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[NeXT_FAQ] 05_Black (NeXT) hardware

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The NEXTSTEP/OpenStep FAQ

5 Black (NeXT) hardware

5.1 What disk drives will work with the NeXT?

disk drives

There are some situations in which there are problems. Here is a short list which might help you in your disk drive quest:

- These drives don't work with NeXT hardware: `FUJITSU 2684SAU, SEAGATE ST51080N, IBM IB06H8891`
- The SCSI driver for NeXT hardware only accepts asynchronous data transfer. Although every new SCSI-2 drive should support this mode, this isn't true for certain drives. Also sometimes there is a hardware switch (a little jumper on the drive) which switches between synchronous and asynchronous mode. You definitly can only use asynchronous disks!
- There are also problems with sync negotiation on NeXT hardware. In general there should be another jumper to toggle this are you might change this with an SCSI utility. There are also problems with the tagged command queuing option. Anyway all these problem can be solved. Often these problems arise with IBM drives. We recommand to look in the technical documentation of the drive, which is available only from IBM's WWW site directly.

Most SCSI disk drives will work without modifying `/etc/disktab`.

There are problems with the installation of boot blocks and badly formed fstab generated by BuildDisk of NEXTSTEP 2.0. A disk connected to the NeXT will need to have a NeXT specific label written to it before it can be properly recognized by the system. If you get an error message "Invalid Label..." this indicates that the drive was successfully seen by the NeXT machine but it does not have the proper label, to install a label use the `/usr/etc/disk` program on the raw disk device that the system assigned to the device and use the label command to write the label onto the disk. [how the NeXT assigns disk devices is explained in the N&SA manual]

NEXTSTEP releases 2.0 and up provide a low level disk formatter, `sdform`, which does not offer much flexibility, but gets the job done. Most drives are already formatted at the factory. You might look for the utility `sdformat` on the FTP sites as well, which overcomes some problems of `sdform` supplied by NeXT.

5.2 Will a 68030 NeXT Computer run NEXTSTEP 3.3?

NS3.3 and 68030

Yes, but note that NeXTstep 3.3 is be optimized for the 68040 CPUs. NeXTstep 1.0 and 2.x were optimized for the 68030 CPU, 68882 FPU machines.

5.3 Does a FUJITSU MO (256 MB) works with NeXT original Hardware?

FUJITSU MO

Yes, they do

5.4 Can I run my SCSI-2 disks in synchronous mode?

SCSI-2, synchronous
synchronous mode

Quick answer is: No. The reason is that the NeXT does not support synchronous transfers from the SCSI bus. It does support SCSI-2 disks running in asynchronous mode, which all SCSI-2 disks must do.

5.5 How do I configure my HP 660 to boot properly?

HP 660, boot
boot, HP 660

It has been reported that HP drives fail to autoboot on power on or while other devices are on the scsi bus. The problem seems to be with drives configured to spin-up automatically on power on do not get recognized at boot time. To remedy this problem reliably with HP 660Mb (HP97548) and 1Gbyte (HP 97549) drives remove the auto spinup jumper on the back of the drive. Looking at the disk from the back with the power connector on the lower left, it is the sixth jumper.

The official fix was an EPROM change to the HP drive from HP. The HP drives took too long to wait up, so the system wasn't happy with the other drives coming ready first especially when the HP was suppose to be the boot device. (The EPROM is no longer available from NeXT).

5.6 What is the procedure for installing a Fujitsu M2263SA/SB SCSI Disk as the NeXT Boot Disk?

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Fujitsu M2263SA/SB

See Izumi Ohzawa's note in `/pub/next/docs/fujitsu.recipe` available via anonymous ftp from `sonata.cc.purdue.edu`.

5.7 How to mount a corrupted OD that won't automount?

OD, corrupt
OD, mount

If you can't automount an OD, and you can't fix it, you can still manually mount it. Log in as root. Type `/usr/etc/mount /dev/od0a /Fo0`. It will ask you to insert the disk. Insert it. It is mounted.

This method WILL mount a corrupted OD so you can read its contents. Since it is corrupted, it is not recommended to write to it. You should copy the important files to something else, then reformat it.

5.8 What non-NeXT CD Players that work with a NeXT?

CD-ROM, NeXT

A USENET survey summary:

```
Apple CD-150
PLI 1035N for NeXT
SUN CD-ROM drive (Sony CDU-8012, Rev. 3.1a)
NEC 73M and 74 (transfer rates > of 300 KB/sec.)
NEC 84 S
NEC 4xi
NEC 6x speed
Apple CD-SC (Sony 541-22 mechanism)
Apple CD-300
Apple CD-300+
Chinon CDS-431 (with new drivers)
Eclipse CD-ROM from Microtech
Toshiba 3201
Toshiba 3301
Toshiba 3401
Toshiba 3501
Toshiba TXM3301E1
Toshiba XM-2200A external
Toshiba XM3601
Plextor Quadspeed
Plextor PX-63CS (6xspeed)
DENON DRD-253 external (data only, no music)
HP's LaserROM drive (Toshiba XM-3301TA drive in HP's box)
Texel 3024 (required a firmware upgrade to version was 1.11)
```

As with all SCSI devices, they just work. Some drives only get problems with their audio support with CD-Player (due to not standardized SCSI audio commands, but this isn't a NeXT specific problem!)

In contrary the question should be: are there SCSI CD-ROMs which don't work together with NEXTSTEP?

5.9 What are some other sources of toner cartridges and trays for the NeXT laser printer?

toner, NeXT printer

The toner cartridge is a standard EP-S cartridge, the same that fits the HP LaserJet III and some other printers.

Any HP LaserJet II or III will fit. HPLJ4mSI cartridges do NOT fit. Any HP LJII or LJIII paper tray will fit. IIISI and 4 trays will not. Confused? Read again :-)

5.10 What printers (laser or otherwise) may be used with a NeXT?

Contact me

printers, on NeXT

If you plan to connect an HP LaserJet (II, IIP, III, etc.) you need to make a special cable in order for the NeXT 040 and HP to get the hardware handshaking correct. This is true for whatever version of the OS you are running.

NeXT 68040 to HP LaserJet III Cable (not a Null-modem cable):

```
Mini-Din   HP DB-25

1  (DTR)   nc
2  (DCD)   4   (RTS)
3  (TXD)   3   (RXD)
4  (GND)   7   (GND)
5  (RXD)   2   (TXD)
6  (RTS)   5   (CTS)
7  (RTXC)  nc
8  (CTS)   20  (DTR)
```

You may want to use hardware flow control for reliability (ie `/dev/ttyfa`).

If you have problems with other printers, check the cable pinouts in the printer's manual against the one recommended in the `zs` man-page! Refer to Chapter 13 in Network and System Administration.

