 CONFIDENTIAL INFORMATION

Revision	ECO #	Description of Change	Date	Approval

Originator/Date **Eric Domejean 5/9/91**	Title NeXT Service Diagnostics Users Guide		Document #	
Department **Service Operations**			Size A	Sheet 1 of 21

1.0 Introduction

NeXT provides several levels of diagnostic tools for troubleshooting system malfunctions. This section introduces you to the diagnostics software that NeXT provides to Authorized Service Centers and tells you how to use this software to perform your NeXT computer repairs quickly and accurately. The NeXT Service Diagnostics are the exact same tests and code that NeXT uses to test systems during the manufacturing process. There is no difference between what the field can test and what the NeXT factory can test, which results in a much more efficient troubleshooting and repair process.

Think of troubleshooting as the process of continually simplifying a problem until the solution to the problem is obvious. NeXT's low-level diagnostics employ this concept by removing such complexities as the Mach Kernel, UNIX utilities, the Display PostScript system, and the Nextstep graphic user interface from the system to be diagnosed. The diagnostics can be booted the same way the whole operating system is started: from optical media, floppy disk, SCSI device, or Ethernet. This start-up flexibility can be especially important when trying to diagnose a boot device.

Warning: Within NeXT's low-level diagnostics, a single keystroke can wipe out user data on a mass storage device. Only NeXT-trained technicians should possess and use these tools.

2.0 Installation

NeXT Service Diagnostics are installed on a floppy diskette and are ready to run. If you do not want to install this on another device please go to section 3.0

This document assumes that the user is familiar with the operating system and file manipulation on a NeXT computer. If you are not familiar with these operations, please consult the *NeXT User's Reference manual f*or instruction on copying and moving files.

For SCSI disks, floppy disks, and optical disks, copy the file dvt040 to the root directory of the device or media.

If you are on a network, copy the file dvt040 into the /private/tftpboot directory.

*Special note for using on optical disk: To run diagnostics from, an optical disk, the disk must be formatted in software Release 2.0 or above. Disks initialized in software release before Release 2.0 will not boot.

3.0 Starting/Loading diagnostics

To load diagnostics do the following:
1. Power on your NeXT computer
2. Enter the ROM monitor
3. At the "NeXT>" Prompt type the following "bfd dvt040" *
4. Diagnostics will now load.

* "bfd" assumes you are booting from the floppy drive. Substitute the following for:
    Optical Disk "bod dvt040"
    SCSI Disk "bsd dvt040"
    Thinnet Ethernet "ben dvt040"
    TWP Ethernet "btp dvt040"

4.0 Quitting diagnostics

For NeXTstation Color:
    1. Press the power key.
    2. Press the "y" key when prompted.

For all other NeXT systems:
    While holding down the Alternate and Command keys, press the * key.(Never do this in normal operation.)

5.0 Main Menu

The main menu gives you the following options:

```
            --- MAIN MENU ---

        e     Execute Test
        p     Adjust Overall Diagnostic Parameters
        t     Enable/Disable Tests
        s     Modify Specific Subtest Parameters

        >>> Enter Selection:
```

Execute Test

Pressing the “e” key will start the diagnostics program according to the parameters and test selected under the other menu options.

Adjust Overall Diagnostic Parameters

This will allow you to adjust the overall parameter of the diagnostics. See section 5.0 for details on this option.

Enable/Disable Tests

This menu will allow you to enable/disable specific subtests. See Section 6.0 for details on this option.

Modify Specific Subtest Parameters

This menu will allow you to adjust specific subtest. See Section 7.0 for details on this option.

6.0 Adjust Overall Diagnostic Parameters

This is the menu displayed when the “p” key is depressed from the main menu.

```
--- Adjust Overall Diagnostics Parameters Menu ---

c: Continue On Error                              FALSE
w: Continue with
        Discretion                                FALSE
e: Halt On Error                                  FALSE
l: Loop On Error                                  FALSE
t: Loop Test                                      FALSE
p: Pause On Error                                  TRUE

>>>Enter Selection to change (c,w,...), h to display all, or x to
exit:
```

Continue On Error (False):
: If this option is true the diagnostics will not stop when it encounters an error.

Continue with Discretion (False):
: If this option is true the diagnostics will not stop when it encounters an error but will skip the test that generated the error on future passes.

