

**Sun Microsystems**

**Sun SCSI Tape Diagnostic  
User's Document**

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**September 5, 1985**

**Revision A**

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## 0.1. Purpose

This document briefly describes the operation of the SCSI tape diagnostic .

## 0.2. Audience

End users, manufacturing, and field service personnel are among the groups of people that may be interested in this diagnostic .

# 1. Revision History

Revision A    20 June 1985    Initial release of this document.

# 2. Glossary

SCSI - Small computer systems interface .

# 3. Operating Instructions

## 3.1. Loading and Starting

Since st.diag is a stand alone diagnostic, it must be booted from the prom monitor . This is done by the following command:

```
>b nn(partition info)path/st.diag
```

where nn, partition info and path are dependent upon your particular configuration . some typical commands are:

```
>b sd(0,0,0)/stand/st.diag
```

which loads the diagnostic from /stand on SCSI disk .  
or:

```
>b ie(0,0,40)/stand/st.diag
```

which loads the diagnostic from ethernet .

## 3.2. User Interface

The user interface consists of a single menu and a command prompt .

### 3.2.1. The Main Menu

When the diagnostic starts running, it should look like this :

```

                                     —
Sun SCSI Tape Diagnostic      Version 1.13      6/12/85

      R - Readback Test
      F - File Skipping Test
      T - End of Tape Test
      E - Erase Test
      A - All
      X - Exit

st>
```

By typing the appropriate letter: R, F, T, E, A, or X, the selected action is performed . (The lower case letters r, f, t, e, a or x may also be used .) When the test is complete, the results are displayed on the screen and the prompt "st>" is printed. At this point the user may select another option or may redisplay the menu by depressing the RETURN key .

### 3.2.2. *R - Readback Test*

The readback test tests the ability of the drive to accurately write and readback data . It writes several files using different data patterns and sizing then reads them back to verify that they were written correctly .

The data patterns sent to the tape controller are not necessarily the ones that get physically written on the tape . The program uses the following patterns:

```
00000000
FFFFFFFF
55555555
AAAAAAAA
A5A5A5A5
F00FF00F
DBE6DBE6
CFCFCFCF
29292929
```

and writes each pattern at 15, 30, 60, and 120 blocks (1 block = 512 bytes) per transfer .

### 3.2.3. *F - File Skipping Test*

The file skipping test tests the drive's file skipping ability . It writes 3 files, each with unique data then skips to each one and verifies that the drive has correctly positioned the tape . The first file is one block (512 bytes) long and its data consists entirely of ones . The second file is two blocks long and is filled with twos and the third file is 3 blocks long and is filled with threes .

### 3.2.4. *T - End of Tape Test*

The end of tape test is useful to diagnose problems with the head positioning mechanism or the end of tape sense . This test writes data until it reaches the end of tape, reads the data and then repeats this read-write operation with different data. The data used here is CF then 29 which causes worst case peak shift patterns on the Archive drive . This test will write to all tracks on either 4 or 9 track drives. On a 9 track drive the test will take a little bit more time .

### 3.2.5. *E - Erase test*

The erase test is used to test the erase function of the tape drive . It writes a block of data on the tape, erases the tape, then attempts to read the data to verify the erase .

### 3.2.6. *A - All*

By typing 'A' the diagnostic will run the readback test, the file skipping test, the end of tape test and the erase test .

### *3.2.7. X - Exit*

This will exit the diagnostic and return to the boot monitor .

## **3.3. Status and Error Messages**

When a test is running it prints a status message of the following format:

st: test : status

such as:

st: readback test : reading

when the test completes it will print "passed", as in the following message

st: readback test : passed .

if the test fails, it will print messages such as :

st: readback test : readback failed .

st: EOT test : write protected, write failed .

### *3.3.1. Soft Errors*

The diagnostic will report soft errors, they will not cause a test to fail, but they are indicative of either tape or cartridge problems . If they occur, try running the diagnostic with another tape. If the problem persists, try cleaning the drive's heads . If you still get soft errors, there is probably a problem with the drive .

