TEXT LISTING

068-001142-01

PROGRAM

6098, 6099, 6100, 6103 MOVING HEAD
DISK/DISKETTE DIAGNOSTIC PROGRAM

TEXT TAPE

097-001142-01

ABSTRACT

THIS PROGRAM IS A LOGIC LEVEL TEST OF THE 6098-9,
6100, 6103 SERIES MOVING HEAD DISK SUB-SYSTEMS.

COPYRIGHT © DATA GENERAL CORPORATION, 1979
ALL RIGHTS RESERVED. PRINTED IN U.S.A.

ONLY FOR OPERATION AND MAINTENANCE PURPOSES
ON DATA GENERAL CORPORATION MANUFACTURED
EQUIPMENT.

THE AFFIXATION OF A COPYRIGHT NOTICE ON THIS
DIAGNOSTIC MATERIAL IS NOT INTENDED BY ITSELF
TO RENDER THE DISTRIBUTION OF THIS DIAGNOSTIC
MATERIAL A PUBLICATION.

NOTICE

DATA GENERAL CORPORATION (DGC) HAS PREPARED
THIS DIAGNOSTIC MATERIAL FOR USE BY DGC
PERSONNEL AND CUSTOMERS AS A GUIDE TO THE
PROPER MAINTENANCE OF DGC EQUIPMENT AND
SOFTWARE. THE DIAGNOSTIC MATERIALS CONTAINED
HEREIN ARE THE PROPERTY OF DGC AND SHALL
NEITHER BE REPRODUCED IN WHOLE OR IN PART WITHOUT
DGC'S PRIOR WRITTEN APPROVAL NOR BE IMPLIED TO
GRANT ANY LICENSE TO MAKE, USE, OR SELL EQUIPMENT
OR SOFTWARE MANUFACTURED IN ACCORDANCE HEREWITH.
**************

PROGRAM NAME:  
-----------

EF0 - 6098, 6099, 6100, 6103 MOVING HEAD DISK/DISKETTE DIAGNOSTIC PROGRAM

REVISION HISTORY:
-------

REV 00 - 06/04/79 - FIRST RELEASE
REV 01 - 11/16/79 - HNIC CORRECTIONS AND ENHANCEMENTS. UPDATES FOR 25 MR NON-REMOVABLE DRIVES.

MACHINE REQUIREMENTS:
----------------------

1. NOVA LINE OR ECLIPSE SERIES CENTRAL PROCESSOR
2. AT LEAST 1KB READ/WRITE (RAM) MEMORY
3. ASYNCHRONOUS INTERFACE (STANDARD 1/0)
4. TELETYPE OR CRT TERMINAL
5. PAPER TAPE READER, DISKETTE DRIVE, AND/OR MAGNETIC TAPE UNIT

TEST REQUIREMENTS:
-------------------

1. ONE OF THE FOLLOWING MODEL DISK SUB-SYSTEMS:
   6098, 6099, 6100, OR 6103 (SEE BELOW)
2. 6098, 6099, 6100, 6103 MOVING HEAD DISK/DISKETTE DIAGNOSTIC PROGRAM
   = LISTING PART # 946 - 000142
   = PROGRAMPART # 945 - 000142

*** SPECIAL NOTE ***

THROUGHOUT THIS TEXT FILE AND THE PROGRAM LISTING, THE TERMS "NON-REMOVABLE DISK", "RIGID DISK" OR "FIXED DISK" ARE ALL TERMS THAT REFER TO THE 12.5 OR 25.0 MEGABYTE WINCHESTER TECHNOLOGY DISK DRIVES, AND ARE USED INTERCHANGEABLY.

**************
RESTRICTIONS:

1. NO DISK TESTING CAN BE PERFORMED IF THE DRIVE PROTECT SWITCH IS IN THE "ON" Position. 

2. DISK TESTING CAN BE PERFORMED IF THE DRIVE PROTECT SWITCH IS IN THE "OFF" Position. 

3. THE DISK TESTING PROCESS IS DESIGNED TO TEST THE DISK MANAGEMENT SYSTEM AND NOT THE DISK ITSELF. 

4. THE DISK TESTING PROCESS IS NOT DESIGNED TO TEST THE DISK'S CAPACITY OR PERFORMANCE. 

5. THE DISK TESTING PROCESS IS NOT DESIGNED TO TEST THE DISK'S COMPLIANCE WITH ANY SPECIFIED PERFORMANCE STANDARDS. 

6. THE DISK TESTING PROCESS IS NOT DESIGNED TO TEST THE DISK'S COMPLIANCE WITH ANY SPECIFIED PERFORMANCE STANDARDS.
17. PROGRAM DESCRIPTION/ THEORY OF OPERATION:

17.1 NON-REMOVEABLE DISK PRODUCT DESCRIPTION:

- The non-removable (or rigid) disk drive has a total storage capacity of 12.5 or 25.0 megabytes. Each disk(s) is formatted and non-removable.
- The drive, which is based on Winchester technology, has 4 or 8 heads, 192 tracks per head, and 32 sectors per track. Each sector contains 4096 bits or 256 words (16 bits each).
- The disk controller uses an 8-bit microcomputer for a major section of the controller's logic functions. Its purpose is to handle seeking activities, initial command decoding, multiple sector head/write data transfers, fault monitoring and power sequencing. The controller also has a micro-coded TTL microprocessor using 65K words. Its functions include:
- Final command decoding, disk read/write logic control, including serial data transfers to and from the disk, timing, disk address and cyclic redundancy check (CRC) operations. The controller also has a 256-word data buffer (RAM) that is used for data channel transfers to/from the host computer and for read/write operations on the disk. The buffer eliminates data late errors. It allows the disk to be mixed with the lowest data channel priority if desired. The structure of the system does not allowed novak operations to be performed on physically contiguous sectors. Multiple sector transfers are possible.
- The microcomputer handles logical to physical sector mapping for maximum throughput. It will perform the following normal mode operations: read, write, seek, re-calculation and format. There is also an extensive diagnostic command set that allows the ability to single-step disk operations (command simulation), to step the head assembly in or out and to read certain registers internal to the microprocessor, see section 1.4 for the complete instruction set.

17.2 QUAD-DENSITY DISKETTE PRODUCT DESCRIPTION:

- The model 6046c/0 sub-systems are quad-density (1.2 MB)
- Each drive has 2 heads, 77 tracks and 16 sectors per track (each sector is 256 16-bit words).
- The diskettes are controlled by a quad-density diskette controller chip that is resident on the disk controller board (in the CPU). The diskette also uses the 8-bit TTL microprocessor step and other hardware on the controller board (I/O signals, phase-locked loops, etc.). Normal mode commands are the same as for non-removable drives (see 7.1). There are several diagnostic commands that allow operations such as head/seek operations to the diskette controller chip internal registers. Extending in and out of the head assembly etc., see section 1.4 for the complete instruction set.