Halt On Error (False):
: If this option is true the diagnostics will terminate when it encounters an error.

Loop On Error (False):
: When this option is true the diagnostics will loop on the test that caused an error

Loop Test (False):
: When true Diagnostics will continue to run until interrupted by the user or an error*.

Pause On Error (True):
: When true Diagnostics will pause when it encounters an error and will not continue until the user specifies.

*If one of the other menu options specifies that the test should be interrupted when it encounters an error.

7.0 Enable/Disable Tests

This is the menu that is displayed when the “t” key is depressed from the main menu.

```
--- Test Select Menu ---

                                  Enable            Disabled
a: Memory                                              X
b: Monitor / Sound                                     X
c: SCC                                                 X
d: DSP                                                 X
e: Ethernet                                            X
f: Memory-to-Memory                                    X
g: Timer                                               X
i: SCSI Disk                                           X
j: Floppy Disk                                         X
k: M.O. Disk                                           X
l: NBIC Tests                                          X

h: Display all states
1: All test ENABLED
2. All test DISABLED
3: Set to default enables
x: Exit

>>> Enter Selection (a,b,....):
```

To enable or disable a particular subtest press the appropriate key. Such as if you want to enable the serial port test (SCC) and the Ethernet test you would depress the “c” key and then the “d” key.

8.0 Modify Specific Subtest Parameters

This is the menu that is displayed when the “s” key is depressed from the main menu.

```
   Test Menus Available
a: Memory
b: Monitor / Sound
c: SCC
d: DSP
e: Ethernet
f: Memory-to-Memory
g: Timer
i: SCSI Disk
j: Floppy Disk
k: M.O. Disk
l: NBIC Tests

>>>Enter Test menu (a,b...) or ‘x’ to quit:
```

Each one of these options will lead to a series of menus appropriate to the selections. To select a sub-menu depress the appropriate key. Such as if you need to adjust the parameters for the Serial Port test (SCC) you would simply press the “c” key.

See section 9 through 19 for details on each subtest.

Each subtest will lead to the following 2 menus.

Variable Menu:

This menu allows the user to check configurations, turn on some option or eject media. It also has these standard options throughout each menu.

1: Subtest Enable Menu
This will take the user to the Subtest enable menu.

h: Print this menu
Pressing the “h” key will display the current menu.

Subtest Enable Menus:

This menu options allows the user to select number of passes on individual subtests. It also has these standard menu options.

h: Display all states
This will redisplay the current menu along with the parameters for each subtest.

1: All loop counts = 1
By pressing the “1” key all subtests will be set to one loop count

2: All Subtest DISABLED
By pressing the “2” key all subtests will be disabled or zero loop counts

3: All Subtest to default
By pressing the “3” key all subtest will be reset to their initial value

x: Exit
By pressing the “x” key the user will be returned to the previous menu.

9.0 Memory

This is the menu that is displayed when the Memory option is selected from the Modify Specific Subtest Parameters menu.

```
--- Memory Test Variables Menu ---

c:    Print Memory System Configuration

1:    Subtest Enable menu
h:    Print This menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Print Memory System Configuration
: This option will display the system memory configuration.

Subtest Enable menu
: This option goes to the memory specific parameters menu. See 9.1 for details.

Print This menu
: This command will reprint this menu.

9.1 Subtest Enable menu:

```
--- Memory Subtest Enable Menu ---
a: Constant Data          - loops = 1(d)
b: Checkerboard           - loops = 1(d)
c: Address as Data        - loops = 1(d)
d: Walking 1's            - loops = 1(d)
e: Growing 0's            - loops = 1(d)
f: Video Ram              - loops = 1(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

Constant Data (loops = 1 (d)):
: This test will read and write banks separately.

Checkerboard (loops = 1 (d)):
: This test will invert bits.

Address as Data (loops = 1 (d)):
: This test will test the addressing portion of memory.

Walking 1's (loops = 1(d)):
: This test will write ones to memory.

Growing 0's (loops = 1 (d)):
: This test will write zeros to memory.

Video Ram (loops = 1 (d)):
: This test will test the video SRAM.

