NeXT™ Hardware Service

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Module 1
Troubleshooting Preparation

It is just a good idea to organize your workspace, your tools, and your thoughts before jumping into your troubleshooting problem. You may be able to save yourself time and trouble if you follow a few common sense guidelines. In this module you'll develop a set of procedures that you can use in any troubleshooting situation.

Objectives

After completing this module, you'll be able to:

- Identify the proper tools needed to repair your computer.
- Perform troubleshooting procedures following proper safety guidelines.
- Plan a strategy for analyzing, identifying, and correcting the problem.

Tools of the Trade

Crowbars and dynamite might do the trick, but you'll probably want to use more delicate, less messy tools. Here is a list of tools that we recommend you use to repair your computer, monitor, or printer.

1. Anti-static mat and wrist strap.
2. Nos. 1 &2 Phillips or cross point screwdrivers
3. 12 inch No. 2 Phillips for work on printer + monitor
4. 3mm, & 4mm hex wrenches * monitor to set tilt + tension
5. Multipurpose scribe; preferably with a right angle point
6. DIP IC extractor for ROM chip
7. SIMM memory module puller
8. Digital Multimeter Power supply

The SIMM remover and the digital multimeter are not necessarily required, but can be very helpful.

QUESTIONS

1. What size hex tool will you need to open the cube?

_____

2. Why must you wear an anti-static wrist strap when working on your computer?

_____

_____

Blazing Trails Through the Hardware

Troubleshooting flow charts are excellent tools for sequencing, or keeping track of events. Unfortunately, it seems that most of the time such troubleshooting charts are unavailable. However, you can jot down a simple flow chart of the things that you plan to do. This will give you a route to follow and help you keep track of your progress. A map can be invaluable when it comes to backtracking. You can easily get lost or create greater difficulty while troubleshooting. Maps can help you undo what you've done.

Here are some ideas about producing a troubleshooting map:

- Start by making a plan of attack. Try to define a line of inquiry. List a few initial steps of procedure. This will give you a good starting point. You can always amend it later.

- List any error messages created in the initial failure and the circumstances under which they were produced. If no error messages are produced, try to determine when the failure occurs.

- Try to reference error messages if possible. Look for clues in the message. Was the device producing the error listed by its special device driver file? Was a hardware device specifically "called out" in the message?

- Write down the results of each step. If you need to re-evaluate the course you've taken. You can always fall back to the beginning and try a different direction.

- Check off each step of your plan and write each event as it occurs.

Lastly, you might want to keep a log of maintenance and troubleshooting events. This will help provide a history that you can refer to at a later date.

ACTIVITY

◆ Produce a simple map to isolate the following problem.

System won't boot.

message:

```
Booting SCSI target 1, lun 0
Read: sdcmd bad state: 0
blk 0 boot: sd(1,0,0) sdmach
sdmach: not found
load failed
```

EXERCISES

1. Working as a group draft a plan of attack. Create a flow chart that will provide you with a troubleshooting strategy.

sd mach is missing

Identify the problem.

verbose mode, scsi diag, try boot from sdmach, boot another device, fsck

Verify the problem. List the steps you follow (or followed) to verify the problem.

List error messages. Were any specific pieces of hardware identified?

Wrap-up

In this module you have identified and designed a plan-of-attack for your troubleshooting process. Use of flow charts and a sequence of steps helps you keep track of your progress and creates very specific information about how and when the failure occurred. You find these tools to be extremely valuable in every troubleshooting scenario.

Module 2
Hard Disk Diagnostics

Sometime, somewhere, a hard disk will fail and you may be the lucky victim. When a hard disk catastrophe strikes, you should be prepared to determine the condition of the disk drive. Can you rebuild it? Has a necessary file disappeared? Is it possible to read important user data on the disk? Some steps that you can take to answer those questions can keep the situation from being a total loss.

Objectives

After completing this module, you'll be able to:

- Isolate a failure to a hard disk.
- Determine the readability of the hard disk.
- Repair a corrupted file system.
- Use the disk rebuilding tools in the NeXT Operating System.
- Compensate for minor media errors.

References

Unix manual pages for: **ln, fsck, disk, mount, umount, reasb**

Defining Symptoms

Software says, "I'm sure it's hardware." Hardware says, "Our stuff is fine. It's gotta be the software." So, where is the problem. Even when a symptom appears obvious, it isn't always. Sometimes you have to look a little deeper than the surface to define the symptom. By looking at error messages and performing some simple tests you solve a great many situations easily.

Examining Messages

As with all things you need a place to start. A good place to start is to first document any initial error messages that might be present on start-up or during normal operation. Ask yourself a few questions. If the failure occurs during the boot process where, exactly, did it occur? Did the operating system post a message? One very good source of error information is the Console panel. You can select the Console panel from the Tools menu in the Workspace Main menu. Another good place to look is in the file **/usr/adm/messages.** Here you will find all of the messages logged by the system logger.

Here is an example from **/usr/adm/messages.**

```
Dec  7 07:15:39 arizona mach:     SCSI Block in
error = 64 (no valid label)
Dec  7 07:15:41 arizona mach: Target 1: MEDIA
ERROR; block 0H retry 1
Dec  7 07:15:42 arizona mach: Target 1: MEDIA
ERROR; block 0H retry 2
Dec  7 07:15:43 arizona mach: Target 1: MEDIA
ERROR; block 0H retry 3
Dec  7 07:15:44 arizona mach: Target 1: MEDIA
ERROR; block 0H retry 4
Dec  7 07:15:45 arizona mach: Target 1: MEDIA
ERROR; block 0H retry 5
Dec  7 07:15:51 arizona mach: sd0 (0,0): sense
key:0x3  additional sense code:0x1
```

EXERCISE

1. In the previous example determine which device failed.

_____

When booting the computer in verbose mode from the ROM monitor you should see an entry for every device in the SCSI chain. If a disk drive does not appear in the list, the kernel is not recognizing the disk. Check the following:

- Power cable installed correctly
- Data Cable installed correctly
- Proper SCSI termination
- Proper SCSI address selection

Refer to Appendix C, **Setting the Hard Disk SCSI Address**, for selecting the SCSI address on your hard disk.

Hard Disk Tools

It may be possible to repair or recover the hard disk without replacing it. Trying a few tests first may save you some time and trouble.

Recovering a Hard Disk

If you can read the hard disk you can probably recover it without replacing it. The chances are also good that you may be able to recover important data from the disk even if you can't completely recover the disk itself. If you can read a hard disk chances are that it is rebuildable. At the very least you might be able to put things back to original condition.

Mounting a Disk Device

If the disk has a Unix file system you can try to manually mount it using the Unix **mount** utility. To do this you must boot from a floppy or optical and mount the hard disk on a directory mount point somewhere convenient in the file system. From here you should be able to browse the hard disk for whatever ails it.

EXERCISES

1. Login as **root** (or use the **su** utility in a shell window) and start **Terminal.app** in **/NextApps**.

2. For this exercise you will be mounting a floppy disk or an optical disk, but you could do this with a hard disk too. Find your disk below and type the appropriate command.

Optical Disk:	`mount /dev/od0a /mnt`
Internal Floppy:	`mount /dev/fd0a /mnt`
External Floppy:	`mount /dev/sd1a /mnt`

3. Insert the disk when prompted.

QUESTION

1. Assume that you have booted from a floppy and mounted your hard disk on **/HardDisk**. You have discovered that the boot file **mach** on your hard disk has somehow been erased. Can you recover that file? If so, how?

_____

_____

2. Which special device file would you have used to mount the hard disk?

_____

Repairing a File System

If you suspect that the file system has been corrupted you can attempt to repair it. You can run the Unix utility **fsck** to correct any inconsistencies in the file system. If your system won't boot, it might be possible to use **fsck** with the **-b** option to specify an alternate superblock. You can use the **disk** utility to find the block number that you will use. Check the Unix manual pages for reference to these utilities.

EXERCISES

1. Boot the system in single-user mode.

2. Run **fsck** on the root file system. Use the Unix manual page for **fsck** as your guide. When you have finished reboot your system.

3. (Optional) Boot your computer in a normal fashion. Log in and make some changes to a file. Without saving the file, pull the power plug. Then, boot in single-user mode and re-run fsck. What errors did **fsck** find?