5.11 What can I do to prevent my NeXT printer from running all the time?

printer, turning off

The NeXT 400dpi printer powers up every time you boot up when the print daemon is started (`/usr/lib/NextPrinter/npd` in `/etc/rc`). Apart from not running the daemon at boot time (commenting it out and having to run it by hand later), you can add the following lines to `/etc/rc.local`:

```
if [ -f /usr/etc/nppower ]; then
  sleep 3
  /usr/etc/nppower off
  (echo 'powering off NeXTprinter') >/dev/console
fi
```

Once you queue a print job the printer daemon will automatically power up the NeXT printer for you. The printer daemon will not automatically power off the machine after a print job, you will need to turn off the printer by typing `/usr/etc/nppower off`.

5.12 What type of microphones will work with the NeXT?

microphone, NeXT

Some NeXT owners use the RadioShack (Realistic) Tie Clip Microphone ($19.95) cat 33-1052. NeXT Computer, Inc. uses the "Sony Electret Condenser Microphone ECM-K7" in-house (available for $60). Some use Sony Tie-Clip microphone, #ECM-144, which costs around $40. Others have successfully used a WalMart brand microphone (available for $6).

5.13 How do I connect a modem to the NeXT?

modem, on NeXT

Previously, we suggested that people use Mac modem cables; however, it has come to our attention that there is no one standard Mac modem cable.

Since correct modem operation on a NeXT depends upon a correctly wired modem cable, buying a Mac cable is not a good idea. Some Mac cables do not allow dial-in and no Mac cable allows the use of hardware flow control. For these reasons, we are recommending that only cables that meet NeXT specifications be used. [however, if you have a Mac modem cable lying around and don't care about dial-in or hardware flow control, then by all means....]

These cables are available commercially from any store, how still sells NeXT stuff, and from Computer Cables and Devices, or can be custom built. Note that no off- the-shelf Mac cable will allow hardware flow control. It is however possible to make a such a cable from an Imagewriter II cable by replacing one of the mini-8 ends with a DB-25 connector.

Hardware flow control is absolutely essential for all serial port connections with speeds of 9600 bps and above. Make certain that you cable supports it, your modem is configured to use it and you are using the hardware flowcontrol devices `/dev/cuf[ab]`, `/dev/ttydf[ab]` and `/dev/ttyf[ab]`, respectively.

Most people use `tip` or `kermit` to control the modem. SLIP and/or UUCP may also be used (but are more complicated to set up and require the remote machine to also have SLIP and/or UUCP (respectively)).

A version of the DOS-program pcomm can be found on `ftp.informatik.uni-muenchen.de`

The 2.0 Network and System Administration Manual, which is available in hard-copy (shipped with each machine) contains an

extensive description of how to use modems with the NeXT machine. Additionally NeXT in their TechSupportNotes series called SerialPortDoc.wn and UUCP for 1.0/1.0a systems . This document is available from most FTP sites that carry NextAnswers. Also, try to obtain the `about.modem.Z` file by Mark Adler in the `pub/next/lore` directory on `sonata.cc.purdue.edu`

5.14 Are there any alternative sources for the SCSI-II to SCSI-I cable required to attach external SCSI devices to the 040 NeXTs?

SCSI cable to NeXT

Yes. This cable is the same as the one used by Sun SparcStations and DecStation 5000's (but not DecStation 3100's which use 68-pin micro rather than the 50pin micro connector used on NeXT 040, Suns and DecStation 5000).

The implication that a Sun SparcStation cable can be used with NeXT peripherals is generally false. NeXT themselves, and DEC, and nearly everyone else who makes SCSI peripherals, puts Telco-50 (centronics) connectors on their devices. Sun in their infinite wisdom uses DD50 which are quite different. Telco-50 is an approved connector type in the SCSI spec.

Probably the original point was that the 50-pin microSCSI on the NeXT and Sun and some DecStations was different from the 68-pin microSCSI on the DecStation 5000. But this does not address the other end of the cable.

5.15 What fax modems will work with the NeXT?

fax modem, on NeXT

Most available modems of today, don't work for with the general fax driver available with NEXTSTEP. In this case you need to perchuse a commercial solution: 'NXFax'. There are demos available. The following information is pretty much old, and might probably be obsolete now:

The following fax modems are currently available for the NeXT Computer:

```
Manufacturer, Model Supplier, Type

DoveFax for NeXT, Dove Computer, Class 1
HSD FaxMaster, HSD Microcomputer, Class 2*
mix fax, i.link GmbH, Class 2**
SupraFAXModem V.32bis, Supra Corp., Class 2 (requires DFax driver or NXFax driver)
ZyXEL U-1496E/E+/S/S+, ZyXEL USA, Class 2 (requires NXFax driver)
Telebit T3000 with fax option
Telebit WorldBlazer with fax option (requires NXFax driver)
Neuron 1414/1414+ with ZyXEL ROM upgrade (requires NXFax driver)
```

(Neuron 1414 and Neuron 1414+ modems are relabelled ZyXEL modems. Contact ZyXEL USA for ROM upgrades. Neuron modems with 512K ROMs should upgrade their ROMs and ROM sockets to 1 Mb ROMs. People with 1Mb ROMs should just order the new ROMs.)

(*) Note that the Class 2 is not yet approved; it is still out for ballot, after having failed in an October 1990 round. The Abaton InterFax 24/96 NX driver supports Class 2 as it was in that draft; there are expected to be very few changes prior to approval.

(**) Note that mix fax works with both the October 1990 and October 1991 draft versions of Class 2, especially with the NeXT supplied Class 2 modem driver. Upgrading to an approved version of Class 2 would be a matter of just a software update (holds true for any forthcoming (class 3?) standard, for that matter).

In order to use a fax modem with the NeXT Computer, a NeXT compatible fax driver must be available to operate the modem. Modem control procedures may be proprietary or conform to one of the following EIA/TIA standards:

Class 1: CCITT T.30 session management and CCITT T.4 image data handling are controlled by the driver.

Class 2*: CCITT T.30 session management and image data transport are handled by the modem. CCITT T.4 image data preparation and interpretation are controlled by the driver.

Release 2.0 of the NeXT system software includes a Class 2 modem driver which will work with any fax modem which meets the EIA/TIA Asynchronous Facsimile Control standard. Other fax modems must supply a NeXT compatible driver.

Note that there's a small bug in 2.0 (fixed in 2.1): a symbolic link is missing for the file `Class2_Fax_Modem_Driver` in `/usr/lib/NextPrinter`. The simple fix: create the link; it should reference `Interfax_Fax_Modem_Driver`, also in the `/usr/lib/NextPrinter` directory.

An alternative workaround for Class 2, especially useful for novices: just use InterFax as the modem type in PrintManager, rather than Class 2*.

After installing a fax modem using PrintManager one must repeat setting things in the Fax Options panel in order for them to be stored correctly. In particular, these include the Rings to Answer and Number of Times to Retry. This affects all fax modems

being installed.

If one uses illegal characters in the Modems Number field in the Fax Options when configuring an InterFax modem then the modem will not answer the phone. Legal characters are digits, spaces, and plus signs. This does not affect the Dove modem.

Modems from the german vendor Dr. Neuhaus also work with the internal Fax-Driver. But only the FURY-series does.

