

#### IDENTIFICATION

Product Code:     MAINDEC-8/1-D5BB-D

Product Name:     DF32 DISCLESS  
                    Logic Test, MiniDisc

Date Created:     April 4, 1968

Maintainer:       Diagnostic Group

Author:           J. Hittell

## 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 the disc 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

Standard PDP-8/1 Computer  
DF32 Disc Logic  
Light Card (for testing track selector)

### 2.2 Storage

The program occupies most of memory from address 100 to 3400 and locations 0, 1 and 2.

## 3. LOADING PROCEDURES

Procedures of normal binary tapes should be followed.

## 4. STARTING PROCEDURE

For normal operation all switches should be down.

### 4.1 Starting Address

The starting address for DF32 DISCLESS is 100.

|     | <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                |
| 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 |

#### 4.2 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 *Set OPERATE/MAINT switch to MAINT*

Connect Light Card if tracks are to be tested (not necessary for test)

Set the Switch Register to ~~77~~ 100

Load address

Set the SWITCH REGISTER to all zero (down)

Press START

Program will run; if the lightcard is used, lights will light from 0 to 17<sub>8</sub> 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    |

There are three basic sections to loop on Interface test, Register test, Shift and Errors test.

When an error is detected and it is necessary to scope it, place SW1 UP to halt on the error, then SW2 UP to loop on it, then SW0 UP to delete printouts.

### 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 1023               |
| 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/<br>D18/D19       |
| 723                | NO FLAG AFTER WRITE       | 0000             | N/A             | A19/B22/A15                       |
| 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                               |
| 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                       |
| 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<br>WLO SWITCHES |
| 1225               | NO WLO (UPPER)            | 0100             | N/A             | SAME AS ABOVE                     |
| 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/B5/B26                |
| **1327             | NO INTERRUPT              | 0000             | N/A             | D20/B22/A15                       |
| 1405               | SKIP ON DFSE (READ)       | 0000             | N/A             | B26/DIODE ON EM<br>SELECT SWITCH  |
| 1413               | SKIP ON DFSE (WRITE)      | 0402             | N/A             | B26/DIODE ON EM<br>SELECT SWITCH  |
| 1420               | SKIP ON DFSE (WRITE)      | 0000             | N/A             | B26/DIODE ON EM<br>SELECT SWITCH  |
| 1504               | RAISE (NED) STATUS        | 7002             | 7000            | B22/B18/C20                       |
| 1522               | INTERRUPT ON (NED)        | 3000             | N/A             | D20/B22                           |

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

\*IF NO LIGHT CARD THEN THIS WILL ALWAYS FAIL

\*\* ERROR IN PROGRAM CAUSES THIS 3  
TO ALWAYS FAIL

| <u>Address Tag</u> | <u>Function Tested</u> | <u>Good (AC)</u> | <u>Bad (AC)</u> | <u>Corrective Action</u>   |
|--------------------|------------------------|------------------|-----------------|----------------------------|
| 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               |                  |                 |                            |
| 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               | EA 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/<br>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             | ALI             | 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

|                |                            |
|----------------|----------------------------|
| NO LIGHTS      | A6/A7                      |
| 2nd & 4th FOUR | A6/A20/A19                 |
| 1st & 3rd FOUR | A6/A20/A17/A21/<br>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"

LOWER WRITE LOCK "ON"

| <u>Address Tag</u> | <u>AC</u> | <u>Function Tested</u> | <u>If No Print Out</u> |
|--------------------|-----------|------------------------|------------------------|
| 1214               | 0000      | WRITE LOCK OFF         | A17/A12/C20            |
| 1420               | 0000      | SKIP ON NO ERROR       | C20                    |

UPPER WRITE LOCK "ON"

|      |      |                  |  |
|------|------|------------------|--|
| 1225 | 0100 | WRITE LOCK OFF   |  |
| 1413 | 0402 | SKIP ON NO ERROR |  |

SYNC SWITCH ON LIGHT CARD "ON"

|      |      |                  |     |
|------|------|------------------|-----|
| 1043 | 4000 | NO SYNC, NO DISC | A30 |
|------|------|------------------|-----|

All switches Normal Except

| <u>EM OFF</u> | <u>EM1</u> | <u>EM2</u> | <u>EM3</u> | <u>AC</u> | <u>Function Tested</u> | <u>If No Print Out</u> |
|---------------|------------|------------|------------|-----------|------------------------|------------------------|
| 0712          | 0712       | 0712       | 0712       | 0002      | NO NED STATUS          | D19                    |
| 0744          | 0744       | 0744       | 0744       | 0001      | ADDRESS ACCEPT (0 DBR) | A13/B29                |
| 1043          | 1043       | 1043       | 1043       | 4002      | NO SYNC                | UNIT SELECTS<br>SW.    |
| 1205          | 1205       | 1205       | 1205       | 1000      | SELECT ERROR STATUS    | C20/B18                |
| 1214          | 1214       | 1214       | 1214       | 1000      | NO WLO                 | A12/A17/C20            |
| 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                    |
| 1413          | 1413       | 1413       | 1413       | 4406      | SKIP ON NO ERROR       | C20/A13                |
| 1420          | 1420       | 1420       | 1420       | 0000      | SKIP ON NO ERROR       | C20/A13/               |
| 1551          | 1551       | 1551       | 1551       | X006      | (NED) SET (TRC)        |                        |
| 2223          | 2223       | 2223       | 2223       | 2525      | SHIFT DMA              | B17/D18                |

| <u>EM OFF</u> | <u>EM1</u> | <u>EM2</u> | <u>EM3</u> | <u>AC</u> | <u>Function Tested</u> | <u>If No Print Out</u> |
|---------------|------------|------------|------------|-----------|------------------------|------------------------|
| 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                    |
| 0622          | 0622       | 0622       | 0622       | 0100      | CL STATUS REQ          |                        |

## 6.2 Error Recovery

Press CONTINUE, or restart at 100.

