www.hp.com/go/vectrasupport

hp vectra vl800 desktop & minitower

technical reference manual

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HP France
Business Desktop Division (BDD)
38053 Grenoble Cedex 9
France

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Preface

This manual is a technical reference and BIOS document for engineers and technicians providing system level support. It is assumed that the reader possesses a detailed understanding of AT-compatible microprocessor functions and digital addressing techniques.

Technical information that is readily available from other sources, such as manufacturers' proprietary publications, has not been reproduced.

This manual contains summary information only. For additional reference material, refer to the bibliography on the following page.

For all warning and safety instructions, refer to the user guide delivered with the PC Workstation.

Conventions

The following conventions are used throughout this manual to identify specific numeric elements:

Hexadecimal numbers are identified by a lower case h.
For example, 0FFFFFFFh or 32F5h

Binary numbers and bit patterns are identified by a lower case b.
For example, 1101b or 10011011b

Bibliography

Documentation can be downloaded from the HP web site: **www.hp.com/go/vectrasupport**.

- ❒ HP Vectra VL800 *Desktop User's Guide*
  Available in English, French, Italian, German and Spanish.
- ❒ HP Vectra VL800 *Minitower User's Guide*
  Available in English, French, Italian, German and Spanish.
- ❒ HP Vectra VL800 *Desktop & Minitower Troubleshooting Guide*
  Available in English, French, Italian, German and Spanish.
- ❒ HP Vectra VL800 *Desktop PC Service Handbook Chapter*
  Available in English only.
- ❒ HP Vectra VL800 *Minitower PC Service Handbook Chapter*
  Available in English only.

Extra Information Can Be Obtained At:

- ❒ Matrox graphics cards
  http://www.matrox.com
- ❒ Sound Blaster audio cards
  http://www.soundblaster.com
- ❒ NVIDIA graphics cards
  http://www.nvidia.com
- ❒ Intel Chipsets. Intel I850 chipset
  http://developer.intel.com
- ❒ Intel Pentium 4 Processor
  http://developer.intel.com

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VL800 Desktop

This chapter introduces the external features of the *HP Vectra VL800 Desktop PC*, and lists the specifications and characteristic data of the system. It also provides a summary of the documentation available.

Overview

The *HP Vectra VL800* is based on the ATX form factor. The following table provides an overview of the system.

Feature	Description
System Board	ATX package, 12in. x 9.6in. or 30.4cm x 24.4cm
Processor	Intel Pentium 4 PGA processor. Socket 423 Processors from 1.3 GHz and upwards 400 MHz (quad pumped 100 MHz), 3.2 GB/s FSB (Front Side Bus)
Cache Memory (integrated in processor package)	• Level-One: 16 KB code, 16 KB data • Level-Two: i256 KB
Internal Processor Clock Speed	1.3, 1.4, 1.5, 1.7 and 2.0 GHz with a quad-pumped 100 MHz FSB
Chipset	Intel Chipset (I850) including Memory Controller Hub (MCH) Host Bridge, Input/Output Controller Hub (ICH2) for input/output sub-system
Super I/O Chip	NS 87364
BIOS (Basic Input/Output System)	Based on Phoenix core including: • 4 M/bits of flash memory • Support for PCI 2.2 Specification • Support for RIMM memory modules

Feature	Description
Firmware - BIOS	Flash EEPROM: Intel's Firmware hub concept
Operating System	Most models are preloaded with Windows 2000. Some models are preloaded with Windows NT® 4.0.
Main Memory	2 pairs of RIMM sockets supporting 2 or 4 PC800 RDRAM memory modules. Each pair of memory sockets must contain identical memory modules (identical in size, speed and type). That is, sockets **A1** and **B1** must contain identical modules, and sockets **A2** and **B2** must contain identical modules (or continuity modules). If only two RDRAM modules are installed, use the sockets marked **A1** and **B1**. The other two sockets (**A2** and **B2**) must contain continuity modules Models are supplied with non-ECC RDRAM modules. Both ECC and non-ECC modules are available. Up-to-date memory upgrades are listed on the HP PC Accessories website at: **www.hp.com/go/pcaccessories**
Mass Storage	Five mass storage shelves supporting: • One front-access, third-height, floppy disk drive • Two front-access, half-height, 5.25-inch drives • Two internal 3.5-inch hard disk drives (one full-height, one half-height).
Optional SCSI Controller	LSI Logic Ultra 160 SCSI PCI card
IDE Controller	All models include an integrated Ultra ATA-100 controller that supports up to four IDE devices
Graphics Controllers	• nVidia GeForce2 GTS AGP graphics controller with 32 MB graphics memory • Matrox Millennium G450-Dual monitor AGP graphics controller with 16 MB SGRAM graphics memory.
Accessory Card Slots	One AGP (Accelerated Graphics Port) 4x 32-bit slot supporting standard 1.5V AGP cards (≤25 W) only. Hardware protection prevents any 3.3V AGP cards from being used.
	Five 32-bit 33 MHz PCI (Peripheral Component Interconnect) slots supporting all bridges and multi-function PCI devices. All five PCI slots comply with the PCI Specification 2.2. PCI slot 5 contains a LAN interface board.

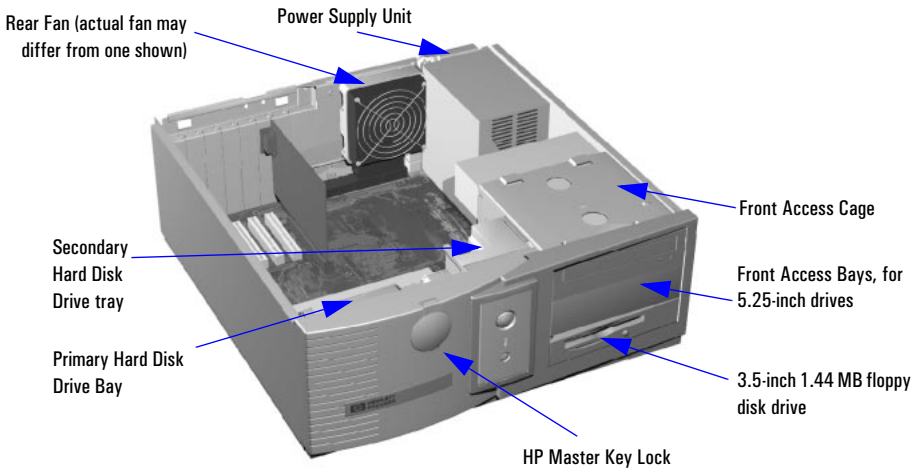
Feature	Description
LAN Card	All models are supplied with an HP 10/100BT PCI Ethernet Adapter LAN card installed in PCI slot 5, supporting Wake-On LAN (WOL) and PCI 2.2 Specification.
Optical Drive	Models have one of these optical drives: ❒ IDE 48X CD-ROM ❒ IDE 8X 4X 32X CD-RW drive ❒ IDE 12X DVD drive.
Standard Audio	CrystalClear™ CS4299 Audio Codec 97 version 2.1 integrated on the system board.
Optional Audio	Creative Labs Sound Blaster Live! audio card
Loudspeaker	Standard in Desktop models
System Board Connectors:	• One flexible disk drive connector • Two ATA-100 IDE connectors (for up to four IDE devices) • One CD-IN audio connector (for use with integrated audio) • Internal speaker connector (1 for Minitower + 1 for Desktop) • WOL connector • Battery socket • Status panel connectors (1 for Minitower + 1 for Desktop) • Main power supply connector • ATX 12V power connector • Main chassis fan connector • Processor fan connector • Chassis intrusion connectors (1 for Minitower + 1 for Desktop).

Feature	Description
Rear Connectors (color coded)	• Keyboard/Mouse ❒ HP enhanced keyboard with mini-DIN connector ❒ HP enhanced scrolling mouse with mini-DIN connector • 25-pin parallel ❒ Mode: Centronics or bidirectional modes (ECP/EPP) ❒ Parallel port: 1 (378h, IRQ 7), 2 (278h, IRQ 5), or Off. • 9-pin serial (two, buffered) ❒ Standard: Two UART 16550 buffered serial ports (both RS-232-C). ❒ Serial Ports A and B: 2F8h (IRQ 3), 2E8h (IRQ 3), 3F8h (IRQ 4), 3E8h (IRQ 4), or Off— (if one port uses 2xxh, the other port must use 3xxh). • Dual USB connectors • Audio (Integrated) ❒ LINE IN jack (3.5 mm) ❒ LINE OUT jack (3.5 mm) ❒ MIC IN jack (3.5 mm)

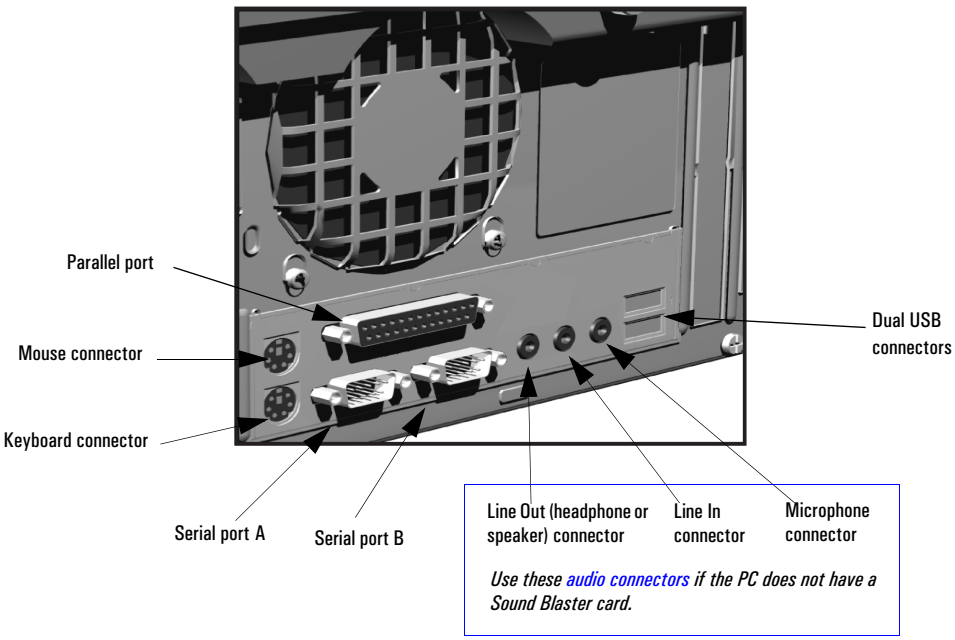
Desktop Package

The following two diagrams show the front and rear views.