5.16 How may I attach more than two serial ports to the NeXT?

serial port, >2 on NeXT

TTYDSP From Yrrid converts the DSP port into an additional serial port.

```
Yrrid Incorporated
507 Monroe St.
Chapel Hill, NC 27516
Voice: 919-968-7858
Fax: 919-968-7856
E-mail: yrrid@world.std.com
```

Unitnet has a device, the SLAT, that will connect to the scsi bus.

```
Uninet Peripherals, Inc.
Voice: 714-263-4222
Fax: 714-263-4299
```

Central Data Corporation made the scsiTerminal Server family of products. However they stopped supporting NeXT hardwer. We are told that Central Data may consider the solling or giving of the driver source to an interested party.

```
Phone: 217/359-8010
Toll-free: 800/482-0315
FAX: 217-359-6904
Email: info@cd.com, support@cd.com, sales@cd.com
```

Also, one can use an IP terminal server. In a non-Internet environment, inexpensive terminal servers, which don't control access to the network securely, can be used. If your network is an Internet subnet, you must use a terminal server that controls either: (1) who can log into the terminal server, or (2) which machines the terminal server will access. These tend to be more expensive (around $250/port, but in 8-port increments), but it may be quite economical means of sharing ports among many NeXTs (or other computers) on the network.

Particularly if one has a NeXT network, an Ethernet terminal server may be the way to go. One that supports Linemode Telnet (such as the Xylogics Annex III) will offer the best performance.

5.17 What is the best and/or cheapest way to connect a NeXT to a thick Ethernet?

Ethernet, thick

There are many possible solutions. For example, here are three:

- The University of Waterloo (Audio Research Group) uses an old door-stop PC XT clone with two Western Digital cards (WD8003E Ethercard Plus, $250 CDN each; you should be able to get them for under $200 (US$)) running Vance Morrison's PCRoute (available from accuvax.nwu.edu). You will also need a thickwire transceiver and a drop cable (about $300). In addition, you will need Internet addresses for the NeXT and both PC Ethernet cards (and a subnet address). The documentation for PCRoute contains quite a bit of information on the performance of this setup. This solution requires two subnets. There is another program called PCbridge that allows the machines on the thin and thick wires to be part of the same subnet. This product also does packet filtering, so that packets destined to machines on the same side of the net do not cross over.
- Cabletron sells a MR-2000C Singleport Repeater for $695 that does exactly what you need minus drop cable and transceiver. Their number is (408) 441-9900.
- The march 1992 INMAC networking and connectivity products catalog lists thicknet to thinnet converters. Product number Z903071 price $445. Claims full ieee 802.3 compatibility and diagnostic LED's.
- NuData (908)-842-5757 (USA) sells AUI<->10 base-T boxes for about $149.

5.18 How can I connect my NeXT to the telephone line and use it like an answering Machine?

answering machine

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A company that is selling both hardware and software to allow you to do this:

```
SES Computing
13206 Jenner Lane
Austin, Texas 78729
Voice: (512) 219-9468 (Demo system number)
```

i.link, a european company, has a combined data/fax modem and telephone answering machine. It uses the DSP port and is implemented mainly in software on the DSP with a little bit of hardware to interface to the phone line.

```
i.link GmbH
Nollendorfstrasse 11-12
D-1000 Berlin 30
Germany
Tel: +49 30 216 20 48
Fax: +49 30 215 82 74
E-mail: info@ilink.de
```

5.19 What color monitors can I use with the Color NeXT machines?

monitor, color

The important specs for the color monitor are:

```
Horz Scan Rate: 61 KHz
Vertical Scan Rate: 68 Hz
Resolution: 1280x1024 (NeXT uses 1120x832) NON-INTERLACED
```

Displays may require alignment to adjust for the scan rate of NeXT machines.

The Nanao T560i 17" color display has been used with NeXTstation Color machines, and seems to work well.

Some larger NEC displays have also worked.

5.20 Where can I get 13W3 to BNC adapters to connect third party color monitors?

13W3 to BNC
BNC to 13W3

You can get them from:`NeXT/Bell Atlantic: part number S4025`.

NuData in New Jersey carries 13W3 female to 4 BNC male connectors. The price is about $100.

```
NuData
Voice: 908-842-5757
```

DISCLAIMER: I take no responsibility for the following. If you can source the bits yourself here's how it's built.

```
1 female 13W3 connector
3 Male BNC connectors
3 mini coax

ie. the pins to the coaxial are male and the regular pins are female.

Looks like this.

.  o o o o o .     .     13W3 FEMALE
A1 o o o o o A2    A3
|            |     |
|            |     |
|            |     |
Red          Green Blue  3 BNC's
```

Contact me

That's the coax part. The outer shielding of the coax's are grounded on both pin 10 and the case.

5.21 How may I attach Centronics or 16 bit wide parallel ports to the NeXT?

centronics, NeXT
parallel port, NeXT

Uninet has devices, the SLAT-2 and the SLAT-DRV11, that will connect to the scsi bus.

```
Uninet Peripherals, Inc.
Voice: 714-263-4222
Fax: 714-263-4299
zardoz!sales@ics.uci.edu or uunet!ucivax!zardoz!sales
```

5.22 Why does an unused serial port consume cpu?

serial port, cpu power usage

Perhaps you've got a (probably fairly long) unshielded serial cable attached to it, with either nothing at the other end or a powered-off device at the other end. EE's call this an antenna. It's probably picking up most of the radio stations in your area, which the serial chip is interpreting as a continuous stream of garbage bytes, which it feeds to getty, which tries to interpret them as login attempts.

How do you avoid this problem?

- leave the device at the other end switched on (even when it's not transmitting, it will assert a voltage that overrides the noise)
- unplug the cable from the next when you're not using it
- use `'kill -STOP'` & `'kill -CONT'` to stop and resume the getty process as needed
- buy an adequately shielded serial cable

5.23 How to adjust MegaPixel Display brightness and focus?

brightness, MegaPixel
focus, MegaPixel

Adjust it using the following information.

From: `Charles William Swiger <infidel@cmu.edu>`

I have adjusted several monitors with no problems, but make sure you know what you are doing before opening anything. I expressly disclaim responsibility for any ill results that may occur.

In order to adjust NeXT's MegaPixel display (called 'the monitor' hereafter), you'll need (a) the NeXTtool (or a 3mm Allen wrench), (b) a plastic adjustment tool (preferred) or a thin bladed screwdriver, and possibly (c) a Phillips-head screwdriver.

(NB: A similar procedure will work for color monitors, but you should either know what you're doing or you'll probably be better off letting a pro deal with it.)

Turn off the computer. Disconnect all cables to the monitor. Look at the back of the monitor. There will be 4 screws there; use the NeXTtool (or Allen wrench) to remove them. Remove the plastic back of the monitor and put it out of your way.

Reconnect the cables and turn the computer back on. As the machine powers up, examine the back of the monitor. You'll see a metallic box (usually silver, though some are black) surrounding the monitor's vitals. This protects you against the dangerous voltages inside, and also insulates the monitor from electromagnetic noise. On the back of this box are several holes for performing adjustments. There are two focus controls (labeled 'focus' and 'dynamic focus'), a brightness control (labeled 'brightness' or possibly 'black level') and several others that adjust various things like screen size and position.

