1472 1370 TAD (3000
1473 6615 DEAL /SELECT DISC/EM3/RAISE NEX
1474 6631 TTA /SET NED
1475 6616 DEAC
1476 0367 AND (2
1477 1366 TAD (-2
1500 7450 SNA
1501 5304 JMP ,+3
1502 6616 DEAC
1503 4777 HALT /NEX UID NOT RAISE AC 10
1504 7200 CLA
1505 6615 DEAL /DISC 0
1506 4776 SCOPE

```

```

/FORCE AN INTERRUPT WITH NED
1507 7200 CLA
1510 1365 TAD (JMP I 0002
1511 3001 DCA 0001
1512 1364 TAD (.+11
1513 3002 DCA 0002
1514 1370 TAD (3000
1515 6615 DEAL /SEL NON EXISTANT DISC
1516 6001 ION
1517 7000 NOP
1520 6002 IOF
1521 4777 HALT /NED DID NOT RAISE AN INTERRUPT
1522 7200 CLA
1523 4776 SCOPE
/DOES TP1 CLEAR PAR "FF"
1524 6601 DCMA /CLEAR PER
1525 6632 TTb
1526 6632 TTb /TP1 CL PAR
1527 1370 TAD (3000
1530 6615 DEAL /GEN DEP VIA NED
1531 6631 TTA /SET NED --- PER IF PAR SET
1532 6621 DFSE /SKIP ON NO ERROR
1533 4777 HALT
1534 4776 SCOPE
/WILL NED SET DONE (TRC)?
1535 6611 DCEA /CLEAR EXT ADDRESS
1536 6601 DCMA
1537 7240 CLA!CMA
1540 3763 DCA WC
1541 6605 DMAW /SET WORD COUNT OVERFLOW
1542 1370 TAD (3000
1543 6615 DEAL /LOAD EXT ADDRESS - RAISE NEX
1544 6631 TTA /SET NED GENERATE DEP
1545 6616 DEAC /READ STATUS
1546 7000 NOP
1547 6622 DFSC /DID NED SET DONE?
1550 4777 HALT /NO
1551 4776 SCOPE
1552 5762 NPAGE

```

```

1562 1600 PAGE
1563 7750
1564 1523
1565 5402
1566 7776
1567 0002
1570 3000
1571 1640
1572 1620
1573 1353
1574 1601
1575 3411
1576 3242
1577 0400
1600 5777 NPAGE
      /STATIC ADDRESS REGISTER TEST (DISK MOTOR OFF)
      /JMS DMA, AC=DATA
      DMA,      XX
1601 7402
1602 3776      DCA GA
1603 3775      DCA IACH
1604 1776      TAD GA
1605 6603      6603      /LOAD ADDRESS REG
1606 7200      CLA
1607 6624      6624      /READ ADDRESS REG
1610 3774      DCA BA
1611 1774      TAD BA
1612 7041      CIA
1613 1776      TAD GA
1614 7440      SZA
1615 4773      JMS BADADD
1616 7200      CLA
1617 5601      JMP I DMA

```



```

/STATIC TEST OF EXTENDED ADDRESS REGISTER (DISK MOTOR OFF)
/JMS EMA AC=DATA
1620 7402 EMA, XX
1621 0372 AND (3770)
1622 3776 DCA GA
1623 1776 TAD GA
1624 6615 DEAL /LOAD EXT ADDRESS
1625 7200 CLA
1626 6614 6614 /READ EXT ADDRESS
1627 0372 AND (3770)
1630 3774 DCA BA
1631 1774 TAD BA
1632 7041 CIA
1633 1776 TAD GA
1634 7440 SZA
1635 4773 JMS BADADD
1636 7200 CLA
1637 5620 JMP I EMA

```