Front and Side Views



Rear View



Internal Features

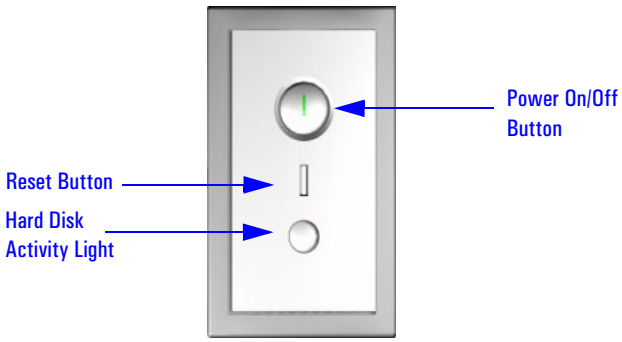
The core architecture of the *HP Vectra VL800 PC* is constructed around the Memory Controller Hub (MCH), the Input/Output Controller Hub (ICH) and the Host bus.

The *HP Vectra VL800 PC* supports a Pentium 4 processor. This processor is described on page 72.

The components of the system board are described in chapter 3; the graphics, network and SCSI devices are described in chapter 4; mass storage devices are described in chapter 5; the HP BIOS routines are summarized in chapter 6; and the Power-On Self-Test routines are described in chapter 7.

Desktop Front Panel

The front panel has the following features:



- *On/Off LED.* There are five states:

  Blank. Indicates that the computer is turned off.
  Green. Indicates that the computer is turned on and running correctly.
  Flashing green. Displayed during system reset, system lock, Standby mode (Windows 98 and Windows 2000) or Suspend mode (Windows 95).
  Red (fixed or flashing). Indicates a pre-boot error or a Power-On Self-Test (POST) error, preventing the system from booting.

- *Hard disk drive activity LED.* Activated during POST and when the hard disk drive is being accessed.

Desktop Specifications and Characteristics

Physical Characteristics

System Processing Unit	
Weight (Standard configuration as shipped, excl. keyboard and display)	10 kilograms (22 pounds)
Dimensions:	45.7 cm max. (D) by 42 cm (W) by 16.2 cm (H) (18 inches by 16.5 inches by 6.37 inches)
Footprint:	0.19 m^2 (2.06 sq ft)

Electrical Specifications

Parameter	Total Rating		Notes	Maximum per PCI Slots 32-bit 33 MHz	Maximum for AGP Slot
Input voltage	100 - 127 V VAC	200 -240 V Vac	Switch select	—	—
Input current (max)	7 A	4 A	—	—	—
Output power	250 W		—	—	—
Input frequency	50 to 60 Hz		—	—	—
Available power	250 W		—	60 W combined	25 W (max)
Max current at +12 V	6 A		—	0.5 A	1 A
Max current at -12 V	0.3 A		—	0.1 A	—
Max current at +3.3 V	14 A		—	7.6 A	6 A
Vddq[1]	—		—	—	2 A
Max current at +5 V	22 A		—	5 A	2 A
Max current at -5 V	0.3 A		—	—	—
Max current at +5Vstdby	2 A		—	—	—

1. Only for I/O buffers.

If the overload protection in the power supply unit is triggered, all power is immediately cut. To reset the power supply unit, remove the power cord and then determine what caused the overload and remedy it. Reconnect the power cord, then reboot the PC. If an overload happens twice, then there is an undetected short circuit somewhere.

NOTE

When the PC is turned off with the power button on the front panel, the power consumption falls below the low power consumption (refer to the below table), but is not zero. The special on/off method used by this PC extends the lifetime of the power supply. To reach zero power consumption in "off" mode, either unplug the PC from the power outlet or use a power block with a switch.

Power Consumption and Cooling

The power consumption and acoustic noise data in the below table are valid for a standard configuration as shipped (256 MB of memory, 250 W power supply, one hard disk drive, graphics card, LAN card)

All information in this section is based on primary power consumptions.

Power consumption (approximate values)	*230 V / 50 Hz and 115 V / 60 Hz*
• Maximum operating	115W - 392.4 Btu/h[1]
• Typical operating	70 W - 238.8 Btu/h
• Suspend (only on Windows 2000 models)	< 4 W - 13.6 Btu/h
• Off	< 4 W - 13.6 Btu/h

1. 1 W = 3.4121 Btu/h

Environmental Specifications

Environmental Specifications (System Processing Unit, with Hard Disk)		
Operating Temperature	+10 °C to +35 °C (+40 °F to +95 °F)	
Storage Temperature	-40 °C to +70°C (-40 °F to +158 °F)	
Over Temperature Shutdown	+50°C (+122°F)	
Operating Humidity	15% to 80% (relative)[1]	
Storage Humidity	8% to 85% (relative)[1]	
Acoustic noise emission (as defined ISO 7779): • Operating • Operating with hard disk access • Operating with floppy disk access	***Sound Power*** LwA ≤ 38 dB (4.1 B) LwA ≤ 46 dB (4.9 B) LwA ≤ 45 dB (4.8 B)	***Sound Pressure*** LpA ≤ 30 dB LpA ≤ 38 dB LpA ≤ 37 dB
Operating Altitude	10000 ft (3100m) max.	
Storage Altitude	15000ft (4600m) max.	

[1] non condensing conditions.

Operating temperature and humidity ranges may vary depending upon the mass storage devices installed. High humidity levels can cause improper operation of disk drives. Low humidity levels can aggravate static electricity problems and cause excessive wear of the disk surface.

Power Saving and Ergonometry

Depending on the operating system, the following power management types are available:

- *No sleeping state*: Windows NT 4 (Full On and Off)
- *ACPI*: Windows 2000 (Full On, Standby, Hibernate, Off).

<table>
<tr><th colspan="2"></th><th>Windows 2000</th><th>Windows NT 4</th></tr>
<tr><td rowspan="3">APM</td><td>Full On</td><td rowspan="3">Not Supported by Windows 2000</td><td>Supported</td></tr>
<tr><td>Suspend</td><td>Not Supported by Windows NT 4</td></tr>
<tr><td>Off</td><td>Supported</td></tr>
<tr><td rowspan="3">ACPI</td><td>Standby (S1 or S3)</td><td>Supported (implemented as S3, Suspend to RAM)</td><td rowspan="3">Not Supported by Windows NT 4 (APM only Operating System)</td></tr>
<tr><td>Hibernate (S4)</td><td>Supported</td></tr>
<tr><td>Off (S5)</td><td>Supported</td></tr>
</table>

Power Saving Modes and Ergonometry for APM Systems

	Full On	Suspend[1]	Off
Processor	Normal speed	Halted	Off
Display	On	Blanked, < 5 W (typical)	Off
Hard disk drive	Normal speed	Halted	Off
Power consumption	Supports up to 250 W	< 40 W (230V, 50 Hz) < 21 W (115V, 60 Hz)	(plugged in but turned off) < 5 W (average)
Resume events		Keyboard, network (RWU), modem, USB	Space bar or power button, RPO
Resume delay		A few seconds	Boot delay

1. Not supported by Windows NT 4.

Power Saving Modes and Resume Events for ACPI Systems

	Full On (S0)	Suspend (S1)	Suspend to RAM (S3)	Suspend to Disk (S4)	Off (S5)
Processor	Normal speed	Halted	Off	Off	Off
Display	On	Blanked	Off	Off	Off
Hard Disk Drive	Normal speed	Halted	Off	Off	Off
Heatsink Fan	On (variable speed)	Off (but can start if system gets too hot)	Off	Off	Off
Active Power Planes	VCC VCCAux	VCC VCCAux	Memory VCCAux	VCCAux	VCCAux
Power Consumption	Supports up to 250 W	< 40 W	< 10 W	< 10 W	< 10 W
Resume Events		Power button, LAN, Modem, USB, Scheduler, HP Start Key	Power button, LAN, Modem, Scheduler, HP Start Key	Power button, LAN, Modem, Scheduler, HP Start Key	Power button, HP Start Key
Resume Delay		Instantaneous	Few seconds	BIOS boot delay + OS restore delay	Regular boot delay

Keyboard Power-On

You can power-on from the keyboard space bar provided that:

- The computer is connected to a keyboard that has a power-on space bar (recognizable by the Power-On icon on the space bar)
- The function is enabled by setting system board switch 6 to **ON**.

Soft Power Down

When the user requests the operating system to shut down, the environment is cleared, and the computer is powered off. *Soft Power Down* is available with Windows NT (when the Soft Power Down utility is used).

Documentation

The table below summarizes the available documentation. Only selected publications are available in paper-based form. Most are available as PDF from the HP web site.

Manual Title	Available
HP Desktop PCs Quick User's Guide	• Printed manual, part number 5970-5080-xx[1]. • PDF file from HP support web site.
HP Vectra VL800 Desktop User's Guide	Only as PDF file from HP support web site.
HP Vectra VL800 Desktop & Minitower Troubleshooting Guide	Only as PDF file from HP support web site.
HP Vectra VL800 Desktop& Minitower Technical Reference Manual (this manual)	Only as PDF file from HP support web site.
HP Vectra VL800 Desktop Service Handbook Chapter	• PDF file from HP support web site. • Will also be included in the 16th edition of the paper-based HP Vectra Service Handbook, when it becomes available.

1. xx = language code.

HP Support Web Site

Documentation, BIOS upgrades and drivers are available from HP's support web site.

To access the HP support web site for:

Documentation	1 Connect to **www.hp.com/go/vectrasupport** 2 In the left hand menu, click **manuals** 3 Select model **hp vectra vl800**.
BIOS Upgrades & Drivers	1 Connect to **www.hp.com/go/vectrasupport** 2 Select model **hp vectra vl800**.
Technical Notes (when available)	1 Connect to **www.hp.com/go/vectrasupport** 2 In the left hand menu, click **technical notes** 3 Select model **hp vectra vl800**.

