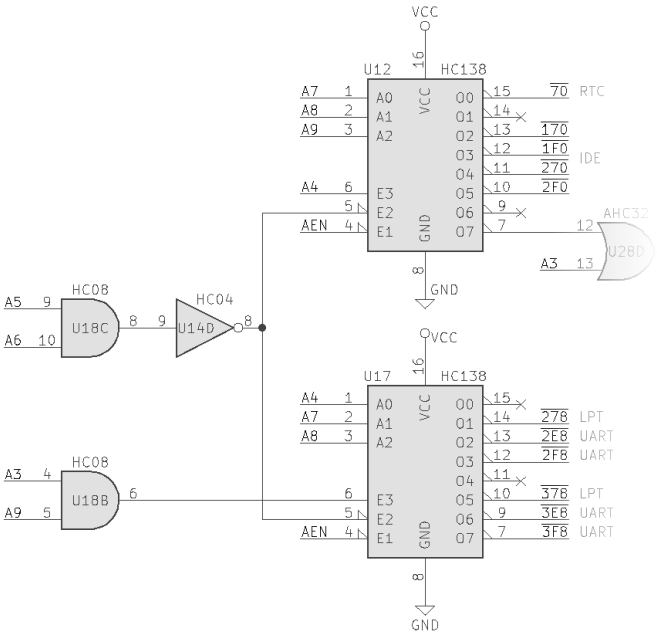
Monotech PCs

NUXT v2.0

MicroATX ‘Turbo XT’ Motherboard

User Manual

First edition (February 2020)



Information in this manual applies to the NuXT v2.0. A lot of it will be incorrect for the older NuXTs.

The CPU section of the NuXT v2.0 schematic, and the System BIOS, are based on open-source projects by Sergey Kiselev. I highly recommend checking out his projects at www.malinov.com.

The XT-IDE section of the schematic is based on the XT-IDE Rev2, created by VCfed forum members: vcfed.org/forum/showthread.php?29202-XTIDE-Rev2

The schematic of the NuXT v2.0 is open source. The source files are at github.com/monotech/NuXTv2

Terminology:

- **ROM** – Read-only memory: Includes System BIOS and Option ROMs. Also known as firmware.
- **RAM** – Random-access memory: Temporary storage of running program data.
- **Memory** – Often refers to RAM, but can also refer to ROM.
- **Memory address** – the location of some RAM or ROM in the 1MiB memory address space.
- **System ROM** – Located in Upper Memory, the System ROM contains the System BIOS, and optionally, some Option ROMs
- **System BIOS** – The first program that the CPU runs. Initializes the system and boots an OS.
- **Option ROM** – Also known as 'Boot ROM' or 'BIOS Extension'. This is a program stored in ROM that adds more BIOS functions, before the OS loads, allowing extended hardware support.
- **Conventional Memory** – RAM located between 0K and 640K. Usable by DOS and all software.
- **Upper Memory** – RAM or ROM located between 640K and 1024K.
- **High Memory** – RAM above 1024K. Not supported by NuXT; 286 and higher PCs only.
- **UMBs** – Upper memory blocks: RAM that has been placed within upper memory, which can be used by drivers, TSRs, and DOS itself.
- **Hardware resource** – I/O addresses, Memory addresses, and IRQs, are all hardware resources. If multiple devices share one, it can cause a *resource conflict* and malfunction.

Contents

Features

- IBM PC/XT Compatible Motherboard
- MicroATX form factor. 244 x 173 mm
- Switchable 4.77MHz, 7.16MHz, and 9.55MHz CPU clock
- Up to 640K Conventional Memory (optionally just 512K)
- Up to 192K Upper Memory Blocks (only with 640K option)
- Dual 64K System ROM – switchable with DIP switch
    - System BIOS is Sergey Kiselev's Micro 8088 BIOS
    - Up to 32K usable as Option ROM space. XT-IDE BIOS uses some of this
- Onboard peripherals:
    - Advanced floppy controller
        - Supports most floppy drives, including HD and ED
        - Supports single-density (FM) disks
    - RS-232 serial port
        - Via a 16550 UART with FIFO buffer
        - Selectable I/O address and IRQ
    - Parallel port
        - Bidirectional type
        - Selectable I/O address and IRQ
    - IDE interface
        - Implemented as XT-IDE Rev2 located at I/O address 170h
        - Connected to onboard CompactFlash slot, and IDE interface
        - Onboard CompactFlash slot can be Master or Slave
    - Real-time clock
        - Uses CR2032 3V cell
        - Just for keeping date and time. SRAM isn't used.
        - Located at I/O address 70h
- PS/2 Keyboard Port
    - Implemented with AT to XT keyboard converter in a microcontroller
    - Can be jumpered for XT protocol, bypassing the AT to XT converter
- PS/2 Mouse Port
    - Implemented with PS/2 Mouse to Serial Mouse converter in a microcontroller
    - Connected to a second onboard UART, with selectable I/O address and IRQ
- ATX power input
    - -5V rail is generated onboard for ISA slots
    - 20-pin connector. 24-pin connectors will fit too
- Four 8-bit ISA Slots
    - Three of the four slots can physically fit 16-bit cards
- PC/104 Platform
    - Supports PC/104 cards that are 8-bit bus compatible
    - Generally used for adding an onboard VGA card
    - VGA port in I/O area connects to a header near the PC/104 platform

