LOTUS 800/812

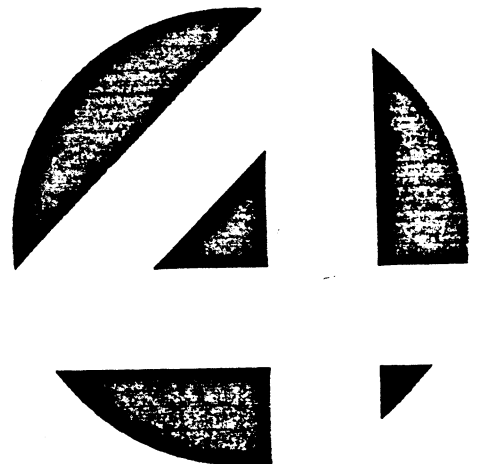## TAPE/DISK
CONTROLLER
DIAGNOSTIC V1.7
MANUAL

Revision 07

NOTICE

Every effort has been made to make this manual complete, accurate and up-to-date. However, all information herein is subject to change due to updates. All inquiries concerning this manual should be directed to POINT 4 Data Corporation.

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LIST OF EFFECTIVE PAGES

Changes, additions, and deletions to information in this manual are indicated by vertical bars in the margins or by a dot near the page number if the entire page is affected. A vertical bar by the page number indicates pagination rather than content has changed. The effective revision for each page is shown below.

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PREFACE

This manual is intended for technicians using the diagnostic program to test the LOTUS 800/812 Controller board during initial installation or troubleshooting of the system. It describes the LOTUS 800/812 Diagnostic program and its options and provides operating procedures.

Related Documents

Related documentation includes:

Title	Document Order No.
LOTUS 800 Controller Manual	HTP0070
LOTUS 812 Controller Manual	HTP0081
LOTUS DISCUTILITY Manual	ITP0018

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Section 1
INTRODUCTION

1.1 GENERAL DESCRIPTION

POINT 4 Data Corporation provides a diagnostic program that verifies the disk and tape controller functions of the LOTUS 800/812 Controller Board. In addition, the diagnostic verifies that the controller board interfaces with several different disk drives and up to four streamer tape drives. The program can be provided with the IRIS Operating System or supplied as a stand-alone program on a streamer tape.

This diagnostic may be used to verify that the controller can communicate with the disk and tape drives. It can also be used for isolating problems with the controller board or with the disk and tape drives. When an error condition is detected, the stop-and-loop-on-error option displays an error message, stops the program, and then loops on the error condition. If no-stop-on-error is selected, the program displays an error message, logs the error, and then attempts to continue the program.

The diagnostic includes 20 options that provide comprehensive testing for the LOTUS 800/812 Controller Board as well as the disk and tape drives. All test options can be used for the LOTUS 800/812 Controller Board. The options and their associated tests are described in Section 2.

Some tests require that additional information be entered prior to execution. Program execution is indicated by various progress messages.

Commands are entered at the terminal by typing the appropriate command character or string followed by a <RETURN>. This <RETURN> is not shown unless it is the only command required or follows a control character.

Two different error logs are generated for all disk functions. The first log reflects errors associated with surface, cylinder, and sector numbers (see Appendix B.1). The other error log maintains a count of several other errors that may occur. If the user is not monitoring the display terminal, these errors could be overlooked; however, the count is displayed with the message "CONTROLLER AND OTHER DISK ERRORS=". When an error count is displayed, the user should run the test again with stop-and-loop-on-error selected. This enables the user to determine the exact error that occurred. Refer to Appendix B.2 for the types of errors that are included in this count.

All disk functions are initiated using Command Descriptor blocks. Refer to Appendix C for a description of the various blocks.

To avoid destroying the manufacturer's error map, this program does not test the last cylinder on disk.

1.2 HARDWARE CONFIGURATION

The following hardware configuration is required for the operation of the LOTUS 800/812 Controller diagnostics.

1. POINT 4 MARK 6 or 12 CPU

2. LOTUS 800 or LOTUS 812 Controller Board

3. MIGHTY MUX Board

4. Display Terminal

5. Streamer Tape Unit (Archive 150MB)

6. ESDI Interface Disk Drive (refer to the appropriate LOTUS 8nn Controller Manual for a list of drives)

1.3 RESTRICTIONS

1. All tests except the controller tests will destroy data on the peripheral being tested (disk or tape). The user-technician should back up a disk prior to running any option that accesses disk. A blank or scratch tape should be used for tape tests. The tape should be retensioned prior to any test. Options M or N may be used to retension the tape. The tape should be retensioned if it is used for more than 10 passes of any tape option.

2. In order to use DBUG with the diagnostic program, the system must have 64K words or larger. The first time the diagnostic is entered, the program attempts to relocate DBUG from location 40000 to 71000 (octal). If the system is only 32K, DBUG is not relocated and the following message is displayed:

```
"SYSTEM IS 32K - DBUG NOT RELOCATED"
```

3. A help module is provided only for the ENTER TEST OPTION prompt. Invoking the help module by entering H at any other time causes the following message to be displayed:

```
NO HELP MESSAGE AVAILABLE
```

4. DISCUTILITY must be run to format the disk prior to restoring it from tape or loading the IRIS Operating System if an option has been executed that accesses the disk.

5. A disk or tape error log is generated if N is entered for the response to the stop-and-loop-on-error query.

6. Before the program sign-on message is displayed, the checksum is computed. This value is then compared for every subsequent running of a selection from the Main Menu. If the checksum routine detects a change in the original code, a checksum error will result. The following will appear:

```
*** CHECKSUM ERROR


      ORIGINAL CHECKSUM = 000000
       CURRENT CHECKSUM = cccccc


  FROM LISTING ADDRESS = xxxxxx
    TO LISTING ADDRESS = yyyyyy


  *** RELOAD DIAGNOSTIC ***
```

where
   000000 - original checksum calculated before sign-on message was displayed
   cccccc - checksum calculated after selected menu item has been executed
   xxxxxx - code address boundary of original checksum
   yyyyyy - code address boundary of current checksum

1.4 SET UP AND OPERATING PROCEDURES

This section is a step-by-step description of the procedure required to make the diagnostic program operational.

1. If the LOTUS 800/812 diagnostic is delivered with the IRIS Operating System (Version 9.1.3B or later), skip to step 6.

2. To load the diagnostic from a stand-alone streamer tape, press the STOP, then the APL button on the front panel.

3. If the diagnostic is delivered on a System Diagnostic tape, refer to the System Diagnostic Executive manual for loading procedures.

4. Enter P42.

5. At the prompt, PROGRAM, enter 0 (zero). The diagnostic is then loaded and the following messages are displayed:

```
*** POINT 4 DATA CORPORATION ***
15442 DEL AMO AVENUE, TUSTIN, CA
PHONE NO. (714)-259-0777
*** LOTUS 800-812 DISK/TAPE (1/4-INCH ONLY) DIAGNOSTIC - VERSION n.n ***
NUMERIC INPUT AND OUTPUT IS OCTAL-EXCEPT FOR ERROR LOG
THIS DIAGNOSTIC REQUIRES A 64KW SYSTEM
***DIAGNOSTIC DESTROYS EXISTING DATA-DO BACKUP***
** PROGRAM DOES NOT TEST THE LAST CYLINDER ON DISK **
STOP AND LOOP ON ERROR? (Y or N) >
```

where

   n.n - current revision number

Proceed to step 7.