Where to Find the Information

The table below summarizes information provided for the *HP Vectra VL800*.

	Quick User's Guide	User's Guide	Troubleshooting Guide	Service Handbook	Technical Reference Manual (this manual)	HP Web Site
	All manuals available at www.hp.com/go/vectrasupport					
Introducing the PC						
Product features		Standard configuration		Exploded view. Parts list.	Key features, this chapter	www.hp.com/go/desktops
Product model numbers				Product range. CPL dates.		www.hp.com/go/desktops
Environmental	Setting up the PC. Working in comfort.					
Safety information		Electrical, multimedia, safety, unpacking, removing & replacing cover.	Safety			
Finding online information	HP Web sites	Preloaded, HP Web sites	HP Web sites		HP web sites and others, page 8 and page 22	
Technical information	Basic details	Basic details			Advanced, this entire manual	
Legal information	Certificate of Conformity. Software License agreement.					
Using the PC						
Connecting devices and turning on PC	Rear panel connectors, starting and stopping					

	Quick User's Guide	User's Guide	Troubleshooting Guide	Service Handbook	Technical Reference Manual (this manual)	HP Web Site
	All manuals available at www.hp.com/go/vectrasupport					
BIOS		Basic details	Updating and recovering		Technical details, chapter 6. Memory maps, page 118.	www.hp.com/go/vectrasupport
Setup program fields and options		Basic details. Viewing *Setup* screen, using, passwords	Basic details		Complete list, page 105.	
Manageability		Power management, Software and drivers				www.hp.com/go/toptools
Upgrading the PC						
Opening the PC		Full description				
Supported accessories				Full part number details		www.hp.com/go/pcaccessories
Installing accessories		Processor(s), memory, accessory boards, mass storage devices.	Error messages, problem solving			
Configuring devices		Installing devices	Installing devices			
System board		Installing and removing, connectors and switch settings	Switch settings	Jumpers, switches and connectors	Jumpers, switches and connectors; chipset details, chapter 3	
Repairing the PC						
Troubleshooting	Basic	Basic, hardware diagnoses	Hardware diagnoses and suggested solutions	Service notes	HP BIOS, chapter 6. Tests and error messages, chapter 7.	www.hp.com/go/instantsupport

	Quick User's Guide	User's Guide	Troubleshoot-ing Guide	Service Handbook	Technical Reference Manual (this manual)	HP Web Site
	All manuals available at www.hp.com/go/vectrasupport					
Power-On Self-Test routines (POST)		Basic details	Error Messages, EMU and suggestions for corrective action		Error codes and suggestions for corrective action, chapter 7. Order of tests, chapter 7	
Hardware diagnostic utility	e-DiagTools, CD-ROM recovery	HP e-DiagTools, CD-ROM recovery	HP e-DiagTools, CD-ROM recovery			www.hp.com/desktops/diagtools

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VL800 Minitower

This chapter introduces the external features of the *HP Vectra VL800 Minitower PC*, and lists the specifications and characteristic data of the system. It also provides a summary of the documentation available.

Overview

The *HP Vectra VL800* is based on the ATX form factor. The following table provides an overview of the system.

Feature	Description
System Board	ATX package, 12in. x 9.6in. or 30.4cm x 24.4cm
Processor	Intel Pentium 4 PGA processor. Socket 423 Processors from 1.3 GHz and upwards 400 MHz (quad pumped 100 MHz), 3.2 GB/s FSB (Front Side Bus)
Cache Memory (integrated in processor package)	• Level-One: 16 KB code, 16 KB data • Level-Two: i256 KB
Internal Processor Clock Speed	1.3, 1.4, 1.5, 1.7 and 2.0 GHz with a quad-pumped 100 MHz FSB
Chipset	Intel Chipset (I850) including Memory Controller Hub (MCH) Host Bridge, Input/Output Controller Hub (ICH2) for input/output sub-system
Super I/O Chip	NS 87364
BIOS (Basic Input/Output System)	Based on Phoenix core including: • 4 M/bits of flash memory • Support for PCI 2.2 Specification • Support for RIMM memory modules

Feature	Description
Firmware - BIOS	Flash EEPROM: Intel's Firmware hub concept
Operating System	Most models are preloaded with Windows 2000. Some models are preloaded with Windows NT® 4.0.
Main Memory	2 pairs of RIMM sockets supporting 2 or 4 PC800 RDRAM memory modules. Each pair of memory sockets must contain identical memory modules (identical in size, speed and type). That is, sockets **A1** and **B1** must contain identical modules, and sockets **A2** and **B2** must contain identical modules (or continuity modules). If only two RDRAM modules are installed, use the sockets marked **A1** and **B1**. The other two sockets (**A2** and **B2**) must contain continuity modules Models are supplied with non-ECC RDRAM modules. Both ECC and non-ECC modules are available. Up-to-date memory upgrades are listed on the HP PC Accessories website at: **www.hp.com/go/pcaccessories**
Mass Storage	Five mass storage shelves supporting: • One front-access, third-height, floppy disk drive • Three front-access, half-height, 5.25-inch drives • Two internal 3.5-inch hard disk drives (one full-height, one half-height).
Optional SCSI Controller	LSI Logic Ultra 160 SCSI PCI card
IDE Controller	All models include an integrated Ultra ATA-100 controller that supports up to four IDE devices
Graphics Controllers	• nVidia GeForce2 GTS AGP graphics controller with 32 MB graphics memory • Matrox Millennium G450-Dual monitor AGP graphics controller with 16 MB SGRAM graphics memory.
Accessory Card Slots	One AGP (Accelerated Graphics Port) 4x 32-bit slot supporting standard 1.5V AGP cards (≤25 W) only. Hardware protection prevents any 3.3V AGP cards from being used.
	Five 32-bit 33 MHz PCI (Peripheral Component Interconnect) slots supporting all bridges and multi-function PCI devices. All five PCI slots comply with the PCI Specification 2.2. PCI slot 5 contains a LAN interface board.

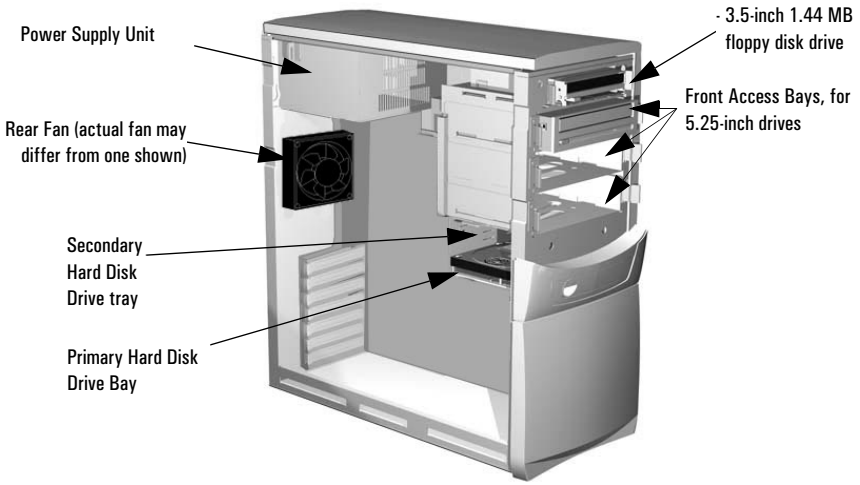
Feature	Description
LAN Card	All models are supplied with an HP 10/100BT PCI Ethernet Adapter LAN card installed in PCI slot 5, supporting Wake-On LAN (WOL) and PCI 2.2 Specification.
Optical Drive	Models have one of these optical drives: ❒ IDE 48X CD-ROM ❒ IDE 8X 4X 32X CD-RW drive ❒ IDE 12X DVD drive.
Standard Audio	CrystalClear™ CS4299 Audio Codec 97 version 2.1 integrated on the system board.
Optional Audio	Creative Labs Sound Blaster Live! audio card
Loudspeaker	Optional in Minitower models
System Board Connectors:	• One flexible disk drive connector • Two ATA-100 IDE connectors (for up to four IDE devices) • One CD-IN audio connector (for use with integrated audio) • Internal speaker connector (1 for Minitower + 1 for Desktop) • WOL connector • Battery socket • Status panel connectors (1 for Minitower + 1 for Desktop) • Main power supply connector • ATX 12V power connector • Main chassis fan connector • Processor fan connector • Chassis intrusion connectors (1 for Minitower + 1 for Desktop).

Feature	Description
Rear Connectors (color coded)	• Keyboard/Mouse ❒ HP enhanced keyboard with mini-DIN connector ❒ HP enhanced scrolling mouse with mini-DIN connector • 25-pin parallel ❒ Mode: Centronics or bidirectional modes (ECP/EPP) ❒ Parallel port: 1 (378h, IRQ 7), 2 (278h, IRQ 5), or Off. • 9-pin serial (two, buffered) ❒ Standard: Two UART 16550 buffered serial ports (both RS-232-C). ❒ Serial Ports A and B: 2F8h (IRQ 3), 2E8h (IRQ 3), 3F8h (IRQ 4), 3E8h (IRQ 4), or Off— (if one port uses 2xxh, the other port must use 3xxh). • Dual USB connectors • Audio (Integrated) ❒ LINE IN jack (3.5 mm) ❒ LINE OUT jack (3.5 mm) ❒ MIC IN jack (3.5 mm)

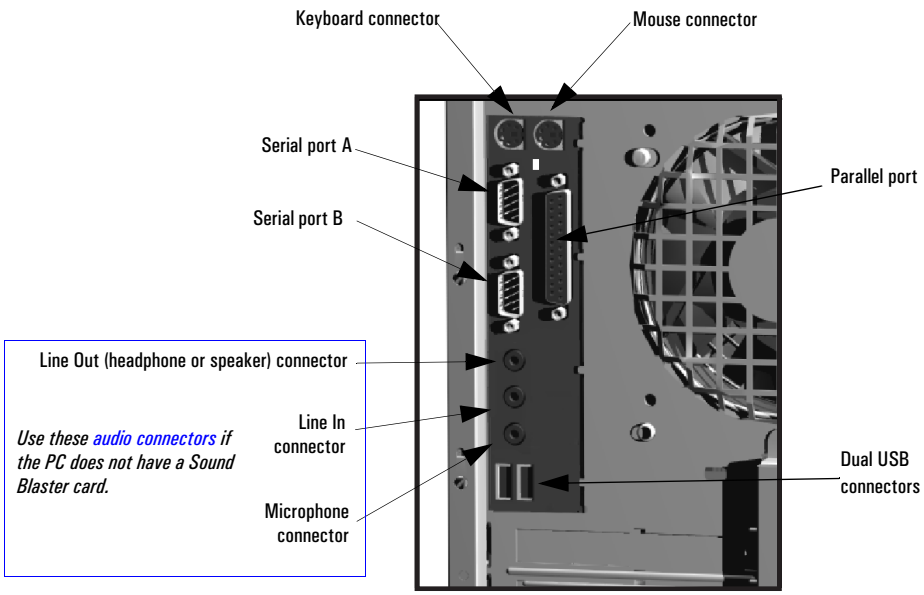
Minitower Package

The following two diagrams show the front and rear views.