```

/STATIC DATA REGISTER TEST (DISK MOTOR OFF)
/JMS DMB, AC=DATA
1640 7402 DMB, XX HALT 1462 = TAD (62) = 6372 (6272) = 1001
1641 3771 DCA GD 3450
1642 7240 CLA: CMA SET AC = -1
1643 3770 DCA WC 7750 WC 7750 = -1
1644 1367 TAD (GD-1) 1767 3417 7751 CA 7751 = 3417
1645 3775 DCA IACH 6604 /LOAD DMB
1646 6604 6604
1647 7240 CLA: CMA SET AC = -1
1650 3770 DCA WC SET WC = -1 7750 = -1
1651 1376 TAD (BD-1) 1776 7751 = 3416
1652 3775 DCA IACH
1653 6602 6602 /READ
1654 6634 6634 /RAISE A REQUEST
1655 7200 CLA
1656 1771 TAD GD
1657 7041 CIA
1660 1767 TAD BD
1661 7440 SZA
1662 4766 JMS BADCOM skip on zero AC
1663 7200 CLA
1664 5640 JMP I DMB can't AC
1766 0434 PAGE
1767 3417
1770 7750
1771 3420
1772 3770
1773 0500
1774 3415
1775 7751
1776 3416
1777 2000

```

56ms

DATA BREAK REQUEST F/F near 2
 "MAD" type instruction
 for static logic test

3416 = 10-1
 3417 = BD BAD DATA
 3120 = CD GOOD DATA

WC = 7750
 IACH = 7751

```

2000 5215      JMP ,+15          /JMP AROUND SCOPE LOOPS
2001 7200  SWDMB,      CLA
2002 7604      LAS
2003 4777      JMS DMB
2004 5201      JMP SWDMB
2005 7200  SWDMA,      CLA
2006 7604      LAS
2007 4776      JMS DMA
2010 5205      JMP SWDMA
2011 7200  SWEMA,      CLA
2012 7604      LAS
2013 4775      JMS EMA
2014 4211      JMS SWEMA
2015 5774  NPAGE
2174 2200  PAGE
2175 1620
2176 1601
2177 1640

```

```

/INTERFACE USING SPECIAL IOTS
/CAN WE SHIFT DISC MEMORY ADDRESS WITH DMA

```

```

2200 4777      SCOPE
2201 6601      DCMA
2202 6611      6611
2203 4776      JMS SAD /SET SAD
2204 7200      CLA
2205 1375      TAD (2525          /DATA TO DMA
2206 6605      DMAW          /LOAD DMA
2207 6632      TTb
2210 6632      TTb          /GEN TP1, CLEAR SAD, SET MAD
2211 4774      JMS SAP /SHIFT DMA
2212 6626      DMAC          /READ DMAC
2213 3773      DCA BA
2214 1372      TAD (1252          /WHAT DATA SHOULD BE
2215 7041      CIA
2216 1773      TAD BA
2217 7650      SNA!CLA /TEST
2220 5223      JMP ,+3
2221 1773      TAD BA          /LOAD AC WITH BA
2222 4771      HALT          /ACI = 2525, ACF = 1252
2223 4777      SCOPE

```

```

/CAN WE SHIFT DMA WITH MAU SET
2224 4776 JMS SAD /SET SAD
2225 7200 CLA
2226 1370 TAD (5252 /DATA TO DMA
2227 6605 DMAW /LOAD DMA AND SET ACH
2230 6632 TTB /GEN TP1, CLEAR SAD SET MAU
2231 6632 TTB
2232 4774 JMS SAP /SHIFT DMA
2233 6626 DMAC /READ DMA
2234 3773 DCA BA /TEMP STORE
2235 1367 TAD (6525 /WHAT DATA SHOULD BE
2236 7041 CIA
2237 1773 TAD BA
2240 7650 SNA:CLA /TEST
2241 5244 JMP ,+3
2242 1773 TAD BA /LOAD AC WITH BA
2243 4771 HALT
2244 4777 SCOPE