6. To load the diagnostic program and DBUG from the IRIS Operating System, shut down the system; from the IRIS manager account, enter

```
SHUTDOWN <CTRL-E>key<CTRL-E>DI.800.n.n,@40000
```

where

   key - password assigned to the SHUTDOWN command by the system manager (default is X)

   n.n - current revision number

7. To execute the diagnostic and relocate DBUG, do the following:

    a. Press STOP and APL on the front panel.

    b. Enter <u>J2</u> (this results in DBUG being relocated to location 71000 octal, if the system is 64K words or larger).

8. The user-technician can now execute DBUG if it was relocated. Two options are available for entering DBUG; these options are as follows:

    a. The first option is to enter DBUG at this point, press STOP and APL; enter <u>J71000</u>.

    b. The second option is to enter DBUG via the Main Menu option Q. This selection can be entered when the ENTER TEST OPTION prompt is displayed.

    If DBUG is executed, refer to the description of DBUG commands in the IRIS R9 System Manager Manual. If the diagnostic is executed, the messages listed in step 5 are displayed.

9. Enter your selection for the stop-and-loop-on-error query. The following query message is then displayed:

```
ENTER DEVICE TO TEST 1=DISK,2=TAPE,3=BOTH (DEFAULT=1) >
```

    a. The following query messages are displayed from options 1 and 3.

```
ENTER DISK DEVICE CODE (DEFAULT=45) >
ENTER DISK DRIVE NUMBER (0,1,2,3 DEFAULT=0) >
ENTER ESDI DRIVE TYPE
     1=MAXTOR      765MB
     2=MICROPOLIS 382MB
     3=MICROPOLIS 170MB
ENTER SELECTION >

ENTER DESIRED NUMBER OF PASSES (DEFAULT=1) >
```

    Enter the desired number of passes (1 to 177777 octal).

```
ENTER TEST OPTION (ENTER "H" FOR A LIST OF OPTIONS)
```

b. The following query messages are displayed for option 2.

```
ENTER TAPE DRIVE NUMBER (1,2,3,4 DEFAULT=1) >
ENTER DESIRED NUMBER OF PASSES (DEFAULT=1) >
```

Enter the desired number of passes (1 to 177777 octal).

```
ENTER TEST OPTION (ENTER "H" FOR A LIST OF OPTIONS)
```

10. Enter H to display the Main Menu, which is described in Section 1.5.

1.5 MAIN MENU

The various options are designed to do a specific test or a group of tests depending on the option selected. Messages reporting the progress and status of the various functions are displayed at the terminal.

The test options are selected via the Main Menu. To display the Main Menu, at the ENTER TEST OPTION prompt, enter H.

The following options are then displayed:

```
A = DISK CONTROLLER TEST
B = DISK AND TAPE CONTROLLER TEST
C = FORMAT DISK-VERIFY DATA
D = WRITE-READ-COMPARE DISK
E = FORMAT DISK-VERIFY FORMAT HEADERS
F = SELECTIVE WRITE-READ-COMPARE
G = DISK AND TAPE TEST
J = TAPE CONTROLLER TEST
K = SELECTIVE WRITE TAPE
L = SELECTIVE READ TAPE
M = RETENSION TAPE
N = ERASE TAPE
P = WRITE-READ-COMPARE TAPE
Q = ENTER DBUG (RESIDES AT 71000)
R = DUMP WRITE BUFFER
S = DUMP READ BUFFER
T = QUICK DISK AND TAPE DIAGNOSTIC
U = MULTIPLE DISK AND TAPE TEST
V = WRITE-READ-COMPARE TAPE (BOT TO EOT)
W = TAPE COMPATIBILITY WRITE-READ-COMPARE
```

To execute an option, enter the letter designator at the command prompt (>) and press <RETURN>. A detailed description of each option is given in Section 2.

1.6 STANDARD PROGRESS AND QUERY MESSAGES

The standard progress and query messages displayed by the various test options are described in the following subsections.

1.6.1 Standard Progress Messages

The following progress messages are displayed for most test options:

```
COMPLETED PASS NUMBER =nnnnnn
(nnnnnn=current pass number)
*** ALL PASSES COMPLETED ***
NO DISK ERRORS
```

1.6.2 Disk Query Messages

The following query messages are displayed from the various disk test options:

```
ENTER DISK DEVICE CODE (DEFAULT=45)
ENTER DISK DRIVE NUMBER (0,1,2,3 DEFAULT=0)
ENTER DESIRED NUMBER OF PASSES (DEFAULT=1)
(1 to 177777 valid range)
WRITE-READ-COMPARE COMPLETE DISK? (Y or N)
FORMAT AND VERIFY HEADER FOR COMPLETE DISK? (Y or N)
FORMAT AND VERIFY DATA FOR COMPLETE DISK? (Y or N)
ENTER PATTERN TO WRITE-READ-COMPARE (DEFAULT=166666)
ENTER STARTING SURFACE NUMBER (0,nnnnnn)
(0 to nnnnnn valid range)
ENTER ENDING SURFACE NUMBER (0,nnnnnn)
(0 to nnnnnn valid range)
ENTER STARTING CYLINDER NUMBER (0,mmmmmm)
(0 to mmmmmm valid range)
ENTER ENDING CYLINDER NUMBER (0,mmmmmm)
(0 to mmmmmm valid range)

STOP AND LOOP ON ERROR? (Y or N)
```

where
        nnnnnn - last surface number for selected drive
     mmmmmmm - last cylinder number for selected drive

If Y is entered at the stop-and-loop-on-error query, the program displays the error messages and goes into a loop where the error was detected. If N is entered, the program continues operation when an error is detected. Error messages are displayed. The disk error log is only generated if N is entered for this query.

1.6.3 Tape Query Messages

The following query messages are displayed from various tape options:

```
ENTER TAPE DRIVE NUMBER (1,2,3,4 DEFAULT=1)
ENTER DESIRED NUMBER OF PASSES (DEFAULT=1)
ENTER PATTERN TO WRITE-READ (DEFAULT=66666)
```

1.6.4 Partial Disk Query Messages

The following query messages are displayed if the user-technician elects to do partial disk functions. The pattern query is not displayed for format functions.

```
ENTER PATTERN TO WRITE-READ (DEFAULT=66666)
ENTER STARTING SURFACE NUMBER (nnnnnn,mmmmmm)
ENTER LAST SURFACE NUMBER (aaaaaa,bbbbbb)
ENTER STARTING CYLINDER NUMBER (cccccc,dddddd)
ENTER LAST CYLINDER NUMBER (eeeeee,ffffff)
```

where

nnnnnn - beginning surface number
mmmmmm - last surface number on disk
aaaaaa - surface number entered as starting surface
bbbbbb - last surface number on disk
cccccc - beginning cylinder number
dddddd - last cylinder on disk
eeeeee - cylinder number entered as starting cylinder
ffffff - last cylinder number on disk

1.6.5 Disk Parameter Messages

The following disk parameter messages are displayed for each disk being tested:

```
DISK PARAMETERS FOR DRIVE: n
NUMBER OF CYLINDERS: xxxx
NUMBER OF SURFACES:  yy
SECTORS/TRACK:       zz
```

where

n - selected drive number
xxxx - maximum number of cylinders
yy - maximum number of surfaces
zz - number of sectors per track

1.7 STANDARD ERROR MESSAGES

Four standard error message screens may be generated by disk or tape tests. The error messages are described in the following subsections.