Compatibility

- CPU: **8088, NEC V20, or compatible**
  - Must be at least 10MHz rated. Set the CPU speed lower in the System BIOS if it isn't.
  - 8088 provides greater replication of original IBM PC, due to identical speed.
  - NEC V20 provides roughly 20% more performance, and 80186 instructions.
- FPU: Intel **8087**
  - Optional. Only used by applications specifically programmed for it.
  - Must be at least 10MHz rated. Set the CPU speed lower in the System BIOS if it isn't.
- RAM: **512K*8 SRAM (DIP-32)**
  - Some compatible chips are: AS6C4008, HM628512, KM684000, BS62LV4006
  - One chip for 512K conventional
  - Two chips required for 640K conventional + UMB RAM
  - Removing RAM **and** disabling via DIP switch, allows using ISA card for RAM instead
- System ROM: **SST39SF010A** 128K Flash ROM
  - First half: XT-IDE Universal BIOS at the start, configured for XT-IDE Rev2 (186+) at 170h, Micro 8088 BIOS at the end. Second half: Same as first half, but XT-IDE BIOS is 8088+ version, to support 8088 CPUs.
  - As of Micro 8088 BIOS 0.9.7, all settings are saved in the System ROM chip itself. The RTC SRAM isn't used for BIOS settings.
  - Full 128K file to flash with programmer: github.com/monotech/NuXTv2
- AT to XT keyboard converter: **PIC12F629 Microcontroller**
  - Programmed with AT2XT firmware: vcfed.org/forum/showthread.php?26426
- PS/2 to Serial mouse converter: **ATTINY2313 Microcontroller**
  - Programmed with PS/2>Serial Mouse firmware: github.com/matze79/PS2-Adapter
- Communications: **16C552A**
  - Contains two 16550 UARTs, and a bidirectional parallel port.
  - One of the UARTs is connected directly to the PS/2 Mouse to Serial Converter microcontroller. The other is connected to a DE-9M serial port via RS-232 transceiver.
- Floppy controller: **National Instruments PC8477* or Intel 82077***
  - PC8477BV-1 is recommended.
  - If an Intel controller is used, a 4.7nF capacitor on the back must be installed.
  - The System BIOS supports booting from floppy disks. The correct drive type must be selected in the BIOS Setup. Supports booting from 360K, 720K, 1.2M, 1.44M, 2.88M.
- Real-time clock battery: **3V CR2032 Lithium** Primary cell. Positive side facing up.

System BIOS

The NuXT uses Sergey Kiselev's Micro 8088 BIOS. This is IBM PC/XT compatible, with some handy features.

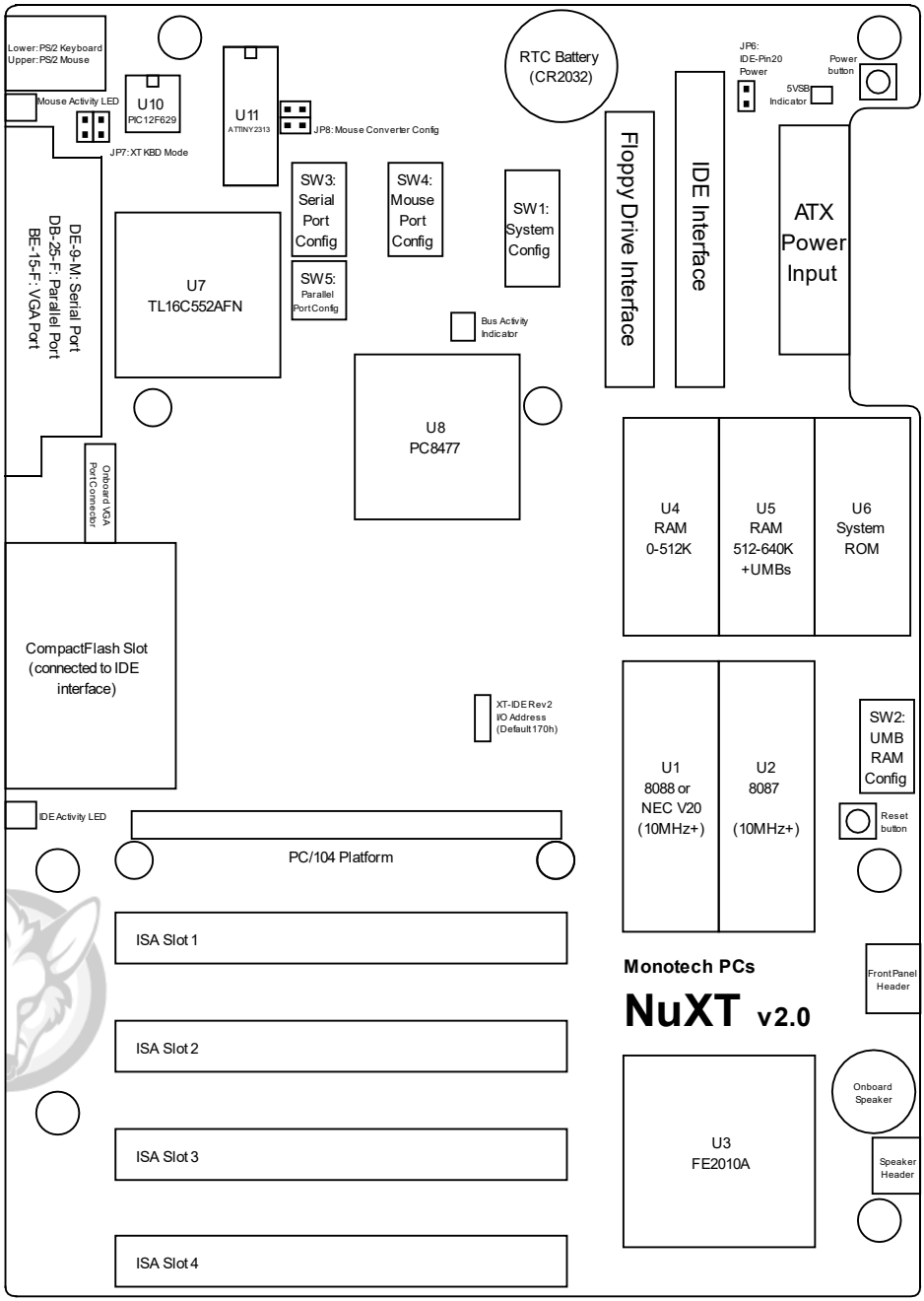
To enter the BIOS Setup, press **F1** then **Esc** during the RAM test or Video BIOS splash.

