Put in the Field Diagnostic tape. After selftest complete enter t and immediately move console to the diagnostic port.

ONYX DIAGNOSTICS MONITOR

— a. Disk test.
  b. Disk patch.
  c. Memory test.
  d. Tape test.
  e. Display sector 0.
  f. return prom monitor.

2.6 Option e (display sector 0) does not work in this version of
the System Exerciser. Select any other option and press the
return key. The following instructions apply to each specific
test.

3.0 DISK TEST

This utility is the most versatile. It can run continuous disk
tests with or without an additional memory or tape test; i.e., a
mode is available to loop the diagnostic such that each pass
includes a memory and tape test. The memory and tape tests are
identical to the stand alone utilities: Options c and d. They
will be described in detail later.

3.1 Proceed with the disk test as follows:

Depress 1 and return

SERIAL NUMBER (enter serial number)

TIME (enter test starting time)

DATE (enter test starting date)
     NOTE: These three fields are optional and are used in
     reporting only.

DRIVE (enter the disk drive number to test)
     NOTE: Drive number must be physical drive 0 to 7 with
     default being 0.

MEMORY TEST (Y/N?)

TAPE TEST (Y/N/?) If Y is specified
                    CAUTION
     Remove SDT before proceeding. Failure to insert a
     test/scratch tape can result in destroying the SDT.

N EXCLUDE RANDOM READ/WRITE (Y/N?)
     NOTE: a N response will include random reading and
     writing. This is the preferred mode for thoroughly
     exercising the disk.

N   READ ONLY (Y/N?)
          WARNING: This response must be Y to preserve the
          contents of the disk. A Y response immediately
          initiates a READ ONLY pass. In this mode, the spare
          sector table is preserved and no additional sparing of
          bad sectors is attempted. The Summary (S) and Quit (Q)
          commands will display the statistics including bad
          sector information. Write this down and save it in
          case a Format is required.

Y   FORMAT (Y/N?)
          WARNING: ANY response to this question will result in
          destroying the contents of the drive. Re-set the
          computer to emergency abort from this utility.

     A Y answer to this question will immediately initiate a
     format pass on the disk. A FORMAT PASS ERASES THE ENTIRE
     DISK CONTENTS INCLUDING THE SPARES TABLE, disables seek
     checking and initiates a Write/Read pass. There might be a
     response from the system that says "Drive Lacks Optical Zero
     Sensor". Please ignore. This has no significance outside
     of Onyx Systems. The Format Pass writes every sector on the
     disk and should be performed on any "virgin or crashed disk"
     to insure correct I.D. headers.

     We strongly suggest a N response if the status of the spares
     table is unknown. If there are no spared sectors, an N
     response initiates a Write/Read Pass with seek checking. If
     there are spared sectors, an N response results in the
     following prompt:

     RE-INITIALIZE SPARES SECTOR TABLE (Y/N?)

     An N response saves the contents of the bad sector table,
     initiates a WRITE/READ pass, and invokes seek checking.
     Summary (S) and Quit (Q) commands will display the test
     statistics. Write down the spared sectors.

     A Y response zeros out the spares table, invokes seek
     checking, and initiates a Write/Read pass.

3.2 A brief description of each pass within the disk test
follows:

     FORMAT PASS:
     The Format Pass writes every sector on the disk. This pass
     must be performed on a "virgin or crashed disk" to insure
     proper I.D. headers.

          STANDARD: A standard disk cannot be hardware protected
          from the Format Pass and is initiated from the

keyboard.

CONTROLLER: On controller disk drives the format
switch must be enabled to allow the Format to proceed.
        WARNING: Do not remove the disk drive to search
        for the enable switch without proper training
        and/or support from a fully qualified service
        technician. Improper handling of the disk drive
        can result in unrepairable damage.

WRITE PASS:
The write pass sequentially writes the sector number in
every sector on the disk.

READ PASS:
The read pass sequentially reads every sector on the disk
and checks the sector number left by the write pass.

WRITING RANDOM:
The writing random pass writes randomly.

READING RANDOM:
The reading random pass reads randomly.

TAPE TEST:
The tape test runs once a pass. It is the same test
explained in a latter part of this document.

MEMORY TEST:
The memory test runs once a pass. It is the same test
explained in a latter part of this document.

3.3   DISK TEST VARIABLES

LOGICAL SECTOR:
The logical sector is a 3 byte sector number, thinking of
the disk as one contiguous string of sectors. The number of
logical sectors on a drive is computed as follows:

        logical sectors <== cylinders * heads * sectors.