1.7.1 Disk Controller Status Register

The following messages may be displayed for disk controller errors:

```
FROM ADDRESS = xxxxxx  EXPECTED = 100000  ACTUAL = aaaaaa
CONTROLLER STATUS DECODES TO:
BIT - 15 (DRIVE ERROR)
BIT - 14 (DRIVE NOT READY)
BIT - 13 (DRIVE WRITE PROTECTED)
BIT - 12 (RELOCATED TRACK FOUND)
BIT - 11 (DATA RECOVERED WITH ECC)
BIT - 10 (DATA RECOVERED WITH RETRIES)
BIT -  9 (NOT USED)
BIT -  8 (NOT USED)
BIT -  7 (NOT USED)
BIT -  6 (NOT USED)
BIT -  5 (NOT USED)
BIT -  4 (FAILED SELF-TEST)
BIT -  3 (BUFFER UNDERFLOW)
BIT -  2 (TIMEOUT)
BIT -  1 (CDB ERROR)
BIT -  0 (CDB DONE)
COMMAND PACKET ADDRESS:yyyyyy
```

where

xxxxxx - code address where error occurred

aaaaaa - disk controller status received

yyyyyy - address of command packet in error

1.7.2 Disk Drive Status Register

The following error messages may be displayed for disk drive errors:

```
FROM ADDRESS = xxxxxx   EXPECTED = 0   ACTUAL = aaaaaa
DISK DRIVE ERROR STATUS DECODES TO:
BIT - 15 (SELF-TEST ERROR)
BIT - 14 (SELF-TEST ERROR)
BIT - 13 (SELF-TEST ERROR)  '
BIT - 12 (SELF-TEST ERROR)
BIT - 11 (SELF-TEST ERROR)
BIT - 10 (SELF-TEST ERROR)
BIT -  9 (NOT USED)
BIT -  8 (ESDI CHANNEL ERROR)
BIT -  7 (DRIVE STATUS TRAP)
BIT -  6 (DRIVE SELECTION FAULT)
BIT -  5 (DATA NON-VERIFY)
BIT -  4 (HEADER ERROR)
BIT -  3 (SECTOR NOT FOUND)
BIT -  2 (RELOCATED TRACK, NO VECTOR FOUND)
BIT -  1 (DATA NOT RECOVERED)
BIT -  0 (SEEK ERROR)
COMMAND PACKET ADDRESS:yyyyyy
```

where

xxxxxx - code address of where error occurred

aaaaaa - disk controller status received

yyyyyy - address of command packet in error

1.7.3 Tape Controller Status Register

The following error messages may be displayed for tape controller errors:

```
CONTROLLER STATUS DECODES TO:
DIRECTION
INTERRUPT
REQUEST
TAPE READY
ON LINE
EXCEPTION
*** LOOPING ON ERROR ***
(displayed if loop-on-error was selected)
```

1.7.4 Tape Drive Exception Status Words

The following error messages may be displayed for tape drive errors:

```
DRIVE STATUS DECODES TO:
RESET OCCURRED
END OF RECORDED DATA
BUS PARITY ERROR
BEGINNING OF MEDIUM
MARGINAL BLOCK DETECTED
NO DATA DETECTED
ILLEGAL COMMAND
FILE MARK DETECTED
BLOCK IN ERROR NOT FOUND
UNRECOVERABLE DATA ERROR
END OF MEDIUM
WRITE PROTECTED
DEVICE FAULT OR SELF TEST FAILED
```

Section 2
LOTUS 800/812 TEST OPTIONS

This section describes the tests performed for each option of the LOTUS 800/812 Tape/Disk Controller Diagnostic.

2.1 DISK CONTROLLER TEST - OPTION A

Option A includes several subtests for the disk controller board. The tests are designed to verify the interface to the disk drives by issuing a Read Status command.

2.1.1 Busy/Done Bit Test

This subtest issues an I/O-Reset, then checks that Busy and Done are both cleared. After a pause, the following messages may be displayed if either of these flags is not cleared:

```
    DISK CONTROLLER TEST
    TEST IN PROGRESS
    TIMEOUT ERROR
    BUSY DID NOT RESET
    DONE DID NOT RESET
    FROM ADDRESS =nnnnnn
     (nnnnnn=memory or listing address where failure occurred)
```

2.1.2 Command Port Register Test

This subtest writes to the device register to verify it is operational. Five data patterns are written, read, and compared. These data patterns are 125252, 177777, 133333, 66666, 00000.

If errors are detected, the following messages are displayed:

```
    *** COMMAND PORT REGISTER COMPARE ERROR
    FROM ADDRESS =xxxxxx
    (xxxxxx=memory or listing address where failure occurred)
    EXPECTED =nnnnnn
    (nnnnnn=expected data pattern)
    ACTUAL =mmmmmm
    (mmmmmm=pattern read from device register)
```

2.1.3 Controller Buffer Test

This subtest tests the Read Buffer and Write Buffer commands. The first part of the test writes the pattern 157355 to the host's Read buffer. The test then issues a Read Buffer command to read the data pattern in the controller's data buffer, which is 21400 octal words. The Read command should overwrite the pattern 157355. The test then verifies that the data pattern has been overwritten. If the data pattern has not been overwritten, the following error messages are displayed:

```
*** READ BUFFER COMMAND ERROR
```

Refer to Section 1.7 for additional error messages that may be displayed.

The next subtest of the Controller Buffer Test writes the data pattern 020422 to the host's write buffer. The test then issues a Write Buffer command to the controller's data buffer. If an error occurs, the following message is displayed:

```
*** WRITE BUFFER COMMAND ERROR
```

Refer to Section 1.7 for additional error messages that may be displayed.

The host's write buffer is then overwritten with all 0's. The test then issues a Read Buffer command to read the pattern 020422 into the host's read buffer. The test then checks to see that the read Buffer command executed without errors. The test then checks that the pattern was read into the host's read buffer. If an error occurred, the following message is displayed:

```
*** READ BUFFER COMMAND ERROR
```

Refer to Section 1.7 for additional error messages that may be displayed.

The test concludes by writing 0's to the host's write buffer; it then issues a Write Buffer command to the controller's data buffer, which is followed by a Read Buffer command to read data into the host's read buffer. The test then verifies that the two buffers are the same. If any errors occur, the following messages are displayed:

```
*** DATA COMPARE ERROR DURING READ AND WRITE BUFFER TEST
FROM ADDRESS =xxxxxx
(xxxxxx=memory or listing address where error occurred)
EXPECTED =nnnnnn
(nnnnnn=expected data pattern)
ACTUAL =mmmmmm
(mmmmmm=actual pattern read from controller buffer)
```

2.1.4 Busy-Set and Reset Test

This subtest uses a verify and an I/O-Reset command to test that busy is set and reset at proper times. If errors are detected, the following error messages are displayed:

```
   DISK CONTROLLER TEST
   BUSY DID NOT SET
   BUSY DID NOT RESET
   FROM ADDRESS =nnnnnn
    (nnnnnn=memory or listing address where failure occurred)
```

2.1.5 Done-Set and Reset Test

This subtest clears the controller, then issues a Read Buffer command. It loads the memory address register and issues a start pulse. After a specified delay, the read-write done bit in the controller status word is checked. If read-write done is not set, the following error messages are displayed:

```
   DISK CONTROLLER TEST
   READ-WRITE DONE NOT SET
```

Refer to Section 1.7.1 for additional error messages.

2.2 DISK AND TAPE TEST

This option is a combination of the tests performed under options A and J. Refer to Sections 2.1 and 2.8 for a description of the tests.