10.0 Monitor / Sound

This is the menu that is displayed when the Monitor/Sound options is selected from the Modify Specific Subtest Parameters menu.

```
--- Monitor / Sound Variables Menu ---

s: Speaker ENABLED
e: Light Both Keyboard LEDs
E: Turn off Both Keyboard LEDs

1: Subtest enable menu
h: Print this menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Speaker (enabled)
: This command will turn on and off the speaker for testing.

Light Both Keyboard LEDs
: This command will turn on both keyboard LEDs

Turn of Both Keyboard LEDs
: This command will turn off both keyboard LEDs

Subtest enable menu
: This option goes to the monitor/sound specific parameters menu. See 10.1 for details.

Print this menu
: This command will display the current menu.

10.1 Subtest Enable Menu:

```
a: Sound Out Single       - loops = 1(d)
b: Sound In Single        - loops = 1(d)
c: Monitor I/F Traffic    - loops = 10(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

Sound Out Single (loops=1(d))
: This subtest will test the sound out channel of the DMA

Sound In Single (loops=1(d))
: This subtest will test the sound in channel of the DMA.

Monitor I/F traffic (loops=10(d))
: This subtest will test the serial interface to the monitor.

11.0 SCC

This is the menu that is displayed when the SCC option is selected from the Modify Specific Subtest Parameters menu.

```
---SCC Variables Menu ---

s: Transfer Size = 400H
u: Baud Rate     =9600(d)

1: Subtest Enable menu
h: Print this menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Transfer Size (400h)
: This variable controls the size of all transfers in all SCC tests.

Baud Rate (9600(d))
: This variable controls the baud rate of all transfers.

Subtest Enable menu
: This will go the SCC Subtest enable menu. See 11.1 for details.

Print this menu
: This will display the current menu.

11.1 Subtest Enable menu

```
--- SCC Subtest Enable Menu ---
a: SCC PIO HDX Transfer - loops = 1 (d)
b: SCC PIO FDX Transfer - loops = 4 (d)
c: SCC DMA HDX Transfer - loops = 0 (d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

SCC PIO HDX Transfer (loops=1(d)):
: This test uses the PIO to perform half duplex transfers.

SCC PIO FDX Transfer (loops=4 (d)):
: This test uses the PIO to perform full duplex transfers.

SCC DMA HDX Transfer (loop=0 (d)):
: This test uses the DMA to perform half duplex transfers.

None of these test requires a loop back plug.

12.0 DSP

This is the menu that is displayed when the DSP option is selected from the Modify Specific Subtest Parameters menu.

```
--- DSP Variables Menu ---

1: Subtest Enable menu
h: Print this menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Subtest Enable menu
: This option will take the user to the dsp subtest enable menu. See section 12.1

Print this menu
: This command will print the current menu.

12.1 Subtest Enable menu

```
DSP Subtest Enable Menu ---

a: DSP MEMORY TEST         -loops = 5(d)
b: DSP DMA                 -loops = 5(d)
c: DSP PIO                 -loops = 5(d)
d: DSP Interrupt W/R       -loops = 5(d)
e: DSP 1/2/3 Byte Mode     -loops = 5(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

DSP MEMORY TEST (loops = 5(d)):
: This subtest will test the DSP Main memory.

DSP DMA (loops = 5(d)):
: This test will transfer data to an from the DSP using the DMA.

DSP PIO (loops = 5(d)):
: This test will transfer data to and from the DSP using the PIO.

DSP Interrupt W/R (loops =(5)):
: This test will transfer data to and from the DSP using interrupts.

DSP 1/2/3 Byte Mode (loops = (5)):
: This subtest will transfer data of various widths to and from the DSP.

13.0 Ethernet

This is the menu that is displayed when the Ethernet option is selected from the Modify Specific Subtest Par-ameters menu.

```
--- Ethernet Variables Menu ---

1: Subtest Enable Menu
h: Print this menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Subtest Enable Menu:
This will go to the Ethernet Subtest Enable menu. See section 13.1 for more details.

Print this menu
This will print the current menu.

13.1 Subtest Enable Menu:

```
--- Ethernet Subtest Enable Menu ---

a: Enet DMA Byte Count    - loops = 5(d)
b: Enet Status            - loops = 0(d)
c: Enet Address Compare   - loops = 5(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

Enet DMA Byte Count (loops = 5(d)):
This will test the ethernet interfaces ability to handle different sizes of transfers.

Enet Status (loops = 0(d)):
This subtest will verify operation of various ethernet device status bits.

Enet Address Compare (loops = 5(d)):
This will test the Ethernet address compare circuitry.