## 7. 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

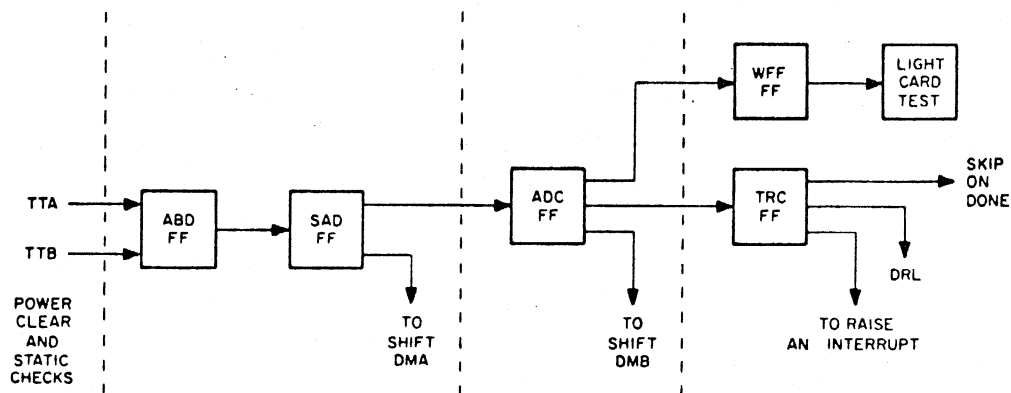
*OPERATE/MAINT switch must be set to MAINT for this IOT to work.*

## 8. PROGRAM DESCRIPTION

### 8.1 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 bits, 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 on 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, then any failure that occurs using the DF32 Data Disc Test should be located on the heads, R/W amplifiers, the disc or associated analog circuits.

## 9. PROGRAM DESCRIPTION

## 10. LISTING

EXPUNGE  
 /MEMORY REFERENCE INSTRUCTIONS  
 AND=0000  
 TAU=1000  
 ISZ=2000  
 DCA=3000  
 JMS=4000  
 JMP=5000  
 IOI=6000  
 OPR=7000  
 /MICROINSTRUCTIONS  
 NOP=7020  
 CLA=7200  
 CLL=7100  
 CMA=7040  
 CML=7020  
 KAR=7010  
 KIR=7012  
 KAL=7004  
 KIL=7006  
 IAC=7001  
 SMA=7500  
 SEA=7440  
 SPA=7510  
 SNA=7450  
 SNL=7420  
 SEL=7430  
 SKP=7410  
 OSR=7404  
 HLT=7402  
 /COMBINED MICROINSTRUCTIONS  
 CIA=7041  
 LAS=7604  
 SIA=7240  
 SIL=7120  
 GLK=7204  
 /PROGRAM INTERRUPT  
 ION=6001  
 IOF=6002  
 PCF=6022  
 KRB=6012  
 /TELETYPE KEYBOARD/READER  
 KSF=6031  
 KCC=6032  
 KRS=6034  
 KRB=6036  
 /TELETYPE TELEPRINTER/PUNCH  
 TSF=6041  
 TCF=6042  
 TPC=6044  
 TLS=6046  
 FIXIAB  
 PAUSE  
 /DIGITAL 8-18-U  
 /MESSAGE TYPE-OUT  
 /CALL WITH A JMS MESSAGE  
 /WITH DATA FOLLOWING  
 /RETURN FOLLOWING END OF MESSAGE

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  
 TTA=6631  
 TTB=6632  
 MDP=6634  
 DBR=6634  
 DCMA=6601  
 DCEA=6611  
 USAC=6612  
 DMAW=6605  
 DEAL=6615  
 DEAC=6616  
 DFSE=6621  
 DFSC=6622  
 DMAC=6626  
 XX=7402  
 WC=7750  
 IACW=7751  
 CACW=IACW

/LOAD AND START READ

/CLEAR MAR, PRIIY, DONE FLAG

/CLEAR EXT ADDRESS REGISTERS

/CLEAR AC SKIP ON ADC

/LOAD AND START WRITE

/LOAD EXTENDED ADDRESS

/READ EXTENDED ADDRESS

/SKIP ON NO ERROR

/SKIP ON FLAG

/READ DISK ADDRESS

/

3400 0000 KA, 0  
 3401 0000 WADD, 0  
 3402 0000 RADD, 0  
 3403 0000 CTC, 0  
 3404 0000 AC, 0 /SAVE AC  
 3405 0000 TKAUD, 0  
 3406 0000 ERRUSK, 0  
 3407 0000 ERRTK, 0  
 3410 0001 NUM, 1  
 3411 0000 CTA, 0  
 3412 0000 CTD, 0  
 3413 0000 WORD1, 0  
 3414 0000 WORD2, 0  
 3415 0000 BA, 0  
 3416 0000 GA, 0  
 3417 0000 BD, 0  
 3420 0000 GD, 0  
 PAGE  
 3600 0000 OUTBUF, 0  
 PAGE  
 4000 2000 INBUF, 0