2.3 FORMAT AND VERIFY DATA - OPTION C

This test formats a complete or partial disk drive by issuing a Format command. The data byte 252 is written into the data field of the sector. The disk drive is formatted one track at a time. When the format is completed, the data pattern that was used in formatting the disk is verified by issuing a Verify command to verify the data pattern used in formatting the disk drive. The Verify command will read a sector's worth of data from the host buffer into the controller's buffer. The Verify command will then verify that the data just read into the controller's buffer matches the data on disk. The Verify command will attempt to verify an entire track of data. The following message is displayed when the format process begins:

```
*** FORMATTING DISK ***
```

If errors occur during the format operation, the following messages are displayed:

```
*** ERROR DURING VERIFY - DISK DATA ERROR
SURFACE = ssssss     CYLINDER = cccccc     SECTOR = xxxxxx
```

where

      ssssss - surface number in error
      cccccc - cylinder in error
      xxxxxx - sector number in error

Refer to Section 1.7 for additional error messages that may be displayed.

During the verification of data phase, the following message is displayed:

```
*** VERIFYING DATA ***
```

If errors occur during the verifying data operation, the following messages are displayed:

```
*** ERROR DURING VERIFY - CONTROLLER OR DRIVE ERROR
```

Refer to Section 1.7 for additional error messages that may be displayed.

```
*** ERROR DURING VERIFY - MEMORY DATA ERROR
MEMORY ADDRESS: xxxxxx   EXPECTED = yyyyyy   ACTUAL = zzzzzz
RUN MEMORY DIAGNOSTIC
```

where

xxxxxx - computer's memory address in error

yyyyyy - expected data pattern—the data pattern used in formatting the disk drive

zzzzzz - data pattern found at the computer's memory address

The user should run the memory diagnostic to verify the integrity of the system memory.

2.4 WRITE/READ/COMPARE DISK - OPTION D

This test writes, reads and compares data on a whole or partial disk drive. The following three data patterns are used:

```
     166666
     133333
     125252
```

The cylinder number is displayed at the lower left of the screen while the test is in progress. Refer to Section 1.6.4 for the partial disk query messages.

The following progress messages are displayed:

```
    COMPLETED PASS NUMBER =nnnnnn
    (nnnnnn=current pass number)
    *** ALL PASSES COMPLETED ***
    WRITING DATA-PATTERN =nnnnnn
    (nnnnnn=current pattern being written to disk)
    READING-COMPARING DATA-PATTERN =nnnnnn
    (nnnnnn=current pattern being read and compared)
```

If errors are detected, the following error messages may be displayed:

```
    DATA COMPARE ERROR
    FROM ADDRESS =nnnnnn
    (nnnnnn=memory or listing address where failure occurred)
    SURFACE =nnnnnn
    (nnnnnn=surface number when error was detected)
    CYLINDER =nnnnnn
    (nnnnnn=cylinder number when error was detected)
    SECTOR =nnnnnn
    (nnnnnn=sector number in error)
```

Refer to Sections 1.7.1 and 1.7.2 for additional error messages.

2.5 FORMAT AND VERIFY FORMAT HEADERS - OPTION E

This test formats a complete or partial disk drive by issuing a Format command. The disk drive is formatted one track at a time. When the format is completed, the headers are verified by issuing a Read Headers command. The headers are verified one sector at a time. The following message is displayed when the format operation begins:

```
    *** FORMATTING DISK ***
```

If errors occur during the format operation, the following messages are displayed:

```
    *** ERROR DURING THE FORMAT OPERATION
    SURFACE = ssssss    CYLINDER = cccccc    SECTOR = xxxxxx
```

Refer to Section 1.7 for additional error messages that may be displayed.

During the verification of headers phase, the following message is displayed:

```
    *** VERIFYING HEADERS ***
```

If errors occur during the verifying header operation, the following messages are displayed:

```
    *** ERROR - BAD HEADER FIELD
    FROM ADDRESS IS xxxxxx
    (xxxxxx=memory or listing address where error occurred)
    EXPECTED =nnnnnn
    (nnnnnn=expected data pattern)
    ACTUAL =mmmmmm
    (mmmmm=pattern read in header field)

    SURFACE = ssssss    CYLINDER = cccccc    SECTOR = xxxxxx
```

Refer to Section 1.7 for additional error messages that may be displayed.

2.6 SELECTABLE PATTERN WRITE/READ/COMPARE DISK

The following test options do a write (Option F), read and compare (Option I) of a complete or partial disk. The user-technician has the option of entering the pattern, or using the default of 66666. The cylinder number is displayed at the lower left of the terminal display while the test is in progress. If a partial disk drive is to be tested, refer to Section 1.6.2 for a description of the query messages.

2.6.1 Selectable Pattern Write Disk – Option F

When the write disk test is in progress, the following messages are displayed:

```
WRITING DATA-PATTERN =nnnnnn
(nnnnnn=pattern being written to disk)
COMPLETED PASS NUMBER =nnnnnn
(nnnnnn=current pass number)
*** ALL PASSES COMPLETED ***
```

2.6.2 Selectable Pattern Read-Compare Disk – Option I

This test option requires a user to enter the starting surface/cylinder number, the ending surface/cylinder number and the pattern that was written in Option F. The following progress messages are displayed:

```
READING-COMPARING DATA PATTERN = nnnnnn
(nnnnnn=pattern being read and compared)
COMPLETED PASS NUMBER = nnnnnn
(nnnnnn=current pass number)
*** ALL PASSES COMPLETED ***
```

If errors are detected, the following error messages may be displayed:

```
DATA COMPARE ERROR
FROM ADDRESS = nnnnnn
(nnnnnn=memory or listing address where failure occurred)
EXPECTED =nnnnnn
(nnnnnn=expected data)
ACTUAL =mmmmmm
(mmmmmmm=actual data read)
SURFACE = nn
(nn=surface number when error was detected)
CYLINDER = nnnn              .
(nnnn=cylinder number when error was detected)
SECTOR = nn
(nn=sector number in error)
```

Refer to Sections 1.7.1 and 1.7.2 for additional error messages.

2.7 DISK AND TAPE TESTS - OPTION G

This option is designed to do comprehensive testing of the controller (both disk and tape) and the disk and tape drives. Included in this option are the A, C, D, E, J, and P tests. Refer to the specific sections that describe these tests in detail. Refer to Sections 1.7.1 through 1.7.4 for error messages that may be displayed from this test.

2.8 TAPE CONTROLLER TEST - OPTION J

Option J includes several subtests for the tape controller board. The tests are designed to verify the interface to the tape drives.

2.8.1 Busy/Done/Reset Test

This subtest issues an I/O-Reset command and verifies that Busy and Done are both cleared.

If errors are detected, the following error messages are displayed:

```
    TAPE CONTROLLER TEST
    TIMEOUT ERROR
    BUSY NOT RESET
    FROM ADDRESS =nnnnnn
    (nnnnnn=memory or listing address where failure occurred)
    DONE NOT RESET
```


2.8.2 Exception/Memory/Block Count Test

This subtest reads the controller status and checks that the exception bit is reset in the status word. The memory address and block count registers are then read to verify that both registers were cleared by the I/O-Reset command in the previous test.

If errors are detected, the following messages are displayed:

```
    TAPE CONTROLLER TEST
    EXCEPTION BIT NOT RESET
    MEMORY ADDRESS REGISTER ERROR
    BLOCK COUNT REGISTER ERROR
```

Refer to Section 1.7.3 for additional error messages.

2.8.3 Illegal Device Codes – Using Block Count Register

This subtest writes all ones to the memory address register. Seventy illegal device codes are used to test that they do not cause a change in the data in the register.

If errors are detected, the following messages are displayed:

```
TAPE CONTROLLER TEST
MEMORY ADDRESS REGISTER ERROR
FROM ADDRESS =nnnnnn
 (nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn
 (nnnnnn=pattern written to the memory address register)
ACTUAL =mmmmmm
 (mmmmmm=pattern read back from the memory address register)
```

2.8.4 Illegal Device Codes – Using Block Count Register

This subtest writes a test pattern (377) to the block count register. This represents the largest number that can be inserted into the register during normal operations. A command with an illegal device code is then issued. The register is read back and compared with the output data.