Depending on the exact placement of the controls on the circuit board of your specific monitor, some of these controls may be difficult (or impossible) to adjust from the back. If this is the case, I will describe what's necessary below. Otherwise, adjust the appropriate controls using either an adjustment tool or a screwdriver. Be warned that a screwdriver probably will cause some interesting video effects when it enters the case. Ignore this the best you can, or find a plastic adjustment tool, which is what you *really* should be using anyway. Using a flashlight will help you see into the hole so that you can align the business end of the tool correctly.

Focus and position controls are fairly obvious. Adjust them slowly until you're happy with the results. Don't muck with anything you don't need to; the factory settings are usually pretty decent.

To correctly adjust the brightness, follow this procedure: Turn the brightness of the monitor all the way down using the keyboard. Adjust the brightness control on the back of the monitor until a barely noticeable picture forms. Then turn the brightness down a little so this picture disappears completely. Check that you can get adequate brightness by using the keyboard to brighten the screen. If the display isn't bright enough, adjust the brightness control on the rear of the monitor high enough so that the monitor display is adequate. Note that you won't be able to dim the screen completely from the keyboard...sorry.

Once you're finished, shut down the computer, take off the cables, reattach the back of the monitor, and reconnect the cables. You're done.

If the control you need to adjust proves to be difficult, you may need to enter the metal case. This happened on one monitor's focus control and another's brightness.

WARNING: THE VOLTAGES INSIDE THE MONITOR'S CASE ARE VERY DANGEROUS, EVEN WHEN THE MONITOR IS OFF. BE VERY CAREFUL, OR YOU CAN SERIOUSLY INJURE OR EVEN KILL YOURSELF.

DO NOT PERFORM THE NEXT INSTRUCTIONS UNLESS YOU ARE CONFIDENT THAT YOU KNOW WHAT YOU ARE DOING.

You'll have to power off the computer again, and disconnect the cables.

Looking at the monitor from the back, notice a section of metallic shielding on the right side of the metal box that extends to the picture tube. This is where the flyback transformer is connected. It shields a wire that is charged to about 25,000 V.

WARNING: DO NOT TOUCH THIS WIRE, IT CAN SHOCK YOU THROUGH ITS INSULATION.

Being very careful of this, remove the metal case by unscrewing the Philip's head screws that hold the case on. Don't touch the screws that hold the picture tube into the front of the monitor's case.

Once you've gotten the metal box off, reconnect the cables. Figure out what control you're going to adjust, and make sure that you can do so without touching anything else inside. Again, *watch out* for the wire that connects to the picture tube on the right side.

Power up the computer. I recommend that you use only one hand to make the adjustment, and that your other hand be placed in your pocket (or similar equivalent, if you're wearing clothes lacking pockets). This precaution reduces the chances that you'll make a short circuit between one hand, your heart, and the other hand --- a good idea.

Perform the necessary adjustment(s), being very careful not to touch anything inside. Then shut down and reassemble the monitor, following the directions given above.

Hopefully, these instructions will prove useful. Once again, please be very careful...I don't want your death and/or injury on my conscience (or a lawsuit, for that matter, either :-)

5.24 I want to emulate a macintosh, how?

MacIntosh, emulation
emulation, MacIntosh

There is a nice way to run macintosh-software on your original black hardware.

It works fine with dual-headed cubes and is optimized for the Apple OS - Version 7.5. To get further information about daydream, please contact:

```
QUIX Computerware AG
011-41-41-440-88-28
9 hour differential
Luzernerstr.10
6030 Ebikon
Switzerland
Next software - 011-41-41-34-86-80
quix@applelink.apple.com
```

There is another solution, completely in software: 'Executor' from Ardi does the job, too. (http://www.ardi.com/)

5.25 My NeXT laser printer fails to fully eject the sheet - how to fix?

printer, eject, NeXT laser
NeXT laser, eject paper

Fix it as follows.

If you continually get messages like, "sorry, the printer is jammed" and you have to pull each page out the last inch, you

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probably need to replace the 14 tooth gear in the output stage(fuse ass'y).

You can see this gear before you disassemble the printer, so that is a good first step. Then read these instructions all the way through and see if you want to attempt it. Next recommends replacing the entire fuse ass'y (big bucks) if the gear is damaged, but Chenesko, Inc., of Ronkonkoma, NY sells the gears for $2.31. The part number is RS1-0132. They recommended I also replace the 20 tooth gear, number RS1-0116, but I don't know if it is really necessary. Their phone number is 800-221-3516.

PartsNow is also selling laserprint replacement parts. Their part number for the a replacement roller part is `RA1-84489-000 000`. You might contact them for further details.

To examine your gear, open the rear (delivery) door and undo the screw attaching the strap that keeps the door from opening down all the way. The gear is on the side nearest the power input to the printer.

There are two gears on the part of the delivery ass'y that swings down. The suspect gear engages the top one, but is mounted on the fixed portion of the fuse. Ours had several teeth missing and/or damaged. To get the gear off you have to remove the fuse ass'y. To remove the fuse you must open the printer lid fully, so it is straight up. To open the lid fully you must remove the case. To remove the case you must remove the plastic cover on the lid.

Are you getting the idea now? This will be a lot of fun, and take most of the afternoon. I hope you have a spacious, well-lit area, because there are a lot of screws, and a lot of them are painted black, so they are hard to see when you drop them, unless you drop them inside of the printer, where you might NEVER see them again.

Fortunately, as with all computer equipment, they seem to put lots of extras in, so just make sure there aren't any where they might do damage, like short out the mega KILOVOLT corona power supply, or grind into the REGISTRATION rollers. You do want your printouts to be straight, don't you?

So, if you're ready, here we go.

- *PREPARATION*
  Most mere mortals will want to power down everything and disconnect the cables, etc. Remove the cartridge and paper trays, etc.

- *REMOVE THE LID COVER*
  open the lid and remove 3 screws. They DO NOT have any red paint on them.

- *REMOVE THE BACK DOOR*
  there is one screw that holds the strap. When you can swing it clear down, you can squeeze the hinges together and remove the door.

- *REMOVE THE CASE*
  There are maybe seven screws that hold the case on. Four are right on top. Two are just inside the rear door area. Two are down inside where you store that green cleaning tool. 4 + 2 + 2 = 7, right? Say, who was the last guy that worked on this printer anyway? The case has to be convinced that you really need to remove it, even when it is loose and all the screws are out.

- *REMOVE THE FUSE ASS'Y*
  You will need a PHILLIPS screwdriver for this, as with the previous steps. But you will need a LONG one this time. Three of the screws are pretty easy to find. Just study the lower part of the fuse, as it is screwed onto the bottom case. Two of the screws are inside. One is under the lid next to the gears, the other near the green cleaning tool. On the outside, in back, there is one on each side. One is under the white wires that connect the fuse to the 10 AMP circuit breaker, which is pretty near that gear, and close to the power input. Unplug that cable. Then remove the small black crew that holds the black plastic gear cover so you will have better access to the last screw. Then you will have to wrestle the fuse out the back of the printer. Be careful with it.