/IACW-1 FOR WRITE

/IACW-1 FOR READ

/DISK ERROR ADDRESS

/DISK TRACK ERROR ADDRESS

/BAD ADDRESS

/GOOD ADDRESS

/BAD DATA

/GOOD DATA

\*76

/JUMPING OFF FOR ROUTINES

```

0076 5124      JMP S82+6          /FOR ABNORMAL TEST
0077 4116      JMS S82           /BS ENTRANCE ADDRESS
0100 5777      JMP BEGIN        /START CR TEST
0101 5776      JMP RTEST        /REGISTER TEST
0102 5775      JMP DYA /SHIFT TEST
0103 5774      JMP SWDMA        /DISC MEMORY ADDRESS
0104 5773      JMP SWEMA        /EXT MEMORY ADDRESS
0105 5772      JMP SWDMB        /DISC MEMORY BUFFER
0106 5771      JMP SA /SAU 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 /IRC "FF"
0114 5763      JMP SG /IOI 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      UMAW
0125 6605      UMAW            /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

```

|      |      | /CODE(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 II                     |
| 0206 | 1216 |             | TAD MSRGHT    |                              |
| 0207 | 7012 |             | RTR           |                              |
| 0210 | 7012 |             | RTR           | /ROTATE 6 BITS RIGHT         |
| 0211 | 7012 |             | RTR           |                              |
| 0212 | 4217 |             | JMS TYPECH    | /TYPE II                     |
| 0213 | 1216 |             | TAD MSRGHT    | /GET DATA AGAIN              |
| 0214 | 4217 |             | JMS TYPECH    | /TYPE RIGHT HALF             |
| 0215 | 5214 |             | 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 II 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       | /10 CODES <40                |
| 0230 | 1253 |             | TAD M3        | /SUBTRACT 3                  |
| 0231 | 7440 |             | SZA           | /IS II ZERO?                 |
| 0232 | 5235 |             | JMP .+3       | /NO                          |
| 0233 | 1254 |             | TAD C212      | /YES: CODE 40 IS             |
| 0234 | 5243 |             | JMP MTP       | /LINE-FEED (212)             |
| 0235 | 1255 |             | TAD M2        | /SUBTRACT 2                  |
| 0236 | 7440 |             | SZA           | /IS II ZERO?                 |
| 0237 | 5242 |             | JMP .+3       | /NO                          |
| 0240 | 1256 |             | TAD C215      | /YES: CODE 40 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                      |

| /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 |

|      |      |               |     |                             |
|------|------|---------------|-----|-----------------------------|
| 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     |     | /0000X                      |
| 0275 | 1667 | TAD I SIXTY+7 |     | /AC (OPERAND)               |
| 0276 | 0370 | AND (0070     |     |                             |
| 0277 | 3341 | DCA MASKB     |     | /00X00                      |
| 0300 | 1667 | TAD I SIXTY+7 |     | /AC (OPERAND)               |
| 0301 | 0375 | AND (0700     |     |                             |
| 0302 | 3342 | DCA MASKC     |     | /0X000                      |
| 0303 | 1667 | TAD I SIXTY+7 |     | /AC (OPERAND)               |
| 0304 | 0374 | AND (7000     |     |                             |
| 0305 | 3343 | DCA MASKD     |     | /X0000                      |
| 0306 | 1342 | TAD MASKC     |     | /0X000                      |
| 0307 | 7112 | RTR:CLL       |     |                             |
| 0310 | 7010 | RAR           |     | /0X00 RS3 00X0              |
| 0311 | 1343 | TAD MASKD     |     | /X0X00                      |
| 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     |     | /0X0X                       |
| 0321 | 3667 | DCA I SIXTY+7 |     | /STORE OPERAND AS SPECIFIED |
| 0322 | 1341 | TAD MASKB     |     | /00X00                      |
| 0323 | 7004 | RAL           |     |                             |
| 0324 | 7006 | RTL           |     | /00X0 SL3 0X00              |
| 0325 | 1340 | TAD MASKA     |     | /0X00+000X=0X0X             |
| 0326 | 1344 | TAD MASKD+1   |     | /0X0X+6000=0X0X             |
| 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     |     | /0X0X                       |
| 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 |               |     |                             |

```

/PRINT OUT ROUTINES
/ROUTINE TO PRINT OUT FAILING TEST ADDRESS
/AND CONTENTS OF AC
/XXXX XXXX ---- ADDRESS (AC)
0400 7402 ERAUD, XX
0401 4777 JMS IPRINT
0402 6002 IOF
0403 4776 JMS SIXTY
0404 0400 ERAUD
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 (2002
0427 7650 SNA:CLA
0430 5600 JMP I ERAUD
0431 1773 TAD AC /AC
0432 7402 HLT
0433 5600 JMP I ERAUD

```

```

/COMPARISON ERROR PRINT OUT
/GDXXXX BXXXXX
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 /CRLF
0461 0704 0704 /GOOD DATA
0462 4040 4040
0463 6060 6060
0464 6060 6060
0465 4002 4002
0466 0440 0440 /BAD DATA
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