**EXTERNAL SPECIFICATION  
(User Perspective)**

**TITLE : SCSI Tape Subsystem Diagnostic External Specification**

**AUTHOR : Gale Snow**

**REPORT NO. :**

**REVISION NO. : A 0 (#)stdiag.txt 1.2 2/21/85**

**DATE : April 5, 1985**

**STATUS : Preliminary**

<b>APPROVALS :</b>	<b>DATE</b>
Originator	----- Gale Snow
Test Engineering	-----
Manufacturing	-----
Production	-----
Quality Control	-----

**Document Review Form**

Please make note and initial on this page all corrections and/or proposed amendments by page number and/or section number.

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Typographical Errors:

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SCSI Tape Subsystem DIAGNOSTIC EXTERNAL SPECIFICATION

1. INTRODUCTION

1.1. Purpose

This specification describes the procedure to follow when testing the SCSI tape subsystem using the diagnostic *st.diag* to insure functionality for Sun Workstations.

1.2. Applicable Documents

- (1) Sun SCSI Programmers' Manual, W. M. Bradley, 7/20/83.

2. SYSTEM OVERVIEW

2.1. General Description

The SCSI tape subsystem diagnostic *st.diag*, was developed to test the SCSI tape controllers (PN:370-1011-01), the Archive 1/4" tape drives and cabling when they are assembled into systems. The diagnostic exercises the subsystem by talking over the SCSI bus to the 1/4" Streaming Cartridge Tape Drive using functions provided by the controller.

2.2. Features

The performance of the tape subsystem is examined through the use of the following functions provided by the Sysgen Controller:

- (1) Test Unit Ready,
- (2) Rewind,
- (3) Space,
- (4) Read,
- (5) Write,
- (6) Write File Mark,
- (7) Request Sense.

2.3. Required Configuration

The following hardware is required for the tape subsystem test:

- (1) a card cage (PN:340-0332).
- (2) power supply(s) (PN:300-0135-03)
- (3) a monitor (PN:540:1015-01), video board (PN:501-0059-01), and keyboard (PN:540-1014-01).
- (4) Sun-2 processor board (PN:501-1007-04).
- (5) a scsi host adapter board (PN:501-1006-01).
- (6) a low power memory board (PN:501-1013-01).
- (7) an ethernet board (PN:501-0243) for booting over the network.
- (8) a 1/4" Streaming Cartridge Tape Drive (Archive) (PN:370-0544-01).
- (9) a 1/4" cartridge tape (PN:370-0543-01).
- (10) cables: one from the scsi to the sysgen (PN:530-1054-01), one from the sysgen to the tape drive (PN:530-1024-01).

**2.4. Error Handling**

Errors are detected and displayed for evaluation.

**2.5. General Performance Characteristics**

The SCSI tape subsystem diagnostic takes on the order of three minutes to execute.

**2.6. Planned Extensions**

**2.7. Limitations**

The following opcodes/commands are not tested:

- (1) 0x09/Set disk block size.
- (2) 0x18/Copy to (from) disk from (to) tape.
- (3) 0x19/Erase tape cartridge.

**3. SCSI Tape Subsystem DIAGNOSTIC SPECIFICATION**

**3.1. User Interface**

The steps listed below should be followed when testing the SCSI Tape Subsystem:

- (1) Connect the Sysgen controller to the SCSI host adapter in the test station using the 50 pin SCSI bus cable from JH on the Sysgen to the SCSI interface connector on the host adapter (on the far left when the board is in the card cage).
- (2) Connect the tape drive to the Sysgen board from J1 on the Archive to the controller at JT using the 50 pin cable with the card edge connector at one end for the tape drive.
- (3) Insert the 1/4" cartridge tape into the tape drive.
- (4) Turn the test station power on.
- (5) Boot the test program, *st.diag*, to the test station from the manufacturing file server.
- (6) At this point the test operation begins with the Open command.

**3.2. Operation**

During operation, commands are sent to the Sysgen Controller according to the SCSI Interface Protocol in the following manner:

- (1) Wait for the busy signal in the Interface Control Register (ICR) to go away.
- (2) Assert select in the ICR.
- (3) Wait for the busy signal in the ICR.
- (4) Set the dma address and count.
- (5) Pass the Command Description Block, byte at a time.
- (6) Wait for a true interrupt request signal in the ICR indicating dma completion.
- (7) Read back status information, byte at a time.
- (8) Read the message byte (hopefully command complete!).
- (9) If a chk condition exists, read back sense information.