Tip: Make sure that you respond to all **fsck** questions with **y**.

QUESTIONS

1. What procedure would you use direct **fsck** to use an alternate superblock to repair a corrupted file system? (Hint: Use the Unix manual page for **fsck**.)

2. Where does **fsck** place orphaned files?

Circumventing Minor Media Errors

The following example shows a media error. You may see these in the console window from time to time. These are caused by spots on the physical disk drive media (oxide) cannot be recorded on or read from. In most cases you can compensate for media errors. Using the Unix utility **/usr/etc/reasb** will allow you to bypass media errors.

```
Oct  17 17:22:27 sanandreas mach:      SCSI Block
in error = 0 (no valid label)
Oct  17 17:22:28 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 1
Oct  17 17:22:29 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 2
Oct  17 17:22:30 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 3
Oct  17 17:22:32 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 4
Oct  17 17:22:33 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 5
Oct  17 17:22:34 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 6
Oct  17 17:22:35 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 7
Oct  17 17:22:36 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 8
Oct  17 17:22:38 sanandreas mach: Target 0: MEDIA
ERROR; block 40H retry 9
Oct  17 17:22:39 sanandreas mach: sd1 (4,0):
sense key:0x3  additional sense code:0x12
```

EXERCISES

- Use the Unix manual page to list the syntax of **/usr/etc/reasb** to reassign block number 64 on your floppy disk.

_____

QUESTIONS

- What is the potential problem listed in the Unix manual page for **/usr/etc/reasb**? (Hint: Bugs).

_____

_____

Using the *disk* Utility

The Unix utility **/usr/etc/disk** can be used to analyze your hard disk drive. The **disk** can be executed from the command line with the syntax: `/usr/etc/disk [ option flags ] [ action flags ] raw-device`

ACTIVITY

1. Log in as root.

2. Execute the **disk** utility by typing the following:

```
/usr/etc/disk /dev/rsd0a
```

3. Type a "?" at the `disk>` prompt.

QUESTIONS

1. Which command would be appropriate for performing a low-level format of the hard disk?

_____

2. Which command(s) would be appropriate for writing a new disk label and installing a boot program?

_____

BuildDisk

You may find it impossible to read your hard disk. However, it does not mean that all is lost. It still may be possible to restore the disk to its factory state. To do this you have to run one of the disk building tools, **/NextAdmin/BuildDisk** or **/usr/etc/builddisk**. Refer to the *NeXTSTEP Network and System Administration Manual* and the Unix manual pages for details on running these programs.

ACTIVITY

(Optional) Setup a NetBoot Cluster and run **/NextAdmin/BuildDisk** on the NetBoot client. Refer to Chapter 13: NetBooting, *NeXTSTEP Network and System Administration Manual.*

Replace It

If the disk is unreadable, or otherwise unsalvageable, you must replace it. Call NeXT Service Operations to obtain a return material authorization number (RMA). Ensure that you properly package your disk drive before shipment.

EXERCISE

1. Use the appropriate job aid in Appendix B to remove the hard disk from your computer.

2. Verify that the SCSI address is set properly using Appendix C, **Setting the Hard Disk SCSI Address.**

3. Reinstall the hard disk in accordance with the appropriate job aid in Appendix B.

4. Verify proper operation.

Wrap-up

In this module you have used a few simple tests to help you define the problem with your disk drive. Testing readability of the hard disk by using these simple tests could possibly get up and running in short order. Rebuilding or repairing the filesystem of the hard disk could prevent you from having to order and install another hard disk.

Module 3
A View of the LandScape

Let's take a look around the various system boards that are found inside NeXT computers. The information here may come in handy when someone looking over your shoulder asks, "What is that big porcupine lookin' thing?" You might want to be able to tell them, especially if the onlooker is your boss. Besides, knowing a few individual parts helps us understand and appreciate the technology a little better.

Objectives

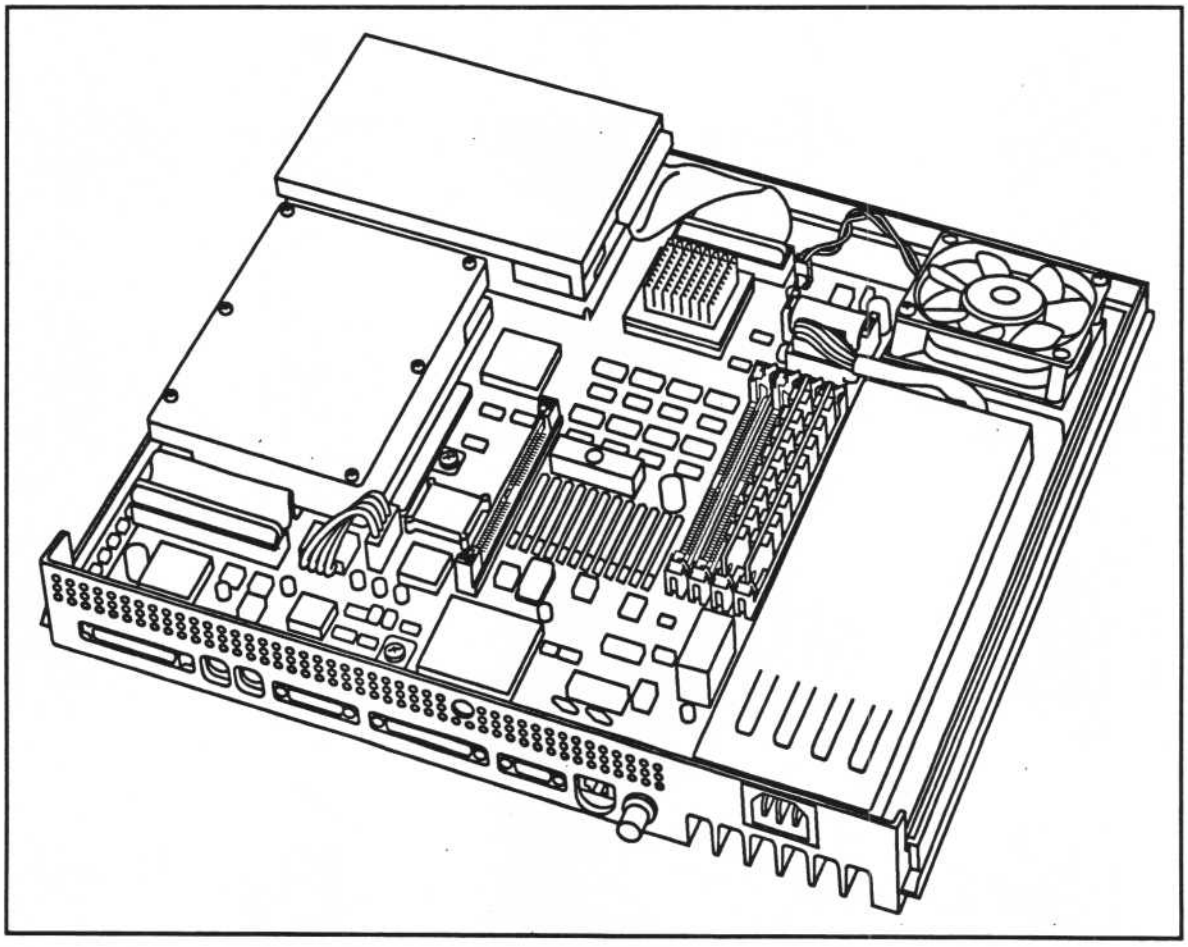
After completing this module, you'll be able to:

- Identify individual components and subassemblies of the NeXTstation™ and NeXTcube™ computers.

Under the Hood

The NeXT computer's main unit consists of several tightly integrated subsystems. These include the CPU board, the hard disk, the floppy disk, and the power supply. All of these subsystems are housed in a black plastic covered, magnesium case. This case technology provides excellent shielding of radio frequency interference from within and without.