If errors are detected, the following error messages are displayed:

```
TAPE CONTROLLER TEST
BLOCK COUNT REGISTER ERROR
FROM ADDRESS =nnnnnn
 (nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn
 (nnnnnn=pattern 377 written to the block count register)
ACTUAL =mmmmmm
 (mmmmmm=pattern read back from the block count register)
```

2.8.5 Device Codes – Using Command Register

This subtest writes a test pattern (40377) to the command register. The pattern is then read back and compared to the output pattern. A command with an illegal device code is then issued. The command register is read back and the input pattern is compared to the output pattern (40377).

If errors are detected, the following error messages are displayed:

```
TAPE CONTROLLER TEST
COMMAND REGISTER ERROR
FROM ADDRESS =nnnnnn
(nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn
(nnnnnn= pattern 40377 written to the command register)
ACTUAL =mmmmmm
(mmmmmm=pattern read back from the command register)
```

2.8.6 Moving Ones and Zeroes – Using Memory Address Register

This subtest writes a moving one-and-zero pattern to the memory address register. After each pattern is written to the register, a command with an illegal device code is issued. The register is then read back and the input pattern is compared to the output pattern.

If errors are detected, the following error messages are displayed:

```
TAPE CONTROLLER TEST
MEMORY ADDRESS REGISTER ERROR
FROM ADDRESS =nnnnnn
(nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn
(nnnnnn=pattern written to the memory address register)
ACTUAL =mmmmmm
(mmmmmm=pattern read back from the memory address register)
```

2.8.7 Moving Ones and Zeroes – Using Command Register

This subtest writes a moving one-and-zero pattern to the command register. After each pattern is written, a command with an illegal device code is issued. The register is then read back and the input pattern is compared to the output pattern.

If errors are detected, the following error messages are displayed:

```
TAPE CONTROLLER TEST
COMMAND REGISTER ERROR
FROM ADDRESS =nnnnnn
(nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn
(nnnnnn=pattern written to the memory address register)
ACTUAL =mmmmmm
(mmmmmm=pattern read back from the memory address register)
```

2.8.8 First Tape Unit Test

This subtest clears the tape controller, then issues a Reset command to tape. The following functions are then performed:

- The tape controller's status is read to check if the exception bit is on.

- Bits 1-5 of the controller's status word are tested to verify that they are reset.

- If the tape exception bit is on, the tape status bytes are read to clear the exception. The exception bit is then checked to verify that it has been reset.

- The following bits are checked to verify that they have been set:

```
Request
Drive Ready
Direction
Interrupt
```

- Interrupts are checked to verify that they are functioning.

If errors are detected, the following error messages may be displayed:

```
TAPE CONTROLLER TEST
EXCEPTION BIT NOT SET
CONTROLLER BITS 1-5 NOT RESET
BUSY NOT SET
REQUEST BIT NOT SET
TIMEOUT ERROR
EXCEPTION BIT NOT RESET
DRIVE NOT READY
DIRECTION BIT NOT SET
INTERRUPT BIT NOT RESET
INTERRUPT BIT NOT SET
NO INTERRUPT
ONLY DRIVE READY SHOULD BE SET
```

Refer to Section 1.7.3 for additional error messages that may be displayed.

2.8.9 Select-Drive/Rewind-Drive Test

This subtest tests the drive for being ready before starting the test. A Read Status command is issued to clear the exception bit if an exception condition results from the drive ready test. The test then performs the following functions:

- Issues a Select command

- Checks the controller's status word for the request bit being set

- Checks the tape drive again for being ready

- Checks the setting of the exception bit again; if the exception bit is set, reads the tape status again to clear the exception bit

- Checks the status bytes for the beginning-of-tape bit; if the tape is not at the beginning, issues a Rewind command

- Checks the request bit once more for being set

- Checks the done bit for being set

If errors are detected, the following error messages may be displayed:

```
     TAPE CONTROLLER TEST
     TAPE NOT AT BEGINNING OF TAPE(BOT)
     BUSY NOT SET
     REQUEST BIT NOT SET
     TIMEOUT ERROR
     DONE NOT SET
     DRIVE NOT READY
```

Refer to Section 1.7.4 for additional error messages that may be displayed.

2.9 SELECTIVE WRITE TAPE - OPTION K

This test does a continuous write to a streamer tape. 35,000 blocks in groups of 40 are written to tape. The user is requested to enter the pattern to be written. The default pattern is 66666. This option was designed to assist technicians in troubleshooting suspect tape drives.

If errors are detected, the following error messages may be displayed:

```
STREAMER TAPE TEST
BUSY NOT SET
EXCEPTION NOT ON AFTER RESET COMMAND
RESET BIT NOT CLEARED-AFTER CLEAR RESET COMMAND
DONE NOT SET
```

Refer to Sections 1.7.3 and 1.7.4 for additional error messages that may be displayed.

2.10 SELECTIVE READ TAPE - OPTION L

This test does a continuous read of a streamer tape. 35,000 blocks in groups of 40 are read from tape. This program is designed to read tapes generated by the continuous write routine in Section 2.9. The user is requested to enter the pattern to be read or to use the default of 66666. This option was designed to assist technicians in troubleshooting suspect tape drives.

If errors are detected, the following error messages may be displayed:

```
STREAMER TAPE TEST
BUSY NOT SET
EXCEPTION NOT ON AFTER RESET COMMAND
RESET BIT NOT CLEARED-BY CLEAR RESET COMMAND
DONE NOT SET
BUSY NOT SET
```

Refer to Sections 1.7.3 and 1.7.4 for additional error messages that may be displayed.

2.11 RETENSION TAPE - OPTION M

This test retensions the tape unit. This option should be executed if the tape has been used several times for short write or read operations. It should also be executed if the tape has not been used for a long time or if the user does not know the last time it was retensioned. The option requires approximately 2 minutes to complete. A message informing the user of the time required is displayed.

If errors are detected, the following error messages may be displayed:

```
STREAMER TAPE TEST
EXCEPTION NOT ON AFTER RESET COMMAND
DONE NOT SET
RESET BIT NOT CLEARED-BY CLEAR RESET COMMAND
BUSY NOT SET
```

Refer to Sections 1.7.3 and 1.7.4 for additional error messages that may be displayed.

2.12 ERASE TAPE - OPTION N

This test erases a streamer tape. It may be used in place of the retension option. The tape is erased from beginning-of-tape to end-of-tape. The option requires approximately two minutes to complete. A message informing the user of the time required is displayed.

If errors are detected, the following error messages may be displayed:

```
STREAMER TAPE TEST
RESET BIT NOT CLEARED-BY CLEAR RESET COMMAND
EXCEPTION NOT ON AFTER RESET COMMAND
BUSY NOT SET
DONE NOT SET
```

Refer to Sections 1.7.3 and 1.7.4 for additional error messages that may be displayed.

2.13 WRITE/READ/COMPARE TAPE - OPTION P

This test writes, reads, and compares three data patterns to and from tape. The patterns used for the test are:

```
166666
133333
125252
```

Five groups of data are written, read, and compared. Refer to Appendix A for specific tape formats.

This test was designed to do comprehensive testing of the streamer tape drive. If errors occur, it is suggested that the user-technician first do the retension option; if errors still occur, try another tape cartridge.