- 'H' – See all available commands
- 'R' – Return to the main menu
- 'C' – Set startup CPU speed
    - 4 – 4.77MHz
    - 7 – 7.16MHz
    - 9 – 9.55MHz
- 'F' – Change first floppy drive type
    - 0 – None
    - 1 – 360K 5 ¼"
    - 2 – 1.2M 5 ¼"
    - 3 – 720K 3 ½"
    - 4 – 1.44M 3 ½"
    - 6 – 2.88M 3 ½"
- 'G' – Change second floppy drive type
    - As above
- 'E' – Enable/Disable Option ROMs stored in the System ROM chip
    - Use this to disable XT-IDE BIOS if you aren't using the onboard IDE, or wish to boot the system from an ISA card's Option ROM instead
- 'D' – Set the RTC's date. 'T' – Set the RTC's time.
    - Can be done from DOS too with 'DATE' and 'TIME' commands
- 'P' – Display current settings on screen
- 'W' – Write current settings to ROM
    - BIOS settings are saved in the System ROM. No battery is needed.
- 'Q' – Exit without saving changes

At any time while in DOS, you may switch CPU speeds with a hotkey. This works in some applications, but not others. It always works at the DOS prompt.

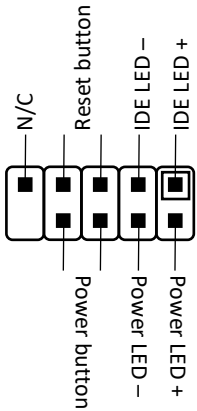
4.77MHz: Ctrl, Alt, Numpad –
7.16MHz: Ctrl, Alt, Numpad *
9.55MHz: Ctrl, Alt, Numpad +

Board Layout



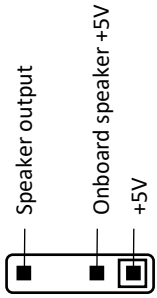
Connectors

Front panel header:



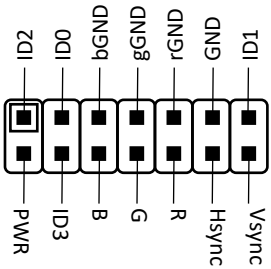
Speaker header:

Jumper pins 1 and 2 to enable the onboard speaker. Otherwise, connect a speaker to pins 1 and 4.



Onboard VGA header:

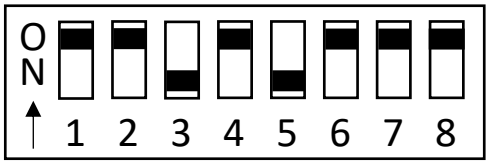
This connects directly to the onboard VGA port in the I/O area. It is meant for PC/104 VGA cards to connect to.



Switches and jumpers

SW1: System Config – Default: 1, 2, 4, 6, 7, 8 ON

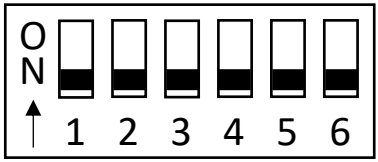
Switches 1 and 2 set the video card type.



Video card type	1	2
VGA or EGA or None	ON	ON
80x25 CGA	ON	OFF
40x25 CGA	OFF	ON
MDA or Hercules	OFF	OFF

3. Enable keyboard E0 scancode passthrough for the AT to XT keyboard converter.
4. Enable onboard RAM.
    - You must remove both RAM chips (U4 & U5) if you disable this.
5. Use secondary System ROM.
    - When switched ON, this will use the second half of the 128K ROM chip as the System ROM instead of the first half.
    - By default, the second half is the same as the first half, except it contains an 8088-compatible version of XT-IDE BIOS, which is slower, but doesn't require a NEC V20.
6. Enable onboard floppy controller.
    - Switch off if using any floppy controller card.
7. Enable onboard IDE interface.
    - Switch off if another device needs to use I/O address 170h.
8. Set the onboard CompactFlash slot as Master.
    - Switch off if using an IDE hard drive as Master, connected to the IDE interface.
    - It is recommended to leave this ON, and set your IDE hard drive as Slave, as CF cards are more likely to have issues with being Slave.