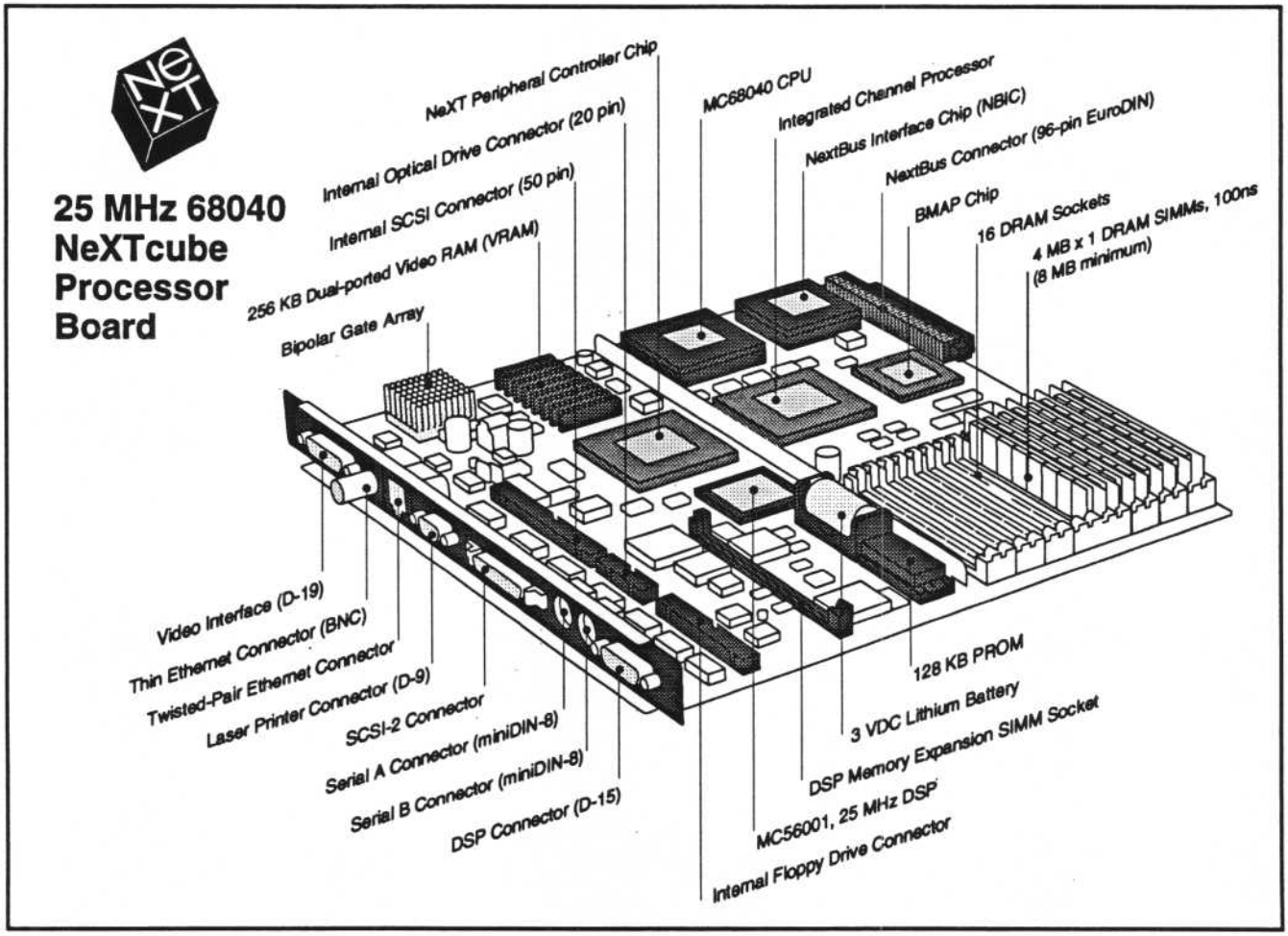
Each subassembly is designed for efficient serviceability. In most cases, the removal of just one screw is enough to remove the part. Structural integrity is maintained by aligning pins and guides in the case or by fastening one subassembly to another to form a rigid framework. All cubes and stations are identical in terms of removal and replacement. No matter which version of hardware you have purchased.



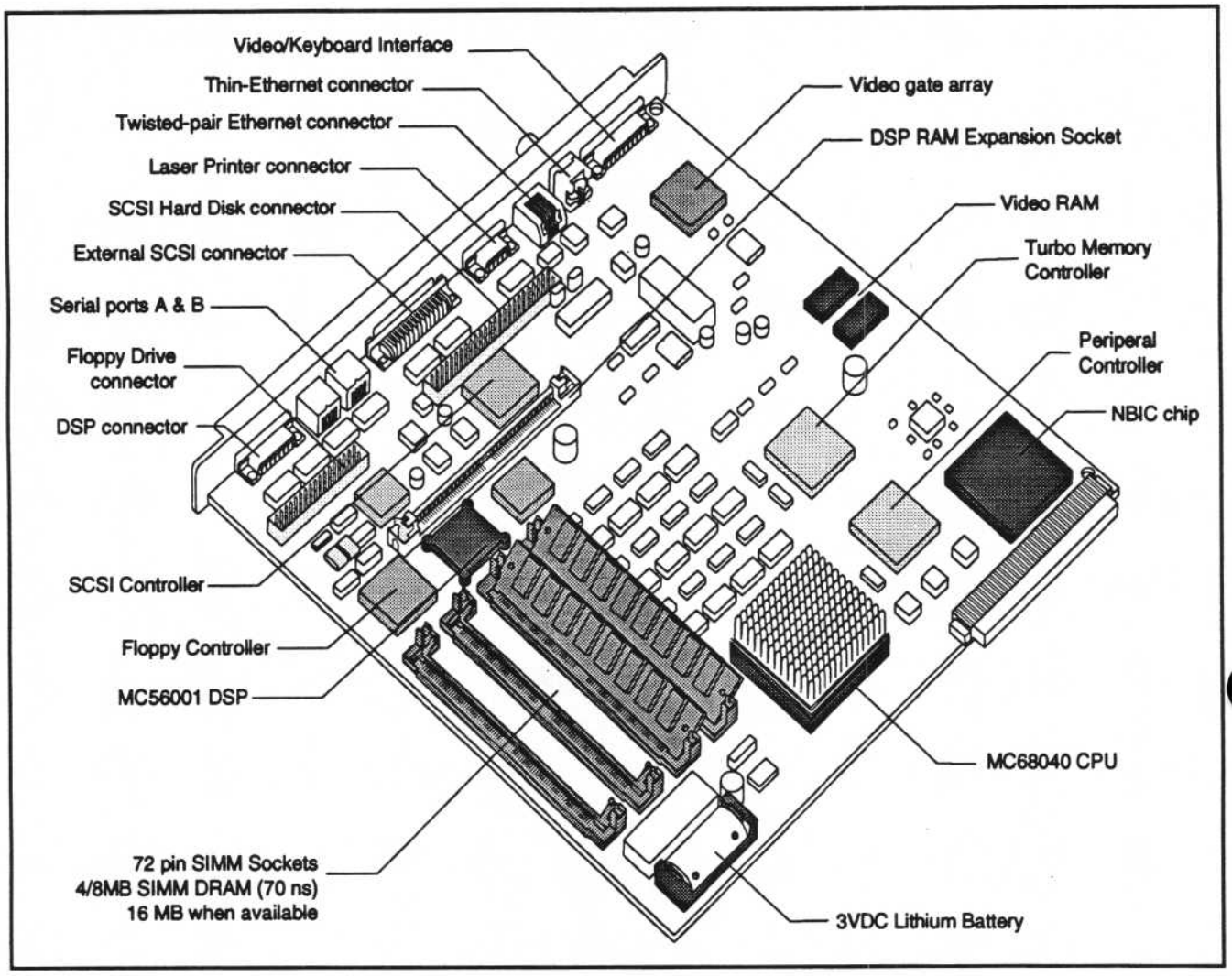
The NeXT CPU board

NeXT CPU boards are technically excellent. They are fine examples of high quality engineering and manufacturing. Large numbers of circuits have been integrated into custom Each CPU is produced in our robotic factory in Fremont, California. The production robotics include: surface mount solder mask stenciling; optically aligned, surface mount component pick and place, through-hole component pick and place, surface mount soldering oven, and through-hole soldering wave. Each robot is monitored by NeXT manufacturing employees to ensure precision and quality.