The following progress messages are displayed during execution:

```
WRITING DATA-PATTERN =nnnnnn
(nnnnnn=current pattern being written to tape)
NUMBER OF BLOCKS RE-WRITTEN OR SOFT ERRORS READ =nnnnnn
(nnnnnn=if write data, number of blocks rewritten;
if read data, number of soft errors read)
NUMBER OF WRITE-READ BUFFER UNDERRUNS = mmmmmm
(mmmmmm= if write data, number of extended gaps;
if read data, number of buffer underruns)
*** REWINDING TAPE ***
READING DATA-PATTERN =nnnnnn
(nnnnnn=current pattern being read from tape)
*** FILE MARK DETECTED ***
*** DATA COMPARE OK ***
COMPLETED PASS NUMBER =nnnnnn
(nnnnnn=current pass number)
*** ALL PASSES COMPLETED ***
```

The following error messages may be displayed:

```
STREAMER TAPE TEST
DATA COMPARE ERROR
FROM ADDRESS =nnnnnn
(nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn              .
(nnnnnn=current data pattern being written to tape)
ACTUAL =mmmmmm
(mmmmmm=actual data read from tape)
WORD NUMBER =nnnnnn
(nnnnnn=word displacement in read
buffer where data error occurred)
BUSY DID NOT RESET
DONE DID NOT RESET
NUMBER OF TAPE BLOCKS WITH COMPARE ERRORS =
```

Refer to Sections 1.7.3 and 1.7.4 for additional error messages that may be displayed.

2.14 RETURN TO DBUG - OPTION Q

This option is selected to enter DBUG from the Main Menu. DBUG must have been loaded at 71000 (octal).

The following error message is displayed if DBUG has been modified or not loaded:

```
DBUG MODIFIED OR NOT LOADED
```

The Main Menu is then displayed.

2.15 DUMP WRITE BUFFER - OPTION R

This option is selected to display all or part of the write buffer. The format for the display is the memory address followed by 10 octal words of data as follows:

```
aaaaaa= xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx xxxxxx
```

where

      aaaaaa - memory address incremented by octal 10 for each line
      xxxxxx - contents of the write buffer

The data is displayed in pages. One page is 10 octal lines plus the following option message:

```
RETURN KEY=NEXT LINES-ANY KEY AND RETURN=EXIT
```

No error messages are displayed from this option.

2.16 DISPLAY READ BUFFER - OPTION S

This option is selected to display all or part of the read buffer. The format for the display is the memory address followed by 10 octal words of data. The format is the same as shown in Section 2.15. The data is displayed in pages. One page is 10 octal lines plus an option message. No error messages are displayed from this option.

2.17 QUICK DISK AND TAPE DIAGNOSTIC - OPTION T

This test can be used as a quick diagnostic to verify that both the disk and tape controller sections of the board are functioning and can communicate with the disk and tape drives. The test does selective formatting and writing to disk.

The data is read from disk and written to tape; it is then read back from the tape and the disk. The two buffers are then compared.

This test only does every 10th cylinder and should not be used as a comprehensive disk and tape drive test. The data pattern used from this test is 166666.

If errors are detected, the following error messages may be displayed:

```
DISK CONTROLLER TEST
TAPE CONTROLLER TEST
BUSY NOT SET
DONE NOT SET
DATA COMPARE ERROR
WORD NUMBER =nnnnnn
(nnnnnn=word displacement in the disk or
tape buffer where error is)
FROM ADDRESS =nnnnnn
(nnnnnn=memory or listing address where error occurred)
EXPECTED =nnnnnn
(nnnnnn=data read from disk)
ACTUAL =mmmmmm (mmmmmm=data read from tape)
```

Refer to Sections 1.7.1 through 1.7.4 for additional error messages that may be displayed.

2.18 MULTIPLE DISK FORMAT, WRITE-READ-COMPARE DISK/TAPE - OPTION U

This option is selected to test the tape drive and to format, write-read-compare more than one disk drive at a time. The tape drive is tested first. Then the disk drives are tested in sequence, starting with the lowest numbered drive selected. Before each disk drive is tested, the disk drive parameters are displayed. Then the drive is formatted and the write- read-compare operations are tested.

The test formats, writes, reads, and compares the entire disk drive. The following three data patterns are used when writing, reading, and comparing data:

```
166666
133333
125252
```

The cylinder number is displayed at the lower left of the screen while the test is in progress.

The following progress messages are displayed:

```
COMPLETED PASS NUMBER = nnnnnn
(nnnnnn=current pass number)
*** ALL PASSES COMPLETED ***
WRITING DATA-PATTERN = nnnnnn
(nnnnnn=current pattern being written to disk)
READ-COMPARING DATA-PATTERN=nnnnnn
(nnnnnn=current pattern being read and compared)
```

If errors are detected, the following error messages may be displayed:

```
DATA COMPARE ERROR
FROM ADDRESS =nnnnnn
(nnnnnn=memory or listing address where failure occurred)
SURFACE =nnnnnn
(nnnnnn=surface number when error was detected)
CYLINDER =nnnnnn
(nnnnnn=cylinder number when error was detected)
SECTOR =nnnnnn
(nnnnnn =sector number is error)
```

Refer to Sections 1.7.1 and 1.7.2 for additional error messages.

2.19 WRITE-READ-COMPARE TAPE (BOT TO EOT) - OPTION V

This test writes, reads, and compares a user selectable data pattern from the beginning of tape to the end of tape. The data is written in files; each file contains 12,400 (octal) blocks of data. Each block is 400 octal words. When the data is read, only the first 40 blocks of each file are compared. This test is designed to test the Archive 20MB, 45MB, 60MB, 125MB, and the 150MB tape drives. Refer to Section 2.13 for progress messages and error messages that may be displayed during this test. If errors are detected during the test, an error log is generated and displayed at the end of all passes of the program. Refer to Section 3 for a description of the error log.

2.20 TAPE COMPATIBILITY AND WRITE-READ-COMPARE - OPTION W

This option tests the capability of the Viper 150MB Tape Drive to read all QIC modes that it supports and to write-read-compare using the QIC-120 and QIC-150 formats. Earlier models of the Viper do not read data in QIC-11 format. This test allows a user/technician to select the QIC mode in which a tape drive is tested. The user/technician also has the option to write-read-compare a partial or a complete tape. If the partial option is selected, 75 files are tested. Each file consists of 170 octal blocks; each block contains 400 octal words.

The user/technician can also use this option to generate tapes in various QIC modes and read these on other drives in testing for compatibility between drives.

The following query messages are displayed when this option is entered:

```
REMOVE TAPE AFTER WRITE (Y or N)
TEST COMPLETE TAPE (Y or N)
ENTER MODE FOR TEST
46= QIC-11 READ ONLY VIPER 150MB
47= QIC-24 READ ONLY VIPER 150MB
50= QIC-120 WRITE AND READ VIPER 150MB
51= QIC-150 WRITE AND READ VIPER 150MB
```

If a drive is not capable of reading the QIC mode selected, the operation terminates and returns to the Main Menu after displaying the following message:

```
END OF MEDIA
```

If the wrong type of tape is used in the Viper drive and a write is issued to it, the operation terminates and the following messages are displayed:

```
EXCEPTION
FROM ADDRESS = nnnnnn
(nnnnnn=memory or listing address where error occurred)
EXPECTED = mmmmmm
(mmmmmm=expected status)
ACTUAL = xxxxxx
(xxxxxx=actual status received)

DRIVE STATUS DECODES TO:
ILLEGAL COMMAND

CHECK THAT CORRECT TAPE IS INSTALLED IN DRIVE
PRESS RETURN TO CONTINUE
```

Refer to Sections 1.7.3 and 1.7.4 for a list of other messages that may be displayed from this option.