SW2: Upper Memory Blocks Config – Default: all OFF

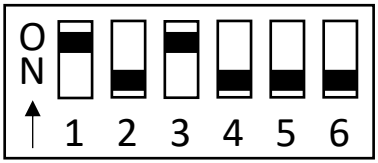


1. C0000-C8000 (768-800K)
2. C8000-D0000 (800-832K)
3. D0000-D8000 (832-864K)
4. D8000-E0000 (864-896K)
5. E0000-E8000 (896-928K)
6. E8000-F0000 (928-960K)

These switches put 32K blocks of usable RAM into Upper Memory. There must not be any Option ROMs or ISA card RAM at the selected locations, or you'll get malfunctions or inability to boot. This UMB RAM can be used for TSRs, Drivers, and DOS itself, to free up conventional memory. More on that on pages 12 and 13.

Leave all switches OFF if you don't have the 640K+UMB RAM option (RAM chip at U5 is present).

SW3 and SW4: UART Config – Default: COM1 and COM2



1. IRQ4
2. IRQ3
3. 3F8
4. 2F8
5. 3E8
6. 2E8

These switches set the I/O address and IRQ of the two onboard UARTs.

One of these UARTs is connected to the PS/2 to Serial Mouse converter, and the other connected to the DE-9M serial port in the I/O area, via an RS-232 transceiver.

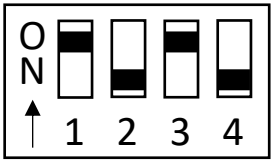
To disable the RS-232 Serial Port, set all switches on SW3 to OFF.

To disable the PS/2 Mouse Port, set all switches on SW4 to OFF.

By default, the RS-232 Serial Port (SW3) is set to COM1, and the PS/2 Mouse Port (SW4) is set to COM2.

COM designation	**I/O Address**	**IRQ Line**
COM1	3F8 (3)	IRQ4 (1)
COM2	2F8 (4)	IRQ3 (2)
COM3	3E8 (5)	IRQ4 (1)
COM4	2E8 (6)	IRQ3 (2)

SW5: Parallel Port Config – Default: LPT1



1. IRQ7
2. IRQ5
3. 378
4. 278

This switch block sets the I/O address and IRQ of the onboard bidirectional parallel port.

To disable the Parallel Port, set all switches on SW5 to OFF.

LPT designation	**I/O Address**	**IRQ Line**
LPT1	378 (3)	IRQ7 (1)
LPT2	278 (4)	IRQ5 (2)

If you install an MDA card or IBM Printer Adapter with a parallel port at I/O address 3BC, it will become LPT1, and the above LPT designations will be incremented by 1.

JP6: IDE Pin20 Power – Default: no jumper

This jumper puts 5V on pin 20 of the IDE interface. This is useful for powering some DoMs and CF adapters.

This is powered through a 1A resettable fuse.

JP7: Keyboard type – Default: no jumpers

This jumper block sets what type of keyboard is connected.

If a PS/2 or AT keyboard is connected, there must be no jumpers here, and U10 (PIC12F629 with AT2XT firmware) must be present.

If an XT keyboard is connected, you must remove U10 (store it safely), and put two jumpers vertically on JP7, as shown.

To connect keyboards with DIN-5 connectors (XT or AT), you must use a passive AT to PS/2 adapter.

JP8: Mouse converter config – Default: no jumpers

This jumper block pulls pins low on the ATTINY2313 microcontroller. This can alter how the PS/2 to Serial Mouse Converter firmware behaves.

The jumpers are connected horizontally. The top jumper ties pin 16 low, and the bottom jumper ties pin 15 low.

This jumper block is not populated on the board by default, as these settings are able to be changed via software methods. It is intended for possible future purposes, or custom firmwares.

IDE Address solder-jumper – Default: hard-wired to 170h

This is a solder jumper that sets the I/O address of the onboard XT-IDE circuit, connected to the IDE interface and CompactFlash slot.

It is hard-wired to 170h by default by a copper trace. If you wish to change to one of the other addresses (1F0h, 270h, 2F0h), you must cut that trace, and solder the new jumper.

This is only present for serious hackers that really need to change this. Leave it be if you are unsure what you're doing. It doesn't need to be changed in 99.99% of scenarios.

PC/104 VGA Card

An optional accessory to the NuXT v2.0 is the 8088-compatible PC/104 VGA card.

This is mounted to the PC/104 platform and provides VGA output on the onboard VGA connector in the I/O area.