25MHz NeXTcube CPU Diagram



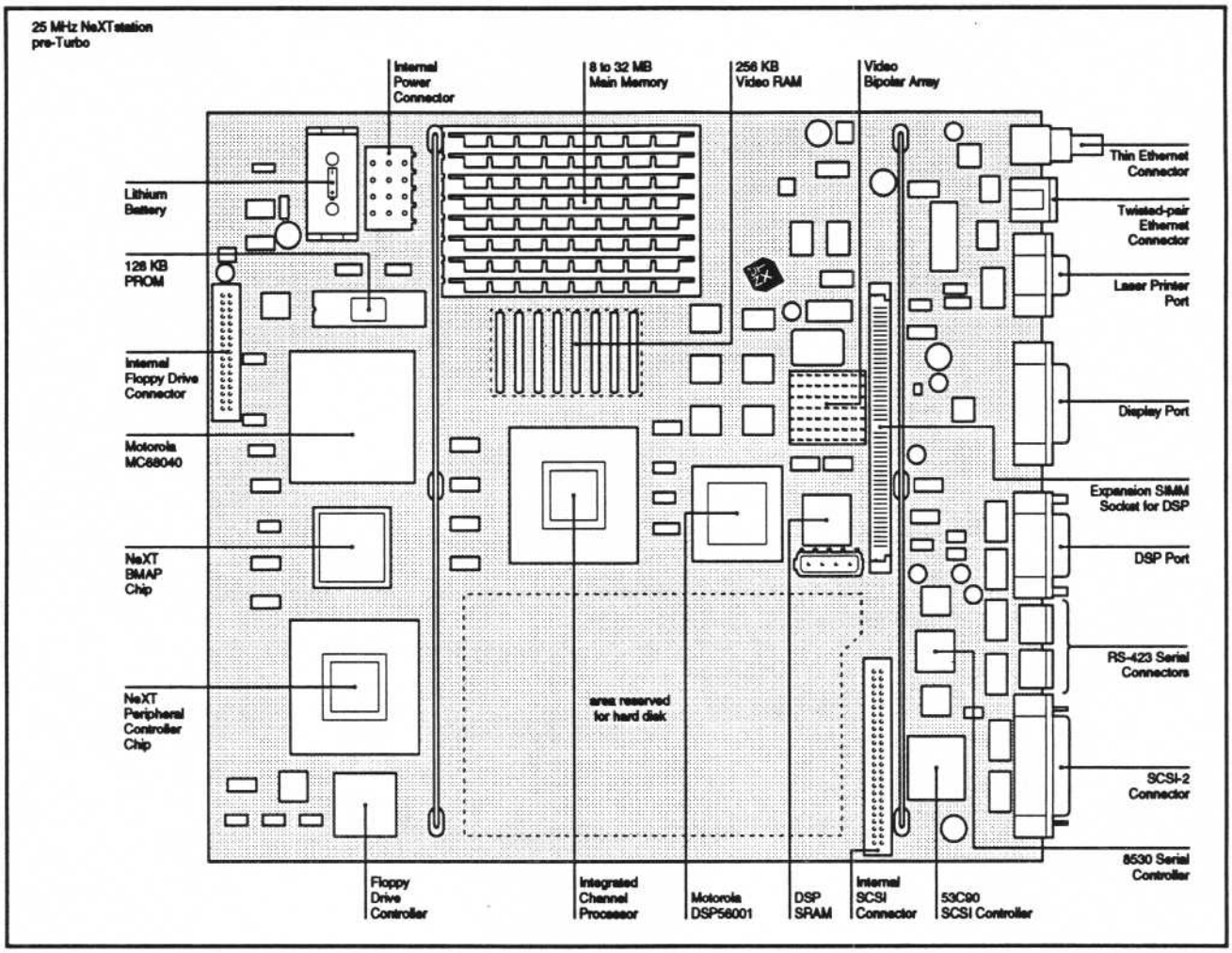
25 & 33 Mhz NeXTCube Turbo CPU Diagram



Features of the NeXTcube Turbo

- 25 or 33 MHz CPU clock rate
- Compatible with 8, 16, or 32 MB SIMMs; interleaved memory architecture; 8-128MB memory capacity
- Significant reduction in linear IC population

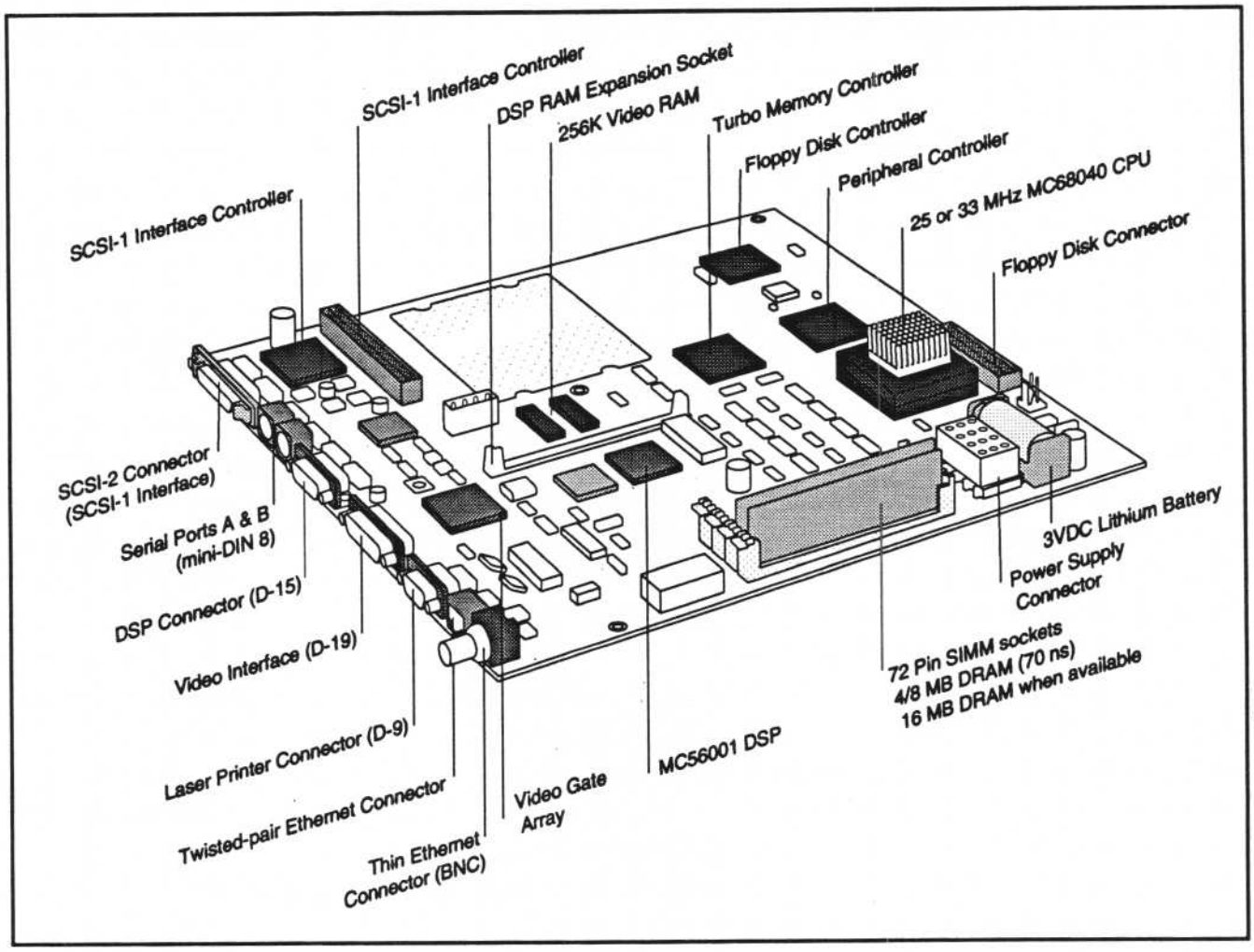
25 MHz NeXTstation



Features of the first generation NeXTstation

- 25 MHz clock rate
- 1 or 4 MB SIMMs compatibility; non-interleaved memory; 8-32 MB capacity
- First NeXT "pizza box"