Section 3
TAPE ERROR LOG

The tape error log is generated for tape write-read-compare functions. A running error count is logged and displayed after all passes of the program have been completed. These values are displayed only in octal. The type of errors displayed depends on the function that was performed.

Errors resulting from a write function include the following:

```
*** TAPE ERROR RECORDED ***
BLOCKS RE-WRITTEN = nnnnnn   WRITE BUFFER UNDERRUNS = mmmmmm
nnnnnn=total number of blocks re-written for all passes
mmmmmm=total number of write buffer underruns for all passes
```

Errors resulting from a read function include the following:

```
SOFT ERRORS READ = xxxxxx   READ BUFFER UNDERRUNS = yyyyyy
xxxxxx=total number of soft errors read for all passes
yyyyyy=total number of read buffer underruns for all passes

NUMBER OF TAPE BLOCKS WITH COMPARE ERRORS = aaaaaa
aaaaaa=total number of block compare errors for all passes
```

If tape controller and other tape errors are detected, the following message is displayed:

```
TAPE CONTROLLER AND OTHER TAPE ERRORS = bbbbbb
bbbbbb=total number of controller and other tape errors for
all passes.
```

The following are the tape controller and other tape errors that are included in the total represented by bbbbbb above:

```
EXCEPTION
NO FILE MARK DETECTED
BUSY NOT SET
BUSY NOT RESET
DONE NOT SET
DONE NOT RESET
NO FILE MARK DETECTED - READ FILE MARK COMMAND
EXCEPTION READING STATUS
DIRECTION ERROR
DIRECTION BIT NOT RESET
EXCEPTION NOT ON AFTER RESET COMMAND
END OF TAPE NOT DETECTED
NO EXCEPTION READING FILE MARK
NO DATA DETECTED
ILLEGAL COMMAND
BLOCK IN ERROR NOT LOCATED
UNRECOVERABLE DATA ERROR
MEMORY ADDRESS REGISTER ERROR
BLOCK COUNT REGISTER ERROR
COMMAND REGISTER ERROR
INTERRUPT ERROR
INTERRUPTS NOT DISABLED
DEVICE CODE ERROR
EXCEPTION BIT NOT SET
CONTROLLER BITS 1-5 NOT RESET
REQUEST BIT NOT SET
TIMEOUT ERROR
EXCEPTION BIT NOT RESET
DRIVE NOT READY
DIRECTION BIT NOT SET
INTERRUPT BIT NOT RESET
INTERRUPT BIT NOT SET
NO INTERRUPT
ONLY DRIVE READY SHOULD BE SET
TAPE NOT AT BEGINNING OF TAPE(BOT)
```

Appendix A
STREAMER TAPE FORMAT

OPTION P

125 BLKS	F M K	2121 BLKS	F M K	125 BLKS	F M K	2121 BLKS	F M K

128-51

Note: Each block is 400 octal words. This sequence is repeated 10 times.

OPTION V

6510 BLKS	F M K	6510 BLKS	F M K	6510 BLKS	F M K	6510 BLKS	F M K

128-52

Note: Each block is 400 octal words. This sequence is repeated from beginning of tape (BOT) to end of tape (EOT).

OPTION W

170 BLKS	F M K	170 BLKS	F M K	170 BLKS	F M K	170 BLKS	F M K

128-53

Note: Each block is 400 octal words. This sequence can be repeated for 75 files or, if the user chooses, from BOT to EOT.

Appendix B
DISK ERROR LOG FORMAT AND MESSAGES

B.1 DISK SURFACE, CYLINDER, SECTOR NUMBERS ERROR LOG

Errors associated with disk surface, cylinder, and sector numbers are displayed as follows:

```
DISK DRIVE:n
DISK ERROR(S) DETECTED (DEC): ddd
DISK ERROR(S) RECORDED (DEC): rrr
SURF-HEAD     CYLINDER     SECT-NUM     ERROR COUNT    TYPE
OCT  DEC      OCT  DEC     OCT  DEC     OCT   DEC      OF ERROR
 xx   xx      nnnn nnnn    mmmm mmmm    ccccc ccccc    hard/soft
 xx   xx      nnnn nnnn    mmmm mmmm    ccccc ccccc    hard/soft
 .    .       .    .       .    .       .     .        .    .
 .    .       .    .       .    .       .     .        .    .
 .    .       .    .       .    .       .     .        .    .
```

where

        n - number of the disk drive being tested
      ddd - total number of errors (in decimal) detected during the test
      rrr - number of errors reported at the end of the test; if the number of errors exceeds the number that the error log can hold, then this number will be less than the total number of errors detected
       xx - number of surface or head where error occurred
     nnnn - number of cylinder where error occurred
    mmmm - number of sector where error occurred
   cccccc - number of times the error was detected during the test
     hard - a hard error is an error recovered with Error Correction Code (ECC); the LOTUS 800/812 uses an error correcting scheme to attempt to recover the data on a bad area of the disk
     soft - a soft error is an error that is recovered with retries; the LOTUS 800/812 reads the sector on disk a number of times trying to recover the data; if recovered, a soft error is reported

If no hard errors are detected during a test, then the following message is displayed:

```
NO DISK HARD ERRORS
```

The following message is displayed if errors not related to any specific surface, cylinder, or sector are encountered:

```
CONTROLLER AND OTHER DISK ERRORS = nnnnnn
```

where
    nnnnnn - number (in octal) of other controller or other disk errors that were detected

If no errors are detected during a test, then the following message is displayed:

```
NO CONTROLLER OR OTHER DISK ERRORS
```

B.2 OTHER DISK ERROR LOG

The following is a list of errors that will be logged as controller or other disk errors:

```
*** DATA COMPARE ERROR DURING READ AND WRITE BUFFER TEST
*** FATAL ERROR - CONTROLLER RESPONSE TIMEOUT ***
*** COMMAND PORT REGISTER COMPARE ERROR
*** WRITE BUFFER COMMAND ERROR
*** READ BUFFER COMMAND ERROR
BUSY DID NOT RESET
DONE DID NOT RESET
TIMEOUT ERROR
```

An option is provided that allows the user to display the error log as many times as he chooses.

Appendix C
COMMAND DESCRIPTOR BLOCKS (DISK)

C.1 DISK OPERATION

Command descriptor blocks (CDBs) for disk operations consists of 10 words (per CDB) located in main memory. The CPU loads the CDBs into main memory before the operation begins. To initiate a disk operation, the CPU loads a memory pointer to the LOTUS 800/812 using programmed I/O instructions. The memory pointer points to the first CDB in main memory. Upon completion of the operation, the LOTUS 800/812 writes status information into the status section of the CDB.