Front and Side Views



Rear View



Internal Features

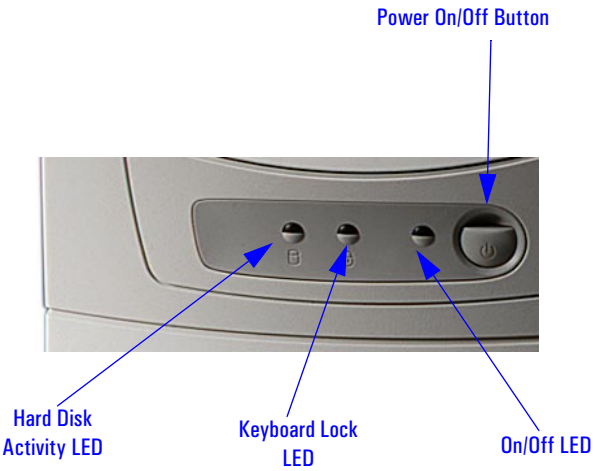
The core architecture of the *HP Vectra VL800 PC* is constructed around the Memory Controller Hub (MCH), the Input/Output Controller Hub (ICH) and the Host bus.

The *HP Vectra VL800 PC* supports a Pentium 4 processor. This processor is described on page 72.

The components of the system board are described in chapter 3; the graphics, network and SCSI devices are described in chapter 4; mass storage devices are described in chapter 5; the HP BIOS routines are summarized in chapter 6; and the Power-On Self-Test routines are described in chapter 7.

Minitower Front Panel

The front panel has the following features:



- *On/Off LED.* There are five states:

  Blank. Indicates that the computer is turned off.
  Green. Indicates that the computer is turned on and running correctly.
  Flashing green. Displayed during system reset, system lock, Standby mode (Windows 98 and Windows 2000) or Suspend mode (Windows 95).
  Yellow (fixed or flashing). Indicates a pre-boot error or a Power-On Self-Test (POST) error, preventing the system from booting.

- *Hard Disk Activity LED.* Activated during POST and when the hard disk drive is being accessed.
- *Keyboard Lock LED.* Activated during POST and when the keyboard is locked.

Minitower Specifications and Characteristics

Physical Characteristics

System Processing Unit	
Weight (configuration with one CD-ROM drive, excl. keyboard and monitor)	14 kilograms (30.86 pounds)
Dimensions:	45.5 cm (D) by 20.6 cm (W) by 46.9 cm (H) (17.9 inches by 8.1 inches by 18.5 inches)
Footprint:	0.094 m^2 (1.01 ft^2)

Electrical Specifications

Parameter	Total Rating		Notes	Maximum per PCI Slots 32-bit 33 MHz	Maximum for AGP Slot
Input voltage	100 - 127 V VAC	200 -240 V Vac	Switch select	—	—
Input current (max)	7 A	4 A	—	—	—
Output power	250 W		—	—	—
Input frequency	50 to 60 Hz		—	—	—
Available power	250 W		—	60 W combined	25 W (max)
Max current at +12 V	6 A		—	0.5 A	1 A
Max current at -12 V	0.3 A		—	0.1 A	—
Max current at +3.3 V	14 A		—	7.6 A	6 A
Vddq[1]	—		—	—	2 A
Max current at +5 V	22 A		—	5 A	2 A
Max current at -5 V	0.3 A		—	—	—
Max current at +5Vstdby	2 A		—	—	—

1. Only for I/O buffers.

If the overload protection in the power supply unit is triggered, all power is immediately cut. To reset the power supply unit, remove the power cord and then determine what caused the overload and remedy it. Reconnect the power cord, then reboot the PC. If an overload happens twice, then there is an undetected short circuit somewhere.

NOTE

When the PC is turned off with the power button on the front panel, the power consumption falls below the low power consumption (refer to the below table), but is not zero. The special on/off method used by this PC extends the lifetime of the power supply. To reach zero power consumption in "off" mode, either unplug the PC from the power outlet or use a power block with a switch.

Power Consumption and Cooling

The power consumption and acoustic noise data in the below table are valid for a standard configuration as shipped (256 MB of memory, 250 W power supply, one hard disk drive, graphics card, LAN card)

All information in this section is based on primary power consumptions.

Power consumption (approximate values)	*230 V / 50 Hz and 115 V / 60 Hz*
• Maximum operating	115W - 392.4 Btu/h[1]
• Typical operating	< 70 W - 238.8 Btu/h
• Suspend (only on Windows 2000 models)	< 5 W - 13.6 Btu/h
• Off	< 5 W - 13.6 Btu/h

1. 1 W = 3.4121 Btu/h

Environmental Specifications

Environmental Specifications (System Processing Unit, with Hard Disk)		
Operating Temperature	+10 °C to +35 °C (+40 °F to +95 °F)	
Storage Temperature	-40 °C to +70°C (-40 °F to +158 °F)	
Over Temperature Shutdown	+50°C (+122°F)	
Operating Humidity	15% to 80% (relative)[1]	
Storage Humidity	8% to 85% (relative)[1]	
Acoustic noise emission (as defined ISO 7779): • Operating • Operating with hard disk access • Operating with floppy disk access	***Sound Power*** LwA ≤ 37.7 dB (4.1 B) LwA ≤ 38.3 dB (4.2 B) LwA ≤ 44.8 dB (4.8 B)	***Sound Pressure*** LpA ≤ 23.7 dB LpA ≤ 24.3 dB LpA ≤ 31.3 dB
Operating Altitude	10000 ft (3100m) max.	
Storage Altitude	15000ft (4600m) max.	

[1] non condensing conditions.

Operating temperature and humidity ranges may vary depending upon the mass storage devices installed. High humidity levels can cause improper operation of disk drives. Low humidity levels can aggravate static electricity problems and cause excessive wear of the disk surface.

Power Saving and Ergonometry

Depending on the operating system, the following power management types are available:

- *No sleeping state*: Windows NT 4 (Full On and Off)
- *ACPI*: Windows 2000 (Full On, Standby, Hibernate, Off).

		Windows 2000	Windows NT 4
APM	*Full On*	Not Supported by Windows 2000	Supported
	Suspend		Not Supported by Windows NT 4
	Off		Supported
ACPI	*Standby (S1 or S3)*	Supported (implemented as S3, Suspend to RAM)	Not Supported by Windows NT 4 (APM only Operating System)
	Hibernate (S4)	Supported	
	Off (S5)	Supported	

Power Saving Modes and Ergonometry for APM Systems

	Full On	Suspend[1]	Off
Processor	Normal speed	Halted	Off
Display	On	Blanked, < 5 W (typical)	Off
Hard disk drive	Normal speed	Halted	Off
Power consumption	Supports up to 250 W	< 40 W (230V, 50 Hz) < 21 W (115V, 60 Hz)	(plugged in but turned off) < 5 W (average)
Resume events		Keyboard, network (RWU), modem, USB	Space bar or power button, RPO
Resume delay		A few seconds	Boot delay

1. Not supported by Windows NT 4.

Power Saving Modes and Resume Events for ACPI Systems

	Full On (S0)	Suspend (S1)	Suspend to RAM (S3)	Suspend to Disk (S4)	Off (S5)
Processor	Normal speed	Halted	Off	Off	Off
Display	On	Blanked	Off	Off	Off
Hard Disk Drive	Normal speed	Halted	Off	Off	Off
Heatsink Fan	On (variable speed)	Off (but can start if system gets too hot)	Off	Off	Off
Active Power Planes	VCC VCCAux	VCC VCCAux	Memory VCCAux	VCCAux	VCCAux
Power Consumption	Supports up to 250 W	< 40 W	< 10 W	< 10 W	< 10 W
Resume Events		Power button, LAN, Modem, USB, Scheduler, HP Start Key	Power button, LAN, Modem, Scheduler, HP Start Key	Power button, LAN, Modem, Scheduler, HP Start Key	Power button, HP Start Key
Resume Delay		Instantaneous	Few seconds	BIOS boot delay + OS restore delay	Regular boot delay

Keyboard Power-On

You can power-on from the keyboard space bar provided that:

- The computer is connected to a keyboard that has a power-on space bar (recognizable by the Power-On icon on the space bar)
- The function is enabled by setting system board switch 6 to **ON**.

Soft Power Down

When the user requests the operating system to shut down, the environment is cleared, and the computer is powered off. *Soft Power Down* is available with Windows NT (when the Soft Power Down utility is used).

Documentation

The table below summarizes the available documentation. Only selected publications are available in paper-based form. Most are available as PDF from the HP web site.

Manual Title	Available
HP Desktop PCs Quick User's Guide	• Printed manual, part number 5970-5080-xx[1]. • PDF file from HP support web site.
HP Vectra VL800 Minitower User's Guide	Only as PDF file from HP support web site.
HP Vectra VL800 Desktop & Minitower Troubleshooting Guide	Only as PDF file from HP support web site.
HP Vectra VL800 Desktop & Minitower Technical Reference Manual (this manual)	Only as PDF file from HP support web site.
HP Vectra VL800 Minitower Service Handbook Chapter	• PDF file from HP support web site. • Will also be included in the 16th edition of the paper-based HP Vectra Service Handbook, when it becomes available.