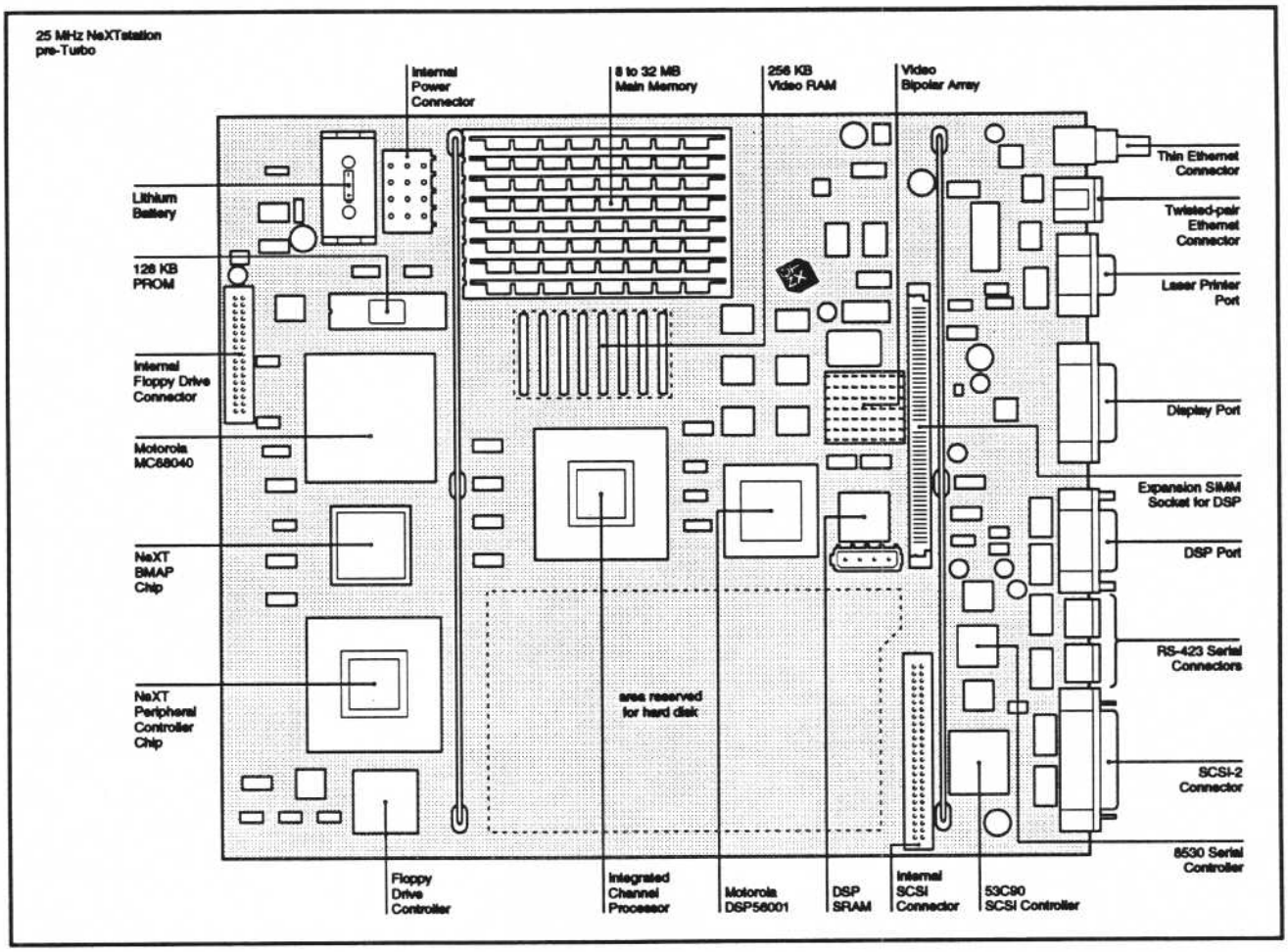
25 MHz & 33Mhz NeXTstation Turbo



Features of the NeXTstation Turbo

- 25 or 33 MHz CPU clock speed
- 4, 8, 16 or 32 MB SIMM compatibility; 8-128 MB capacity; interleaved memory architecture
- Greater throughput; 25 MHz Turbo is 15% faster than 1st generation 25 MHz NeXTstation
- Significant reduction in IC population

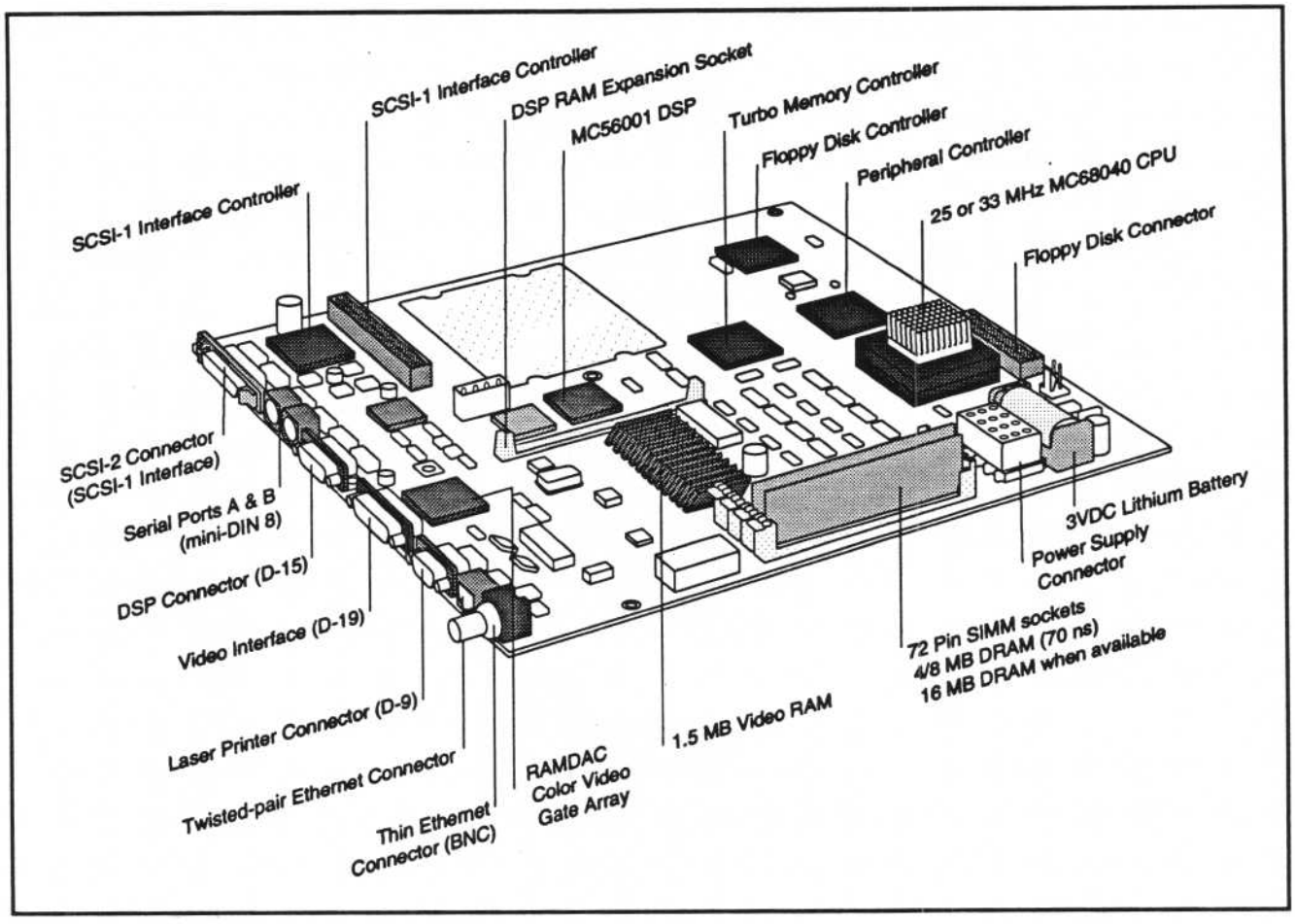
25MHz NeXTstation Color



Features of the 1st generation NeXTstation Color

- 25 MHz CPU clock rate
- 1.5 MB of static RAM memory for 12 bit color video (4096 colors)
- 12-32 MB interleaved memory
- Brooktree RAMDAC for multilevel color output