/
/TO PASS THIS, THE PREVIOUS TEST MUST BE GOOD!!
/SHIFT DMA WITH MAD CLEARED
2245 1366 TAD (7252 /MAD AND ACH SHOULD BE CLEARED
2246 3765 DCA GA
2247 6631 TTA /WITH SAD SET=SAP
2250 6626 DMAC /READ DMA
2251 3773 DCA BA
2252 1773 TAD BA
2253 7041 CIA
2254 1765 TAD GA /SHOULD BE 7252
2255 7650 SNA:CLA /COMPARED
2256 5261 JMP ,+3 /GOOD
2257 1773 TAD BA /BAD
2260 4771 HALT /BAD IS IN AC
2261 7604 LAS /SCOPE LOOP SET UP
2262 0364 AND (1000
2263 7640 SZA:CLA
2264 5763 JMP RETURN+1

/
/TO PASS THIS THE PREVIOUS TEST MUST BE GOOD!!
/MAU AND ACH SHOULD BE CLEARED
2265 1362 TAD (5525 /MAU AND ACH SHOULD BE CLEARED
2266 3765 DCA GA
2267 6631 TTA /WITH SAD SET=SAP=SHIFT DMA
2270 6626 DMAC /READ DMA
2271 3773 DCA BA
2272 1773 TAD BA
2273 7041 CIA
2274 1765 TAD GA /SHOULD BE 5525
2275 7650 SNA:CLA /COMPARE
2276 5301 JMP ,+3 /GOOD
2277 1773 TAD BA /BAD
2300 4771 HALT /BAD IS IN AC
2301 7604 LAS /SCOPE LOOP SET UP
2302 0364 AND (1000
2303 7640 SZA:CLA
2304 5763 JMP RETURN+1

```

```

/INTERFACE USING SPECIAL TIMING PULSES
/SKIP ON ADC PULSE
2305 4761 JMS ADC
2306 6612 DSAC
2307 4771 HALT /ADC NOT SET
2310 4777 SCOPE
/
/SHIFT MEMORY BUFFER/SHIFTS SEVENS
2311 6601 DCMA
2312 6611 DCEA
2313 7240 CLA:DMA
2314 3760 DCA GD
2315 7240 CLA:CMA
2316 3757 DCA WC
2317 1356 TAD (GD-1
2320 3755 DCA IACW
2321 4754 JMS SDP /SHIFT DATA PULSE/LOAD UMB
2322 7240 CLA:DMA
2323 3757 DCA WC
2324 1365 TAD (BD-1
2325 3755 DCA IACW
2326 4753 JMS CLADC
2327 6602 /READ
2330 6634 6634 /RAISE A REQUEST
2331 7200 CLA
2332 1352 TAD (7777
2333 7041 CIA
2334 1756 TAD BD
2335 7650 SNA:CLA
2336 5341 JMP ,+3
2337 1756 TAD BD
2340 4771 HALT /FAILED SHIFTING UMB
2341 4777 SCOPE
2342 5751 NPAGE
PAUSE
/PDP-8 DISCLESS RMX5 - IAPE 4
PAGE
2351 2400
2352 7777
2353 3030
2354 3024
2355 7751
2356 3417
2357 7750
2360 3420
2361 3017
2362 5525
2363 3253
2364 1000
2365 3416
2366 7252
2367 6525
2370 5252
2371 0400
2372 1252
2373 3415
2374 3013
2375 2525
2376 3000
2377 3242

```

```

/SHIFT MEMORY BUFFER SHIF1 ZERO
2400 6601 DCMA
2401 6611 DCEA
2402 7200 CLA
2403 3777 DCA GD
2404 7240 CLA!CMA
2405 3776 DCA WC
2406 1375 TAD (GD-1
2407 3774 DCA IACW
2410 4773 JMS SDP /SHIFT DATA PULSE/LOAD DMB
2411 7240 CLA!CMA
2412 3776 DCA WC
2413 1372 TAD (BD-1
2414 3774 DCA IACW
2415 4771 JMS CLADC
2416 6602 6602
2417 6634 6634
2420 7200 CLA
2421 1370 TAD (4000 /WHAT DATA SHOULD BE AFTER SHIFT
2422 7041 CIA
2423 1775 TAD BD
2424 7650 SNA!CLA
2425 5230 JMP ,+3
2426 1775 TAD BD
2427 4767 HALT /FAILED TEST DMB SHIFT
2430 4766 SCOPE

```