**3.3. Diagnostic**

The diagnostic runs through the following sequence of commands to test the tape subsystem (the letter in parenthesis is displayed on the monitor as each command is

executed):

### 3.3.1. Open (O)

An open consists of a test unit ready command followed by a rewind command.

Possible errors are:

- (1) st: open failed!
- (2) st: not ready!
- (3) st: cannot rewind!
- (4) st: short transfer!

### 3.3.2. Write (W)

The following patterns are written out to the tape in a sequence of 10 blocks of 1024 bytes each.

- (1) 0x00000000
- (2) 0xffffffff
- (3) 0x55555555
- (4) 0xaaaaaaaa
- (5) 0xf00ff00f
- (6) 0xdb6db6
- (7) 0xec6dec6d
- (8) 0xcfcfcfcf
- (9) 0x29292929

Possible errors are:

- (1) st: write failed!
- (2) st: write protected!
- (3) st: short transfer!

### 3.3.3. Close (C)

A close consists of a write file mark if the last command was a write, and a rewind command.

### 3.3.4. Open (O)

An open consists of a test unit ready command followed by a rewind command.

Possible errors are:

- (1) st: open failed!
- (2) st: not ready!
- (3) st: cannot rewind!
- (4) st: short transfer!

### 3.3.5. Read (R)

The patterns written out are read back in sequence and the buffers checked against the data patterns to insure correctness. The checking is the reason the streaming tape speed is not maintained. Reads are attempted until the end of file mark is reached.

Possible errors:

- (1) st: read failed!
- (2) st: data readback error!
- (3) st: short transfer!

**3.3.6. Write (W)**

The following patterns are written out to the tape in a sequence of 10 blocks of 1024 bytes each.

- (1) 0x00000000
- (2) 0xffffffff
- (3) 0x55555555
- (4) 0xaaaaaaaa
- (5) 0xf00f00f
- (6) 0xdb6db6
- (7) 0xec6dec6d
- (8) 0xcfcfcfcf
- (9) 0x29292929

Possible errors are:

- (1) st: write failed!
- (2) st: write protected!
- (3) st: short transfer!

**3.3.7. Close (C)**

A close consists of a write file mark if the last command was a write, and a rewind command.

**3.3.8. Open (O)**

An open consists of a test unit ready command followed by a rewind command. Possible errors are:

- (1) st: open failed!
- (2) st: not ready!
- (3) st: cannot rewind!
- (4) st: short transfer!

**3.3.9. Space (S)**

The space command will skip over a specified number of file marks, in this case one file mark. Possible errors:

- (1) st: cannot skip file!

**3.3.10. Read (R)**

The patterns written out are read back in sequence and the buffers checked against the data patterns to insure correctness. The checking is the reason the streaming tape speed is not maintained. Reads are attempted until the end of file mark is reached.

Possible errors:

- (1) st: read failed!

- (2) st: data readback error!
- (3) st: short transfer!

**3.3.11. Close (C)**

A close consists of a write file mark if the last command was a write, and a rewind command.

**3.4. Error Handling**

If any of the following errors occur there is a problem in the SCSI Tape Subsystem (the Sysgen controller, Archive tape drive, or cabling are suspect in this case):

- (1) st: open failed!
- (2) st: write failed!
- (3) st: write protected!
- (4) st: read failed!
- (5) st: data readback error!
- (6) st: cannot skip file!
- (7) st: not ready!
- (8) st: cannot rewind!
- (9) st: sense error!
- (10) st: short transfer!

If at any time an error occurs, the cabling should be checked and/or swapped out first, then the Sysgen controller, and finally the Archive tape drive.

During operation of the test the following line is displayed:

OW0123456789COR0123456789W0123456789COSR0123456789C

At the end of the test, if no errors have occurred, the following message will appear:

NO ERRORS - PASS!