25 MHz & 33 MHz NeXTstation Turbo Color



Features of the NeXTstation Turbo Color

- 25 or 33 MHz CPU clock speed
- 4, 8, 16 or 32 MB SIMM compatibility; 16-128 MB capacity; interleaved memory architecture
- Greater throughput; 25 MHz Turbo Color is 15% faster than 1st generation 25 MHz NeXTstation Color
- Significant reduction in IC population

ACTIVITY

1. Follow the instructions given in the appropriate job aid in Appendix B for removing the CPU board in your system.

2. Compare a NeXTcube CPU with a NeXTstation CPU.

3. Compare your CPU with the diagrams in the preceding pages.

4. Follow the instructions in the appropriate job aid to reinstall the CPU board.

Wrap Up

NeXT hardware engineering philosophy continues to lead the computer industry in terms of integration, reliability, and serviceability. Performance enhancements have not sacrificed serviceability. Each NeXT computer has been thoughtfully designed to provide minimum downtime and maximum upgradeability.

Module 4
Memory Diagnostics

Wow! Things are looking bright. The boss just sprung from those badly needed memory upgrades. Now people trying to run FormRaker and Annihilistrator at the same time will most certainly be pleased. Unfortunately, after installing the new memory you encounter a "System Test Failed" on the display of one of the systems. Now it is time to figure out which SIMM has failed.

The NeXT system, through the ROM monitor, gives you all of the information that you will need to find the offending gismo. In this module you will use the data in the ROM monitor display to isolate a failed SIMM module. You will also learn proper technique for removing and replacing SIMMs.

Objectives

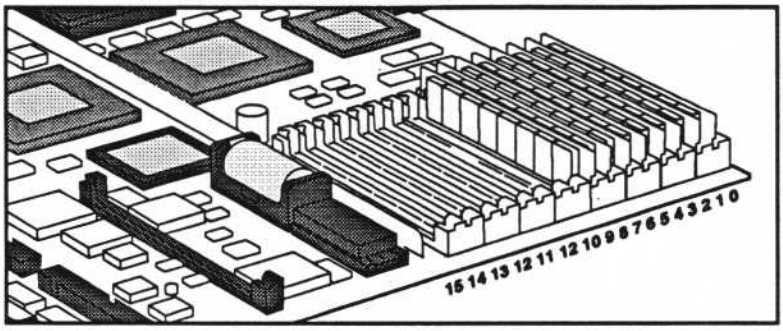
After completing this module, you'll be able to:

- Isolate a memory failure to an individual SIMM.
- Repair the damaged memory system using proper removal and installation techniques.

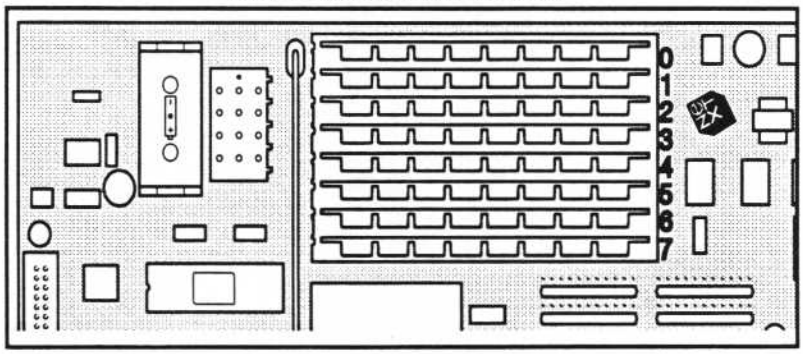
Physical Layout

Here are a few diagrams showing the physical location and slot numbering of the SIMMs in NeXT computers. Use the edge of the CPU board to help you orient the SIMM sockets.

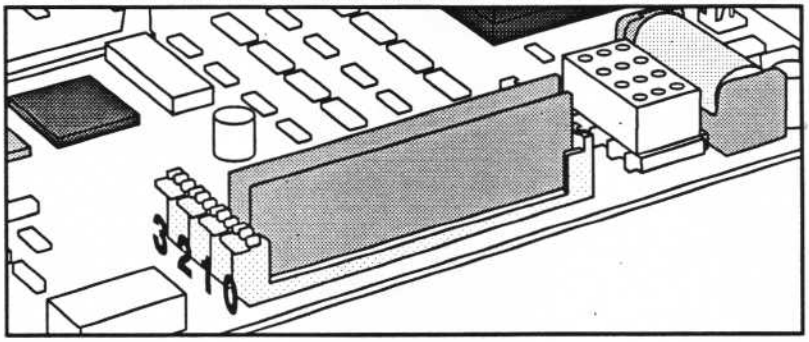
1st Generation 25 MHz NeXTcube



1st Generation 25 MHz NeXTstation & NeXTstation Color

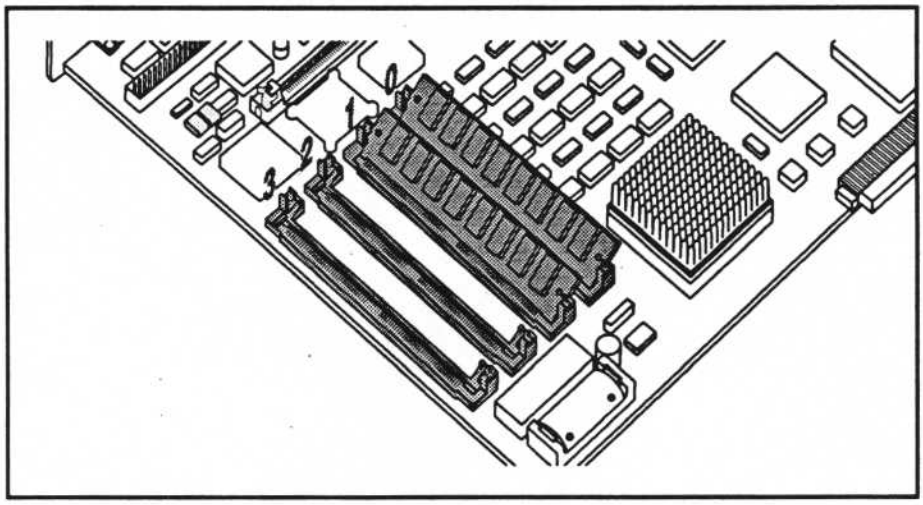


25 & 33 MHz NeXTstation Turbo & Turbo Color



Physical Layout (cont'd)

25 & 33 MHz NeXTcube Turbo



Memory Arrangement

In the 1st generation NeXT computers memory is arranged in sets of 2 or 4 SIMM slots. The NeXTcube, monochrome NeXTstation, and the NeXTdimension all have SIMMs arranged in groups of 4. In these computers a bank of memory will not operate with less than 4 SIMMs. The original NeXTstation Color operates an interleaved memory system that has its SIMMs arranged in sets of 2 SIMMs. All of the Turbo systems have their SIMMs arranged in pairs.

SIMMs in a particular bank must be identical in speed, capacity, and electrical characteristics. However, each bank may be different than the others. If, for example, you were upgrading an 8 MB system to 20 MB, you could install 4, one megabyte SIMMs in one bank and 4, four megabyte SIMMs in another. It is possible, though not recommended, to mix speeds between banks as well.

Below is a table that correlates memory address assignments and SIMM slots.