14.0 Memory-to-Memory

This is the menu that is displayed when the Memory-to-Memory option is selected from the Modify Specific Subtest Parameters menu.

```
--- Memory-to-Memory Test Variables Menu ---

1: Subtest Enable Menu
h: Print this menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Subtest Enable Menu:
This will go to the Memory-to-Memory DMA Subtest Enable menu. See section 14.1 for more details.

Print this menu
This will print the current menu.

14.1 Subtest Enable Menu.

```
--- Memory-to-Memory DMA Subtest Enable Menu ---

a: Memory To Memory DMA    -loops = 1(d)
b: Memory To Memory 288    -loops = 0(d)
c: Video-to-Memory DMA     -loops = 1(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

Memory To Memory DMA (loops=1(d)):
This will write to and from main memory via buffers and compare the results

Memory To Memory 288 (loops=0(d)):
Same as Mem-to-Mem but uses the '288' increment mode.

Video-to-Memory DMA (loops=1(d)):
This subtest will copy to and from video memory to main memory.

15.0 Timer

This is the menu that is displayed when the Timer option is selected from the Modify Specific Subtest Parameters menu.

```
--- Timer Menu ---

t: Set Time of Day
d: Set Date

1: Subtest enable menu
h: Print this menu

>>> Enter Selection, 'h' for help, or 'x' to exit:
```

Set Time of Day
: This will set the initial time for the time stamping portion of the diagnostics.

Set Date
: This will set the initial date for the time stamping portion of the diagnostics.

Subtest enable menu
: This will go to the Timer Subtest Enable menu. See section 15.1 for more details.

Print this menu
: This will print the current menu.

15.1 Subtest enable menu

```
--- Timer Subtest Enable Menu ---

a: System Timer            -loops = 0(d)
b: Event Counter           -loops = 0(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

System Timer
: This subtest will generate interrupts once every millisecond.

Event Counter
: This subtest will compare the event counter against the system timer.

16.0 SCSI Disk

This is the menu that is displayed when the SCSI Disk option is selected from the Modify Specific Subtest Parameters menu.

```
--- SCSI Variables Menu ---

n: Minimum Block   = OH
m: Maximum Block = max available on device

1: Subtest Enable Menu
h: Print this menu

>>>Enter selection, 'h' for help, or 'x' to exit:
```

Minimum Block
: This command will allow the user to assign the lowest block to be accessed by the diagnostics.

Maximum Block
: This command will allow the user to assign the maximum block to be accessed by the diagnostics.

Subtest enable menu
: This will go to the Timer Subtest Enable menu. See section 16.1 for more details.

Print this menu
: This will print the current menu.

16.1 Subtest enable menu

```
--- SCSI Subtest Enable Menu ---

a: Basic Command Test      - loops = 0(d)
b: Basic Read/Write        - loops = 0(d)
c: Full Disk Read/Write    - loops = 0(d)
d: Full Disk Read Only     - loops = 0(d)
e: Random Read/Write       - loops = 0(d)
f: Random Read Only      - loops = 1000(d)
g: Access Time             - loops = 0(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

See next page for details on SCSI subtest options

Basic Command Test

This will verify the proper operation of the Request Sense and the Inquiry commands.

Basic Read/Write

This will verify the proper operation of the Read and the Write commands.

Full Disk Read/Write

This subtest will write, read, and verify the entire disk. This test is destructive to user data.

Full Disk Read Only

This subtest will do a non-destructive read of the entire disk.

Random Read/Write

This subtest will write, read, and verify random location on the disk. This test is destructive to user data.

Random Read only

This subtest will read and verify random location on the disk.

Access Time

This subtest will measure performance of the SCSI bus.

17.0 Floppy Disk

This is the menu that is displayed when the Floppy Disk option is selected from the Modify Specific Subtest Parameters menu.

```
--- Floppy Disk Variables Menu ---

e: Eject Floppy
i: Reset and Initialize Floppy

1: Subtest Enable menu
h: Print this menu

>>>Enter selection, 'h' for help, or 'x' to exit:
```

Eject Floppy

This command will eject the floppy. Please note that the Reset and Initialize command must first be issued.

Reset and Initialize Floppy

This command will reset and initialize the floppy drive and controller.

Subtest Enable menu

This will go to the Floppy Subtest Enable menu. See section 17.1 for more details.