1. xx = language code.

HP Support Web Site

Documentation, BIOS upgrades and drivers are available from HP's support web site.

To access the HP support web site for:

Documentation	1 Connect to **www.hp.com/go/vectrasupport** 2 In the left hand menu, click **manuals** 3 Select model **hp vectra vl800**.
BIOS Upgrades & Drivers	1 Connect to **www.hp.com/go/vectrasupport** 2 Select model **hp vectra vl800**.
Technical Notes (when available)	1 Connect to **www.hp.com/go/vectrasupport** 2 In the left hand menu, click **technical notes** 3 Select model **hp vectra vl800**.

Where to Find the Information

The table below summarizes information provided for the *HP Vectra VL800*.

	Quick User's Guide	User's Guide	Troubleshooting Guide	Service Handbook	Technical Reference Manual (this manual)	HP Web Site
	All manuals available at www.hp.com/go/vectrasupport					
Introducing the PC						
Product features		Standard configuration		Exploded view. Parts list.	Key features, this chapter	www.hp.com/go/desktops
Product model numbers				Product range. CPL dates.		www.hp.com/go/desktops
Environmental	Setting up the PC. Working in comfort.					
Safety information		Electrical, multimedia, safety, unpacking, removing & replacing cover.	Safety			
Finding online information	HP Web sites	Preloaded, HP Web sites	HP Web sites		HP web sites and others, page 8 and page 40	
Technical information	Basic details	Basic details			Advanced, this entire manual	
Legal information	Certificate of Conformity. Software License agreement.					
Using the PC						
Connecting devices and turning on PC	Rear panel connectors, starting and stopping					

	Quick User's Guide	User's Guide	Troubleshooting Guide	Service Handbook	Technical Reference Manual (this manual)	HP Web Site
	All manuals available at www.hp.com/go/vectrasupport					
BIOS		Basic details	Updating and recovering		Technical details, chapter 6. Memory maps, page 118.	www.hp.com/go/vectrasupport
Setup program fields and options		Basic details. Viewing *Setup* screen, using, passwords	Basic details		Complete list, page 105.	
Manageability		Power management, Software and drivers				www.hp.com/go/toptools
Upgrading the PC						
Opening the PC		Full description				
Supported accessories				Full part number details		www.hp.com/go/pcaccessories
Installing accessories		Processor(s), memory, accessory boards, mass storage devices.	Error messages, problem solving			
Configuring devices		Installing devices	Installing devices			
System board		Installing and removing, connectors and switch settings	Switch settings	Jumpers, switches and connectors	Jumpers, switches and connectors; chipset details, chapter 3	
Repairing the PC						
Troubleshooting	Basic	Basic, hardware diagnoses	Hardware diagnoses and suggested solutions	Service notes	HP BIOS, chapter 6. Tests and error messages, chapter 7.	www.hp.com/go/instantsupport

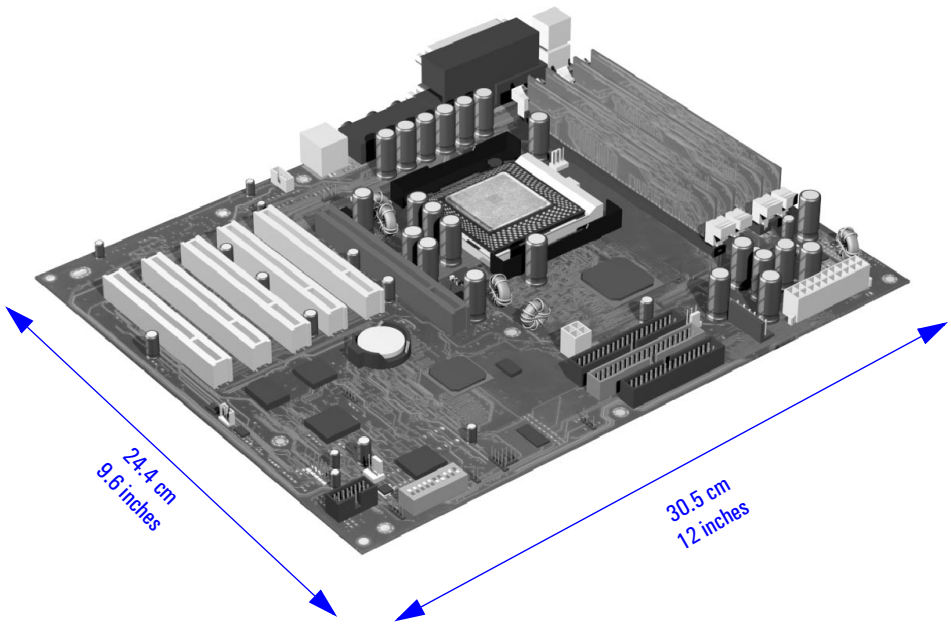
	Quick User's Guide	User's Guide	Troubleshoot-ing Guide	Service Handbook	Technical Reference Manual (this manual)	HP Web Site
	All manuals available at www.hp.com/go/vectrasupport					
Power-On Self-Test routines (POST)		Basic details	Error Messages, EMU and suggestions for corrective action		Error codes and suggestions for corrective action, chapter 7. Order of tests, chapter 7	
Hardware diagnostic utility	e-DiagTools, CD-ROM recovery	HP e-DiagTools, CD-ROM recovery	HP e-DiagTools, CD-ROM recovery			www.hp.com/desktops/diagtools

3

System Board

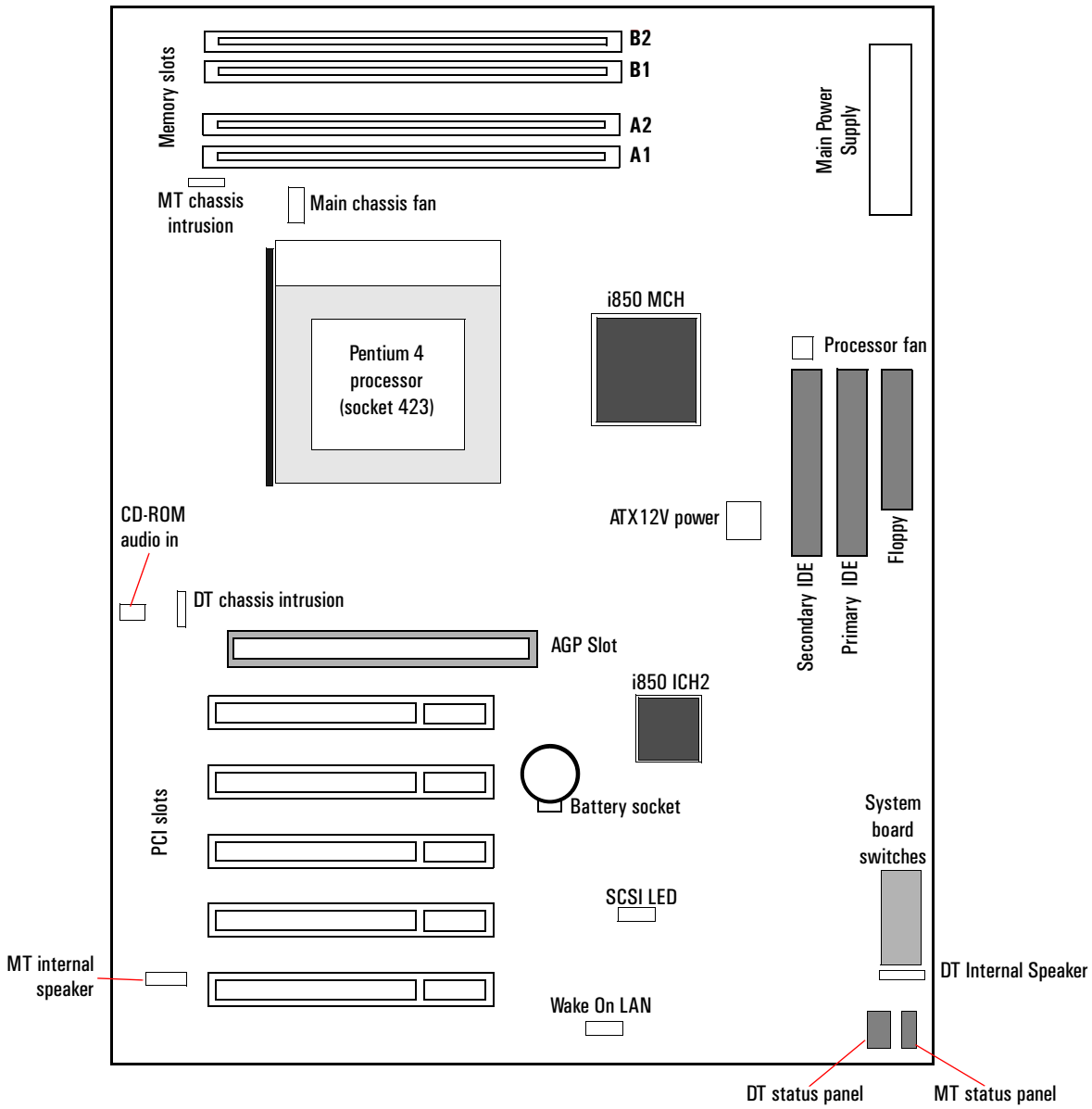
This chapter describes the components of the system board, taking in turn the components of the Memory Controller Hub (MCH), the Input/Output Controller Hub (ICH2), FirmWare Hub (FWH) and the System Bus.

The following diagram shows the *HP Vectra VL800 PC* system board in detail.