```

|      |      |              |
|------|------|--------------|
| 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 |

```

0544 0000 PAUSE0
/PUP-8 INTERFACE TEST NO DISC RMX5 3/6/67
/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 1 (.,+200&7600)>
/PFLAG 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 TARI 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 | 3/73 | DCA WC   |                                   |
| 0632 | 7240 | CLA CMA  |                                   |
| 0633 | 3/72 | DCA IACW | /WRITE ONE WORD                   |
| 0634 | 6605 | DMAW     |                                   |
| 0635 | 7200 | CLA      |                                   |
| 0636 | 1/73 | TAD WC   |                                   |
| 0637 | 7440 | SZA      |                                   |
| 0640 | 4/77 | HALT     | /WORD COUNT NOT CORRECT           |
| 0641 | 7200 | CLA      |                                   |
| 0642 | 1/72 | TAD IACW |                                   |
| 0643 | 7440 | SZA      |                                   |
| 0644 | 4/77 | HALT     | /ADDRESS CONTROL WORD NOT CORRECT |
| 0645 | 4/76 | SCOPE    |                                   |

/IS AC CLEARED BY DMAW?

|      |      |         |                      |
|------|------|---------|----------------------|
| 0646 | 7240 | CLA CMA |                      |
| 0647 | 3/73 | DCA WC  | /ONE WORD            |
| 0650 | 7240 | CLA CMA |                      |
| 0651 | 6605 | DMAW    | /IDI SHOULD CLEAR AC |
| 0652 | 7440 | SZA     |                      |
| 0653 | 4/77 | HALT    | /AC NOT CLEARED      |
| 0654 | 4/76 | SCOPE   |                      |

/IS AC CLEARED BY DMAR

|      |      |         |                      |
|------|------|---------|----------------------|
| 0655 | 7240 | CLA CMA |                      |
| 0656 | 3/73 | DCA WC  | /ONE WORD            |
| 0657 | 7240 | CLA CMA |                      |
| 0660 | 6605 | DMAR    | /IDI SHOULD CLEAR AC |
| 0661 | 7440 | SZA     |                      |
| 0662 | 4/77 | HALT    | /AC NOT CLEARED      |
| 0663 | 4/76 | SCOPE   |                      |

```

/UMAC SHOULD NOT SKIP
0664 6611 DCEA
0665 6620 UMAC
0666 7410 SKP
0667 4777 HALT /UMAC SKIPPED
0670 4776 SCOPE
/
/WILL UMAC CLEAR AC
0671 6601 UCMA /CLEAR UMAC
0672 7240 CLATCMA
0673 6620 UMAC
0674 7440 SZA /MAR TO AC
0675 4777 HALT /AC NOT CLEARED BY USAC
0676 4776 SCOPE
/
/STATUS REGISTER TEST (NO DRL)
0677 6611 DCEA
0700 6610 DEAC /EM0
0701 0371 AND (4 /MASK FOR DRL
0702 7440 SZA
0703 4777 HALT /DRL UP
0704 4776 SCOPE
/
/STATUS REGISTER TEST (NO NEG FF)
0705 6611 DCEA /EM0
0706 6610 DEAC
0707 0370 AND (2
0710 7440 SZA
0711 4777 HALT /WRITE LOOK OUT OR NEG SET
0712 4776 SCOPE
/

```

/

/CHECK FOR NO FLAG AFTER WRITE

/

(DMAW) (DFSC)

|      |      |          |                       |
|------|------|----------|-----------------------|
| 0/13 | 7240 | CLA CMA  |                       |
| 0/14 | 3/72 | DCA IACW | /MEMORY LOCATION ZERO |
| 0/15 | 7240 | CLA CMA  | /AC=7/7/              |
| 0/16 | 3/73 | DCA WC   | /WORD COUNT=7/7/      |
| 0/17 | 6605 | DMAW     | /START WRITE ONE WORD |
| 0/20 | 6622 | DFSC     | /SKIP ON FLAG         |
| 0/21 | 7410 | SKP      |                       |
| 0/22 | 4/77 | HALT     | /FLAG UP              |
| 0/23 | 6622 | DFSC     | /SKIP ON FLAG         |
| 0/24 | 7410 | SKP      |                       |
| 0/25 | 4/77 | HALT     | /FLAG UP              |
| 0/26 | 4/76 | SCOPE    |                       |

/

/WILL ADDRESS ACCEPT CLEAR DATA BREAK REQUEST FF?

|      |      |          |                            |
|------|------|----------|----------------------------|
| 0/27 | 6605 | DMAW     | /WRITE SET DBR FF          |
| 0/30 | 7200 | CLA      |                            |
| 0/31 | 3/73 | DCA WC   |                            |
| 0/32 | 3/72 | DCA IACW |                            |
| 0/33 | 6603 | DMAW     | /SHOULD NOT SET DBR "FF"   |
| 0/34 | 7000 | NOP      |                            |
| 0/35 | 1/73 | TAD WC   |                            |
| 0/36 | 7440 | SZA      |                            |
| 0/37 | 4777 | HALT     | /WORD COUNT SHOULD BE ZERO |
| 0/40 | 7200 | CLA      |                            |
| 0/41 | 1/72 | TAD IACW |                            |
| 0/42 | 7440 | SZA      |                            |
| 0/43 | 4777 | HALT     | /IACW SHOULD BE ZERO       |
| 0/44 | 4/76 | SCOPE    |                            |
| 0/45 | 5/67 | NPAGE    |                            |

0/6/ 1000 PAGE  
 0/70 0002  
 0/71 0004  
 0/72 7/51  
 0/73 7/50  
 0/74 0070  
 0/75 3/00  
 0/76 3242  
 0/77 0400

/DISK MEMORY ADDRESS READ

1000 7240 CLA CMA  
 1001 3/77 DCA WC /READ ONE WORD  
 1002 7240 CLA CMA  
 1003 3/76 DCA IACW /MEMORY LOCATION ZERO  
 1004 6603 DMAR /START READ ONE WORD  
 1005 6622 DFSC /SKIP ON FLAG  
 1006 7410 SKP  
 1007 47/5 HALT /FLAG UP  
 1010 6622 DFSC /SKIP ON FLAG  
 1011 7410 SKP  
 1012 47/5 HALT /FLAG UP  
 1013 4/74 SCOPE

/STATUS REGISTER CHECK EXTENDED ADDRESS

1014 7200 CLA  
 1015 6615 DEAL  
 1016 7200 CLA /LOAD EXTENDED ADDRESS WITH ZEROS  
 1017 6616 DEAC  
 1020 03/3 AND (3700  
 1021 7440 SZA  
 1022 4/75 HALT /DISC EXTENDED ADDRESS NOT CLEAR  
 1023 6616 DEAC  
 1024 0372 AND (0070  
 1025 7440 SZA  
 1026 4/75 HALT /COMPUTER EXTENDED ADDRESS NOT CLEAR  
 1027 47/4 SCOPE