- *DISASSEMBLE THE FUSE*
  There are several screws and a spring. It's not too hard to take apart. You can see the gear, so you just have to take off the covers on that end of the ass'y to get to it. I should caution you that I had trouble putting them back on, because they have funny shapes and don't make a lot of sense. Plus I was tired, so I went home, ate dinner, played with the dog, went to bed, got up and ate breakfast before I put it back together. You might want to label some parts, make some drawings, etc. to reassure yourself that you can put the parts back just like they were.

- *REMOVE THE GEAR*
  You can remove the gear pretty easily with a small screwdriver by unspringing the "E"-ring that holds it on the shaft. Try not to bend the e-ring.

- *PUT EVERYTHING BACK TOGETHER*
  Sorry, I can't help you with this part (HA HA!) I told you you should read the instructions first. Maybe you should buy a new printer, or try to attach some third party printer via the serial port!

Well, if you got this far I hope you dropped little crumbs of bread so you can find your way back. I try to save all the little screws by putting them back in the holes they came from, or putting them in some small container. You might clean some of the gears or the paper path while you have it open. You can also install a new OZONE filter. Remember OZONE is hazardous to your health, so you don't want to inhale it.

Contact me

DISCLAIMER: BE CAREFUL IF YOU TRY THIS PROCEDURE. THERE ARE DANGEROUS VOLTAGES PRESENT, AND EVEN IF YOU ARE TOO CHICKEN TO WORK ON IT POWERED UP, YOU COULD CUT YOURSELF, OR DROP THE WHOLE THING ON

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YOUR FOOT, THUS VOIDING THE WARRANTY. ALSO, THE PRINTER WON헥 WORK WITHOUT THE COVERS, BECAUSE THERE ARE TWO SECRET SWITCHES THAT INFORM THE NEXT CPU THAT SOMEONE "IS FOOLING AROUND WITH THE PRINTER AGAIN."

Yet another update to reflect that Jacob Gore received gears for an Apple Laserwriter from Chenesko, which are similar enough to work, but with some modification.Also, if the original gear is in fair condition, it can be reversed on the shaft until a replacement is ordered.

5.26 What are the NeXT mouse connections?

mouse, connector

Read the following instruction.

Thanks to Alvin Austin (austin@cs.USask.Ca) I have the information I need on the NeXT mouse connections.

```
Pin  Function

1    +5v
2    X Encoder Phase A
3    X Encoder Phase B
4    Y Encoder Phase A
5    Y Encoder Phase B
6    Right Button
7    Left Button
8    Ground
```

5.27 What type of memory may be installed in a NeXT?

References: NeXTanswers' hardware.620, 92_spring_bulletin "Announcing NeXTstation Turbo and NeXTcube Turbo"

```
NeXT Computer (68030-25MHz/68040-25MHz),
NeXTcube (68040-25MHz):

Number SIMM slots: 16
SIMM group size: 4
SIMM type: 30-pin low profile>
SIMM access rating: 100 ns
SIMM capacity: 1, 4 MB (1x8/1x9, 4x8/4x9)
Maximum RAM: 64 MB
```

The low-profile vertically mounted 4 MB SIMMs are easier to install in the NeXTcube than the horizontally mounted 4 MB SIMMs because of the small height clearance above the SIMM slots. It is possible to install the horizontally mounted 4 MB SIMMs, but you will be required to slide the CPU board and the center tower in simultaneously.

Parity (9-bit) SIMMs can be used in both 68030 and 68040 NeXT machines, but should not be mixed with non-parity SIMMs. Only 68040 boards with ROM levels of 2.2 (v63) and higher can use the parity memory to detect parity errors.

It is OK to mix parity and non-parity memory, but the system will not boot unattended. Cubes with early boot ROMs will not work with 4 Mb parity ram, unless at least 3 banks are used. The system gives an exception error on power up. The fix is to get a new boot rom from Next.

You can pay $30, or you may be able to squawk and get one for free. I have found Next to be pretty responsive, once I find the right person.

The correct version is v66 which was the last or final rev for this series of 040 boards. This version also fixed the problem in the second paragraph.

```
NeXTdimension boards (i860):

Number SIMM slots: 8
SIMM group size: 4
SIMM type: 72-pin
SIMM access rating: 80 ns
SIMM capacity: 1, 4, 8 MB (256Kx32, 1Mx32, 2Mx32)
Maximum RAM: 64 MB (32 MB official NeXT)
```

Contact me

NeXT didn't officially bless the use of 8 MB SIMMs, but they seem to fit and work.

```
NeXTstations (68040-25MHz) serial numbers below ABB 002 6300:

Number SIMM slots: 8
SIMM group size: 4
SIMM type: 30-pin
SIMM access rating: 100 ns
SIMM capacity: 1, 4 MB (1x8/1x9, 4x8/4x9)
Maximum RAM: 32 MB
```

Faster SIMMS (70/80 ns) don't make the memory system work any faster than the 100 ns units.

```
NeXTstation Color (68040-25MHz):

Number SIMM slots: 8
SIMM group size: 2
SIMM type: 72-pin
SIMM access rating: 80 ns5
SIMM capacity: 1, 4 MB (256Kx32/256Kx36, 1Mx32/1Mx36)
Maximum RAM: 32 MB


NeXTcube Turbo (68040-33MHz),
NeXTstation Turbo (68040-33MHz),
NeXTstation Color Turbo (68040-33MHz),
NeXTstations (68040-25MHz) serial numbers above ABB 002 6300:

Number SIMM slots: 4
SIMM group size: 2
SIMM type: 72-pin
SIMM access rating: 70/100 ns
SIMM capacity: 1, 4 ,8, 16, 32 MB (256Kx32/256Kx36, 1Mx32/1Mx36)
Maximum RAM: 128 MB
```

For maximum performance use 70 ns SIMMs: SIMMs rated at 80 or 100 ns will be detected upon powerup and the memory system clock slowed to 100 ns. Faster RAM than 70 ns won't give you a speed increase anymore. In fact it could slow things down again, because some hardware drives 60 ns RAM as 100 ns RAM.

NeXT manufacturing introduced the new 25 MHz NeXTstation CPU board into production in late June '92. To verify which SIMM type your machine uses, check the system's memory configuration. You can do this by using the ROM monitor쩐 print memory configuration command m. Start with your machine powered down. Press the Power key to power on. As soon as the message 책esting system...?disappears, press command-command-tilde (on the numeric keyboard). Under these circumstances, this will access the ROM monitor. In the ROM monitor, type m and press return. Turbo-designed boards?ncluding new 25 MHz NeXTstations and all Turbo systems?ill return messages reporting the memory configuration contained in four sockets (sockets 0 -3); old 25 MHz boards will return messages for more than four sockets (usually 8). You can tell a Turbo-designed board, and the accompanying 72 pin, 70 nanosecond SIMMs, by the fact it only reports information for only four sockets.

