

adding to and troubleshooting NeXT memory

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Installing memory in a NeXT computer is an easy, inexpensive way to improve your system's performance. And with the new 33-megahertz (MHz) NeXT Turbo systems, the new 25 MHz NeXTstation^δ, and the earlier NeXTcubes^δ, you can add to or upgrade your memory yourself. This article lets you know just what's involved and includes help in case you run into trouble.

You'll remember that only Authorized Service Providers (ASPs) are allowed to service NeXTstation Color systems or first-generation 25MHz NeXTstations. On all NeXT systems, an ASP is required for such services as upgrading or repairing hard disks or replacing CPUs. When the new 25MHz NeXTstation Color system is

available sometime this fall, you'll be able to upgrade its memory, too. For information, you can call 1-800-848-NeXT.

deciding what you need

The first step is to review your memory configuration. The processor boards in the NeXT Turbo systems and the new 25 MHz NeXTstation have 4 slots for single inline memory modules (SIMMs). On the NeXTdimension[®] board for the NeXTcube, there are 8 slots, and on the processor board for the 25 MHz NeXTcube, 16 slots.

No matter which board you have, you must install SIMMs in identical pairs, although the pairs can differ from each other. If you want to configure your computer to allow parity checking, however, be sure to install all parity SIMMs. You can use parity memory in the NeXT Turbo systems with little, if any, performance degradation, unless you fully load your system with double-sided parity SIMMs, which will cause about an 8 percent performance degradation.

Memory installed in NeXT computers resides in banks, each consisting of a set of two or four identical SIMMs. Combinations of 4-MB or 8-MB SIMMs are allowed as long as all the SIMMs in a particular bank have the same capacity and speed. All the NeXT Turbo computers require SIMMs installed in sets of two. First-generation NeXTcubes and NeXTdimension processor boards require SIMMs installed in sets of four.

how to tell when you've got the new 25 MHz NeXTstation

The new 25 MHz NeXTstation board requires different SIMMs from the old version. Like the NeXT Turbo systems, the 25 MHz NeXTstation's processor board includes four memory sockets that require 72-pin, 70-ns SIMMs. Both single- and double-sided SIMMs are compatible.

NeXT began shipping the new 25 MHz NeXTstation in late June 1992. All system serial numbers higher than ABB0028000 include the new boards. A few systems shipped in late June with lower serial numbers also have the new boards. To find out whether you have one of these new NeXTstations, check the system's memory configuration by using the ROM monitor's print memory configuration command m.

- 7 With the machine powered down, press the Power key to power on.
- 7 As soon as the message "Testing system..." disappears, press Command-Command-tilde (~).
- 7 In the ROM monitor, type m and press Return.

If you have a new 25 MHz NeXTstation, messages will report memory contained in only 4 slots (slots 0-3). Old 25 MHz boards return messages for 16 slots (slots 0-15).

Table 1 shows possible memory configurations for the 4-slot processor boards, which use the 72-pin, 70-nanosecond (ns) SIMMs. The 8-slot NeXTdimension processor boards use 72-pin, 80-ns SIMMs; and the 16-slot NeXTcube boards use the smaller 30-pin, 100-ns SIMMs.

table 1: memory capacity for NeXT Turbo systems

total RAM	slot 1	slot 2	slot 3	slot 4
8 MB	4 MB	4 MB		

16 MB	8 MB	8 MB		
16 MB	4 MB	4 MB	4 MB	4 MB
24 MB	8 MB	8 MB	4 MB	4MB
32 MB	8 MB	8 MB	8 MB	8 MB
64 MB	16 MB	16 MB	16 MB	16 MB
128 MB	32 MB	32 MB	32 MB	32 MB

upgrading and adding memory

Now we'll get into the nitty-gritty, going through the process step by step with the NeXTstation Turbo Color system as the primary example. Where other NeXT computers differ, those differences are explained. For a more thorough discussion of installing memory in any of these systems, see its owner's guide.