Compatibility notes:

- Video RAM: Two or four **256Kx4bit 70ns** DRAMs
  - Two ICs, in the sockets closest to the Trident chip, for 256K. All four ICs for 512K.
  - Examples of compatible DRAMs are: TC514256AP-70, MT4C4256-7, MCM514256AP70, MB81C4256A-70P.
- Video BIOS: **27C256**
  - Programmed with TVGA9000i BIOS D4.01E.
- The Trident TVGA9000i SVGA chip supports standard VGA modes, plus SVGA modes, as well as MDA, CGA, Hercules, EGA. Some modes require specific support for the chip, such as a driver. Compatibility won't be perfect for all modes.
  - Some SVGA modes require 512K VRAM:

VGA mode	256K	512K
640x480, 16 colour	Yes	Yes
640x480, 256 colour		Yes
800x600, 16 colour	Yes	Yes
800x600, 256 colour		Yes
1024x768, 4 colour	Yes	Yes
1024x768, 16 colour		Yes

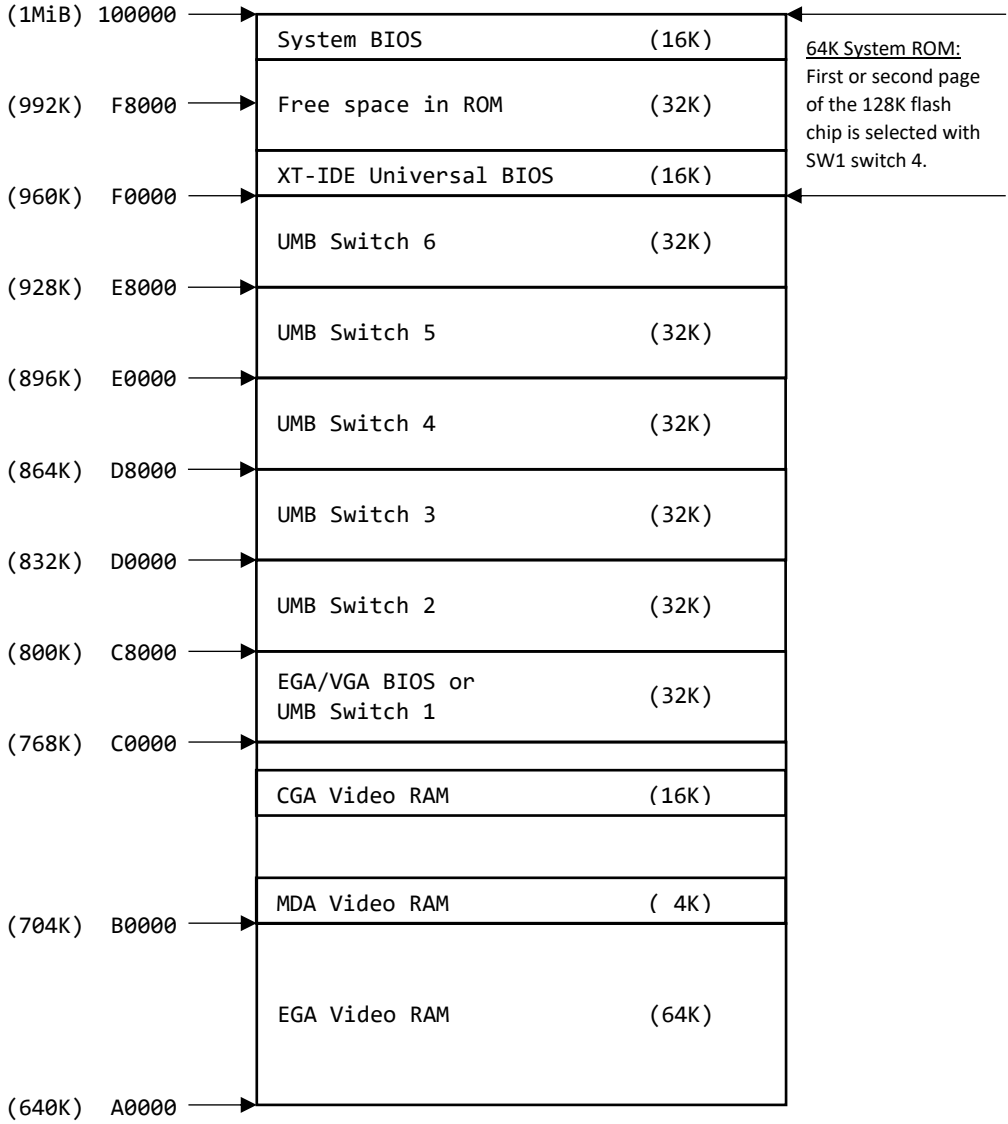
  - You can get a 1024x768 16 colour driver for Windows 3.0, which works on 8088. This is cool but it's very slow. Running Windows 3.0 on the NuXT is already a novelty enough at standard VGA resolution.
  - The standard VGA driver in Windows 3.0 requires a NEC V20. If you wish to use an 8088 with Windows 3.0, you need a modified driver.

PC/104 VGA Card DIP Switch

1: Enable the card. Disable this if using an ISA video card. Easier than removing the whole PC/104 card.

2: Enable if your VGA monitor only accepts signals with H-sync < 48.7kHz. This is only useful for old monitors.

Upper Memory Map



If enabled in the BIOS config, the Micro 8088 BIOS scans for Option ROMs from C0000 (768K) to F8000 (992K), so some of the 64K System ROM can be used for Option ROMs.

By default, XT-IDE Universal BIOS is located here (along with some more free space) and configured for an XT-IDE Rev2 circuit at I/O address 170h.

Upper Memory Blocks DOS Setup

To use the upper memory blocks in DOS, you need a driver. USE!UMBS 2.20 is the recommended driver, along with DOSMAX to move DOS to upper memory. This configuration should leave you with only 10K Conventional Memory used. DOS 5.0 or later is required.