```

/SHIFT MEMORY BUFFERS (2525) ONE SHIFT
2431 7200 CLA
2432 6601 DCMA
2433 6611 DCEA
2434 1365 TAD (2525
2435 3777 DCA GD
2436 7240 CLAICMA
2437 3776 DCA WC
2440 1375 TAD (GD-1
2441 3774 DCA IACW
2442 4773 JMS SDP /MOP ALSO SET NOW/SHIFT DATA
2443 7240 CLAICMA
2444 3776 DCA WC
2445 1372 TAD (BD-1
2446 3774 DCA IACW
2447 4771 JMS CLADC
2450 6602 /READ
2451 6634 /RAISE A REQUEST
2452 7200 CLA
2453 1364 TAD (5252
2454 7041 CIA
2455 1775 TAD BD
2456 7650 SNAICLA
2457 5262 JMP ,+3
2460 1775 TAD BD
2461 4767 HALT
2462 4766 SCOPE

```

```

/SHIFT MEMORY BUFFER (2525) 2 SHIFTS
2463 6601 DCMA
2464 6611 DCEA
2465 7200 CLA
2466 1365 TAD (2525
2467 3777 DCA GD
2470 7240 CLA!CMA
2471 3776 DCA WC
2472 1375 TAD (GD-1
2473 3774 DCA IACW
2474 4773 JMS SDP
2475 6631 TTA
2476 7240 CLA!CMA
2477 3776 DCA WC
2500 1372 TAD (BD-1
2501 3774 DCA IACW
2502 4771 JMS CLADC
2503 6602 6602
2504 6634 6634
2505 7200 CLA
2506 1365 TAD (2525
2507 7041 CIA
2510 1775 TAD BD
2511 7650 SNA!CLA
2512 5315 JMP ,+3
2513 1775 TAD BD
2514 4767 HALT
2515 4766 SCOPE

/SHIFT DATA MDP ALSO SET
/EXTRA SHIFT MDP SHOULD BE CLEARED

/READ
/RAISE A REQUEST

```

STRINGS (CSCS) ADDRESS MEMORY ADDRESS

63	NPAGE	ADD	0000	0000	0000
00	PAGE	ADD	0100	0000	0000
52		ADD	0200	0000	0000
25		ADD	0300	0000	0000
42		ADD	0400	0000	0000
00		ADD	0500	0000	0000
00		ADD	0600	0000	0000
30		ADD	0700	0000	0000
16		ADD	0800	0000	0000
24		ADD	0900	0000	0000
51		ADD	0A00	0000	0000
17		ADD	0B00	0000	0000
50		ADD	0C00	0000	0000
20		ADD	0D00	0000	0000

/

00	/SHIFT DMA WITH ACH ZERO	DASHN	0000	0000	0000
00	CLA	ADD	0100	0000	0000
05	DMAW /DMA11 TO ZERO	ADD	0200	0000	0000
77	JMS SAP /CLEAR ACH	ADD	0300	0000	0000
40	CLA:DMA	ADD	0400	0000	0000
05	DMAW /LOAD ALL SEVEN	ADD	0500	0000	0000
77	JMS SAP /SHIFT DMA	ADD	0600	0000	0000
26	DMAC /READ DMAC	ADD	0700	0000	0000
76	DCA BA /TEM STORE	ADD	0800	0000	0000
75	TAD (5777	ADD	0900	0000	0000
41	CIA	ADD	0A00	0000	0000
76	TAD BA	ADD	0B00	0000	0000
50	SNA:CLA /TEST	ADD	0C00	0000	0000
17	JMP ,+3	ADD	0D00	0000	0000
76	TAD BA	ADD	0E00	0000	0000
74	HALT	ADD	0F00	0000	0000
73	SCOPE	ADD	1000	0000	0000

/

10	/DATA REQUEST LATE/STATUS AND SKIP TEST				
35	S81, SKP				
01	JMP ,+14	/VALID FOR 8SS ONLY			
72	DCMA	/CL DRL			
04	JMS ADC				
32	6604	/RAISE A REQUEST			
16	TTB	/GENERATE DEP			
71	DEAC	/READ STATUS			
50	AND (4				
74	SNA				
21	HALT	/DATA REQUEST LATE STATUS NOT SET			
10	DFSE	/SKIP ON NO ERROR			
74	SKP				
73	HALT	/SKIPPED ON URL			
73	SCOPE				

/

70	/CHECK GENERATION OF DONE FLAG				
22	JMS TCR /SET DONE FLAG				
74	DFSC /SKIP ON FLAG				
73	HALT /NO DONE FLAG				
73	SCOPE				