The memory system has programmable memory timing such that the number of processor clocks needed to access a given amount of data can be tailored to the speed of the memory installed. 70 ns memory is just enough faster than 80 ns memory to allow the cpu to access the data with fewer clock cycles. This improves memory system performance.

"70 ns" memory is faster than "80 ns" memory in many parameters other than just RAS access time. The faster CAS access time in particular allows the memory system to respond quicker to burst (16 bytes) bus transfers.

5.28 What is the NeXT SIMM tool?

SIMM Tool

The tool came with 68040 upgrade kits for NeXTcubes.

It really makes removing SIMMs easy. It looks like a dental tool: about six inches long with a 1/2" long head offset at 90 degrees. To remove SIMMs, you slip the head into the hole on one side of the SIMM, rest the head on the SIMM socket next to the SIMM you are pulling, and pivot the tool back, using the simple fulcrum to gently pry the SIMM up about 1/8" from the socket on that side. Repeat on the other side, and the SIMM can be then removed by hand.

5.29 Where can I purchase a NeXT machine?

Purchase, NeXT
NeXT, purchase

NeXT discontinued manufacturing hardware in Feb, 1993. Used systems are often advertised in comp.sys.next.marketplace.

5.30 Where to obtain hardware service?

service, hardware
hardware, service

Hardware service can be obtained through the following firms:

USA hardware service has been purchased by Bell Atlantic. They will be supporting the Authorized Service Centers and are selling extended warranty contracts.

```
Decision One
Voice: 800-499-6398, or 800-848-NeXT
Fax: 510-732-3078
```

For Europe, please contact:

```
SORBUS
40549 Duesseldorf
Willstaetter Strasze 13
```

5.31 What types of NeXT machines were manufactured?

NeXT, types of
cube
section

There are two packages: a cube, and a station.

```
NeXTcube systems:

68030-25 2-bit grayscale (NeXT Computer)
68040-25 2-bit grayscale (NeXTcube)
68040-33 2-bit grayscale (NeXTcube Turbo)
NeXTdimension board adds 32-bit color (i860) to any of above systems
```

Cube systems can use any of the boards. With hacks, multiple independent CPU boards can run in one cube.

NeXT Computer systems have room for 2 full-height 5.25" internal devices with a wide slot for an Optical Disk drive(s) in either position.

NeXTcube systems also have room for 2 full-height 5.25" internal devices with a wide slot for an Optical Disk drive in the lower position, but have additional mounting holes for 1/2-height devices, and have a floppy slot at the top position.

```
NeXTstation systems:

68040-25 2-bit grayscale (NeXTstation)
68040-33 2-bit grayscale (NeXTstation Turbo)
68040-25 16-bit color (NeXTstation Color)
68040-33 16-bit color (NeXTstation Color Turbo)
```

NeXTstation systems have room for two 1/2-height 3.5" devices, with a floppy slot at the side.

5.32 What can be done about older 030 NeXT cubes that have a fan that turns in the "wrong" direction?

fan, running wrong

The fan on older 030 NeXTs cubes sucks air out of the back of the cube which means that it draws unfiltered air in through the optical disk on the front of the cube. This causes optical disks to succumb to dust must sooner than cubes with the new-style fan which turns in the opposite direction.

NeXT has apparently reversed their decision regarding fan reversal in the case of machines that have been upgraded to 040

processor boards. It is now considered okay to reverse the direction of fans in these machines. If you have many third-party cards installed in your cube or an older processor board, you may wish to consider not reversing fan direction (overheating could become a problem). In any case, do not reverse the fan's polarity, only reverse the fan assembly itself.

Perhaps the best solution is obtain the cleaning kit and OD filter from NeXT.

5.33 Can I connect SONY MPX-111N to my 68030 NeXT Computer?

SONY MPX-111N

The SONY MPX-111N internal 2.88 MB floppy drive which was shipped with all the 68040 NeXT machines is *not* a SCSI device, therefore there is no way of connecting that particular drive internally on a 68030 system.

5.34 Why does the OD continually spin up and spin down?

OD, spinning

A big problem with the Canon optical drives is that air flows through the drive to cool it. Dust accumulates inside the drive causing it to fail with the continuous spin-up spin-down syndrome. NeXT as part of it's 040 upgrades provided a dust filter to prevent this. If your drive has this problem it usually can be fixed simply by cleaning out dust from the drive. NeXT sold a cleaning kit for both the drives and the optical disks.

5.35 How many colors can NeXT machines display?

NeXT, colors

The monochrome machines can display 4 gray levels. You can use color apps on a monochrome machine, they will converted into monochrome images and dithered accordingly.

Color NeXTstations can combine 4 bits of red, green and blue primaries for a total of 4096 pure colors. The imaging functions dither the image to produce intermediate colors.

NeXTdimension can combine 8 bits of red, green and blue for 16,777,216. There are not 16 million points on the display so all can not be displayed at once. Further display technology limits the usable color space.

None of the NeXT products support color look up tables where the user can define their own color palette on a per window basis. This feature is useful for displaying images which have adaptive lookup tables, and display pure grayscale images on the color NeXTstation. On the NeXTdimension images can be converted to full 24 bit representation.

5.36 Why is my machine so slow when I run the monochrome and NeXTdimension displays?

speed, display
display, speed drops

There is a bug with the window system in which if you select the monochrome display as your primary display the server will be much much slower. The solution for those wishing to use both displays is to select the color (NeXTdimension) display as the primary display. The most optimal configuration at present with the NeXTdimension is to run only the color display.

5.37 Where to obtain replacement mouse parts?

mouse, parts

From: `jdavidso@nextwork.rose-hulman.edu`

For those who have need of a new button in their mouse, and don't want to pay for the whole mouse when it is only the button that has gone bad, we have recently discovered a satisfactory replacement for the Omron switch. It is in the Digikey catalog, # 931, Jan-Feb 1993, page 141, under Cherry switches D4, DG, and DH series. Digikey part # CH164-ND, Cherry part # DG1C-B1AA. We ordered one of these, and just received it today. Tried it out, and it seems to be working flawlessly so far.

It is also possible to replace mouse buttons from a two button mouse with mouse buttons of the three button mice.

5.38 Where to obtain extra batteries?

battery, purchase
purchase, battery

Battery part number: BR 2/3A 3V Lithium Battery (Panasonic)

Source: Engineered Assemblies & Components Corporation

```
5204 Green's Dairy Road
```

```
Raleigh, NC 27604
Phone: 919-790-9700 (ask for Debra)
```


5.39 How to convert a Turbo system to use ADB?

ADB, turbo system

If ADB equipment are used with older NeXT systems they won't work properly. Here are the ADB requirements:

- A Turbo computer.
- CPU eprom version 74.
- New revision computer to soundbox/monitor cable. The part number is molded at both ends of the connector:

```
Cable              NEW   OLD (Non ADB)

NeXTcube           4534  150
NeXTstation        4535  1532
NeXTstation color  4536  2286
```

- New revision monitor which uses a vertical scan rate of 72hz instead of 68hz, except on NeXTdimension systems color monitor stays 68hz.

```
Monitor    NEW (72hz)    OLD (68hz)

17" mono   ACX (N4000b)  AAA (N4000a & N4000)
17" color  ADF (N4006)   ABG (N4001)
21" color  ADB (N4005a)  ABH (N4005)
```

- ADB soundbox for color systems. S/N prefix ADD instead of ABN.