Print this menu

This command will print the current menu.

17.1 Subtest enable menu

```
--- Floppy Subtest Enable Menu ---

a: Floppy Seek Test       - loops = 1(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

Floppy Seek Test

This subtest will test the seeking function of the floppy drive.

18.0 MO Disk (optical drive)

This is the menu that is displayed when the MO Disk option is selected from the Modify Specific Subtest Parameters menu.

```
--- Optical Disk Variables Menu ---

n: Minimum Track  = 1000H
m: Maximum Track  = 4C7FH

t: Initialize Drive
j: Eject cartridge

1: Subtest Enable menu
h: Print this menu

>>> Enter selection, 'h' for help, or 'x' to exit:
```

Minimum Track
: This command will allow the user to select the lowest track to be tested.

Maximum Track
: This command will allow the user to select the highest track to be tested.

Initialize Drive
: This command will initialize the drive.

Eject cartridge
: This command will eject the cartridge in the optical drive. Note: You must initialize the drive before ejecting the cartridge.

Subtest Enable menu
: This will go to the M.O Disk Subtest Enable menu. See section 18.1 for more details.

Print this menu
: This command will print the current menu.

18.1 Subtest Enable menu:

```
See next page for subtest enable information
```

```
--- M.O. Disk Subtest Enable Menu

a: Flag Register W/R      - loops = 20(d)
b: ECC Write/Read         - loops = 10(d)
c: ECC Row Fixed          - loops = 1 (d)
d: ECC Column Fixed       - loops = 1 (d)
e: ECC Row Random         - loops = 1 (d)
f: ECC Column Random      - loops = 1 (d)
g: ECC Diagonal           - loops = 1 (d)
i: ECC Encoder            - loops = 1 (d)
j: Random Write/Read      - loops = 1 (d)
k: Sequential Wr / Rd     - loops = 1 (d)
l: Erase Command          - loops = 0 (d)
m: W/R Commands           - loops = 1 (d)
n: Relative Jump          - loops = 1 (d)
o: Seek Time             - loops = 100(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

Flag Register W/R (loops = 20(d))
: This tests the basic read/write/compare capabilities of the Disk chip.

ECC Write/Read (loops = 10(d))
: This tests the write/read/decode function using the Error Correction Circuitry(ECC)

ECC Row Fixed (loops = 1 (d))
: This test verifies that the ECC can correct any errors occurring sequentially on the disk surface.

ECC Column Fixed (loops = 1 (d))
: This test verifies that the ECC can correct any errors occurring vertically along the disk surface.

ECC Row Random (loops = 1 (d))
: Same as Row fixed except will test randomly.

ECC Column Random (loops = 1 (d))
: Same as column fixed except randomly.

ECC Diagonal (loops = 1 (d))
: Test that the ECC can correct errors that occur on both rows or columns.

ECC Encoder (loops = 1 (d))
: This test the encoder circuitry.

Random Write/Read (loops = 1 (d))
: This is a standard erase/write/read test.

Sequential Wr / Rd (loops = 1 (d))
: Same as Random write/read except will test sequentially.

Erase Command (loops = 0 (d))
: Verifies the operation of the erase command and its circuitry.

W/R Commands (loops = 1 (d))

Test the Write/Read command and verifies.

Relative Jump (loops = 1 (d))

This will test the relative jump command.

Seek Time (loops = 100(d))

This subtest will determine the average seek time of the drive. This test will not generate any errors but does exercise the drive.

19.0 NBIC

This is the menu that is displayed when the NBIC option is selected from the Modify Specific Subtest Parameters menu.

```
--- NBIC Test Variables Menu ---

1: Subtest Enable menu
h: Print this menu

>>>Enter selection, 'h' for help, or 'x' to exit:
```

Subtest Enable Menu
: This will go to the N.B.I.C Subtest Enable menu. See section 19.1 for more details.

Print this menu
: This command will print the current menu.

19.1 Subtest enable menu:

```
--- NBIC Subtest Enable Menu ---

a: NBIC ID test           - loops =25(d)

h: Display all states
1: All loop counts = 1
2: All subtests DISABLED
3: Set to default loop counts
x: Exit

>>> Enter selection (1,2,...):
```

NBIC ID test (loops = 25(d))
: This will test the address of the NBIC on the board. (This test does not require another board.)