DRB (disk request block cylinder, head, and sector):
The DRB cylinder, head, and sector is calculated by dividing
down the logical sector number into a physical address.

MAPPED (mapped cylinder, head, and sector):
The mapped cylinder, head, and sector is the result of
adjusting the DRB cylinder, head, and sector for sector skew
and sparing. This is the TRUE physical address of the
sector under test.

HEADER (disk status table header):

The header cylinder, head, and sector is only valid for
standard disks and shows the address read from the sectors
header. This field should be the same as the mapped
cylinder, head, and sector.

DMA (disk data DMA buffer):
The DMA cylinder, head, and sector shows the address read
from the first 4 bytes of the data buffer. This address is
written to every sector by the WRITE PASS and should be the
same as the DRB. This field is not valid for read only
mode.

ER (error return code):
This is the error code returned by the disk BIOS.

0000	no error
0001	bad command
0002	no ACK from disk cont.
0003	ACK from disk cont.
0004	read CRC error
0005	SEEK error
0006	read wrong sector
0007	read wrong head
0008	read wrong cylinder
0009	drive not ready
000A	rezero error
000B	write fault
000C	invalid drive
000D	invalid head
000E	invalid cylinder
000F	invalid sector
0010	servo error
0011	read/write fault
0012	disk speed error
0013	servo phase (thermal)
0014	write protected
0015	guard band cyl
0016	servo offset error
0017	disk xfer timeout
0018	system sector bad
0019	format protected
001A	BIOS busy

DRIVE:
Drive under test.

MODE:
Disk drive mode as follows:

        MODE 0 - 10 Meg standard
        MODE 1 - 20 Meg standard
        MODE 2 - 40 Meg standard
        MODE 3 - 6 Meg standard

```
                MODE 4 - 10 Meg controller
                MODE 5 - 20 Meg controller
                MODE 6 - 40 Meg controller
                MODE 7 -  6 Meg controller
```

PASSES:
Number of disk test passes completed.

ERRORS:
Number of test errors detected.

OFF:
This field is only valid on standard disk drives and shows
the current servo offset as follows:

```
        X - no servo offset
        F - forward servo offset
        R - reverse servo offset
```

VER:
This shows the current version of the disk test program.

SERIAL:
This shows the drive serial number. (If set by user)

TIME:
DATE:
This shows the time and date the test was started. (If set
by user)

3.4   DISK TEST COMMANDS

(Q)UIT:
The "Q" command will prompt the user with the following
message:

                Quit (Y/N)?

        A "Y" answer will return the user to the diagnostic
monitor.
        A "N" answer will continue the disk test.

(S)ummary:
The "S" command will display a summary of spared sectors;
memory, tape, and disk errors.

(P)rint:
The "P" command will send a summary out the serial printer
channel.

3.5   DISK TEST SUMMARY

```
CYL HD SC:
Cylinder, head, and sector where error occurred.

ER:
Disk BIOS error code; see Section 3.3

OFF:
Servo offset.

PASS:
Disk test pass when error was detected.

COUNT:
Error count.
```

3.6 DISK TEST ANALYSIS

The Onyx system can handle 30 spared sectors. More than 30
will require replacement of the disk. Other errors can
periodically occur and do not necessarily signify a
defective disk requiring replacement. Consult a factory
trained service technician for help in interpreting errors.

IMPORTANT

If the spare sector table is erased during disk test you
must either:

1. Recreate it from scratch by running write/read with
random write/read for 48 hours, or

2. If you know what it was, it can be recreated using
the sparing utility within the operating system.
WARNING: Failure to successfully recreate the bad
sector table will result in a very high incidence of
disk CRC errors.

4.0 DISK PATCH

The disk patch utility allows the user to read, write, or modify
any sector on the disk. Its purpose is to aid the very
knowledgeable user in crash recovery and failure analysis.
WARNING: Do not proceed without phone support from a
trained support specialist. A complete loss of data can
result from untrained use of the disk patch utility.

4.1 DISK PATCH COMMANDS

A summary of disk patch commands follows. This section is

intended to be reference material for a trained specialist.
Do not experiment with these commands:

(R)ead:
The "R" command reads and displays the currently selected
sector.

(W)rite:
The "W" command writes to the currently selected sector, the
contents of the DMA buffer. The contents of the DMA buffer
can be set by the (R)ead command or the (P)atch command.

(P)atch:
The "P" command allows the user to change the contents of
the DMA buffer. When the "P" command is entered the user
will be prompted with:

Address:

At this time the user should enter an address offset
into the DMA buffer. The address and data will then be
displayed as follows:

aaaa dd

At this time the user can do one of the following:

1. Enter a new data value for this address.
2. Enter a space bar to advance to the next
address.
3. Enter a back space to get to the previous
address.
4. Enter a CR to return to the disk patch command
monitor.