Following is the format of the Disk Command Descriptor Block:

BIT

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	NEXT CDB POINTER (SET TO 0 FOR LAST CDB)															
1	MEMORY ADDRESS															
2	0 ——————————————————————————————————— 0															
3	DISK COMMAND							0	SE	0	0	TV	0	0	0	
4	0 ——————————————————————————————————— 0														DRV #	
5	CYLINDER															
6	0 ————— 0			HEAD			SECTOR									
7	0 —————————————— 0						SECTOR COUNT								
8	DISK CONTROLLER STATUS							DISK DRIVE STATUS								
9	DISK DRIVE ERROR STATUS															

WORD
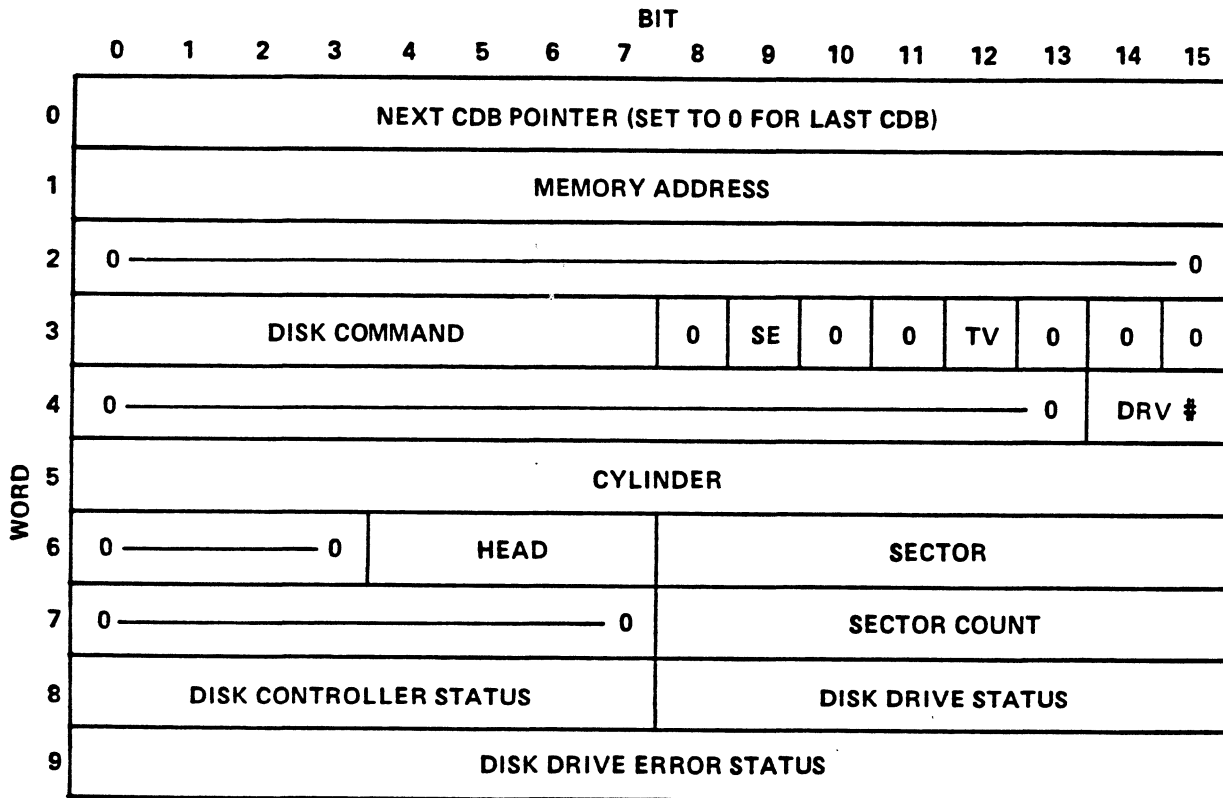
128-01

The following are the command packets that are sent to the LOTUS 800/812 during various phases of execution. Please note that some of the command packets are completed by the routine using the packet.

READ BUFFER COMMAND PACKET

```
RBPKT:
    0       0       ;next CDB pointer
  103100    RBUFF   ;memory destination address (host memory)
    0       0       ;<all zeroes>
  21000     RBCMD   ;Read Buffer command
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;buffer source address (from LOTUS 800/812)
   32      32       ;block count (16K bytes)
    0       0       ;disk controller status
    0       0       ;<all zeroes>
```

WRITE BUFFER COMMAND PACKET

```
WBPKT:
    0       0       ;next CDB pointer
  103100    WBUFF   ;memory source address (from HOST)
    0       0       ;<all zeroes>
  20000     WBCMD   ;Write Buffer command
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;buffer destination address (to LOTUS 800/812)
   32      32       ;block count (16K bytes)
    0       0       ;disk controller status
    0       0       ;<all zeroes>
```

REZERO COMMAND PACKET

```
RZPKT:
    0       0       ;next CDB pointer
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
  4110      RZCMD   ;Rezero command,SE,SS,TV
    0       0       ;<drive #>
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;disk controller & drive status
    0       0       ;disk drive error status
```

READ STATUS COMMAND PACKET

```
RSPKT:
    0       0       ;next CDB pointer
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
 10003    RDSTA     ;Command,SE
    0       0       ;drive #
 20000   020000     ;reserved
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;disk controller & disk drive status
    0       0       ;disk drive error status
```

FORMAT COMMAND PACKET

```
FMPKT:
    0       0       ;next CDB pointer
 32042    SECMP     ;sector map pointer
    0       0       ;<all zeroes>
 3500     FMCMD     ;Format command,SE
    0       0       ;drive #
    0       0       ;cylinder
    0       0       ;head, pattern (head set by caller)
    1       1       ;track count (1 track at a time)
    0       0       ;disk controller & disk drive status
    0       0       ;disk drive error status
```

READ DRIVE PARAMETER COMMAND PACKET

```
RPPKT:
    0       0       ;next CDB pointer
103100    WBUFF     ;memory destination address
    0       0       ;<all zeroes>
 1500     RPCMD     ;Command,SE
    0       0       ;drive #
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;<all zeroes>
    0       0       ;disk controller & disk drive status
    0       0       ;disk drive error status
```

READ HEADER COMMAND PACKET

```
        RHPKT:
     0       0        ;next CDB pointer
103100       WBUFF    ;memory destination address
     0       0        ;<all zeroes>
  4500       RHCMD    ;Command,SE,AS
     0       0        ;drive #
     0       0        ;cylinder
     0       0        head,physical sector
     0       0        ;<all zeroes>
     0       0        ;disk controller & disk drive status
     0       0        ;disk drive error status
```

WRITE COMMAND PACKET

```
        WTPKT:
     0       0        ;next CDB pointer
103100       WBUFF    ;memory destination address
     0       0        ;<all zeroes>
  6500       WTCMD    ;Command,SE
     0       0        ;drive #
     0       0        ;cylinder
     0       0        head, sector
    43      43        ;sector count
     0       0        ;disk controller & disk drive status
     0       0        ;disk drive error status
```

READ COMMAND PACKET

```
        RDPKT:
     0       0        ;next CDB pointer
135600       RBUFF    ;memory destination address
     0       0        ;<all zeroes>
  6100       RDCMD    ;Command,SE
     0       0        ;drive #
     0       0        ;cylinder
     0       0        head, sector
    43      43        ;sector count
     0       0        ;disk controller & disk drive status
     0       0        ;disk drive error status
```

READ ONE SECTOR

RDPK1:

0	0	;next CDB pointer
135600	RBUFF	;memory destination address
0	0	;<all zeroes>
6100	RDCMD	;Command,SE
0	0	;drive #
0	0	;cylinder
0	0	head, sector
1	1	;sector count
0	0	;disk controller & disk drive status
0	0	;disk drive error status

WRITE DRIVE PARAMETER COMMAND PACKET

WPPKT:

0	0	;next CDB pointer
103100	WBUFF	;memory destination address
0	0	;<all zeroes>
0	WPCMD	;Command,SE
0	0	;drive #
0	0	;<all zeroes>
0	0	;<all zeroes>
0	0	;<all zeroes>
0	0	;disk controller & disk drive status
0	0	;disk drive error status

VERIFY COMMAND PACKET

VFPKT:

0	0	;next CDB pointer
0	0	;set by the user
0	0	;<all zeroes>
7500	VFCMD	;Command,SE
0	0	;drive #
0	0	;cylinder
0	0	;head, sector
43	43	;sector count (one track)
0	0	;disk controller & disk drive status
0	0	;disk drive error status