5.40 68030 board in the same NeXTcube as a 68040 board?

DISCLAIMER: THE FOLLOWING PROCEDURE IS NOT SUPPORTED BY NEXT, INC. AND WILL DEFINITELY VOID THE WARRANTY ON YOUR NEXT COMPUTER. FOLLOW IT AT YOUR OWN RISK. I DISCLAIM ALL RESPONSIBILITIES FOR DAMAGES CAUSED BY NEGLIGENCE IN FOLLOWING THE PROCEDURE. THERE IS NO GUARANTEE THAT THE PROCEDURE WILL WORK ON ALL VERSIONS(?) OF THE NEXT CUBE HARDWARE. ALL I KNOW IS THAT IT WORKED ON THE NEXT CUBE I WAS WORKING ON!!!! SO BEWARE.

Here we go! I'll first provide a description of the hardware I was using and comment on what I accomplished and how I got the information on how to do it!

The hardware included a NeXT cube with 660 MB drive, OD, etc., a 68040 upgrade board, and a 68030 motherboard. I successfully installed both the 68040 and 68030 boards on a SINGLE NeXT cube and linked them together through their ethernet ports. The 68040 was configured as a boot server and the 68030 was used as its client (booting off the network for lack of an additional hard drive).

The procedure reconfigures slot #2 on the cube's back-plane as slot #0. This provides two slots configured as #0, required for booting the two motherboards. Once I determined what the slot pin-outs were (thanks to my good friend John Chmielewski), it was a matter of time before the two boards happily co-existed.

The procedure:

- First, follow the procedure on the NeXT User's Reference manual for removing the system board (Appendix C: Opening the Cube, page 291 of the 2.0 manual).
- Using the NeXT supplied screwdriver, remove the two screws that attach the power-supply housing to the cube (the screws are located on the lower part of the housing) and gently pull the housing out. Set it aside in a safe place (away from kids and nosey friends!)
- Remove the two plastic grooved plates (used to slide the system boards in) at each side of the inside bottom of the cube. (For each plate, lift the side closest to the rear opening and gently pull them out). Set them aside.
- Using the NeXT tool, remove three screws holding the back-plane to the cube and then take the back-plane out of the cube. Let the cube rest for a while.

  Inspect the back-plane. You will see five bus slots (four vertical and one horizontal). The horizontal slot connects the back-plane to the power supply housing. We're only interested in the four vertical slots. From the factory these slots are

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configured as 6, 2, 0, and 4 (starting from the left and going right with the horizontal slot at the bottom).

The system board connects to slot #0 (which you've probably noticed). Each slot contains three columns of 32 pins. Following is an ASCII representation of one of the slots:

```
 x y z      C B A

 o-o o  32  . . .
 o-o o  31  . . .
 o-o o  30  . . .
 o-o o  29  . . .
        28  . . .
              .
              .
              .
         3  . . .
         2  . . .
         1  . . .
```

...where x, y, and z are labeled GND, SID, and VCC, respectively. The GND, SID, and VCC "holes" are used to configure the slot number using simple binary encoding, where GND is logical zero, VCC is logical one, and SID (for Slot-ID I guess) determines the current bit state (one or zero).

Notice the four rows of GND, SID, VCC triads; each row is equivalent to one bit position in the slot number, the bottom row bit position 0, the top row bit position 3. This gives a total of four bit positions, or 16 possible slot numbers. To encode a slot number, you need to connect an SID row to its corresponding GND or VCC row. For example, the diagram below shows the configuration of the slots in my cube's back-plane (you'll have to look very closely to see the actual connections):

```
        SLOT 6  SLOT 2  SLOT 0  SLOT 4

 BIT 3: o-o o   o-o o   o-o o   o-o o
 BIT 2: o o-o   o-o o   o-o o   o o-o
 BIT 1: o o-o * o o-o * o-o o   o-o o
 BIT 0: o-o o   o-o o   o-o o   o-o o
```

- To reconfigure slot 2 as slot 0, cut the trace between SID and VCC for bit position 1 (see * o o-o * above) and connect SID to GND on the same row. I used the SIMM removal tool supplied by NeXT in the 040 upgrade (talk about multi-purpose) to cut the trace! Very gently, scrape the solder off between the two holes. Take a paperclip, shape it to fit between the holes in SID and GND, and trim it down to an even 1/4 inch (perfect fit)!

  That's all there is to it. If for some reason you ever want to revert to slot 2, just remove the paperclip from GND-SID and reconnect it to SID-VCC.

- Now put the cube back together. First, re-install the back-plane using its three connecting screws, then snap on the plastic plates, and finally insert the power-supply housing and secure with its two screws.

  At this point the cube is ready to take on the two system boards (it is up to you to determine where/how you want to use the two boards; I'll explain how I used mine) ...

- I installed the 68040 in the original slot 0 and the 68030 in the reconfigured slot 0 (previously slot 2). The 68040 was used as the main processor board. I connected the 660 MB drive, the OD, and the monitor to it.

  NOTE: Before beginning the procedure, I went into the NeXT Monitor on the 68030 and disabled the Sound out, SCSI tests and verbose test mode and enabled serial port A as a console terminal. I also made "en" the default boot device. I setup the 68040 as a boot server and taught it about the 68030 (which took some time in getting it setup properly).

- I connected the 68040 to the 68030 using a thin-ethernet cable and I booted. First thing I noticed was that the 030 timed-out a couple of times waiting for the 040 to tell it to boot. But after the 040 was up, the 030 booted nicely.

That's all folks. Hope all this made some sense and people find it useful.

Comments:

- To power off the cube, I have to first shutdown the 030 (I run "halt -p" as root from a telnet connection and wait for the 030 to go down), and I then power-down the 040. If you shut down the 040 before the 030, you'll have to pull the power plug to turn the machine off. The cube will not power off if either of the two boards is providing a load to the power-supply.

- Remember, I've only performed this procedure on one system. I do not know what will happen on your system. So make sure you plan ahead what your going to do and that you understand the procedure.

Contact me

- I don't know what problems may arise when you add a board that uses the NeXTbus, such as the NeXTdimension, or how it will behave. If someone is courageous enough to perform the procedure and installs another board, please post your results to the net.