Memory Arrangement

Computer	Slot #s	Bank #	Memory Address Range	Max. Amount of Memory
NeXTcube	0-3	0	4000000H - 4fa0000H	16 MB
	4-7	1	5000000H - 5fa0000H	16 MB
	8-11	2	6000000H - 6fa0000H	16 MB
	12-15	3	7000000H - 7fa0000H	16 MB
NeXTstation	0-3	0	4000000H - 4fa0000H	16 MB
	4-7	1	5000000H - 5fa0000H	16 MB
NeXTstation Color	0-1	0	4000000H - 47effffH	8 MB
	2-3		47D0000H - 4fa0000H	8 MB
	4-5	1	5000000H - 57effffH	8 MB
	6-7		57d0000H - 5fa0000H	8 MB
All Turbo Systems	0	0, 1, 2, 3	4000000H - 7ffffffH	32 MB
	1			32 MB
	2	4, 5, 6, 7	8000000H - bffffffH	32 MB
	3			32 MB

Verbosity of POST (Power On Self Test)

You won't have to go far to find where the memory problem exists. When the system first powers up it runs a series of tests to verify that the hardware works in, at least, some basic form. If the ROM monitor is set to "verbose mode," the computer will report what it is testing and will display any error output. Verbose mode can be a great deal more useful than the "icon animation" mode.

When you have "icon animation" mode set a "System Failed" banner will replace the "Testing System" banner if there is a problem during POST.

In "icon animation mode" the presentation of the "System Failed" message gives way to the ROM monitor display. You may see an error message like the one below.

```
Coupling dependant memory fault!
Error at memory location:     64404e8
Value at the time of failure: aaabaaaa
One or more SIMMs in bank 2 is bad
```

This message contains everything that you need to figure out which SIMM has failed.

What's in the Message

The interpolation of the error message differs between the 1st generation NeXT computers and the Turbo systems. This is due to changes in the memory architecture in the Turbo computer. The Turbo uses an interleaved memory system as opposed to the page mode memory system of the 1st generation system.

1st Generation NeXTstation and NeXTcube

Finding exactly which SIMM has failed takes a little detective work. The error location posted in the ROM monitor display indicates which bank holds the failed SIMM and the "value" is used to identify which SIMM has failed.

In the 1st generation 68040 CPU the ROM monitor displays a line in the error message lets you know what bank has the failed SIMM. You might see the following.

```
One or more SIMMs in bank 2 is bad.
```

If you really want to impress your friends you can use the failure address to figure out which memory bank holds the bad SIMM.

```
Error at memory location: 64404be8
```

Banks are significant in older monochrome systems because memory slots are grouped in banks. Use the following table to identify the indicated bank. Find the range in which the bad memory location falls.

Bank #	Address Range	Slot #s
Bank 0	4000000 - 4ffffff	0 - 3
Bank 1	5000000 - 5ffffff	4 - 7
Bank 2	6000000 - 6ffffff	8 - 11
Bank 3	7000000 - 7ffffff	12 - 15

The table shows that 64404e8 is in bank 2. This bank is comprised of SIMM slots 8, 9, 10, & 11. So, one of these SIMMs is bad.

So, Which SIMM is Bad?

Once you have narrowed down the possible slots you need the "value at the time of error" to show which SIMM actually failed.

The Power On Self Test will attempt to write one of several repeating patterns and then verify the results. First, start by grouping the value into four pairs of letters (bytes).

```
aa  | ab  | aa  | aa
```

Then focus on the bad byte. In this case the third byte from the right that is bad. Each byte of this test pattern is stored in a different SIMM within the bank. The value on the right corresponds to the lowest number SIMM; the value on the left, the highest. For example:

```
11     10     9      8
aa  | ab  | aa  | aa
```

The bad third byte indicates that the SIMM in slot 10 is bad.

Examples of Test Patterns

Here are some of the test patterns that POST will try to write.

```
00000000
ffffffff
12345678
87654321
55555555
aaaaaaaa
db6db6db
b6db6db6
```

Each of these can be represented by a series of 32 ones and/or zeros.

For example:

0	1	5	6	a	b	d	f
0000	0001	0101	0110	1010	1011	1101	1111

NeXTstation Color and NeXT Turbo Systems

The only significant piece of the error message for the old Color or the Turbos is the error location.

```
Error at memory location: 5404be8
```

These computers use an interleaved memory system such that SIMMs are grouped in pairs. One SIMM stores the odd memory addresses the other stores the even addresses.

The least significant nibble (last digit) tells you whether the odd or even SIMM failed.

If the nibble is:

0 - 3	Even
4 - 7	Odd
8 - b	Even
c - f	Odd

The tables on the following page tell you which SIMM is odd and which one is even.

5404be8 tells us that one the SIMMs in slots 4 or 5 of the NeXTstation Color is bad. If this computer is a NeXTstation Turbo then one of the SIMMs in slots 0 or 1 is bad.

The least significant nibble is "8," so, an even SIMM is the one that failed. In the NeXTstation Color the failed SIMM is in slot 4. In a Turbo system the failed SIMM is in slot 1.

NeXTstation Color

Slot #	Failure Address Range	Odd or Even
0	4000000 - 4e7ffffH	Even
1	4000000 - 4e7ffffH	Odd
2	47D0000 - 4fa0000H	Even
3	47D0000 - 4fa0000H	Odd
4	5000000 - 5e7ffffH	Even
5	5000000 - 5e7ffffH	Odd
6	57D0000 - 5fa0000H	Even
7	57D0000 - 5fa0000H	Odd

All NeXT Turbo Systems

Slot #	Failure Address Range	Odd or Even
0	4000000 - 7ffffffH	Odd
1	4000000 - 7ffffffH	Even
2	8000000 - bffffffH	Odd
3	8000000 - bffffffH	Even

Test Yourself

QUESTIONS

1. A NeXTcube Turbo fails its POST and displays the following message. Which SIMM should be replaced?

```
Coupling dependant memory fault!
Error at memory location:     9d505e5
Value at the time of failure: db90db90
```

odd

slot 2

2. Which slot numbers in a 1st generation NeXTstation constitute bank 1?

4-7

3. Use the following error message to determine which SIMM is bad in a 1st generation NeXTcube. Which slot number has the bad SIMM?

```
Coupling dependant memory fault!
Error at memory location:     7c403e9
Value at the time of failure: b6b6b6db6
```

3 bad

14 15 (9 13 12

Just Do It

ACTIVITY

Generate your own memory error so that you can get actual output from the computer. You will be removing and replacing memory, so be sure to use your ant-static mat and wrist strap.

1. Remove the cover from the computer.

2. Select any group of SIMMs. Make sure to remove all SIMMs in a bank or group. *Be very careful not to break or damage the*

SIMMs or sockets. See your instructor if you are unsure of how to use the "SIMM removal tool."

3. Select one SIMM from the group and place a very narrow piece of scotch tape on pin 10. Make sure that the sliver of tape only touches pin 10 and covers the contacts on both sides of the printed circuit board.

4. Shuffle the SIMMs and reinstall them.

QUESTIONS

- What error message did you receive when you powered up.

_____

_____

_____

5. Move the "failed" SIMM to a new location. What new message did you receive?

_____

_____

_____

ACTIVITY

6. Remove the tape from the "bad" SIMM and reinstall all of your memory.

7. Replace the cover and test the system to ensure that it still works.

Compatibility and Interchangeability

Memory is not necessarily interchangeable between systems. For example the NeXTstation Color and the Turbo systems have compatible memory, but their SIMMs will not fit in the older Cubes and monochrome NeXTstations. Even though SIMMs in NeXTstation Color are physically compatible with the Turbos, the new computers are likely to have performance problems if the slower memory from an older color computer is installed.

Also, you should only use memory from manufacturers that are specifically qualified by NeXT. Using "off-brand" memory is very likely to bring you grief.

Refer to Appendix D, **SIMM Compatibility Chart**, to determine which SIMMs to use.

Wrap-up

In this module you have discovered how to use the ROM monitor error message display to troubleshoot memory failures. With the information in this display you can determine exactly which SIMM has failed and replace it using proper anti-static safety precautions.

Module 5
NeXT Monitors

There are a few things that you can check before you send that dim monitor back for repair. It may be possible to adjust the brightness or the contrast; or correct the focus. There are other adjustments that you can do, as well. In addition to adjustments, there are some parts that can be replaced in the field. Careful and thorough procedure might save you time and money.

In this module you will learn how to perform these adjustments and how to replace all replaceable parts. Plus all of the proper safety precautions to take.

Objectives

After completing this module, you'll be able to:

- Perform all available monitor adjustments.
- Remove and replace field replaceable parts.
- Analyze problems associated with NeXT monitors.