17.3 OTHER INFORMATION:

- The head/write board has two switches on it that define the configuration. The left hand switch is the write-protect switch for the non-removable drive. The right hand switch defines the non-removable disk drive unit 0 as either 0 or 1. If it is unit 0, the initial program load sequence (IPL) will be performed from the non-removable drive. If it is unit 1, the IPL can occur from a diskette drive with unit 0. See section 11.5 for more information on jumpers and switches. If the test configuration allows it, the operator will be asked to change the position of the unit select switch on the first pass of the diagnostic (see section 12). There is a jumper on the controller board that defines whether or not a non-removable drive is attached. If there is no non-removable drive, then up to 4 diskettes can be in the system. Otherwise 1-3 diskette drives are possible.

17.4 SUB-SYSTEM MODULE BREAKDOWN:

- Non-removable drive/diskette drive common module(s):
  - Disk controller board (in CPU chassis)
  - Power supply board (top back in non-removable drive unit in back of diskette cabinet if no non-removable drive in system)

- Non-removable drive only modules (in drive):
  - Head/write head current driver/clock board (under front panel)
  - Drive assembly: a sealed module which contains:
    - 1 or 2 fixed disk platters (2 or 4 surfaces)
    - Head/write heads (4 or 8)
    - Head positioner, drive can, stepping motor, spinlock, drive motor/widamper, sector disc, home indicator, blower, filters etc. Note that some of these are inside the sealed plastic unit and some are attached to the outside of it.

- Diskette drive only modules (in drive):
  - Head/write/stepper board
  - Drive assembly
  - Head/write heads (4 or 8) and head positioning mechanism (including stepping motor)
  - Diskette unit motor etc.
10007  MAIN
01  17.51 PROGRAM OPERATION:
02
03 THIS DIAGNOSTIC PROGRAM IS USED TO TEST LOGIC, CONTROL,  
04  HARDWARE ETC. ON THE DISK CONTROLLER, TO PROPER  
05  FUNCTIONING (SEEK, READ, WRITE/FORMAT, RECALT) OF ANY  
06  DRIVE(s) ATTACHED TO IT (SEE SECTION 5) AND FOR  
07  DURING DIAGNOSTIC INITIALIZATION (SEE SECTION 9).  
08  IT IS A PROGRESSIVE SERIES OF INDIVIDUAL SUB-TESTS,  
09  IN GENERAL, EACH TEST ASSUMES THAT PREVIOUS LOGIC  
10  AND FUNCTION SUB-TESTS PASSED WITHOUT ERROR, THE  
11  TEST COMPLEXITY USUALLY INCREASES WITH THE TEST  
12  PROGRESSION, THE SUB-TESTS THEMSELVES, CONSIST OF  
13  A SERIES OF SUB-Routines THAT PERFORM VARIOUS  
14  FUNCTIONS AND OTHER INSTRUCTIONS THAT SET FLAGS,  
15  POINTERS, ADDRESSES, PARAMETERS ETC., MANY OF THE  
16  SUB-Routines PERFORM COMPLICATED DATA, STATUS AND/OR  
17  REGISTER CHECKS, DETAILED ERROR AND COMMAND SUMMARY  
18  INFORMATION IS PRINTED ON DETECTION OF AN ERROR, ALSO  
19  CONTAINED IN SUB-Routines THAT PERFORM ERROR CHECKING  
20  IS A "PROBABLE FAILING MODULE" REPORT THAT TELLS THE  
21  OPERATOR WHAT THE FIRST AND SECOND MOST LIKELY CAUSES  
22  FOR THE DETECTED ERROR ARE. THE "CAUSE"S ARE USUALLY  
23  A MODULE SUCH AS THE DISK CONTROLLER BOARD, REFER TO  
24  SECTION 10 FOR MORE ERROR INFORMATION, THE SUB-TESTS  
25  ARE SEPARATED INTO SEVERAL DIFFERENT CLASSICS:
26
27  1) DISK CONTROLLER ONLY FUNCTION TESTS  
28  (INCLUDING NOVA/ECLIPSE I/O INTERFACE TESTS)  
29
30  2) DIAGNOSTIC MODE TESTS  
31  (COMMON, DISKETTE ONLY & NON-REMOVABLE ONLY)  
32
33  3) DRIVE UNIT FUNCTION TESTS  
34  (COMMON, DISKETTE ONLY & NON-REMOVABLE ONLY)  
35
36  THE FIRST CLASS OF TESTS ARE THE DISK CONTROLLER  
37  BASIC LOGIC & CONTROL FUNCTION TESTS, THESE TESTS  
38  CHECK THE FOLLOWING: SUB-1, DIRE STR, 1, 1.0,  
39  E03, DISK COMMAND REGISTER (DCMR), DISK ADDRESS  
40  REGISTER (DCR), DISK STATUS REGISTER (GIA), DEVICE  
41  SELECTION, LOAD/READ MEMORY ADDRESS REGISTER (MRA),  
42  INTERRUPT REQUEST LOGIC, INTERRUPT DISABLE (TKO),  
43  CH1 RANDOM ADDRESS EXERCISERS, I/O COMMANDS WITH NO  
44  DEVICE SELECTION AND MISCELLANEOUS  
45
46  THE SECOND CLASS OF TESTS ARE THOSE THAT MAKE USE  
47  OF THE DIAGNOSTIC COMMANDS AND STATUS (11,4,2), THESE  
48  COMMANDS ENABLE THE PROGRAM TO HELP DETECT & ISOLATE  
49  FAULTS, MAINLY TO THE DISK CONTROLLER. ALL DIAGNOSTIC  
50  TESTS ARE PERFORMED BEFORE ANY ACTUAL DISK WRITE  
51  OPERATIONS ARE ATTEMPTED. NON-REMOVABLE DRIVES ALSO  
52  HAVE A DIAGNOSTIC TRACK AREA TO CHECK DISK WRITE/READ  
53  OPERATIONS WITHOUT AFFECTING USER DATA AREAS. NOTE  
54  THAT WRITE/PROTECT IS ENABLED ON THE SCOTT DRIVE WHEN  
55  DIAGNOSTIC MODE IS SET (DIAG CMD 0). THESE FEATURES  
56  WILL HELP PROTECT ANY DATA THAT EXISTS ON THE DISK.  
57  EXAMPLES OF FUNCTIONS AND OPERATIONS TESTED FOLLOW:
58
59  PROCESSOR INTERNAL REGISTERS (TRACK ADDRESS, PROGRAM  
60
61
10008  MAIN
01  02
03 HEUSION #: NON-REMOVABLE ONLY: HEAD/WHITE COMMAND  
04  SIMULATION (DISK SURFACES NOT AFFECTED), CHECK DATA  
05  BUFFER AND DATA CHANNELING, CHECK SECTOR COUNTER  
06  AND STEPPER PHASES (INSIG DRIVE ONLY) AND PERFORM READ  
07  HEAD OPERATIONS TO INSURE PROPER HEAD POSITIONING.  
08  FOR THE NON-REMOVABLE DRIVE, A CHECK IS MADE TO  
09  INSURE THAT THE HEADS CAN STEP INTO THE HOME AREA  
10  FOR WRITE/READ OPERATIONS ON THE DIAGNOSTIC TRACK.  
11  THE WRITE/READ TESTS FOLLOW THE SEEK TESTS. IF  
12  NO TEST RESTRICTIONS EXIST (SEE SECTION 6), THEN THE  
13  FOLLOWING TESTS WILL BE PERFORMED NON-REMOVABLE ONLY  
14  (ALL ARE PERFORMED ON TRACK 301 (DIAG TRACK ONLY)):  
15  FORMAT HEAD 0/SECTOR 0, FORMAT ALL SECTORS, READ  
16  HEADER ALL SECTORS, FORMAT ALL HEADS, READ HEADER FROM  
17  ALL HEADS, FORMAT/NATIVE HEAD 0/SECTOR 0, FORC  
18  UNSAFE ERROR AND FORCE BAD SECTOR ERROR, THE STATUS, DISK  
19  ADDRESS AND MEMORY ADDRESS REGISTERS ARE ALL CHECKED  
20  DURING THESE OPERATIONS, DISKETTE/NON-REMOVABLE TESTS:  
21  DATA CHANNEL EXERCISE, WRITE/READ HEAD 0/SECTOR 0,  
22  WRITE/READ TO ALL SECTORS, READ ALL SECTORS, WRITE/ 
23  READ ALL HEADS, WRITE/READ PATTERN ON ALL  
24  HEADS, WRITE/READ MULTIPLE SECTIONS (WITH AND WITHOUT  
25  CROSSING A HEAD BOUNDARY), FORCE END OF CYLINDER ERROR,  
26  WRITE/READ ALL TRACKS, READ ALL TRACKS, RANDOM WRITE/ 
27  READ EXERCISES AND PERFORM IPL SEQUENCE ON UNT  
28  OR ON UNITS 0 & 1 (SHIPPED 0=1, 1=0). IF APPLICABLE,  
29  THE STATUS, DISK ADDRESS AND MEMORY ADDRESS REGISTERS  
30  ARE ALL MONITORED FOR CORRECT OPERATION DURING THESE  
31  TESTS. NO WRITE/READ OPERATIONS ARE PERFORMED IF A DRIVE IS  
32  WRITE-PROTECTED. THIS SERIOUSLY CUTS DOWN THE TEST-  
33  ABILITY OF A DRIVE AND SHOULD ONLY BE DONE IF DATA ON  
34  A NON-REMOVABLE DRIVE IS TO BE PROTECTED. NO FORMAT  
35  OPERATIONS ARE PERFORMED ON DISKETTE Drives OR ON THE  
36  USER TRACKS OF THE NON-REMOVABLE DRIVE IN THIS PROGRAM.  
37
38  THE PROGRAM CHECKS THE ABOVE THROUGH A SERIES OF SUB- 
39  TESTS, IF NO ERROR IS FOUND, THE PROGRAM WILL THEN  
40  CHECK THE TESTS IN A LOGICAL PROGRESSION, UNTIL THE LAST  
41  TEST. THE PROGRAM WILL THEN TEST THE NEXT CONFIGURED  
42  DRIVE (IF ANY), AN END OF PASS MESSAGE IS PRINTED  
43  AFTER ALL OF THE CONFIGURED DRIVES HAVE BEEN TESTED.  
44  IF ANY ERROR(S) ARE DETECTED, THE OPERATOR WILL  
45  BE INFORMED OF IT, TO FIND THE PROBLEM, REFER TO THE  
46  REPORTED ERROR ADDRESS (CONTENTS OF PROGRAM COUNTER-1)  
47  IN THE DIAGNOSTIC LISTING, TO FIND THE ACTUAL HARDWARE  
48  FAULT, SET UP A SCOPE LOOP (SEE SECTION 5) AND TRAC  
49  THE FAILURE WITH AN OSCILLOSCOPE, THE COMMENTS IN THE  
50  LISTING WILL GIVE THE OPERATOR INFORMATION ABOUT THE  
51  PROBLEM AS WELL AS INFORMATION CONCERNING THE ACCUMU-  
52  LATOR CONTENTS.
OPERATING MODES/SWITCH COMMANDS:

LOCATION "SWREG" IS USED TO SELECT THE PROGRAM OPTIONS
(NOT SYSTEM CONFIGURATION), WHILE RUNNING UNDER DOS,
HOWEVER UNDER STAND ALONE AND PROGRAM LOAD MODES THIS
LOCATION WILL BE LOADED BY THE MONITOR.

LOCATION CAN BE SET ACCORDING TO THE ANSWERS SUPPLIED
BY THE OPERATOR. IN ANY CASE THE OPTIONS CAN BE CHANGED
ON VERIFICATION BY USING ONE OF THE COMMANDS GIVEN IN SEC.

0.2

18.1 SWITCH OPTIONS AND SPECIAL SWITCHES
DIFFERENT BITS AND THEIR INTERPRETATION AT LOCATION
"SWREG" IS AS FOLLOWS:

<table>
<thead>
<tr>
<th>BIT</th>
<th>OCTAL</th>
<th>BINARY</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40000</td>
<td>1</td>
<td>LOOP ON ERROR</td>
</tr>
<tr>
<td>2</td>
<td>20000</td>
<td>1</td>
<td>SKIP LOOPING ON ERROR</td>
</tr>
<tr>
<td>3</td>
<td>1000</td>
<td>1</td>
<td>PRINT TO CONSOLE</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
<td>ABORT PRINT OUT TO CONSOLE</td>
</tr>
<tr>
<td>5</td>
<td>000</td>
<td>1</td>
<td>DO NOT PRINT I/F FAILURE</td>
</tr>
<tr>
<td>6</td>
<td>0100</td>
<td>1</td>
<td>PRINT I/F FAILURE</td>
</tr>
<tr>
<td>7</td>
<td>0020</td>
<td>1</td>
<td>ALLOW END OF PASS PRINT OUT</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>0</td>
<td>SUPPRESS END OF PASS PRINT OUT</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>DO NOT PRINT ON THE LINE PRINTER</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>PRINT ON THE LINE PRINTER</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>0</td>
<td>DO NOT HALT ON ERROR</td>
</tr>
<tr>
<td>12</td>
<td>00100</td>
<td>1</td>
<td>HALT ON ERROR</td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>0</td>
<td>PRINT ONLY THE FIRST ERROR</td>
</tr>
<tr>
<td>14</td>
<td>0020</td>
<td>1</td>
<td>PRINT EVERY ERROR</td>
</tr>
<tr>
<td>15</td>
<td>0</td>
<td>0</td>
<td>OPERATOR WILL BE ASKED TO SNAP UNIT SELECT SWITCH (FIRST PASS).</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>0</td>
<td>OPERATOR WILL NOT BE ASKED TO SNAP THE UNIT SELECT SWITCH.</td>
</tr>
</tbody>
</table>