Update:

To clear up some misunderstandings with the settings in the "p" command of the NeXT monitor (these settings are only required for the system board that doesn't have the NeXT display monitor connected):

- Sound out test must be "no"; the boot process will not proceed if the monitor isn't connected to the board and this is set to "yes" (the sound out tests will fail, aborting the boot procedure).
- SCSI tests should be "no" if you don't have SCSI devices attached to the board (SCSI tests will fail otherwise, aborting the boot procedure).
- Verbose test mode must be "no" for booting from the network. If set to "yes", the boot process will timeout waiting for a BOOTP and you'll be left in the monitor with no means of restarting the board (except pulling the power plug)! This is probably true also for booting from an OD that hasn't been inserted (assuming the OD was attached to the board).
- Allow serial port A as alternate console if you want to view the boot process (for problems and peace-of-mind).
- Other settings were not modified from their factory defaults or had no effect on the procedure.

There is also a way in using 2 boards plus NeXTDimension board in one Cube.

I've run my "screw with the backplane trick" cube with :

```
| <empty> | 32MB-ND | | 64MB-040 | 40MB-030 |
```

without any problems. Using the od got the system warm, but never had a problem. The cool part was having the printer on the 030. One day I tried to dump an 040 into the 030 position, but I couldn't get it to boot. I played for a couple minutes, but put the 030 back in and went on with life...

5.41 How to expand DSP memory?

memory, DSP
DSP, memory

The Speech Recognition Lab at San Francisco State University has developed a DSP memory expansion board for the NeXT computer that provides the maximum memory supported by the DSP56001 processor. We are now offering this board to those whose are interested in high-performance custom DSP development.

- The board is a 576KB DSP expansion memory board organized as three non-overlapping 192KB banks: X-data, Y-data and Program. The board uses relatively fast (<35ns) SRAM. This board compares with NeXT's DSP memory expansion board, which offers only 96KB in an imaged memory configuration.
- The board is a high-quality, 4-layer board, open-circuit tested prior to assembly. It fits into the DSP memory daughterboard slot on all NeXT machines.
- The price will be $600. Please let us know if you are interested. Delivery will be in about 3-4 weeks.
- Contact Tom Holton (th@ernie.sfsu.edu). E-mail is preferred. The address is:

```
Tom Holton
Division of Engineering
San Francisco State University
1600 Holloway Avenue
San Francisco, CA 94132
415-338-1529 (phone)
415-338-0525 (fax)
```

NOTE: Because we've organized our memory as three separate (non-overlapping) banks (X, Y and P) of 192KB apiece, none of the DSP memory image functionality provided by NeXT with its existing 8K base configuration, or its 96KB DSP expansion module is supported. While we cannot guarantee that every existing DSP application ever written will be plug-and-play compatible with our DSP expansion memory, we are not aware of any existing applications that use the image functionality. The MusicKit, and demo programs that use the DSP, such as Mandlebrot and ScorePlayer, work fine with our memory module.

5.42 How to boot a NeXT without a monitor?

The procedure is to just touch pins 6 and GND on the DB-19 NeXT monitor out with a 470 Ohm resistor (450 is the actual resistance, but 470 ohms is more commonly found in resistors). Pin 6 is the power sense, and pins 13-19 (and the DB shell) are the GND. Just say "pin 19", it may be easier.

There's a pinout diagram of the DB-19 in the NeXT Users Reference Manual.

If you have an old Cube, the power supply needs to have more power drawn from it than an 030 (and 040?) board uses to stay on. So: On the DB-19, attach a Power Resistor (20 Ohm, at least 20 Watt) between pins 12 and GND. (Pin 12 is -12V, pin 13 works well for GND). Then just "touch" the 470 ohm resistor as described above, and you're set.

The 20 Ohm resistor draws an old 030 running without monitor in an old CUBE), but it isn't necessary - just don't touch it (*HOT!* ;-)

To power off, type "halt -p" as root on the machine (either through a terminal connected to port A, or over the ethernet connection).

Also, you have to have the Rom Monitor settings done correctly. The important ones are:

```
Wait until keypress? N
Sound out tests? N
Port A as alternate Console? Y (if you have one, it's nice)
Verbose mode? N (I think this may need to be N to work, don't remember).
```

5.43 Where can I get black spray paint for my NeXT?

Black, spray paint
paint, black spray

You can get black spray from the following address.

```
Sprayon Paint
Omni-Packblend
4Next-Black (icon black)
LAV-16
25216
```

Call `1-800-777-2966` for the name of a dealer near you.

5.44 What makes aged NeXT monitors dim?

monitor, dim

The cause of the dimming monitors is the CRT cathode wearing out. The most common type of CRT (and the type used in most NeXT monochrome monitors and all of the NeXT color monitors) uses what is called an oxide cathode. A thin coating of oxide is deposited on the cathode to allow the electronics which form the picture to get off the cathode easily. The oxide gradually boils off the cathode itself, and when the oxide is gone, the CRT goes dim.

Typically, the oxide will last from 10,000 to 20,000 power on hours (screen savers don't help the cathode, they only prevent phosphor aging). Unfortunately, the black monochrome monitors fall into the short end of the life range thanks to Toshiba who made the CRT's. The aging is more noticeable in Unix machines because they tend to be left on. Note that there are about 8,000 hours in a year. If you leave your monitor on all the time, all oxide type CRTs will be dim in three years.

The other type of CRT cathode is the I-cathode or dispenser type. This type of cathode is porous and continually brings new activation material to the surface. Its lifetime is 40,000 hours or more. The last of the NeXT monochrome monitors (N4000B) used this type of CRT and they don't go dim. There aren't many of that type around because NeXT quit the hardware business after producing only a few thousand. If you can get an N4000B monitor, you won't ever have to worry about a dim monitor.

Many manufacturers are going to dispenser cathode type CRTs in their monitors with Panasonic leading the way. The best advice is to turn off the monitor when not in use. If that is impractical, try to purchase one with the long life cathode.

Spherical Solutions (smg@orb.com) has a supply of new N4000B long life monitors for sale in either ADB or non-ADB configurations. If you need to repair or replace a monochrome monitor, that is by far the best type to use.

If you read this far, you probably know more than you ever wanted to about CRT aging, but I hope this helps.

5.45 How to use two internal hard drives

drives, two internal

It is possible to fit a second internal hard drive in a NeXT slab, in addition to the floppy drive and the first hard drive. The

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second drive must be third height, or 1 inch high. There is no room for a half height device. Buy a bracket or make one out of sheet metal for the 1 inch high drive. On 25 MHz mono stations the SIMMs are smaller and the drive doesn't have to go all the way against the back wall. In this case, glue the bracket to the underside of the NextStation cover, centered from side to side and as far to the back as possible. This is sufficient. On 25 MHz colorstations, however, one must file away a bit of the interior metal on the cover in order to glue the bracket fully to the rear of the cover. Once this modification is done, the drive will clear the RAM when the cover is closed. Screw the drive into the bracket, with the power and SCSI plugs toward the right hand side of the NextStation so that the cables will reach. Go to your favorite computer store and get both a "dual internal SCSI bus cable" and a "dual internal SCSI power cable." Plug in the cables to both internal hard drives and close the cover.

This was verified on both a 25 MHz mono and a 25 MHz color NextStation. No power or heating problems occurred.

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