```

/FORCE AN INTERRUPT WITH IRC
2642 7200 CLA
2643 1367 TAD (JMP I 0002
2644 3001 DCA 0001
2645 1366 TAD (.+6
2646 3002 DCA 0002
2647 4770 JMS TCR /SET IRC
2650 6001 ION
2651 7000 NOP
2652 4774 HALT /TRC DID NOT RAISE IN INTERRUPT
2653 4773 SCOPE

/INCREMENT EXTERNAL MEMORY ADDRESS/EMA
2654 6611 DCEA
2655 7200 CLA
2656 1365 TAD (-37
2657 3364 DCA (XX
2660 6615 DEAL /CLEAR EXT ADDRESS
2661 7240 CLA!CMA
2662 4763 JMS DEP /LOAD DMA SET ACH
2663 6601 DCMA /INCREMENT EMA
2664 2364 ISZ (XX /COUNTER
2665 5261 JMP .-4
2666 6616 DEAC /READ EMA
2667 0362 AND (3700
2670 1361 TAD (-3700
2671 7450 SNA /TEST
2672 5275 JMP .+3
2673 6616 DEAC /READ EMA
2674 4774 HALT /AC = 37
2675 4773 SCOPE
2676 7240 CLA!CMA
2677 4763 JMS DEP /LOAD DMA SET ACH
2700 6601 DCMA /INCREMENT EMA
2701 6616 DEAC
2702 0362 AND (3700
2703 7440 SZA
2704 4774 HALT
2705 4773 SCOPE

```

```

2706 4760 /LOOP ON ROUTINE
2707 7604 JMS CLADC
2710 0374 LAS
2711 7640 AND (400 /LOOP ON SHIFT AND STATUS REG TEST
2712 5757 SZA:CLA
JMP DYA /SHIFT AND STATUS TEST
//
//TEST FOR SKIPPING LIGHT BOX TEST
//
2713 4760 JMS CLADC
2714 6611 DCEA
2715 6601 DCMA
2716 7604 LAS
2717 0356 AND (200
2720 7640 SZA:CLA /SKIP LIGHT BUT
2721 5755 JMP BEGIN /YES
//
//AUTOMATIC CONTROL FOR LIGHT BOX
2722 7200 CLA
2723 6611 DCEA
2724 1354 TAD (7760 /NUMBER OF TRACKS
2725 3753 DCA CTA
2726 3752 DCA KA /TRACK NUMBER
2727 4751 JMS LGBOX /LIGHT BOX ROUTINE
2730 2752 ISZ KA
2731 7200 CLA
2751 3051 TAD KA
2752 3400
2753 3411
2754 7760
2755 0600
2756 0200
2757 1471
2760 3030
2761 4100
2762 3700
2763 3044
2764 7402
2765 7741
2766 2653
2767 5402
2770 3034
2771 0004
2772 3017
2773 3242
2774 0400
2775 5777
2776 3415
2777 3013
2732 1750 /TRACK NUMBER INCREMENTED
2733 2747 ISZ CTA /DONE
2734 5327 JMP .-5 /NO
2735 6611 DCEA /YES
2736 6601 DCMA /CLEAR DISC
2737 4746 SCOPE
2740 4745 JMS CLADC
2741 5744 JMP BEGIN /GO TO START OF PROGRAM

```

2744 0600 PAGE
 2745 3030
 2746 3242
 2747 3411
 2750 3400