Note: NeXT computers contain circuits easily damaged by static electricity. When you receive your new SIMMs from NeXT, you get a disposable antistatic wriststrap to use when you install them.To prevent damage from static electricity, always wear

the antistatic wriststrap when you install or remove SIMMs. You can't use your computer as a ground because it will be unplugged when you work on it.

accessing memory slots

1. Back up your system's hard disk and remove any floppy disks. Note that you can damage the floppy disk drive if you try to remove the cover when a floppy disk is inserted.
2. Turn off the computer, display, and any peripheral devices.
3. Leave your computer plugged in while you unplug the display and peripherals from their power sources and disconnect their cables from the back of the computer. If there is a network cable connected to the computer, disconnect it; then unplug the power cord and disconnect it from the computer.
4. Remove the single screw from the back of the computer and tilt the back of the

cover away from the CPU board until you can move it away from the unit.

5. Locate the memory slots next to the power supply, as shown here:

figure-1-b.eps ,

ordering SIMMs from NeXT

simm-sheet.ps ,

NeXTcube and NeXTdimension

For the NeXTcube, use a hex wrench to loosen the four captive screws that hold the back panel in place. Pull the panel away from the cube and unplug the fan cable from the fan. Firmly pull the processor board out of the cube until you can disconnect the two data cables from it. Slide the board out of the cube and lay it on your work surface with the component side up.

The memory slots in the first-generation NeXTcube and on the NeXTdimension board start with the first slot nearest the edge. In the NeXTcube Turbo, the fourth slot is nearest the edge.

removing SIMMs

1. Starting with the slot nearest the power supply, use your thumbs to push the metal tabs at each end of the slot away from the SIMM. When a SIMM is firmly in place, these tabs fit securely around each end of the module. Handle the tabs carefully. If a tab bends or breaks, you have to replace your CPU board!

Gently tilt the SIMM toward the power supply until it comes free from its slot.

2. Repeat this process with all remaining SIMMs.

NeXTcube Turbo

SIMMs installed on this board are tilted at a 45-degree angle away from the edge of the board. After you release the tabs, move the SIMMs toward an upright position

until you can pull them out of their slots.

first-generation NeXTcube

Use a SIMM-removal tool, which you can buy at any computer store, to remove SIMMs from this board. Starting with the SIMM nearest the edge of the board, insert the point of the bent end of the tool into the hole near one edge of the SIMM. Firmly pry the SIMM up and out of that side of its slot. Repeat this process on the other side of the SIMM. Remove each successive SIMM using the same method.

adding SIMMs

The SIMMs in each pair must have the same speed, capacity, and electrical characteristics, but the pairs of SIMMs may be different. Note that slots 1 and 2 must be filled, or the computer won't pass its self-test.

1. Starting with the empty slot nearest the power supply, position the SIMM so the notch is in its lower left corner.

2. Insert the notched corner into the slot first; then move the rest of the SIMM into the slot, keeping it at a 45-degree angle, as shown:
3. Repeat steps 1-2 for each SIMM.
4. When you've placed all SIMMS in their slots, start with the SIMM farthest from the power supply and, one by one, tilt each SIMM into a vertical position. Make sure that the tabs at the end of each slot fit securely around the ends of each SIMM and that all SIMMs are seated firmly in their slots.

If you're adding a pair of SIMMs to an existing pair, tilt the already installed SIMMs until they lean at about a 45-degree angle toward the power supply before installing the new SIMMs.

NeXTcube Turbo

Position the SIMM so the notched corner is on the side away from the yellow battery in the corner of the board. Holding the SIMM nearly vertical, insert it into the empty slot farthest from the edge of the board. Tilt the SIMM 45 degrees away from the edge of the board until the tabs on the ends of the slot fit securely around the ends of the SIMM. Repeat this process with each SIMM.

first-generation NeXTcube

Facing the part of the board that has the external connectors, position the SIMM so the chips on it face you. On this board, there are no tabs. Starting with the slot nearest the edge of the board, press the SIMM firmly into the slot until you hear it click into place. Repeat this process with each SIMM.

troubleshooting memory

When you turn on your computer after installing or upgrading memory, if the system powers on but fails its power-on self-test because of a memory error, it displays a message that tells you which SIMM or slot is reporting the failure. The message

varies depending on which type of computer you have.