*SEE SECTION 12.*
TO RUN THIS DIAGNOSTIC:

1. ALL DRIVES TO BE TESTED MUST BE CONNECTED TO THE CONTROLLER BOARD BY THE APPROPRIATE RIBBON CABLE WHICH RUNS FROM THE DRIVE TO THE STANDARD I/O CONNECTOR ON THE CPU ChASSIS. EACH DRIVE MUST HAVE A UNIQUE UNIT # AND ALL MUST HAVE THE POWER ON AND THE UNIT MUST BE READY (NON-REMOVABLE). SCRATCH DISKETTE(S) MUST BE INSERTED IN ORDER TO TO DISKETTE DRIVES, THE CONTROLLER MUST HAVE ITS INTERRUPT PRIORITY (INTP/) AND DATA CHANNEL PRIORITY (/DCHP/) I/O LINES PROPERLY JUMPED TO THE BACKPLANE.

2. LOAD THE DIAGNOSTIC. THIS CAN BE DONE MANUALLY VIA PAPER TAPE. AUTOMATIC LOADING AND STARTING IS ACCOMPLISHED BY LOADING THE PROGRAM FROM A DIAGNOSTIC TAPE OPERATING SYSTEM (DOS) MODEL 3 OR A MAGNETIC TAPE THAT HAS THE PROGRAM NAME "6098 DIAG" IN ITS DIRECTORY (COMMAND = DIR) ITS NAME COULD ALSO BE LOADED FROM A DISKette, FOR DTOS; MOUNT TAPE, LOAD AND PUT "NON-LINE", PROGRAM LOAD FROM ITS DISC CODE (USUALLY 22). THE FOLLOWING SHOULD BE TYPED:

"TOP OF MEMORY = XXXXX"

"TOP OF MEMORY = DTOS REW XXXX"

"LOAD 6098 DIAG"

"** CAUTION ** EXISTING DATA WILL BE DESTROYED BY WRITING TO THE ENTIRE DISK. "TYPE 0 TO ABORT OR 1 TO CONTINUE..."

"IF CONTINUED, TYPE FOLLOWING OTHERWISE GO TO "H"

"D" AUTOMATIC ASSUMES USER DATA TRACKS ARE FORMATTED"

"I" RESPONSES FOR THE FOLLOWING UNIT NUMBERS ARE:

"C" OR "NO DISKETTE, 1=DISKETTE, 2=DISKETTE=WRITE" PROTECTED"

"K" "NON-REMOVABLE TRANSDUCER ALIGNMENT PROCEDURE IS STARTING ADDRESS = ENTER FROM D0T (CRTL-0, 8.) SELECT SNREG/DDOT, THEN RETURN TO START DIAGNOSTIC"

THE DIAGNOSTIC WILL THEN BEGIN OPERATION ACCORDING TO THE MODES SELECTED BY THE "SNREG" SWITCHES.
NOTES:

1) DEVICE CODE (QUESTION A) ENTERED IN OCTAL AND IN THE
RANGE: 20 X OCT CODE X 77.

2) QUESTIONS RE-ASKED IF INCORRECT RESPONSES ARE MADE.

3) QUESTION "A" (DISKETTE UNIT INFO) IS ASKED FOR ALL
UNIT #'S (0-3) THAT ARE NOT ALREADY TAKEN BY A
NON-REMOVABLE DRIVE (UNIT 0 OR 1 ONLY).

4) SEE SECTION 6 FOR RESPONSES FOR QUESTION "K".

5) IF NO UNITS ARE SPECIFIED FOR TESTING, AN ERROR
MESSAGE IS PRINTED AND THE SEQUENCE RE-STARTS
FROM QUESTION "H".

PROGRAM OUTPUT/ERROR DESCRIPTION:
-------------------------------------
ALL PROGRAM OUTPUTS, BOTH MESSAGES AND ERROR
REPORTS, ARE CONTROLLED BY THE VALUE OF "SHRED"
(SEE SECTION 6) SWITCHES 2 AND 5 AS FOLLOWS:

<table>
<thead>
<tr>
<th>SWITCH</th>
<th>PRINTOUT TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TTY/CRT LPT</td>
</tr>
<tr>
<td>5</td>
<td>------------</td>
</tr>
<tr>
<td>0</td>
<td>YES NO</td>
</tr>
<tr>
<td>1</td>
<td>YES YES</td>
</tr>
<tr>
<td>2</td>
<td>NO NO</td>
</tr>
<tr>
<td>3</td>
<td>NO YES</td>
</tr>
</tbody>
</table>

IF TTY AND/OR LPT OUTPUTS ARE ENABLED AND IF AN
ERROR IS ENCOUNTERED DURING DIAGNOSTIC TESTING,
AN ERROR REPORT IS GIVEN ON THE SELECTED OUTPUT
DEVICE. THE ERROR INFORMATION PRINTED DEPENDS ON
THE ERROR, HOWEVER, ALL ERROR REPORTS CONTAINS
AT LEAST THE FOLLOWING INFORMATION:

<table>
<thead>
<tr>
<th>CHN</th>
<th>ACO</th>
<th>AC1</th>
<th>AC2</th>
<th>AC3</th>
<th>PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

WHERE: CHN = CARRY
ACO, AC1, AC2, AC3 = ACCUMULATOR CONTENTS
(CONTENTS DEPEND ON SPECIFIC TEST, TESTS
THAT COMPARE TWO VALUES FOR EqUVALENCE,
RETURN ACO/AC1 = 0000/0000 VALUES).