```

/COMMANDS TO BE GENERATED WITH SPECIAL IOTS
/ROUTINE TO SET SEARCH ADDRESS/SAD
3000 7402 SAD, XX
3001 6606 6606 /SET MRS WITH LAD
3002 6632 TTb /SET ABD
3003 6632 TTb /SET TCA
3004 6632 TTb /CL TCA, SET TCB
3005 6632 TTb /SET TCA
3006 6632 TTb /CL TCA, CL TCB, SET MMR
3007 6631 TTA /CL ABD TO SYNC DRS
3010 6632 TTb /DRS=SET WCE
3011 6631 TTA /SET SAD
3012 5600 JMP I SAD /EXIT
/ROUTINE TO SET SHIFT ADDRESS PULSE/SAP
3013 7402 SAP, XX
3014 4200 JMS SAD
3015 6631 TTA /SHIFT DMA
3016 5613 JMP I SAP /EXIT
/ROUTINE FOR SETTING ADDRESS CONFIRMED/ADC
3017 7402 ADC, XX
3020 4200 JMS SAD /SAD AND ABC SHOULD BE SET
3021 6632 TTb
3022 6632 TTb /SET ADC CL SAD
3023 5617 JMP I ADC /EXIT
/ROUTINE TO SHIFT MEMORY BUFFER/SUP
3024 7402 SDP, XX
3025 4217 JMS ADC
3026 6631 TTA /SHIFT DMb
3027 5624 JMP I SDP
/ROUTINE TO CLEAR ADC "FF"
3030 7402 CLADC, XX
3031 6632 TTb
3032 6632 TTb
3033 5630 JMP I CLADC

```

```

/ROUTINE TO SET TRANSFER COMPLETE TCR
3034 7402 TCR, XX
3035 6601 DCMA
3036 7240 CLA!CMA
3037 3777 DCA WC
3040 7240 CLA!CMA
3041 3776 DCA IACW /WRITE ONE WORD WCO SHOULD BE SET
3042 4244 JMS DEP
3043 5634 JMP I TCR

/ROUTINE FOR DATA END PULSE/DEP
3044 7402 DEP, XX
3045 4217 JMS ADC
3046 6632 TTB
3047 6632 /GENERATE TP1
3050 5644 JMP I DEP

/LIGHT BOX USED TO TEST TRACK SELECTION
/SET OR CLEAR "WFF"?
3051 7402 LGBOX, XX
3052 6601 DCMA
3053 3375 DCA (XX /STORE SWITCH
3054 1375 TAD (XX
3055 0374 AND (4 /MASK FOR "WFF"
3056 7450 SNA /SET OR CLEAR
3057 5264 JMP ,+5 /CLEAR
3060 4267 JMS KWFF /LOAD DMB, UMA CLEAR WFF
3061 6631 TTA /GEN UPS SET WFF
3062 4311 JMS STALL
3063 5651 JMP I LGBOX
3064 4267 JMS KWFF /LOAD DMB, UMA AND CLEAR WFF
3065 4311 JMS STALL
3066 5651 JMP I LGBOX

```