(Q)uit:
The "Q" command returns the user to the diagnostics monitor.

4.2 DISK PATCH VARIABLES

(D)rive:
The "D" command is used to set the currently selected disk
(0-7).

(C)ylinder:
The "C" command is used to set the currently selected
cylinder.

(H)ead:
The "H" command is used to set the currently selected head.

(S)ector:

The "S" command is used to set the currently selected
sector.

(I)nterlace:
The "I" command is used to set the currently selected sector
interlace.

5.0 MEMORY TEST

The memory test returns to the diagnostics menu upon completion.
Initializing the computer will also abort the memory test.

The SU and MU memory tests consist of 3 minor tests which are
MARCHING, OPCODE, and DMA.

The major Subroutines are:

MARCHING:
The marching ones test does the following:
    1. Memory is filled with a background pattern.
    2. In ascending order each byte is read back to determine
if it contains background; if it does not, the location is
failed. Each location is then filled with the opposite of
the background and read back to determine if it has the
opposite data pattern; if it does not, the location fails.
    3. In descending order, the memory locations are read back
and checked to see if the data is the opposite pattern; if
it is not, the location fails. The original byte is then
written into the location and read back.

OPCODE:
The opcode test is needed because the timing for an opcode fetch
is shorter than for a normal memory fetch with a Z80. The opcode
test does the following:
    1. Memory is filled with the pattern 58 00 58 00 58 . . .,
which the CPU "opcodes" through.
    2. Next the data pattern 00 A7 00 A7 00 . . . is used to
fill memory, which the CPU "opcodes" through.
    3. The data pattern A7 58 A7 58 . . . is used.
What the opcode test does is create a parity error if memory is
slow. This test will report all errors as parity errors.

DMA:
The DMA, which has tighter timing than the CPU, is used in this
test.
    1. A pseudo random data pattern is written into RAM memory.
    2. Using the DMA, this pattern is moved. The source is
then compared with the destination.
    3. The data pattern is inverted and again moved and
checked.
    4. The data parity bit is inverted and again moved.

     5.   The above process is repeated with the source and
       destination reversed.
The DMA test will report a DMA failure as memory errors. If this
happens, the errors will be massive and the memory will have
passed the marching and opcode tests.

5.1   MEMORY TEST ANALYSIS

The memory test will accumulate errors in a table which is
displayed on the screen if errors occur. The table is of
the form:

BANK	-----------BITS-----------								
2	0	1	2	3	4	5	6	7	P
3	..	..	..	..	..	..	..	..	..
4	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..
6	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..	..	..
A	..	..	..	..	..	..	..	..	..
B	..	..	..	..	..	..	..	..	..
C	..	..	..	..	..	..	..	..	..
D	..	..	..	..	..	..	..	..	..
E	..	..	..	..	..	..	..	..	..
F	03	..	..	..	..	..	..	..	..

In the above example, bit 0 of bank F failed the memory test
3 times.

6.0   TAPE TEST

CAUTION

Remove SDT before proceeding. Failure to insert a
test/scratch tape can result in destroying the SDT.

If the Diagnostic Monitor can be loaded from tape, its very
probable that the tape drive is functional. The tape test,
however, will insure that all four channels of the drive are
functional and that the drive can lock into a worst case data
pattern. The test can also be used to sample the quality of
tape. The tape test writes a worst case data pattern to each
channel of the tape and reads it back. Its reported errors are
accumulative and only reloading the Diagnostic Monitor will
rezero the error count. The errors reported are:

    1.   TAPE NOT ONLINE   00
    2.   END OF CARTRIDGE   00
    3.   UNRECOV. ERRORS   00

```
 4.  TAPE NOT READY          00
 5.  END OF CHANNEL          00

 6.  CRC ERRORS              0000
 7.  LOST DATA DETECT        0000
 8.  DATA NO SYNC            0000
 9.  TOO LONG ASS. CHAR      0000
10.  TOO LONG ASS CRC        0000
11.  BUFFERS NOT EQUAL       0000
```

6.1 TAPE TEST ANALYSIS

Any failures of parameters 1-5 are catastrophic and will require replacement of the tape drive.

Errors logged against parameters 6-11 are potential indicators of trouble but are not necessarily the result of a defective drive requiring replacement. Poor tape media can also cause these errors. Solicit the help of an Onyx trained Service Representative for correct interpretation of these errors.