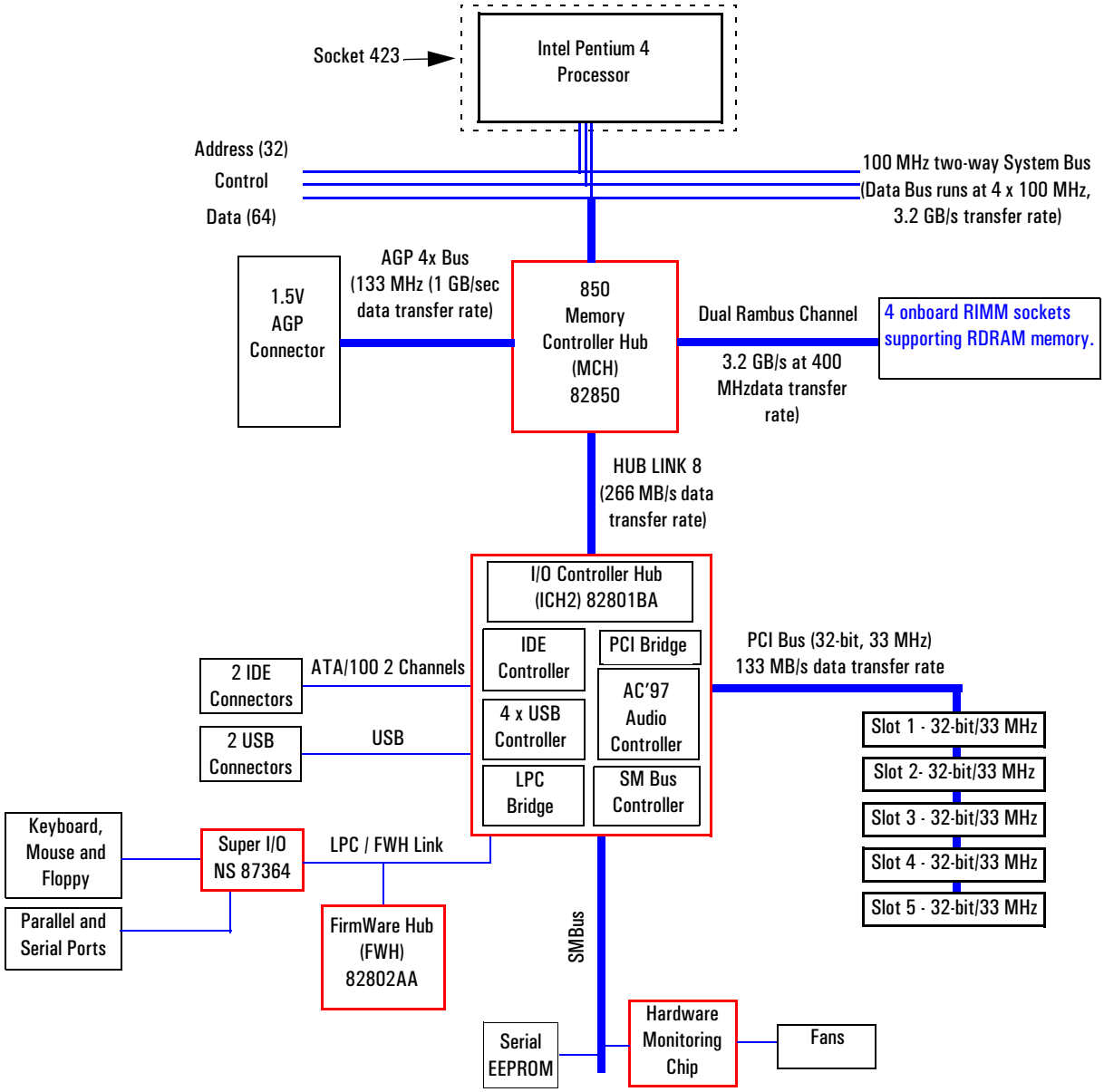


System Board Overview

The following diagram shows where the different chips and connectors are located on the system board.

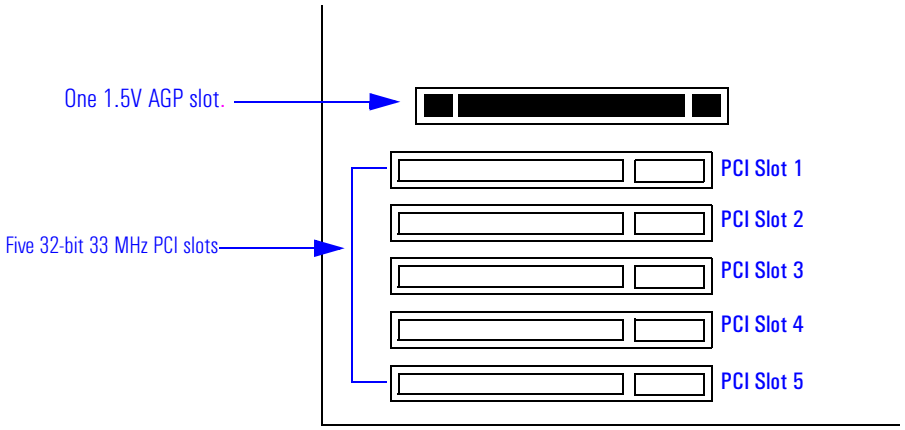


Architectural View

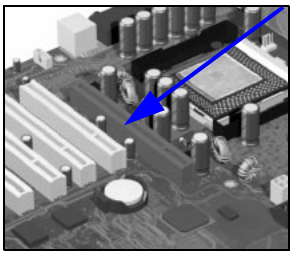


Accessory Board Slots

The following block diagram shows the position of the accessory board slots on the system board.



AGP Slot



Minitower models of the HP Vectra VL800 are equipped with a single AGP (Accelerated Graphics Port) graphics slot.

The 1.5V AGP slot provides the ultimate graphics performance for high-end graphics cards, combining AGP 4X bandwidth (with data transfer rates up to 1056 MB/s).

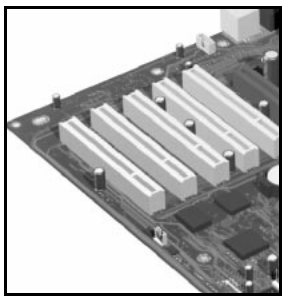
NOTE

AGP 3.3V graphics cards cannot be used.

The 1.5V AGP slot is backwards compatible with both AGP 1x and 2x modes (using 1.5 V signalling), and AGP 4x mode (where 1.5 V signalling is required).

The AGP interface and bus are explained on page 54.

PCI Slots



There is a total of five Peripheral Component Interconnect (PCI) 32-bit, 33 MHz connectors on the system board.

The PCI slots accept 3.3 V and 5 V PCI 32-bit 33 MHz cards, and universal PCI cards (which are 3.3 V or 5 V compatible). Refer to the table on the following page for the different PCI board installations.

The maximum supported power consumption per slot is 25W, either from the 5V or the 3.3V supply and must respect the electrical specifications of the PCI 2.2 specification. Total power consumption for the PCI slots must not exceed 60 W.

The power consumption of each PCI board is automatically reported to the system through the two Presence Detect pins of each PCI slot. These pins code the following cases:

- No accessory board in the PCI slot
- 7 W maximum PCI board in the PCI slot
- 15 W maximum PCI board in the PCI slot
- 25 W maximum PCI board in the PCI slot.

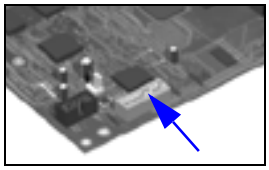
The following table shows the various PCI board installations for the different PCI slots:

	PCI Card					
	3.3 V and 5 V		*Universal (3.3 V or 5 V compatible)*			
PCI Slot	32-bit/ 33 MHz	64-bit/ 33 MHz	32-bit/ 33 MHz or 66 MHz		64-bit/ 33 MHz or 66 MHz	
Slots 1, 2, 3, 4 & 5 5 V, 32-bit/33 MHz	*yes*	*yes*[1]	*yes*	*yes*[2]	*yes*[1]	*yes*[2]

1. A 64-bit card can be installed in a 32-bit slot. However, this card will only operate in 32-bit mode.
2. A 66 Mhz card can be installed in a 33 MHz slot. However, this card will only operate in 33 MHz mode.

The system board and BIOS support the PCI specification 2.2. This specification supports PCI-to-PCI bridges and multi-function PCI devices, and each of the five PCI slots have Master capabilities.

The PCI slots are connected to the ICH2 PCI 32-bit 33 MHz bus.

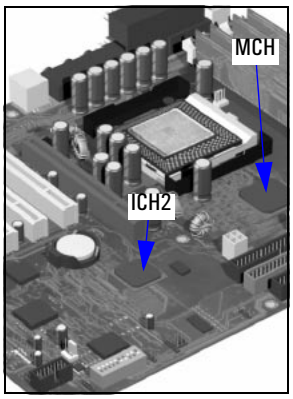


System Board Switches

There are ten system board switches used for configuration, numbered from 1 to 10. Some switches are reserved and should not be modified, otherwise it could lead to a system failure.

Switch	Default Position	Use
1-5	OFF	Reserved. **Do Not change Default Settings**
6	ON	Enables keyboard power-on. OFF disables this option.
7	OFF	Enables normal modes. ON enables the BIOS recovery mode at next boot.
8	OFF	Retains CMOS memory. ON clears CMOS memory at next boot.
9	OFF	Enables User and System Administrator passwords. ON clears the passwords at next boot.
10	OFF	

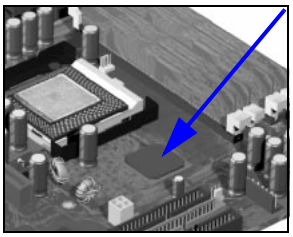
Chipset



The Intel® i850 chipset is a high-integration chipset designed for graphics/multimedia PC platforms and is comprised of the following:

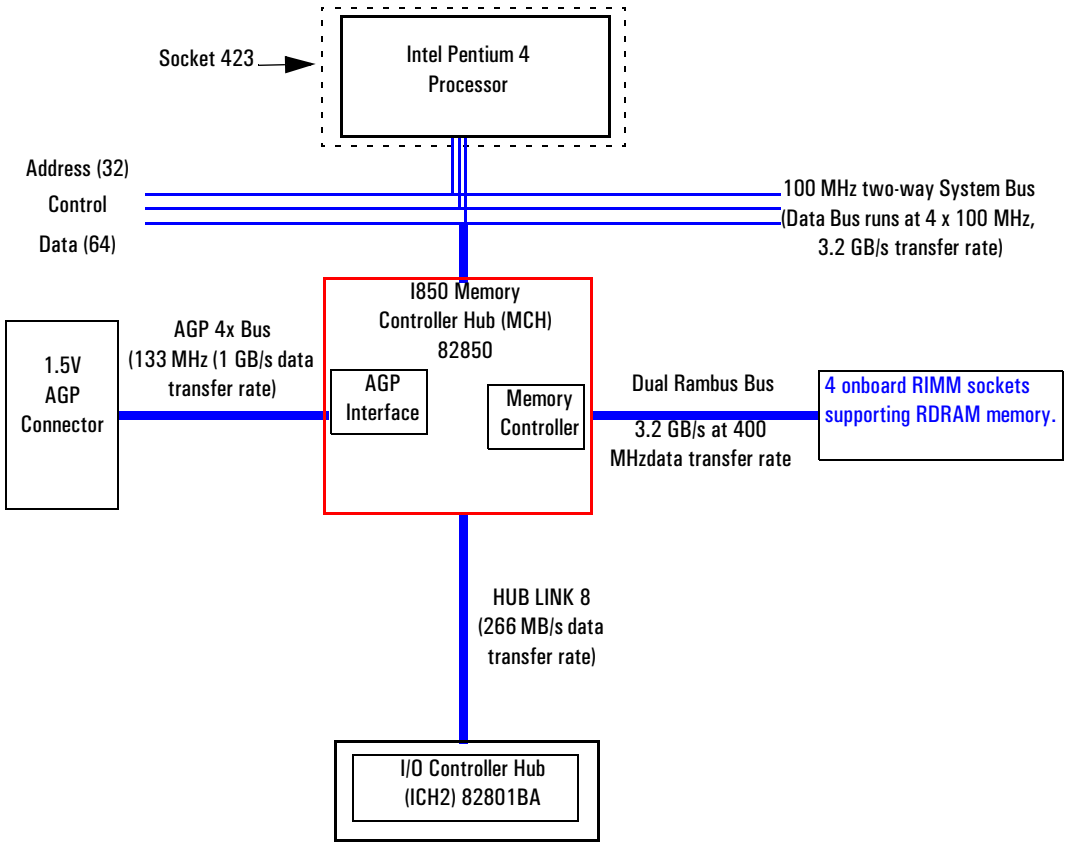
- The 82850 Memory Controller Hub (MCH) is a bridge between: the System bus, Dual Rambus bus (main memory), AGP 4x (graphic) bus and Hub Link 8-bit. The MCH chip feature is described in detail on page 52.
- The 82801BA Input/Output Controller Hub2 (ICH2) is a bridge between the following buses: the PCI bus (32-bits/33 MHz) and SMBus. In addition, the ICH2 supports the integrated *IDE controller (Ultra ATA/100)*, Enhanced DMA controller, *USB controller, Interrupt controller, Low Pin Count (LPC) interface, FWH interface, ACPI Power Management Logic, AC'97 2.1 Compliant Link, AOL (Alert-On-LAN) and Real Time Clock (RTC) and CMOS*. The ICH2 is described in detail on page 58.
- The 82802AB Firmware Hub (FWH) stores system BIOS and SCSI BIOS, nonvolatile memory component.

Memory Controller Hub (82850)



The MCH Host Bridge/Controller is contained in a 615-pin Organic Land Grid Array (OLGA) package and is the bridge between the System bus, Dual Rambus bus (main memory), AGP 4x (graphic) bus and Hub Link 8-bit.

The following figure shows an example of the system block diagram using the MCH.



The following table shows the features that are available in the MCH Host Bridge/Controller.

Feature	Feature
• Processor/System Bus: ❒ Supports Pentium 4 processor at: 100 MHz System Bus frequency (400 MHz Data Bus). ❒ Provides an 8-deep In-Order Queue supporting up to eight outstanding transaction requests on the System bus. ❒ Desktop optimized AGTL+ bus driver technology with integrated AGTL + termination resistors. ❒ Support for 32-bit System bus address.	• Accelerated Graphics Port (AGP) Interface: ❒ Single 1.5V AGP connector. ❒ AGP Rev 2.0 compliant, including AGP 4x data transfers and 2x/4x Fast Write protocol. ❒ AGP 1.5V connector support with 1.5 V signalling only. ❒ AGP PIPE# or SBA initiated accesses to RDRAM is not snooped ❒ AGP FRAME initiated accesses to RDRAM are snooped (snooper identifies that data is coherent in cache memory). ❒ Hierarchical PCI configuration mechanism. ❒ Delayed transaction support for AGP-to-RDRAM reads that cannot be serviced immediately.
• Direct Rambus Memory Controller. ❒ Dual Direct Rambus Channels operating in lock-step (both channels must be populated with a memory module). Supporting 300 MHz or 400 MHz. ❒ RDRAM 128 Mb, 256 Mb devices. ❒ Minimum upgrade increment of 32 MB using 128 Mbit RDRAM technology. ❒ Up to 64 Direct Rambus devices. Dual channel maximum memory array size is: — 1 GB using 128 Mbit RDRAM technology. — 2 GB using 256 Mbit RDRAM technology. ❒ Up to 8 simultaneous open pages: — 1 KByte page size support for 128 Mbit and 256 Mbit RDRAM devices. — 2 KByte page size support for 256 Mbit RDRAM devices.	• Power management: ❒ RDRAM space re-mapping to A0000h - BFFFFh (128 KB). ❒ Extended RDRAM space above 256 MB, additional 128 K, 256 K, 512 K, 1 MB TSEG from Top of Memory, cacheable (cacheability controlled by processor). ❒ Suspend to RAM. ❒ ACPI Rev. 1.0 compliant power management. ❒ APM Rev. 1.2 compliant power management. ❒ Power-managed states are supported.
• Hub Link 8-bit Interface to ICH2: ❒ High-speed interconnect between the MCH and ICH2 (266 MB/sec).	• Arbitration: ❒ Distributed Arbitration Model for Optimum Concurrency Support. ❒ Concurrent operations of System, hub interface, AGP and memory buses supported via a dedicated arbitration and data buffering logic.
• 615 OLGA MCH package.	• Input/Output Device Support: ❒ Input/Output Controller Hub (ICH2).

MCH Interface

The MCH interface provides bus control signals and address paths via the Hub Link 8-bit access to the ICH2 for transfers between the processor on the system bus, Dual Rambus bus and AGP 4x bus.

The MCH supports 32-bit host addresses, allowing the processor to address a space of 4GB. It also provides an 8-deep In-Order Queue supporting up to eight outstanding transaction requests on the system bus.

Host-initiated input/output signals are positively decoded to AGP or MCH configuration space and subtractively decoded to Hub Link 8-bit interface. Host-initiated memory cycles are positively decoded to AGP or RDRAM, and are again subtractively decoded to Hub Link 8-bit interface.

AGP semantic memory accesses initiated from AGP to RDRAM do not require a snoop cycle (not snooped) on the System bus, since the coherency of data for that particular memory range will be maintained by the software. However, memory accesses initiated from AGP using PCI Semantics and accesses from Hub Link interface to RDRAM do require a snoop cycle on the System bus.

Memory access whose addresses are within the AGP aperture are translated using the AGP address translation table, regardless of the originating interface.

Write accesses from Hub Link interface to the AGP are supported.

The MCH supports one Pentium 4 processor at an FSB frequency of 100MHz using AGTL+ signalling. Refer to page 71 for a description of the System bus.

Accelerated Graphics Port (AGP) Bus Interface

A controller for the 1.5V AGP (Accelerated Graphics Port) slot is integrated in the MCH. The AGP Bus interface is compatible with the Accelerated Graphics Port Specification, Rev 2.0, operating at 133 MHz, and supporting up to 1 GB/sec data transfer rates. The MCH supports only a synchronous AGP interface, coupling to the System bus frequency.

AGP 4x Bus

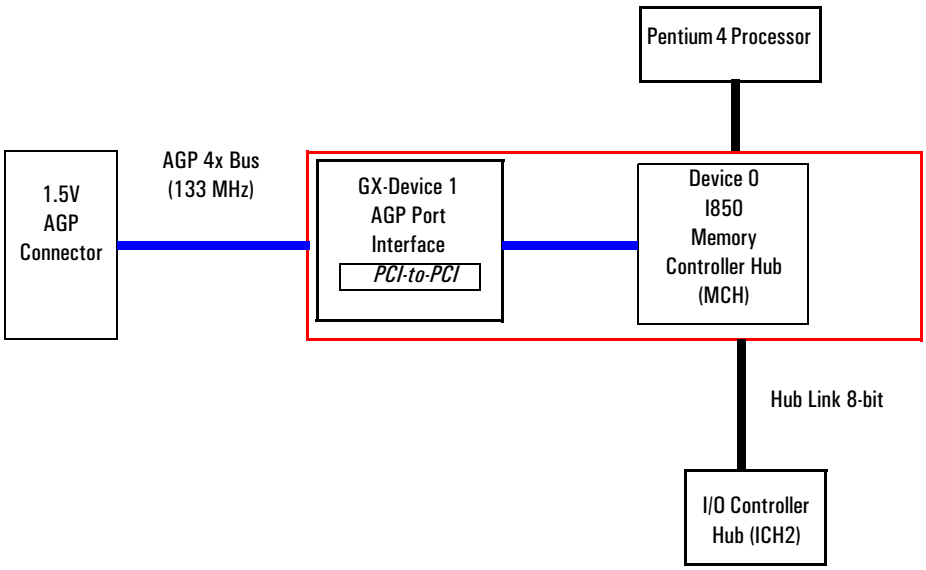
The AGP bus is a dedicated bus for the graphics subsystem, which meets the needs of high quality 3D graphics applications. It has a direct link to the MCH.

The AGP bus is based upon a 66 MHz, 32-bit PCI bus architecture, to which several signal groups have been added to provide AGP-specific control and transfer mechanisms.