```

/ROUTINE TO CLEAR WFF
3067 7402 KWFF, XX
3070 7200 CLA
3071 1373 TAD (7777 /DATA FOR MB
3072 3772 DCA GD
3073 1371 TAD (GD-1
3074 3776 DCA IACW
3075 1375 TAD (XX /SWITCH REG
3076 7012 RTR
3077 6611 6611 /CL TRACK
3100 6631 6631
3101 6632 6632
3102 4217 JMS ADC
3103 1375 TAD (XX /SWITCH
3104 7104 RAL:GCL
3105 7006 RTL
3106 7006 RTL
3107 6615 DEAL /LOAD EXT ADDRESS
3110 5667 JMP I KWFF /EXIT
3111 7402 STALL, XX
3112 7240 CLA:CHA
3113 1370 TAD (7740
3114 3322 DCA ,+6
3115 2323 ISZ ,+6
3116 5315 JMP , -1
3117 2322 ISZ ,+3
3120 5315 JMP , -3
3121 5711 JMP I STALL
3122 0000 0
3123 0000 0
3124 7402 IPRINT, XX
3125 3767 DCA AC
3126 7604 LAS
3127 0366 AND (4000
3130 7650 SNA:CLA
3131 5337 JMP ,+6
3132 1324 TAD IPRINT
3133 1365 TAD (-2
3134 3324 DCA IPRINT
3135 1724 TAD I IPRINT
3136 3324 DCA IPRINT
3137 1767 TAD AC
3140 5724 JMP I IPRINT

```

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3165 7776 PAGE
3166 4000
3167 3404
3170 7740
3171 3417
3172 3420
3173 7777
3174 0004
3175 7402
3176 7751
3177 7750

/MAINTENANCE SCOPE LOOPS
/SEARCH ADDRESS
3200 6611 SA, DCEA
3201 4777 JMS SAD
3202 6632 TT8
3203 6632 TT8
3204 5200 JMP ,-4

/SHIFT ADDRESS PULSE
3205 6611 SB, DCEA
3206 4776 JMS SAP
3207 5205 JMP ,-2

/ADDRESS CONFIRMED
3210 6611 SC, DCEA
3211 4775 JMS ADC
3212 5210 JMP ,-2

/SHIFT DATA PULSE
3213 6611 SD, DCEA
3214 4774 JMS SDP
3215 5213 JMP ,-2

/DATA END PULSE
3216 6611 SE, DCEA
3217 4773 JMS DEP
3220 5216 JMP ,-2

/TRANSFER COMPLETE
3221 6611 SF, DCEA
3222 4772 JMS TCR
3223 5221 JMP ,-2

```

```

/MAINTENANCE SCOPE LOOPES FOR IOTS
/USE SR 8 TO 11 TO SELECT IOT
3224 7000 SG, NOP
3225 7200 CLA
3226 3771 DCA WC
3227 3770 DCA IACW
3230 7604 LAS /IOP SELECTION
3231 0367 AND (0037
3232 1366 TAD (6600
3233 3234 DCA ,+1 /GENERATE IOT
3234 7402 XX
3235 7000 NOP /EXECUTE IOT
3236 5225 JMP SG+1 /LOOP
/SCOPE LOOP FOR LIGHT BOX, SR 8-11 EQUAL TRACK
3237 7604 SH, LAS /AC = TRACK
3240 4765 JMS LGBOX
3241 5237 JMP ,-2
/SCOPE LOOP SETUP
3242 7402 SCOPEA, XX
3243 7604 LAS
3244 0364 AND (1000
3245 7440 SZAICLA
3246 5652 JMP I RETURN
3247 1242 TAD SCOPEA
3250 3252 DCA RETURN
3251 5642 JMP I SCOPEA
/
/POINTER FOR SCOPE LOOP
3252 3363 RETURN, (BEGIN
3253 5652 JMP I ,-1