ALL NUMERIC VALUES ARE IN OCTAL, THE ACTION
TAKEN AFTER ERROR MESSAGE PRINTOUT DEPENDS ON
THE VALUE OF "SHRED" (SEE SECTION 6). IF SWITCH
6 = 1 THEN THE PROGRAM WILL EXIT TO OUT AFTER THE
MESSAGE "HALTED ON ERROR" IS PRINTED. IF SWITCH
1 = 0 THEN THE PROGRAM WILL LOOP ON THE ERROR
AFTER THE MESSAGE "LOOPING ON ERROR" IS PRINTED.
THIS FORMS A TEST LOOP LOOP FOR FAILURE TRACING
WITH AN OSCILLOSCOPE. IF SWITCH 1 = 0 AND SWITCH 6 = 1
THE PROGRAM WILL EXIT TO OUT; THEN LOOP ON THE
ERROR ON PROCEED FROM OUT ("MP"), IF SWITCH 6
= 0 THEN ONLY THE FIRST ERROR WILL BE REPORTED,
IF THE PROGRAM IS LOOPING ON AN ERROR AND "SHRED"
SWITCH 3 = 1, A SUBTEST FAILURE RATE IS REPORTED.
THE ERROR RATE IS REPORTED AS A DECIMAL PERCENTAGE,
(NOTE: WHEN LOOPING ON A TEST THAT HAS MORE THAN
ONE ERROR BEING DETECTED, AND A 1 FAILURE RATE IS
BEING REPORTED, THE FAILURE RATE WILL APPEAR AS
X% WHERE X IS THE # OF ERRORS OCCURING, FOR
EXAMPLE, A SCOP LOOP WITH 2 ERRORS WOULD REPORT
"SUBTEST (#) FAILED 500%"

IN ADDITION TO THE ABOVE INFORMATION, A DETAILED ERROR
REPORT IS GIVEN IN MOST CASES ON DETECTION OF AN ERROR.
THE INFORMATION CONTENT VARIES WITH THE TYPE OF ERROR.
THE INTENT IS TO GIVE THE OPERATOR INFORMATION SUCH
AS THE LAST COMMAND/ADDRESS ISSUED BEFORE THE FAILURE
WAS DETECTED, OR TO BREAK STATUS INFORMATION DOWN TO THE
BIT LEVEL ETC. THE FOLLOWING ARE SOME EXAMPLES:
0015 .MAIN

"*** DISK STATUS ERROR ***
UNIT #1 0
EXPECTED (GOOD) DISK STATUS: DIA = 101596
RECEIVED (BAD) DISK STATUS: DIA = 101596
TYPE OF STATUS: DIAGNOSTIC
REASON FOR ERROR:
HEAD GATE (DIAG BIT 10) = 0
CHECKWORD ERROR (DIAG BIT 14) = 1"

"UNIDENTIFIED INTERRUPT FROM DEVICE 37"

"DISK INTERRUPT NOT RECEIVED"

"*** LAST DISK COMMAND/ADDRESS SUMMARY ***
DISK COMMAND WORD: DDA = 003000
DISK ADDRESS WORD: DDC = 000000
UNIT #1 1
COMMAND TYPE: NORMAL
COMMAND: RECALIBRATE"

"*** FAILED STEPPER PHASE SEQUENCE TEST ***
UNIT #1 0"

"*** MEMORY ADDRESS REGISTER ERROR ***
EXPECTED (GOOD) ADDRESS: DIB 010300
RECEIVED (BAD) ADDRESS: DIB 010106"

"*** WRITE/READ DISKETTE CONTROLLER REGISTER ERROR ***
UNIT #1 2
EXPECTED (GOOD) REGISTER CONTENTS: DIC = 110000
RECEIVED (BAD) REGISTER CONTENTS: DIC = 110452
(DATA IN BITS 8-15)"

"*** DISK HEADER ERROR ***
UNIT #1 1
EXPECTED (GOOD) HEADER:
DIC TRACK HEAD SECTOR
140040 301 0 0
RECEIVED (BAD) HEADERS:
DIC TRACK HEAD SECTOR
140040 301 0 0"

"*** LAST DISK COMMAND/ADDRESS SUMMARY ***
DISK COMMAND WORD: DDA = 003001
DISK ADDRESS WORD: DDC = 040037
UNIT #1 1
COMMAND TYPE: NORMAL
COMMAND: READ
TRACK HEAD SECTOR # OF SECTORS
301 0 0 1"

FOR MOST ERRORS, A PROBABLE FAILING MODULE ANALYSIS IS ALSO PRINTED. THIS CONSISTS OF THE FIRST AND SECOND (IF ANY) CAUSES OF THE DETECTED FAILURE. AN EXAMPLE FOLLOWS (SEE SECTION 7.6 FOR A MODULE BREAKDOWN):

"PROBLEM/PROBABLE FAILING MODULES:
FIRST: MEDIA - FORMAT ERROR
SECOND: READ/WRITE (CLOCK) DRIVER BOARD (IN DRIVE)"

10016 .MAIN

"*** UCTAL DEBUG TOOL (ODT) ***
THE DIAGNOSTIC IS EQUIPPED WITH A BUILT IN ODT WHICH CAN BE ACCESSSED BY HITTING CONTROL O ("O") AT ANY TIME DURING THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARAMETERS).
ON ENTERING ODT THE ADDRESSES OF THE LOCATION HAVING THE NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.

11.1 CONVENTIONS AND SYMBOLS
THE FOLLOWING CONVENTIONS ARE USED BY THE ODT:

1. Pressing any illegal key causes the ODT TO RES- POND WITH A "?".
2. ODT IS READY AND AT YOUR SERVICE.

11.2 COMMAND STRUCTURE
AN ODT COMMAND HAS THE FOLLOWING FORMAT:

[ARGUMENT] [COMMAND]

AN ARGUMENT MAY BE ONE OF THE FOLLOWING:

"EQA" AN OCTAL EXPRESSION CONSISTING OF OCTAL NUMBERS SEPARATED BY PLUS (+) OR MINUS (-) SIGNS. LEAD-
ING ZEROS NEED NOT BE TYPED.
"ADK" AN ADDRESS IS THE SAME AS AN EXPRESSION EXCEPT THAT BIT 0 IS NEGLECTED.
A COMMAND IS A SINGLE TELETYPE CHARACTER

11.3 ODT COMMANDS
THE LOCATIONS THAT CAN BE EXAMINED AND MODIFIED BY THE USER ARE CALLED CELLS. THESE CELLS ARE OF TWO TYPES:
INTERNAL CPU CELLS AND MEMORY LOCATIONS.

11.3.1 OPENING INTERNAL CELLS
THE COMMAND TO OPEN ONE OF THE INTERNAL REGISTERS IS OF THE FORM "#N" WHERE N IS ANY OCTAL EXPRESSION BETWEEN 0 AND 7
0 = FOR ACCUMULATORS 0-3
4 = FOR PC OF THE NEXT INSTRUCTION TO BE EXECUTED IN THE EVENT OF A "P" COMMAND.
5 = CPU AND TIO STATUS
6 = BIT INTERPRETATION
15 = STATUS OF TIO DONE FLAG
16 = STATUS OF INTERRUPTS (IDN FLAG)
13 = STATUS OF CARRY BIT
6 = ADDRESS OF THE LOCATION HAVING THE BREAK POINT (IF ANY)
7 = INSTRUCTION AT THE BREAK POINT LOCATION
11017 .MAIN

OTHER COMMANDS TO OPEN CELLS ARE:

"ADR"/ OPEN THE CELL AND PRINT ITS CONTENTS

"+" OPEN THE CELL CURRENTLY POINTED TO BY THE POINTER

AND PRINT ITS CONTENTS.