Ensure there are no other cards that use the upper memory ranges that you've enabled as RAM on the SW2 DIP switch.

Examples of cards that would conflict with some of the SW2 switches:

- EMS memory cards. These usually have a 64K block of upper memory used as their window.
- Ethernet cards. Some Ethernet cards are memory-mapped. Check the Ethernet card configuration.
- Cards with Option ROMs. Some examples:
    - Hard Drive controllers
    - HD floppy controllers
    - Ethernet card Boot ROMs
    - EGA and VGA cards, including the optional PC/104 VGA card

For a graphical representation of the upper memory area, see the NuXT Upper Memory chart to the left. This is also on the back of the motherboard itself.

To add the USE!UMBS 2.20 driver to your CONFIG.SYS, add the following two lines to the start of the file, after any FILES or BUFFERS lines: (Find USE!UMBS 2.20 at github.com/monotech/NuXTv2)

```
DOS=UMB
DEVICE=C:\USE!UMBS.SYS C800-F000
```

- "C800-F000" specifies the range of upper memory that can be used as RAM (take a zero off the end). Ensure this matches what you have SW2 set to.
- C800-F000 matches switches 2 through 6 being ON.
- If switch 3 through 5 was ON instead, it would be D000-E800. Refer to the chart on the left.

Then add DOSMAX to your CONFIG.SYS to move DOS into upper memory. Add the following line right after USE!UMBS.SYS: (This assumes you have all the DOSMAX files copied to C:\UTILS\DOSMAX)

```
DEVICE=C:\UTILS\DOSMAX\DOSMAX.EXE /R+ /N+ /P-
```

And the following line at the end of CONFIG.SYS:

```
SHELL=C:\UTILS\DOSMAX\SHELLMAX.COM C:\COMMAND.COM C:\ /E:256 /P
```

Preparing a CompactFlash card for DOS

This guide applies to any DOS PC, not just the NuXT.

You will need:

- A modern PC, with software that can wipe a drive by filling with zeroes
- A USB card reader with a CompactFlash card slot
- A DOS 6.22 floppy. Boot Disk or Disk 1.
- (optional) A DOS 3.x floppy if you wish to use DOS 3.x. The DOS 6.22 floppy is still needed.

To prepare a CF card for MS-DOS 6.22:

1. Wipe the CF card on a modern PC. Software such as a partition editor, or 'dd' under Linux/macOS, can do this. You want to write zeroes to the whole card. "Formatting" a card is not wiping it.
2. Put the CF card into the vintage PC, turn the PC on, and boot from a DOS 6.22 floppy.
3. Run **`FDISK /MBR`**
4. Run **`FDISK`**, and create any partitions.
5. Reboot and boot from the same DOS floppy.
6. Run **`FORMAT C: /S`**
7. Done! The CF card is now bootable with minimal DOS 6.22. Feel free to install the rest of DOS, or move the CF card to a modern PC to transfer apps and games.

To prepare a CF card for DOS 3.x:

1. Wipe the CF card on a modern PC. Software such as a partition editor, or 'dd' under Linux/macOS, can do this. You want to write zeroes to the whole card. "Formatting" a card is not wiping it.
2. Put the CF card into the vintage PC, turn the PC on, and boot from a **DOS6.22 floppy**.
3. Run **`FDISK /MBR`**
4. Run **`FDISK`**, and create one partition. 32MB max. 512MB max for MS-DOS 3.31.
5. Reboot and boot from a **DOS 3.x floppy**.
6. Run **`FORMAT C: /S`**
7. If you'd like more partitions, run DOS 3.x FDISK now to create them.
8. Done! The CF card is now bootable with minimal DOS 3.x. Feel free to install the rest of DOS, or move the CF card to a modern PC to transfer apps and games.

If you'd like to back up or clone your kitted out CF card to another of identical size, you can use software such as Win32DiskImager, or 'dd' in Linux/macOS. Rufus can also do the writing function.

Structure of the NuXT System ROM

The NuXT System ROM is a 128KiB Flash ROM (SST39SF010A), split into two pages, with the selected page (SW1 Switch 5) located at F0000 to 100000 (960K to 1M).

We effectively have two 64K System ROMs that we can switch between.

You may wish to create another for various reasons, or insert more Option ROMs into it. A common reason to alter the System ROM is to change XT-IDE Universal BIOS from the 8088-compatible version to the faster 186-compatible version that requires a NEC V20. By default, the NuXT comes with the 186-compatible version in the first half, and the 8088-compatible version in the second half.

The System ROM must contain the System BIOS for the NuXT to work at all. The NuXT uses Sergey Kiselev's Micro 8088 BIOS. This BIOS has a settings menu, and all settings are saved to the System ROM itself. The RTC SRAM isn't used for storing BIOS configuration, as of Micro 8088 BIOS version 0.9.7.

Option ROMs may be placed in the first 32K of each half of the ROM chip, at 4K boundaries.

The hardware is capable of flashing the System ROM in-system from DOS, but requires a software utility to be written to do this.

If you'd like to alter the System ROM in a hex editor on a modern PC, I recommend acquiring the pre-made 128K ROM image from github.com/monotech/NuXTv2. This is ready to program with a programmer device such as a universal programmer or most PCI Ethernet cards with a 32-pin ROM socket.