Adjust It

All of the adjustments that can be performed are accessible on the back of the MegaPixel Display™. The adjusters behind the bucket of the display.

EXERCISE In this exercise you will open the back of the display and perform all field adjustments available to the service engineer.

Note: These adjustments only apply to the NeXT MegaPixel Display™. There are no internal field adjustments possible on the NeXT 17" and 21" color displays.

Here is a list of what the controls adjust.

Cutoff	Adjusts black level
White Level	Adjusts white level
Focus	Sets primary focus
Width	Adjusts horizontal size
V Height	Adjusts vertical size
H Cent	Sets horizontal display position
V Cent	Sets vertical display position
V Lin	Adjusts the aspect ratio

Warning: Fatally high voltages are present.Use extreme caution when working on open display systems. Remove any anti-static wrist straps or jewelry before attempting to work on computer displays.

1. Disconnect all cables from the rear of the monitor.

2. Remove the four hex screws that attach the bucket and remove the bucket.

3. Reattach the cables and power the system on.

4. Load USMonitor_Adjust.tiff. If you don't have access to this file see your instructor.

Note: USMonitor_Adjust.tiff is a picture file that is the size of an 11 by 8.5 inch landscape page with some 12 point text and concentric squares. You can use any style of display to adjust brightness and focus. The standard size page display of the monitor adjustment file assists in adjusting proper display size.

5. Use the lower corner drag handles to increase the TIFF window until the scroll bars disappear.

6. Adjust the Cutoff control by turning it counter clockwise until the black margin of the display turns gray. Adjust Cutoff clockwise until the gray disappears. Turn Cutoff clockwise again 1/8 - 1/4 of a turn.If the display darkens too much, readjust Cutoff to desired threshold.

7. Adjust White Level for desired brightness.

8. Use H Cent and V Cent to set the position for the center of the display.

9. Place a sheet of 8.5 x 11 inch paper on the display face, such that it covers the image. The sheet of paper should exactly align with the TIFF image.

10. Use the Width and V Height adjustors if the image does not align with the sheet of paper.

11. Remove the sheet of paper and use the Focus control to adjust the focus of the text in all quadrants of the display.

Repairing Monitors

If the adjustments are not enough to produce satisfactory output, there may be more serious damage. Other than sending the whole monitor in to the factory, the only other replaceable component is the L-board.

There are no test points that can be used to measure voltages, currents, etc. The best way to verify the condition of the L-board is to swap it with a known working one.

EXERCISE

◆ In this exercise you will remove and replace the L-board.

Warning: Extremely dangerous voltages may be present even when power is not. Be sure to remove all jewelry. Follow all safety precautions carefully.

There have been three versions of the MegaPixel Display™. Maintenance-wise they only differ slightly. You instructor will point out the differences.

1. Power off the computer and remove all cables from the monitor.

2. Follow the procedure in the MegaPixel Display Job Aid in Appendix B for bleeding the anode voltage and removing the L-board.

3. Reassemble the monitor.

Warning: When reassembling the monitor make absolutely certain that anode cap is installed properly with both prongs inserted into the hole. The bleeder resistor that normally bleeds the anode voltage will not be in the circuit if the anode is not installed correctly. If the monitor is powered with the anode cap incorrectly installed, you will have to manually bleed the anode before handling the monitor.

QUESTION

◆ What system functions, other than video, could be affected by the L-board?

_____

Wrap Up

In this module you learned how to adjust the MegaPixel Display™ crisp, precise output. You also learned how to remove and replace subassemblies of the MegaPixel display.

Module 6
NeXT 400 DPI Printers

In this module we will investigate some common printer malfunctions and remove and replace printer subassemblies.

Objectives

After completing this module, you'll be able to:

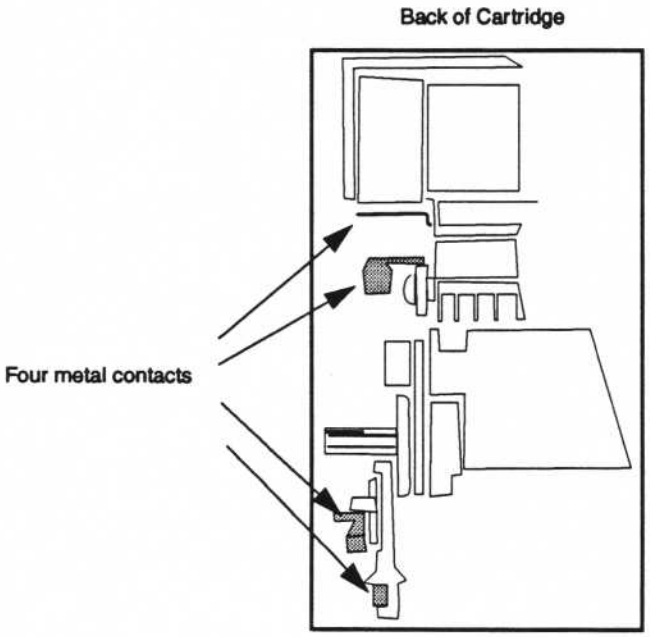
- Follow procedures listed in the Laser Printer Service manual for troubleshooting common printer malfunctions.
- Remove and replace field replaceable parts in accordance with the Laser Printer Service Manual.

Output Quality Problems

A substantial number of image defects occur with the toner cartridge. It is quite common, these days, to buy replacement toner cartridges from remanufacturers. If this is the case where you work, make sure to get a full replacement warrantee in writing. Though, refurbished cartridges usually work well, every-now-and-then you might get one that doesn't work so well. If that happens be sure and get your money back.

ACTIVITY

- Remove the toner cartridge from the printer. Turn the cartridge upside down. Notice the four metal contacts along one side. Place a piece of scotch tape on each contact, one at a time and describe the output below. Locate the bad output in the service manual.



Paper Jams

Paper jams can be caused by problems ranging from fault sensors to environmental factors. Make sure that you follow the troubleshooting table in the Laser Printer Service manual for paper jams.

QUESTIONS

1. What are the three major sections for paper transport?

2. Which printed circuit boards, if faulty, are likely to cause paper jams?

3. Which roller assembly might be a problem if the printer doesn't pick up paper?

Repairing the Printer

It's time to remove and replace some parts.

ACTIVITY

- Using the Laser Printer Service Manual remove all assemblies necessary for removal of the DC Drive Motor. Show your instructor when you have removed all parts.

- Replace all parts and test printer.

Note: You will lose points if there is any spare hardware or if the printer doesn't work.

Wrap Up

In this module you investigated several output quality problems and paper jam symptoms. You also got a chance to remove and replace several parts. Hopefully, reassembly went smoothly, the printer still works, and there are no spare parts. Of course.

Now you have a firm grasp of how to use the Laser Printer Service Manual. It will be invaluable in helping you to troubleshoot and maintain your NeXT Laser Printer.

Appendix A
Answers

This appendix contains answers to selected questions and exercises from the modules. Only those questions and exercises having a specific answer are dealt with here.

Module 1: Troubleshooting Preparation

Tools of the Trade

QUESTIONS

1. 3 mm

2. To protect the equipment from the effects of electrostatic discharge.

Module 2: Hard Disk Diagnostics

Defining Symptoms

1. The SCSI disk "sd0." The last line of the message shows that "sd0 (0,0) is the failed device.

Mounting a Disk Device

1. The mach is actually a link file. Once the hard disk has been mounted you can recreate any needed files on it.

2. /dev/sd0a

Repairing a File System

1. Use newfs or disk to find a valid alternate superblock. Use fsck -b to repair the file system with the alternate superblock.

2. In the /lost+found.

Circumventing Minor Media Errors

1. Some SCSI drives will fail because they do not implement the reassign block function. Also, the disk may run out of spare blocks if blocks in a particular area are reassigned too many times.

Using the disk Utility

1. init

2. label, boot

Module 4: Memory Diagnostics

Test Yourself

1. The SIMM in slot 2.

2. Slots 2 & 3.

3. The SIMM in slot 14

Module 6: NeXT 400 DPI Laser Printers

Paper Jams

1. Pickup section, Separation and feeder section, Fixing and delivery section

2. Driver Sensor PCB, DC Controller PCB

3. Pickup roller