```

/
/DEAC READ DISK EXTENDED ADDRESS
/CHECK FOR NO SYNC MARK
1030 7300 CLA CLL
1031 3771 DCA CID
1032 6616 DEAC
1033 7000 NOP
1034 7500 SMA /SYNC
1035 7410 SKP /NO
1036 5242 JMP .+4 /YES
1037 2771 ISZ CID /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 0570 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 |            |                                            |
| /TEST WRITE LOCK OUT SWITCH OR NO DISC               |      |            |                                            |
| 1200                                                 | 6602 | 6602       | /READ MODE INHIBIT WRITE LOCK OUT SWITCHES |
| 1201                                                 | 6616 | DEAC       |                                            |
| 1202                                                 | 7012 | RTR        |                                            |
| 1203                                                 | 7430 | SZL        |                                            |
| 1204                                                 | 4777 | HALT       | /NO DISC NEU SET                           |
| 1205                                                 | 4776 | SCOPE      |                                            |
| /                                                    |      |            |                                            |
| /CHECK TO SEE IF WRITE LOCK OUT SWITCHES OFF (LOWER) |      |            |                                            |
| 1206                                                 | 6604 | 6604       | /WRITE MODE                                |
| 1207                                                 | 6616 | DEAC       | /READ STATUS                               |
| 1210                                                 | 7000 | NOP        |                                            |
| 1211                                                 | 7012 | RTR        | /AC10 TO LINK                              |
| 1212                                                 | 7430 | SZL        |                                            |
| 1213                                                 | 4777 | HALT       | /AC1 UP WRITE LOCK OUT SWITCH              |
| 1214                                                 | 4776 | SCOPE      |                                            |
| /CHECK TO SEE IF WRITE LOCK SWITCH OFF (UPPER)       |      |            |                                            |
| 1215                                                 | 1377 | TAD (0400) | /UPPER TRACK                               |
| 1216                                                 | 6616 | DEAC       |                                            |
| 1217                                                 | 6604 | DMAW-1     | /WRITE MODE                                |
| 1220                                                 | 6616 | DEAC       |                                            |
| 1221                                                 | 7000 | NOP        |                                            |
| 1222                                                 | 7012 | RTR        | /AC10 TO LINK                              |
| 1223                                                 | 7430 | SZL        |                                            |
| 1224                                                 | 4777 | HALT       | /AC1 UP WRITE LOCK OUT SWITCH              |
| 1225                                                 | 4776 | SCOPE      |                                            |
| /                                                    |      |            |                                            |
| /RAISE STATUS BIT AC0/VEX                            |      |            |                                            |
| /EM3 SHOULD NOT BE SELECTED                          |      |            |                                            |
| 1226                                                 | 1375 | TAD (3000) |                                            |
| 1227                                                 | 6616 | DEAC       | /SELECT DISC/EM3                           |
| 1230                                                 | 6616 | DEAC       | /READ STATUS                               |
| 1231                                                 | 7000 | NOP        |                                            |
| 1232                                                 | 7500 | SMA        |                                            |
| 1233                                                 | 4777 | HALT       | /VEX DID 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 /BAU
1266 4777 HALT /AC SHOULD =3/00
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 /BAU
1302 4777 HALT /AC SHOULD=00/0
1303 4776 SCOPE
/
/SKIP ON NO ERROR CFSE
1304 6611 DCEA
1305 6603 DMAR /READ STATE
1306 6621 DFSE /SKIP ON NO ERROR
1307 4777 HALT /DATA REQUEST LATE, PARITY OR NO DISC SET
1310 4776 SCOPE

```

```

/WILL THE DISK HONOR AN INTERRUPT
1311 4340 JMS CLFLAG
1312 7200 CLA /SET UP FOR INTERRUPT
1313 1367 TAD (10F
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 6012 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 CID
1355 7200 CLA
1356 1761 TAD CID
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 3750  
 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 /WRITE 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 RIEST, CLA
1422 6002 IOF
1423 3/75 DCA CIA
1424 4/74 JMS DMA
1425 7240 CLA!CMA
1426 4/74 JMS DMA
1427 4/73 JMS RANDOM
1430 4/74 JMS DMA
1431 2/75 ISZ CIA
1432 522/ JMP .-3
1433 4/76 SCOPE

```