This pre-made image is structured like this, and it is recommended to keep to that structure:

- Start of the file – XT-IDE Universal BIOS, configured for XT-IDE Rev2 at 170h, 186+ version.
- Empty space (FF's)
- C000 – FFFF – Micro 8088 BIOS

--- this is the 64K boundary where the 'secondary System ROM' starts ---

- 10000 – XT-IDE Universal BIOS, configured for XT-IDE Rev2 at 170h, XT version.
- Empty space (FF's)
- 1C000 – FFFFF – Micro 8088 BIOS

Configuring XT-IDE Universal BIOS (XUB)

Most of this applies to XUB in general, not just on the NuXT.

XUB can be found at xtideuniversalbios.org/binaries

XUB is a hard disk Option ROM, that supports a wide range of HDD controllers and HDDs, including special modern 8-bit-bus-compatible controllers such as “XT-IDE” and “XT-CF”.

The NuXT has an XT-IDE Rev2 circuit for the IDE interface and CF slot, and uses XUB to detect and access the drive(s). XUB is located in the 32K half of the System ROM that is scanned by the System BIOS for Option ROMs. The IDE I/O Address for the NuXT’s onboard XT-IDE Rev2 is fixed at 170h (unless you cut and change the solder-jumper).

You may wish to reconfigure XUB for the following reasons:

- Update to a newer version that may fix issues or increase compatibility.
- Change between the faster 186-compatible version, or the 8088-compatible version.
- Add more controllers for XUB to handle, such as ones on a card you add to the NuXT, including XT-IDE, XT-CF, and “16-bit ISA IDE in 8-bit mode” (supports CF cards only).

XUB releases have the following files:

Filename	Minimum CPU	Size	Boot menu
IDE_XT.BIN	8088	8K	
IDE_XTL.BIN	8088	12K	Yes
IDE_XTP.BIN	NEC V20	8K	
IDE_XTPL.BIN	NEC V20	12K	Yes
IDE_AT.BIN	286	8K	
IDE_ATL.BIN	286	12K	Yes
IDE_386.BIN	386	8K	
IDE_386L.BIN	386	12K	Yes

XTIDECFG.COM – Configuration utility. Used to alter the XUB BIOS images, and to flash any image (not just XUB) to an EEPROM, in-system. Can be run in DOSBOX to alter the images on a modern PC, and then flash to EEPROM with a programmer.

The higher minimum CPU images will generally provide greater disk performance.

The 12K releases may be only 10K sometimes. Either way, they won’t fit on an 8K ROM.

The regular 8K image will boot from the first hard drive, unless you press ‘A’ to boot from the first floppy drive instead. This can be swapped. The 12K ROM has a boot menu, which lets you choose from any drive to boot from. This may swap drive letters to please DOS, and isn’t always hassle-free. Since the NuXT System ROM has 32K of free space for Option ROMs, you can freely use the 12K release here.

The higher CPU versions can work with even higher CPUs. For example, the 186-compatible version will work on a 286 just fine, and the 8088-compatible will work with all CPUs.

When reconfiguring an XT-IDE or XT-CF card, use the following table to determine action:

Desired change	Must change switches on card	Must configure and re-flash XUB
Change Boot ROM Address	Yes	No
Change IDE I/O Address	Yes	Yes
Change XT-IDE HiSpeed mode	Yes	Yes
Change other XUB settings	No	Yes

The Boot ROM address for XUB on the NuXT is well out of the way of other devices that use upper memory, because it's stored in the System ROM above F0000 (960K). See page 12 for clarification.

HiSpeed mode (also known as "Chuck mod", named after Chuck(G) on VCF who discovered it) only applies to XT-IDE cards, not XT-CF. It improves disk performance but is incompatible with a small number of systems.

If using in a 286 or up, once everything is working how it should, enable ROM Shadowing in your BIOS Setup (if the option is available) for the location of the XUB Boot ROM, improving disk performance.

To configure XUB, do the following:

1. Run **XTIDECFG.COM** from DOS.
2. Select 'Load BIOS from file'. Select an appropriate XUB image as per previous page.
3. Select 'Configure XTIDE Universal BIOS'.
4. Set the number of IDE controllers to whatever number you'd like XUB to handle. Default is 1. If configuring more than 2, you must enable 'Full operating mode'.
5. You can then enter each of the IDE controller menus, and set the **Device Type**, and **I/O address**. You can usually leave 'Master Drive' and 'Slave Drive' as default, and XUB will autodetect drives at boot. Choose from the following Device Types:
    - 16-bit ISA/VLB/PCI – this is a standard IDE interface as seen on motherboards, Multi-I/O cards, and some sound cards. Only works in a 286 and up.
    - 32-bit VLB/PCI IDE – this is for 486 machines and up, with those interfaces.
    - XTIDE rev 1 – this is an XT-IDE card in Compatibility Mode.
    - XTIDE rev 2 or modded rev 1 – this is an XT-IDE card in HiSpeed mode.
    - XT-CF PIO8 – this is an XT-CF card, simpler than an XT-IDE but less compatible.
    - 16-bit ISA IDE in 8-bit mode – works with most standard IDE interfaces as seen on 16-bit sound cards and multi-I/O cards. This can only be used with CF cards.
6. Go back, and enter Boot Settings. Here, you can change Display Mode, and the default drive.
7. Go back to the main menu. You can now either save the XT-IDE configuration to the original ROM image you selected at the start, or you can flash it if you're doing this in-system.
    - Flashing the XT-IDE BIOS **in-system** can be done on XT-IDE and XT-CF cards, but not on the NuXT's System ROM unless a special utility is written.
    - To flash the EEPROM, you must have the card switched to enable writes.
    - Ensure the EEPROM Type and Address are correct, and choose Start Flashing.
    - If it fails, and you are sure the above settings are correct, change the Page Size to 64 bytes, and then each of the other Page Size settings, until it works. Some systems need this setting set differently.