"-" ADD "ADR" TO THE POINTER, OPEN THE CELL AND PR "-" ITS CONTENTS.

"-" SUBTRACT "ADR" FROM THE POINTER, OPEN THE CELL AND PRINT ITS CONTENTS.

"CR" THE RETURN KEY IS USED TO CLOSE THE OPEN CELL

WITH OR WITHOUT MODIFICATION.

"LF" LINE FEED IS USED TO CLOSE THE OPEN CELL WITH OR

WITHOUT MODIFICATION AND TO OPEN THE SUCCEEDING

CELL.

"-" CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION

AND OPEN THE PRECEDING CELL.

"-" CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND

OPEN THE CELL POINTED TO BY ITS CONTENTS.

"+" CLOSE OPEN CELL WITHOUT MODIFICATION, AND

OPEN THE CELL POINTED TO BY ITS CONTENTS.

"ADR"/ CLOSE OPEN CELL WITHOUT MODIFICATION, AND

OPEN THE CELL POINTED TO BY ITS CONTENTS.

11018 .MAIN

1113.3 OTHER GDT COMMANDS

"RUBOUT" THIS KEY IS USED TO DELETE ERRONEOUSLY TYPED

DIGITS. EACH TIME THE KEY IS PRESSED THE RIGHT MOST

DIGIT IS DELETED AND ECHOED ON THE TERMINAL. IF

THE RUBOUT KEY IS PRESSED RIGHT AFTER OPENING A

CELL THEN IT DELETES THE RIGHT MOST DIGIT OF THE CELLS

CONTENT. THIS ALLows THE MODIFICATION OF THE CELL

AS IF ITS CONTENTS WERE TYPED IN JUST BEFORE THE

KEY WAS PRESSED.

"ADR"/ INSERT A BREAK POINT AT LOCATION "ADR".

ONLY ONE BREAK POINT CAN BE INSERTED AND ANY

ENTRY TO GDT AFTER EXECUTING A BREAK POINT WILL

CAUSE IT TO BE DELETED.

"DELETE" DELETE THE BREAK POINT IF ANY.

"RESET" RESTART THE EXECUTION OF THE PROGRAM AT LOCATION

POINTED BY "4A.

"ADR"/ START EXECUTING THE PROGRAM AT "ADR" AFTER AN

"IGNORE".

"KILL" THE STRING TYPED SO FAR, THE GDT Responds

WITH A "?" AND THE OPEN CELL IS CLOSED WITHOUT

MODIFICATION.

"PRINT" THE OCTAL VALUE OF THE INPUT ONLY.

THIS WILL CLOSE ANY OPEN CELLS WITHOUT

MODIFICATION AND WILL NOT OPEN A CELL

NOTE: IN PROGRAMS WHICH RELOCATE THEMSELVES THE

THE USER SHOULD PLACE BREAK POINTS ONLY IN THE

THE ORIGINAL PROGRAM AREA. IF A BREAK POINT IS

PLACED OUTSIDE THIS AREA THE RESULTS WILL

BE UNPREDICTABLE.

"IGN"*, A RUBOUT COMMAND GIVEN RIGHT AFTER OPENING A CELL.

ALLOWS THE MODIFICATION OF ITS CONTENTS AS IF THEY WERE

TYPED IN JUST BEFORE THE COMMAND WAS ISSUED.
11.4 INSTRUCTION SET:

11.4.1 NORMAL MODE INSTRUCTIONS:

0-4 CLEAN

ANY OF THESE BITS = 1 WILL SET 
THE FOLLOWING = 0 FOR ANY AND 
ALL DEVICES CONNECTED TO THE 
CONTROLLER R/M (DEVICE) DONE, 
SEEK DONE, DISK ERRORS :

BIT 0 = 0, 7, 8, 10-15.

5-6 COMMAND

SPECIFY THE DISK COMMAND FOR 
THE SELECTED DRIVE AS FOLLOWS:

5 6 NORMAL MODE COMMAND

0 0 READ

0 1 WRITE

1 0 SEEK

1 1 RECALIBRATE

7-15 CYLINDER

SPECIFY DESIRED CYLINDER FOR 
A SEEK OR READ/WRITING OPERATION.

CYLINDER #'S ARE AS FOLLOWS:

BIT(S) DESCRIPTION

0 READ/WRITE DONE

IF = 1, READ OR WRITE OPERATION COMPLETED.

IF = 0, OPERATIONS NOT COMPLETE.

THIS IS THE DISK DEVICE DONE FLAG, AND IS 
TESTABLE VIA AN I/O SKIP INSTRUCTION. IT WILL 
BE SET ONLY AFTER A READ/WRITE OPERATION, AN 
IDPLS, START, IOSB AND/OR CLEAR WILL RESET.

1-4 SEEK DONE

IF = 1, SEEK/RECALIBRATE COMPLETED FOR DRIVES 
0-3. ONLY SEEK DONE FOR THE SELECTED DRIVE CAN 
BE SET. IDPLS, START, IOSB OR CLEAR WILL RESET.

5 DISKETTE:

= 0 IF NON-REMOVABLE IS SELECTED 
= 1 IF DISKETTE IS SELECTED

6 WRITE-PROTECT

IF = 1, THE SELECTED DRIVE IS WRITE-PROTECTED.

FOR THE NON-REMOVABLE, WRITE-PROTECT = 1 IF THE 
DRIVE IS IN DIAGNOSTIC MODE (PAGE 0 "DIAG"=1).

7 BAD SECTOR/DATA FIELD ERROR

IF = 1, THE LAST DATA TRANSFER ATTEMPTED TO 
READ ON WRITE A SECTOR PREVIOUSLY DESIGNATED 
AS BAD FOR NON-REMOVABLE DRIVES OR AN ERROR 
DETECTED IN THE DATA FIELD FOR DISKETTES.