NeXTstation Turbo, new 25 MHz NeXTstation, and NeXTcube Turbo

Here's an example of how to interpret a failure message for these computers. Our example is for the NeXTstation Turbo Color.

When the power-on self-test fails, a message similar to the following appears on the display:

Memory error at location: 64404e5

To figure out from this message which SIMM is causing the problem, you need to know the following:

- 7 Reads and writes to memory addresses are performed in 16-bit words.
- 7 SIMM slots 1 and 2 contain memory addresses between 4000000 and 7ffffff

hexadecimal. Each SIMM in this pair is used to store odd or even words. Slot 1 holds odd words; slot 2, even, as shown in table2.

table 2: memory addresses in the NeXTstation and NeXTcube Turbos

slot	memory address range	SIMM
slot 1	4000000-7ffffff	odd
slot 2	4000000-7ffffff	even
slot 3	8000000-bffffff	odd
slot 4	8000000-bffffff	even

7 Slots 3 and 4 contain addresses 8000000 through bffffff. Slot 3 holds odd words; slot 4, even.

7 The first digit of the error message tells you which pair of slots contains the failed SIMM. Numbers 4-7 indicate that the first pair (slots 1 and 2) has the bad SIMM. Digits 8-b indicate the second pair (slots 3 and 4).

- 7 The last digit in the message tells you whether the failed slot is odd or even. If the last digit is 0, 1, 2, 3, 8, 9, a, or b, the failed SIMM is even. If the last digit is 4, 5, 6, 7, c, d, e, or f, the failed SIMM is odd.

Now you can interpret the sample message that said the memory error is at location 64404e5. The 6 in the first digit of the address tells you that one of the SIMMs in slots 1 or 2 is bad. The 5 in the last digit says that it's the odd SIMM.

When you've determined which SIMM has failed, call 1-800-848-NeXT and select the Service and Support option (press 4) to order replacement SIMMs.

first-generation NeXTcube and NeXTdimension board

Now we'll look at the message displayed by the NeXTcube and NeXTdimension. When the power-on self-test fails, a message similar to the following appears:

Memory error at location: 64404e8

Value at time of failure: aabaaaaa
Coupling dependent memory fault!
One or more SIMMs at memory bank 2 is bad
Note: bank 0 is the first bank
Main Memory Test Failed

This message gives you all the information you need to determine which SIMM needs to be replaced. Line 4 in the sample message indicates that memory bank 2 is reporting the failure. To find out which of the four SIMMs that make up this bank has failed, you have to do a bit of detective work.

Line 2 tells you that the value at the time of failure was aabaaaaa. To interpret this value, you need to figure out what repeating pattern the memory test was trying to write into memory. To find the pattern, break the value into pairs of digits. Each pair represents a SIMM. Then, working from right to left across the pattern, examine the pairs of digits until you can tell what the pattern is for each SIMM.

This time the test tried to write all as into this single memory location. The test then detected the error while reading the results. In this case, the third pair from the right contains a b, which tells us that the third SIMM in bank 2 has failed.

aa | ba | aa | aa

The power-on self-test doesn't always write the same value in each digit. The following are some other values the test writes in memory. Remember, always break these values into pairs of digits and always study the pairs from right to left when you try to determine the pattern.

00000000
ffffff
55555555
aaaaaaaa
b6db6db6
db6db6db

When you've determined which SIMM has failed, call 1-800-848-NeXT and select the Service and Support option (press 4) to order replacement SIMMs.

what to do if all else fails

If the failure message doesn't go away or doesn't change, something more drastic may be amiss. This would be a good time to call in the cavalry-your nearest NeXT Authorized Service Provider.