Troubleshooting

If you have trouble with the NuXT, you may find a solution here:

- Dead board, or beeping on and off and not booting up – general error
    - Bad CPU, FPU, RAM, ROM, peripherals, or logic
        - Perform a minimal diagnostic. Remove all unnecessary items (you need a PLCC extractor tool to remove some, and practice removing DIP ICs).
            - Any ISA and PC/104 cards
            - Any CF cards, IDE and floppy cables, and all I/O cables, including VGA
            - U2 – 8087-1
            - U5 – Optional RAM
            - U7 – 16C552
            - U8 – PC8477
            - U10 – PIC12F629
        - If your board does not say "REV B" in the bottom left corner, and the 16C552 (U7) is **not** present, you must solder a 10K resistor across U22 pins 7 and 11.
        - Reseat the socketed ICs.
        - Replace the RAM and ROM (ROM and CPU are usually okay if it's beeping).
        - To disable onboard RAM in order to try a RAM card, remove both RAM chips (U4 & U5) and disable SW1 switch 4.
    - Shorted ISA bus lines
        - Check for debris in the ISA slots.
        - Remove all ISA cards.
        - Ensure any PC/104 cards are aligned properly. Damage to the card or motherboard can result from installing it incorrectly.
        - Check CF slot for bent pins or metallic debris.
- You hear the POST jingle, but there is no display
    - Video card issue, bad connection, or incompatible display
        - Try another monitor.
        - Disable the onboard VGA PC/104 card (if present) and try another video card.
        - Reseat the VRAM and Video BIOS ICs on the onboard PC/104 VGA card.
        - Check your VGA cable for bent pins.
        - The VGA card you're using may not be compatible with 8-bit ISA or 8088 CPUs.
- Keyboard issues
    - Check your keyboard's connector for bent pins.
    - Enable keyboard E0 scancode passthrough (SW1 switch 3).
    - Try another keyboard. A small number may not be compatible.
    - Ensure the PIC12F629 microcontroller is programmed with AT2XT firmware.
    - Ensure U10 is present and JP7 has no jumpers if using PS/2 or AT keyboard.
    - Ensure U10 is removed and JP7 has two jumpers lined up vertically if using XT keyboard.

- RS-232 serial port issues
    - Ensure +12V and -12V rails are present.
    - Some serial mice are known to be unreliable or picky.
    - Ensure any UARTs on ISA cards are not set to the same COM designation as SW3 or SW4. See page 9.
    - If the UART is detected by the System BIOS, but won't operate, ensure the oscillator X1, is outputting 1.8432MHz.
- PS/2 mouse issues
    - Some picky mice may not work well with the PS/2 to Serial mouse converter. Try another.
    - Ensure any UARTs on ISA cards are not set to the same COM designation as SW3 or SW4. See page 9.
    - If the UART is detected by the System BIOS, but won't operate, ensure the oscillator X1, is outputting 1.8432MHz.
    - If the green Mouse Activity LED blinks as you move the mouse, the connection between mouse and microcontroller is working, and the issue likely lies between microcontroller and UART, or UART and mouse software. Microsoft Mouse 8.20 is the recommended driver. CuteMouse driver sometimes causes odd behaviour, and so isn't recommended.
- Parallel port issues
    - Ensure any parallel ports on ISA cards are not set to the same LPT designation as SW5. See page 9. Sound cards sometimes use IRQ7 or more commonly, IRQ5.
- RTC not detected, not ticking, or has a corrupted date or time
    - Set the date and time by typing DATE or TIME from DOS.
    - Ensure the RTC battery is not depleted. Reseat the battery.
    - Check for debris on the front and back of the PCB around U9 and crystal Y1.
    - The RTC oscillator circuit is very sensitive. Moving the NuXT around out of a PC case, or touching the RTC circuit, can cause temporary RTC issues or corruption.
- IDE device not detected, has a corrupted name, or has intermittent corruption issues
    - Incompatible IDE device. The XT-IDE circuit, as used on the NuXT, works with most CF cards and IDE hard drives, but a small number may not work.
        - Try another CF card or IDE hard drive.
        - Very early IDE hard drives may not be autodetected, and need reconfiguring and re-flashing of XT-IDE BIOS in the System ROM.
    - Board damage
        - Check CF slot for bent pins or debris.
    - Resource conflict
        - Ensure no other devices are using I/O address 170h. A 16-bit sound card's CDROM interface may be set to this, or even hard-wired to it.
- Floppy controller issues
    - Bad connection or floppy controller IC
        - Reseat the floppy controller IC.
        - Replace the floppy controller IC.
    - Resource conflict
        - Ensure there are no other floppy controllers in the system.