```

/EXECUTE EMA TEST
1434 7240 CLA!CMA
1435 6615 DEAL
1436 7000 NOP
1437 7000 NOP
1440 7000 NOP
1441 7200 CLA
1442 3/75 DCA CIA
1443 4/72 JMS EMA
1444 7240 CLA!CMA
1445 4/72 JMS EMA
1446 4/73 JMS RANDOM
1447 2/75 ISZ CIA
1450 5245 JMP .-3
1451 4/76 SCOPE

```

```

/EXECUTE DMB TEST
1452 7200 CLA
1453 6611 DCEA
1454 3/75 DCA CIA
1455 4/71 JMS DMB
1456 7240 CLA!CMA
1457 4/71 JMS DMB
1460 4/73 JMS RANDOM
1461 4/71 JMS DMB
1462 2/75 ISZ CIA
1463 5260 JMP .-3
1464 4/76 SCOPE
1465 7604 LAS
1466 037/ AND (400
1467 7440 SZA
1470 5221 JMP RIEST

```

```

/
/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 NEU
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 DID 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 GENFRATE 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 IACW   |                   |
| 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 BADA00 |                   |
| 1616 | 7200 | CLA        |                   |
| 1617 | 5601 | JMP I DMA  |                   |

```

/STATIC TEST OF EXTENDED ADDRESS REGISTER (DISK MOTOR OFF)
/JMS EMA AC=DATA
EMA,      XX
1620 7402
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 4775    JMS BADADD
1636 7200    CLA
1637 5620    JMP I EMA
/STATIC DATA REGISTER TEST (DISK MOTOR OFF)
/JMS DMB, AC=DATA
DMB,      XX
1640 7402
1641 3771    DCA GD
1642 7240    CLA:CMA
1643 3770    DCA WC
1644 1367    TAD (GD-1)
1645 3775    DCA IACW
1646 6604    6604      /LOAD DMB
1647 7240    CLA:CMA
1650 3770    DCA WC
1651 1376    TAD (BD-1)
1652 3775    DCA IACW
1653 6602    6602      /READ
1654 6634    6634      /RAISE A REQUEST
1655 7200    CLA
1656 1771    TAD GD
1657 7041    CIA
1660 1767    TAD BU
1661 7440    SZA
1662 4766    JMS BADCOM
1663 7200    CLA
1664 5640    JMP I DMB
1666 0434    PAGE
1667 3417
1670 7750
1671 3420
1672 3770
1673 0560
1674 3415
1675 7751
1676 3416
1677 2000