```

```

3363 0600 PAGE
3364 1000
3365 3051
3366 6600
3367 0037
3370 7751
3371 7750
3372 3034
3373 3044
3374 3024
3375 3017
3376 3013
3377 3000

/CONSTANTS
DMAR=6603 /LOAD AND SIART READ
TTA=6631
TTB=6632
MDP=6634
DBR=6634
DCMA=6601 /CLEAR MAR, PRITY, DONE FLAG
DCEA=6611 /CLEAR EXT ADDRESS REGISTERS
DSAC=6612 /CLEAR AC SKIP ON ADC
DMAW=6605 /LOAD AND SIART WRITE
DEAL=6615 /LOAD EXTENDED ADDRESS
DEAC=6616 /READ EXTENDED ADDRESS
DFSE=6621 /SKIP ON NO ENHOR
DFSC=6622 /SKIP ON FLAG
DMAC=6626 /READ DISK ADDRESS
XX=7402 /
WC=7750
IACW=7751
CACW=IACW

3400 0000 KA, 0
3401 0000 WADU, 0 /IACW-1 FOR WRITE
3402 0000 RADD, 0 /IACW-1 FOR READ
3403 0000 CTC, 0
3404 0000 AC, 0 /SAVE AC
3405 0000 TKADD, 0
3406 0000 ERRDSK, 0 /DISK ERROR ADDRESS
3407 0000 ERRTK, 0 /DISK TRACK ERROR ADDRESS
3410 0001 NUM, 1
3411 0000 CTA, 0
3412 0000 CTD, 0
3413 0000 WORD1, 0
3414 0000 WORD2, 0
3415 0000 BA, 0 /BAD ADDRESS
3416 0000 GA, 0 /GOOD ADDRESS
3417 0000 BD, 0 /BAD DATA
3420 0000 GD, 0 /GOOD DATA
PAGE
3600 0000 OUTBUF, 0
PAGE
4000 0000 INBUF, 0

```



```

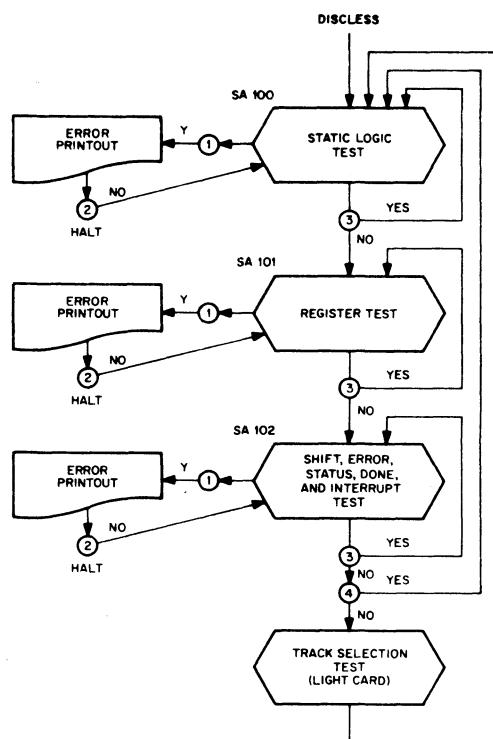
*76
/JUMPING OFF FOR ROUTINES
/
0076 5124      JMP S82+6      /FOR ABNORMAL TLST
0077 4116      JMS S82        /8S ENTRANCE ADDRESS
0100 5777      JMP BEGIN      /START CR TEST
0101 5776      JMP RTEST     /REGISTER TEST
0102 5775      JMP DYA /SHIFT TEST
0103 5774      JMP SWOMA    /DISC MEMORY ADDRESS
0104 5773      JMP SWEMA    /EXT MEMORY ADDRESS
0105 5772      JMP SWOMB    /DISC MEMORY BUFFER
0106 5771      JMP SA /SAD FF
0107 5770      JMP SB /SAP PULSE
0110 5767      JMP SC /ADC "FF"
0111 5766      JMP SD /SDP PULSE
0112 5765      JMP SE /DEP PULSE
0113 5764      JMP SF /TRC "FF"
0114 5763      JMP SG /IOT 66XX SR = XX
0115 5762      JMP SH /LIGHT BOX SR 8 TO 11 = TRACK
0116 7402      S82,      XX
0117 1161      TAD (NOP
0120 3760      DCA STALL+2
0121 1161      TAD (NOP
0122 3757      DCA S81
0123 5516      JMP I S82
0124 6605      DMAH
0125 6605      DMAH          /CLEARWORD COUNT
0126 5100      JMP 100

/
0157 2620      $
0160 3113
0161 7000
0162 3237
0163 3224
0164 3221
0165 3216
0166 3213
0167 3210
0170 3205
0171 3200
0172 2001
0173 2011
0174 2005
0175 1471
0176 1421
0177 0600

```

11. FLOW CHARTS

11.1 Basic Flow



11.2 Detail Flow