8 UNSAFE

IF = 1, THE SELECTED DRIVE IS IN AN UNSAFE CON- 
DITION. FOR NON-REMOVABLE, A READ/WRITE ERROR 
IS INDICATED (NO READ SELECT, MULTIPLE READ 
SELECT, WRITE CURRENT SELECT, WRITE CURRENT WITH 
NO WRITE COMMAND OR CLOCK FAULT). STATUS WILL 
RESET WITH START, CLEAR, IDPLS OR IOSB, BUT 
THIS WILL NOT REMOVE THE DISK'S UNSAFE CON- 
DITION. TRY POWER DOWN/UP.
10021 .MAIN                        10022 .MAIN
 01  BIT                     01  4-6  CURRENT HEAD
 02  FUNCTION/DESCRIPTION    02  INDICATES THE HEAD # SELECTED
 03    -------------------------------  FOR THE NEXT SECTOR TRANSFER, *
 04  9  UNIT READY            05  7-11  CURRENT SECTOR
 05  IF = 1; SELECTED DRIVE NOT PERFORMING ANY HEAD
 06  MOVEMENTS AND IS READY FOR A COMMAND, FOR NON-
 07  REMOVE, IF = 0, A DISK SPEED FAULT IS INDICATED.
 08  ---------
 09  10  OPERATION TIMEOUT/SEEK ERROR
 10  IF = 1, AN ERROR OCCURRED IN THE LAST SEEK OR
 11  RECALIBRATION, FOR NON-REMOVABLE, HOME
 12  NOT FOUND DURING A RECALIBRATION OR A SEEK.
 13  COMMAND WITH CYLINDER > 257 (OCTAL) WAS ISSUED.
 14  11  END OF CYLINDER:
 15  IF = 1, THE LAST READ/WRITE COMMAND ATTEMPTED
 16  TO CONTINUE BEYOND THE LAST HEAD OF THE DRIVE.
 17  12  ADDRESS (HEADER) ERROR:
 18  IF = 1, THE ADDRESS READ FROM THE ADDRESS FIELD
 19  OF THE SELECTED DRIVE'S STARTING SECTOR DID NOT
 20  EQUAL THE LAST ADDRESS SPECIFIED TO THE DISK
 21  CONTROLLER.
 22  ---------
 23  13  CHECKWORD (CRC) ERROR:
 24  IF = 1, THE CYCLIC REDUNDANCY CHECK (CRC) WORD
 25  READ AT END OF SECTOR WAS NOT EQUAL TO THE CRC
 26  WORD CALCULATED BY THE CONTROLLER DURING THE
 27  DATA TRANSFER.
 28  ---------
 29  14  DATA LATE:
 30  IF = 1, THE DATA CHANNEL FAILED TO RESPOND IN
 31  TIME TO A DATA CHANNEL REQUEST FOR NON-REMOVABLE
 32  DRIVES, THIS BIT SHOULD ALWAYS = 0.
 33  15  ERROR:
 34  IF = 1, ONE OR MORE OF THE ABOVE ERROR STATUS
 35  BITS = 1 (LOGICAL "OR" OF 7, 8, 10-14).
 36  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54  55  56  57  58  59  60
 40  DIB;  READ MEMORY ADDRESS
 41  ---------
 42  BITS 0-15 INDICATE THE NEXT MEMORY WORD LOCATION FOR A
 43  DATA CHANNEL TRANSFER, BIT 0 IS THE MAP SELECT BIT
 44  (0 = MAP A SELECTED, 1 = MAP B SELECTED).
 45  ---------
 46  47  48  49  50  51  52  53  54  55  56  57  58  59  60
 47  DICI;  READ DISK ADDRESS AND SECTOR COUNT
 48  ---------
 49  BITS 1-4:
 50  NAME CONTENTS/FUNCTION
 51  0-1 DRIVE CURRENTLY SELECTED DRIVE (0-3)
 52  2 FORMAT IF = 1, THE CONTROLLER IS IN
 53  MODE FORMAT MODE.
 54  55  56  57  58  59  60
 56  DIAGNOSTIC COMMAND
 57  IF = 1, DIAGNOSTIC COMMANDS
 58  ARE ENABLED.
 59  60
 60

UNLESS THE OPERATION TERMINATES WITH THE ADDRESS
ERROR STATUS BIT SET = 1, THE HEAD & SECTOR #/S
INDICATE THE NEXT LOGICAL SECTOR FOR A DATA TRANS-
FER.

CONTROL PULSE FUNCTIONS:

-------------------------

PULSE ACTION TAKEN

-----

NIOB (START) SET DONE, READ/WRITE DNE AND SEEK
DONEフラッグ = 0, SET ALL ERROR STATUS
BITS (7-15 & 10-15) = 0, SET BUSY # 1
AND START A PREVIOUSLY DEFINED READ
OR WRITE OPERATION.

NIOC (CLEAR) SET BUSY, DONE, READ/WRITE DONE, SEEK
DONE = 0, SET ALL ERROR STATUS BITS
(7-15 & 10-15) = 0, TERMINATES ANY
OPERATION IN PROGRESS.

NIOP (IOPLS) SET DONE, READ/WRITE DONE, SEEK
DONEフラッグ = 0, SET ALL ERROR STATUS BITS
(7-15 & 10-15) = 0, START A PREVIOUSLY
DEFINED SEEK ON RECALIBRATION OPERA-
TION, DOES NOT AFFECT BUSY.

IDRB (RESET) PERFORMS SAME FUNCTIONS AS NIOC. IN
ADDITION, SET INTERRUPT DISABLE FLOP
= 0, SET MEMORY ADDRESS REGISTER = 0,
SET INITIAL PROGRAM LOAD FLAG = 1,
TRACK POSITION INFORMATION FOR ALL
DRIVES IS LOST. HOWEVER, IF A SEEK IS
ISSUED AFTER AN IDRB, A RECALIBRATION
IS PERFORMED, FOLLOWED BY THE SEEK.

11.4.2 DIAGNOSTIC MODE COMMANDS:

--------------------

DIAGNOSTIC COMMANDS ARE ENABLED WHEN DIB Bit 3 = 1.
THIS OVERIDES ALL OTHER COMMANDS AND MAY RE-DEFINE
COMMAND DEFINITIONS FOR DCA, DCC, DIA AND DIO DEPEN-
DING ON THE DIAGNOSTIC COMMAND SPECIFIED IN THE DIA
WORD BITS 11-15. ALL DIAGNOSTIC COMMANDS MOVE DCA
BITS 0-3 TO DCC BITS 0-7, UNLESS OTHERWISE NOTED.
ALL DIAGNOSTIC COMMANDS SET DNE AS LONG AS DCA BIT
5 = 0 (OTHERWISE NOT). READ/WRITE DNE WILL ALSO BE
SET IN THE DIA STATUS WORD (BIT 0). THE DIAGNOSTIC
COMMAND SUMMARY FOLLOWS:


NON-REMOVE: THE HEADER TO BE READ IS SPECIFIED BY THE
DOC HWD (HEAD/SECTOR Only); SECTOR COUNT IS IGNORED;
DOC 0-15 = HEADER HEAD FROM DISK
0-7 = TRACK, 8-10 = HEAD, 11-15 = SECTOR
DIA 0-15 = DIAGNOSTIC STATUS.
F0M DISKETTE, HEADS THE HEADER FOR THE NEXT SECTOR
ENCOUNTERED AFTER THE COMMAND IS ISSUED (HEAD # IS
SPECIFIED BY THE DOC HWD), THE 3 WORD HEADER IS DATA
CHANGED INTO HOST MEMORY STARTING AT THE ADDRESS
IN THE CM MEMORY ADDRESS REGISTER (DOC0).
WORD 11: 0-7 = TRACK, 8-15 = SIDE NUMBER
WORD 21: 0-7 = SECTOR, 8-15 = SECTOR LENGTH (2)
WORD 31: 0-15 = CRC4
DIA 0-15 = DISKETTE STATUS.
DOC BITS 8-15 TRANSFERRED TO SELECTED DISKETTE
CONTROLLER INTERNAL REGISTER (ALL ARE 0-BITS).
SELECTED DISKETTE CONTROLLER INTERNAL REGISTER
TRANSFERRED TO DIC BITS 8-15.
DOA BITS 8-15 TRANSFERRED TO DIC 8-15, BITS 8-10
ONLY WILL VARY.
NON-REMOVE SHIFT REGISTER MOVED TO DIC 0-15, THIS
REGISTER CONTAINS THE FOLLOWING INFORMATION:
- AFTER HEAD/WRITING OPERATIONS, ADDRESS ERROR OR
  AFTER A HEAD HEADER = HEADER WORD.
- AFTER A READ WITHOUT ERROR = MICRÓ WORD.
- AFTER A WRITE = CRC WORD (MIRROR IMAGE)
THE SPECIFIED DOC REGISTER IS MOVED TO
DIC BITS 8-15, VALID REGISTER ADDRESS RANGE IS
0-77 AND IS SPECIFIED BY DOC BITS 8-15.
IF NON-REMOVE DRIVE, DIAGNOSTIC STATUS RETURNED IN
DIA REGISTER BITS 7, 8 & 10-15.
RIGID DISK CAPACITY AS FOLLOWS:
14 15 DISK CAPACITY
1 0 12.5 MEGABYTES
1 1 25.0 MEGABYTES
DIAGNOSTIC MODE STATUS:
---
DIAGNOSTIC STATUS IS RETURNED IN THE DIA REGISTER ONLY
IF THE UNIT UNDER TEST IS A NON-REMOVE DISKETTE, AND
ONLY ON EXECUTION OF DIAGNOSTIC COMMANDS 1-3, 5-6 & 20.
DIA STATUS BITS 0-6 AND 9 ARE THE SAME AS THE NORMAL
DIA STATUS INFORMATION. BITS 7-8 & 10-15 ARE REDEFINED
AS FOLLOWS:
---
BIT FUNCTION/DESCRIPTION
7 WRITE DATA (LOW ACTIVE)!
8 SERIAL DATA COMING OUT OF THE READ/WRITE
9 SHIFT REGISTER ON A WRITE OR FORMAT OPERA-
10 TION, USED FOR COMMAND SIMULATION ONLY.
11 WRITE GATE!
12 IF = 1, SERIAL WRITE DATA IS ENABLED AND
13 VALID, USED FOR COMMAND SIMULATION. THIS IS
14 ONE OF THE MAIN CONTROL SIGNALS.
15 HEAD GATE:
16 IF = 1, SERIAL READ DATA IS ENABLED AND
17 VALID, USED FOR COMMAND SIMULATION. THIS IS
18 ONE OF THE MAIN CONTROL SIGNALS.
19 PRM OPERATION:
20 IF = 1, THE PRM SEQUENCER IS ENABLED, USED
21 FOR COMMAND SIMULATION.
22 SECTOR FAULT:
23 IF = 1, A SECTOR PULSE OCCURRED WHEN EITHER
24 READ GATE OR WRITE GATE WAS ACTIVE AND IS
25 AN OPERATION TIME OUT TYPE ERROR.
26 CHECKWORD (CRC) ERROR:
27 IF = 1, A CHECKWORD ERROR IS INDICATED ON A
28 SIMULATED OPERATION JUST PERFORMED.
29 ADDRESS (HEADER) ERROR:
30 IF = 1, A HEADER ERROR ENCOUNTERED (SEE ABOVE).
31 HOME:
32 IF = 1, THE HEADS ARE LOCATED IN THE HOME
33 AREA (TRACKS > 301 OCTAL).
Disk subsystem models 6096, 6094, 6100, 6103

Jumper/Switch Configuration Information

(On main controller board):

Switches: **FUNCTION (N)OTES** (*+* = "ON" position)

SH1 (1-14): Device code select 0 (on if 1 MB)
SH2 (2-13): Device code select 1
SH3 (3-10): Device code select 2
SH4 (4-11): Device code select 3
SH5 (5-10): Device code select 4
SH6 (6-9): Device code select 5
LBB

Controller:

Jumpers: **FUNCTION (N)OTES**

W1: Always out
M2: Non-removable (rigid) disk capacity
W3: In selects 12.5 MB capacity (6096/94)
W4: Out selects 25.0 MB capacity (6100/3)
W5: Out = non-removable drive attached
W6: In = no non-removable drive attached
W7: Always in

Scope Loop Speed-up Information:

Tests that have an I/O reset in them (IDMB) use

"LTOPX" (JSH XICYC) as the scope loop handler routine.

When looping on an error, this routine adds a

Rather large delay in the scope loop in order to allow

TTY inputs to be recognized and processed without being

cleared by the I/O reset command in the loop, to shorten

the scope trace time significantly when looping on an

error occurring in one of these types of loops. Simply

change the "LTOPX" instruction to a "LYOPX" (JSH XICYC)

Instruction. This can be done by entering the OCTAL

debug tool (OCT). The constants "XICYC" and "ICYC" are

in page zero. Refer to these labels in the listing to

obtain their respective addresses for the command.

Special Notes/Special Features:

Starting address a. entered from the internal octal

debugger. Is the non-removable home transducer alignment

procedure. This is a step-by-step series of instructions

which is printed on the output device. The instruction

sequence is simple and self-explanatory.

Unless suppressed by switch "+*" (see section 8.1), the

operator will be asked to change the position of the

unit select switch (see section 7.3) so that an IPL can

be performed from the other drive, if any. This occurs

only on the first pass, and only if the following con-
ditions are met:

1) If there is a non-removable drive at unit 0 and a

diskette drive at unit 1.
2) If there is a diskette drive at unit 0 and a

non-removable drive at unit 1.

Also, neither drive can be write-protected (as specified

by the operator during diagnostic initialization), as a

write operation is performed during the IPL test.

Run Time:

-------

The program will test all drives specified for testing

one at a time, starting with unit 0. The program prints

an end of pass message after all units have been tested.

On pass # 1, all sub-tests are performed once only (no

multiple sub-test iteration counts). The time for two

passes on an individual drive is as follows:

Drive type: time (first two passes)

Drive -------

Diskette < 10 minutes
Non-removable < 5 minutes
(12.5/25 MB)