```

```

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 IOIS
/CAN WE SHIFT DISC MEMORY ADDRESS WITH DMA
2200 4777      SCOPE
2201 6601      DMA
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 IP1, CLEAR SAD, SET MAD
2211 4774      JMS SAP /SHIFT DMA
2212 6620      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 IP1, 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 MAC CLEARED
2245 1360 TAD (7252 /MAU 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!!
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: CMA
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 DMB
2322 7240 CLA: CMA
2323 3757 DCA WC
2324 1365 TAD (BD-1
2325 3755 DCA IACW
2326 4753 JMS CLADC
2327 6602 6602 /READ
2330 6634 6634 /RAISE A REQUEST
2331 7200 CLA
2332 1352 TAD (7777
2333 7041 CIA
2334 1756 TAD BU
2335 7650 SNA: CLA
2336 5341 JMP ,+3
2337 1756 TAD BU
2340 4771 HALT /FAILED SHIFTING DMB
2341 4777 SCOPE
2342 5751 NPAGE
PAUSE
/PDP-8 DISCLOSES RMXD - TAPE 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 SHIFT 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 UMB
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 1375 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 UMB 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 | CLA: CMA  |
| 2437 | 3776 | DCA WC    |
| 2440 | 1375 | TAD (GD-1 |
| 2441 | 3774 | DCA IACW  |
| 2442 | 4773 | JMS SUP   |
| 2443 | 7240 | CLA: CMA  |
| 2444 | 3776 | DCA WC    |
| 2445 | 1372 | TAD (BD-1 |
| 2446 | 3774 | DCA IACW  |
| 2447 | 4771 | JMS CLADC |
| 2450 | 6602 | 6602      |
| 2451 | 6634 | 6634      |
| 2452 | 7200 | CLA       |
| 2453 | 1364 | TAD (5252 |
| 2454 | 7041 | CIA       |
| 2455 | 1775 | TAD BU    |
| 2456 | 7650 | SNA: CLA  |
| 2457 | 5262 | JMP .+3   |
| 2460 | 1775 | TAD BU    |
| 2461 | 4767 | HALI      |
| 2462 | 4766 | SCOPE     |

/MDP ALSO SET NOW/SHIFT DATA

/READ

/RAISE A REQUEST

/SHIFT MEMORY BUFFER (2525) 2 SHIFTS

|      |      |           |
|------|------|-----------|
| 2463 | 6601 | UCMA      |
| 2464 | 6611 | UCEA      |
| 2465 | 7200 | CLA       |
| 2466 | 1365 | TAD (2525 |
| 2467 | 3777 | UCA GU    |
| 2470 | 7240 | CLA!CMA   |
| 2471 | 3776 | UCA WC    |
| 2472 | 1375 | TAD (GU=1 |
| 2473 | 3774 | UCA IACW  |
| 2474 | 4773 | JMS SUP   |
| 2475 | 6631 | TIA       |
| 2476 | 7240 | CLA!CMA   |
| 2477 | 3776 | UCA WC    |
| 2500 | 1372 | TAD (BU-1 |
| 2501 | 3774 | UCA IACW  |
| 2502 | 4771 | JMS CLADC |
| 2503 | 6602 | 6602      |
| 2504 | 6634 | 6634      |
| 2505 | 7200 | CLA       |
| 2506 | 1365 | TAD (2525 |
| 2507 | 7041 | CLA       |
| 2510 | 1775 | TAD BU    |
| 2511 | 7650 | SNA!CLA   |
| 2512 | 5315 | JMP .+3   |
| 2513 | 1775 | TAD BU    |
| 2514 | 4767 | HALT      |
| 2515 | 4766 | SCOPE     |

/SHIFT DATA MDP ALSO SET

/EXTRA SHIFT MDP SHOULD BE CLEARED

/READ

/RAISE A REQUEST

2516 5763 NPAGE  
 2563 2600 PAGE  
 2564 5252  
 2565 2525  
 2566 3242  
 2567 0400  
 2570 4000  
 2571 3030  
 2572 3416  
 2573 3024  
 2574 7151  
 2575 3417  
 2576 7150  
 2577 3420

/

/SHIFT DMA WITH ACH ZERO

2600 7200 CLA  
 2601 6605 DMAW /DMA11 TO ZERO  
 2602 4777 JMS SAP /CLEAR ACH  
 2603 7240 CLA:DMA  
 2604 6605 DMAW /LOAD ALL SEVEN  
 2605 4777 JMS SAP /SHIFT DMA  
 2606 6626 DMAC /READ DMAC  
 2607 3776 DCA BA /ITEM STORE  
 2610 1375 TAD (5777 /WHAT DATA SHOULD BE  
 2611 7041 CIA  
 2612 1776 TAD BA  
 2613 7650 SNA:CLA /TEST  
 2614 5217 JMP .+3  
 2615 1776 TAD BA  
 2616 4774 HALT  
 2617 4773 SCOPE

/

/DATA REQUEST LATE/STATUS AND SKIP TEST

S81, SKP

2620 7410  
 2621 5235 JMP .+14 /VALID FOR BSS ONLY  
 2622 6601 DCMA /CL DRL  
 2623 4772 JMS ADC  
 2624 6604 6604 /RAISE A REQUEST  
 2625 6632 TT6 /GENERATE DEP  
 2626 6616 DEAC /READ STATUS  
 2627 0371 AND (4  
 2630 7450 SNA  
 2631 4774 HALT /DATA REQUEST LATE STATUS NOT SET  
 2632 6621 DFSE /SKIP ON NO ERROR  
 2633 7410 SKP  
 2634 4774 HALT /SKIPPED ON DRL  
 2635 4773 SCOPE

/

/CHECK GENERATION OF DONE FLAG

2636 4770 JMS TCR /SET DONE FLAG  
 2637 6622 DFSC /SKIP ON FLAG  
 2640 4774 HALT /NO DONE FLAG  
 2641 4773 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 /IRC 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 DEAC /CLEAR EXT ADDRESS
2661 7240 CLA:DMA
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:DMA
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

```

```

/LOOP ON ROUTINE
2/06 4760 JMS CLADC
2/07 7604 LAS
2/10 0374 AND (400 /LOOP ON SHIFT AND STATUS REG TEST
2/11 7640 SZA:CLA
2/12 575/ JMP DYA /SHIFT AND STATUS TEST
/
/
/TEST FOR SKIPPING LIGHT BOX TEST
/
2/13 4760 JMS CLADC
2/14 6611 DCEA
2/15 6601 DCMA
2/16 7604 LAS
2/17 0356 AND (200
2/20 7640 SZA:CLA /SKIP LIGHT BOX
2/21 5755 JMP BEGIN /YES
/
/AUTOMATIC CONTROL FOR LIGHT BOX
2/22 7200 CLA
2/23 6611 DCEA
2/24 1354 TAD (7760 /NUMBER OF TRACKS
2/25 3753 DCA CTA
2/26 3752 DCA KA /TRACK NUMBER
2/27 4751 JMS LGBOX /LIGHT BOX ROUTINE
2/30 2752 ISZ KA
2/31 7200 CLA
2/51 3051 TAD KA
2/52 3400
2/53 3411
2/54 7760
2/55 0600
2/56 0200
2/57 1471
2/60 3030
2/61 4100
2/62 3700
2/63 3044
2/64 7402
2/65 7741
2/66 2653
2/67 5402
2/70 3034
2/71 0004
2/72 3017
2/73 3242
2/74 0400
2/75 5777
2/76 3415
2/77 3013
2/32 1750 /TRACK NUMBER INCREMENTED
2/33 2747 ISZ CIA /DONE
2/34 5327 JMP .-5 /NO
2/35 6611 DCEA /YES
2/36 6601 DCMA /CLEAR DISC
2/37 4746 SCOPE
2/40 4745 JMS CLADC
2/41 5744 JMP BEGIN /GO TO START OF PROGRAM

```

2/44 0600 PAGE  
 2/45 3030  
 2/46 3242  
 2/47 3411  
 2/50 3470

/COMMANDS TO BE GENERATED WITH SPECIAL I/O'S  
 /ROUTINE TO SET SEARCH ADDRESS/SAU

3000 7402 SAU, XX  
 3001 6606 6606 /SET MRS WITH LAD  
 3002 6632 TTB /SET AED  
 3003 6632 TTB /SET ICA  
 3004 6632 TTB /CL TCA, SET ICB  
 3005 6632 TTB /SET ICA  
 3006 6632 TTB /CL TCA, CL TCB, SET MWR  
 3007 6631 TTA /CL ABL TO SYNC DRS  
 3010 6632 TTB /DRS=SET WCE  
 3011 6631 TTA /SET SAU  
 3012 5600 JMP I SAU /EXIT

/ROUTINE TO SET SHIFT ADDRESS PULSE/SAP

3013 7402 SAP, XX  
 3014 4200 JMS SAU  
 3015 6631 TTA /SHIFT DMA  
 3016 5613 JMP I SAP /EXIT

/ROUTINE FOR SETTING ADDRESS CONFIRMED/AUC

3017 7402 AUC, XX  
 3020 4200 JMS SAU /SAU AND ABC SHOULD BE SET  
 3021 6632 TTB  
 3022 6632 TTB /SET AUC CL SAU  
 3023 5617 JMP I AUC /EXIT

/ROUTINE TO SHIFT MEMORY BUFFER/SDP

3024 7402 SDP, XX  
 3025 4217 JMS AUC  
 3026 6631 TTA /SHIFT DMA  
 3027 5624 JMP I SDP

/ROUTINE TO CLEAR AUC "FF"

3030 7402 CLAUD, XX  
 3031 6632 TTB  
 3032 6632 TTB  
 3033 5630 JMP I CLAUD

```

/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 TTB /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, DMA CLEAR WFF
3061 6631 TTA /GEN OPS SET WFF
3062 4311 JMS SIAL
3063 5651 JMP I LGBOX
3064 4267 JMS KWFF /LOAD DMB, DMA AND CLEAR WFF
3065 4311 JMS SIAL
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 AJC
3103 1375 TAD (XX /SWITCH
3104 7104 RAL:CLL
3105 7006 RIL
3106 7006 RTL
3107 6615 DEAL /LOAD EXT ADDRESS
3110 5667 JMP I KWFF /EXIT
3111 7402 STALL, XX
3112 7240 CLA:CMA
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 IPRINI, XX
3125 3767 DCA AC
3126 7604 LAS
3127 0366 AND (4000
3130 7650 SNA:CLA
3131 5337 JMP .+6
3132 1324 TAD IPRINI
3133 1365 TAD (-2
3134 3324 DCA IPRINI
3135 1724 TAD I IPRINI
3136 3324 DCA IPRINI
3137 1767 TAD AC
3140 5724 JMP I IPRINI

```

|      |      |      |
|------|------|------|
| 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 | TTB                      |
| 3203 | 6632 | TTB                      |
| 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 AUC                  |
| 3212 | 5210 | JMP .-2                  |
|      |      | /SHIFT DATA PULSE        |
| 3213 | 6611 | SD, DCEA                 |
| 3214 | 4774 | JMS SUP                  |
| 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                  |

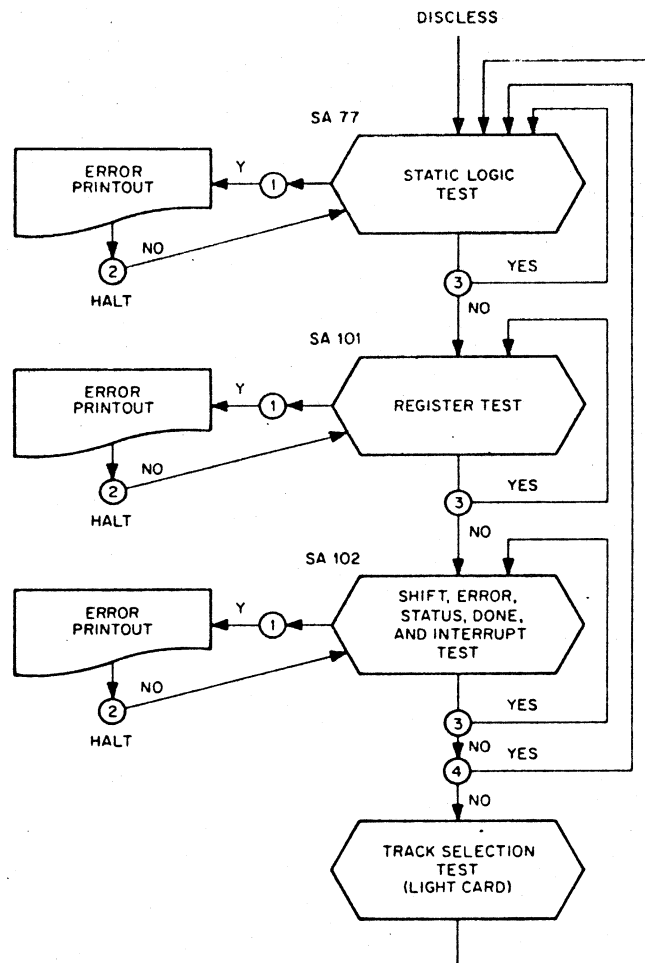
```

/MAINTENANCE SCOPE LOOPS 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 7640 SZA:CLA
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

```

## 11. FLOW CHARTS

### 11.1 Basic Flow



## DISCLESS DF32