AGP specific transactions always use pipelining. This control mechanism increases the bus efficiency for data transfer. Sideband Addressing (SBA) may also be used by AGP transaction requests which further increases the bus efficiency for data transfer. The supported modes are detailed below:

- FRAME-based AGP. Only the PCI semantics are: 66 MHz, 32-bit, 1.5 V, 266 MB/s peak transfer rate.
- AGP 1X with pipelining, sideband addressing can be added: uses 66 MHz, 32-bit, 1.5 V, increased bus efficiency, 266 MB/s peak transfer rate.
- AGP 2X with pipelining, sideband addressing can be added: 66 MHz double clocked, 32-bit, 1.5 V, 533 MB/s peak transfer rate.
- AGP 4X with pipelining, sideband addressing can be added: 133 MHz double clocked, 32-bit, 1.5 V, increased bus efficiency, 1066 MB/s peak transfer rate

AGP PCI Bus Implementation



Main Memory Controller

The main memory controller is integrated in the MCH supporting two primary rambus channels (A and B).

RDRAM Interface

The MCH provides optional System bus error checking for data, address, request and response signals. Only 400 MHz Direct Rambus (PC800) devices are supported in any of 128 or 256 Mbit technology. 128 Mbit RDRAM uses page sizes of 1 kbytes, while 256 Mbit devices target 1 kbyte or 2 kbyte pages.

A maximum number of 32 Rambus devices (128 Mbit technology implies 1 GB maximum in 32 MB increments, 256 Mbit technology implies 2 GB maximum in 64 MB increments) are supported on the Direct Rambus channel without external logic.

The MCH also provides optional data integrity features including ECC in the memory array. During RDRAM writes, ECC is generated on a QWord (64 bit) basis. During RDRAM reads, the MCH supports multiple-bit error detection and single-bit error correction when the ECC mode is enabled.

MCH will scrub single bit errors by writing the corrected value back into RDRAM for all reads when hardware scrubbing is enabled. This, however does not include reads launched in order to satisfy an AGP aperture transaction.

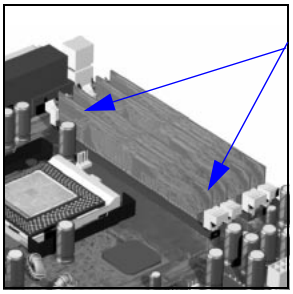
ECC can only be enabled when all RDRAM devices are populated in a system that supports the extra two data bits used to store the ECC code.

Dual Rambus Bus

The Dual Rambus bus is comprised of 16 x 2 bits of data information, and 1 x 2 bits of Error Correcting Code (ECC). The bus is connected to the RIMM memory slots and to the MCH chip supporting two Dual Rambus channels (A and B).

Both channels run 400 MHz supporting up to 32 rambus devices per channel. The maximum available data bandwidth is 3.2 GB/s at 400 MHz.

The configuration of both primary rambus channels must be symmetrical – the memory configuration on channel A must be identical to the memory configuration on channel B. This means the memory must be installed in identical pairs.



RIMM Memory Slots

The PC has four RIMM memory sockets, RIMM A1, RIMM A2, RIMM B1, RIMM B2, for installing two or four RDRAM memory modules.

Each pair of memory sockets must contain identical memory modules (identical in size, speed and type). That is, sockets **A1** and **B1** must contain identical modules, and sockets **A2** and **B2** must contain either identical modules or continuity modules.

If only two RDRAM modules are installed, use the sockets marked **A1** and **B1**. The other two sockets (**A2** and **B2**) must contain continuity modules.

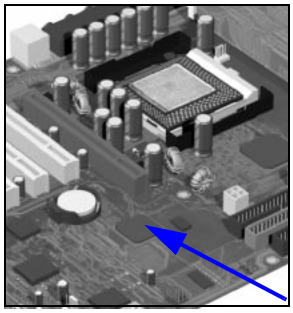
Read/Write Buffers

The MCH defines a data buffering scheme to support the required level of concurrent operations and provide adequate sustained bandwidth between the RDRAM subsystem and all other system interfaces (CPU, AGP and PCI).

System Clocking

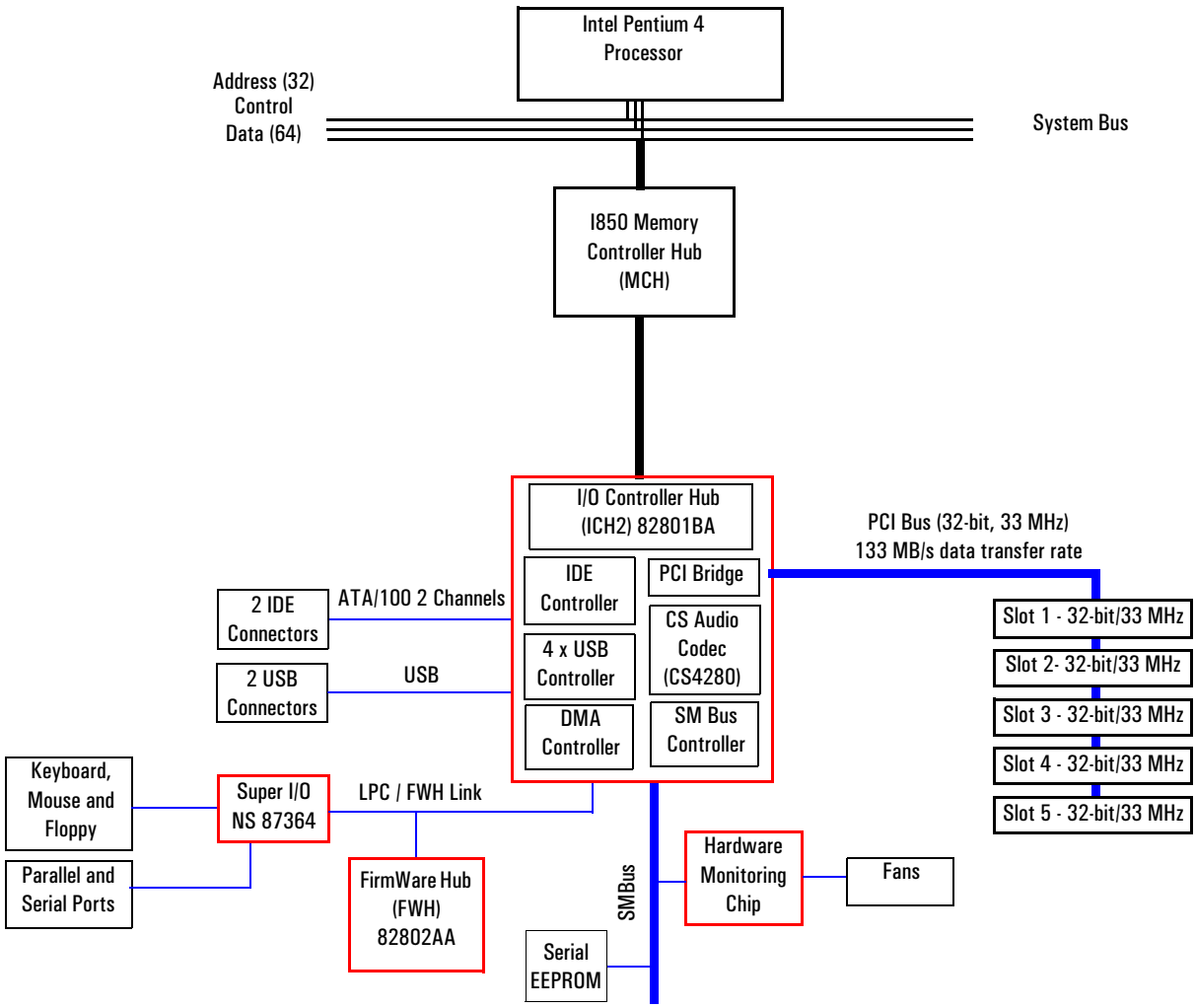
The MCH operates the System interface at 100 MHz, PCI at 33 MHz and AGP at 66/133 MHz. Coupling between all interfaces and internal logic is done in a synchronous manner. The clocking scheme uses an external clock synthesizer (which produces reference clocks for the host, AGP and PCI interfaces).

The Input/Output Controller Hub 2 (82801BA)



The ICH2 is encapsulated in a 360-pin Enhanced Ball Grid Array (EBGA) package and is located on the system board just underneath the AGP connector. It provides the interface between the PCI bridge (PCI Rev. 2.2 compliant with support for 32-bit 33 MHz PCI operations), PCI-to-LPC (Low Pin Count) bridge, IDE controller, USB controller, SMBus controller and Audio Codec '97 controller.

The ICH2 functions and capabilities are discussed in detail later on in this section. The following figure shows an example of the system block diagram using the ICH2.



The following table shows the available ICH2 features.

Feature	Feature
• Multi-function PCI Bus Interface: ❒ PCI at 32-bit 33 MHz. ❒ PCI Rev 2.2 Specification. ❒ 133 Mbyte/sec data transfer rate. ❒ Master PCI Device Support for up to five devices.	• Enhanced DMA Controller: ❒ Two 82C37 DMA controllers. ❒ PCI DMA with 2 PC/PCI Channels in pairs. ❒ LPC DMA. ❒ DMA Collection Buffer to provide Type-F DMA performance for all DMA channels.
• USB, supporting: ❒ USB revision 1.1 compliant. ❒ UHCI Implementation with four USB Ports for serial transfers at12 or 1.5 Mbit/sec. ❒ Wake-up from sleeping states. ❒ Legacy keyboard/mouse software.	• Interrupt Controller: ❒ Two cascaded 82C59 controllers. ❒ Integrated I/O APIC capability. ❒ 15 Interrupt support in 8259 Mode, 24 supported in I/O APIC mode. ❒ Serial Interrupt Protocol.
• Power Management Logic: ❒ ACPI 1.0 compliant. ❒ Support for APM-based legacy power management for non-ACPI implementations. ❒ ACPI defined power states (S1, S3, S4, S5). ❒ ACPI power management timer. ❒ SMI generation. ❒ All registers readable/restorable for proper resume from 0 V suspend states. ❒ PCI PME#.	• Integrated IDE Controller: ❒ Independent Timing of up to four drives. ❒ Ultra ATA/100 Mode (100 Mbytes/sec). ❒ Ultra ATA/66 Mode (66 Mbytes/sec). ❒ Ultra ATA/33 Mode (33 Mbytes/sec). ❒ PIO Mode 4 transfers up to 14 Mbytes/sec. ❒ Separate IDE connections for Primary and Secondary cables. ❒ Integrated 16 x 32-bit buffer for IDE PCI Burst transfers. ❒ Write Ping-Pong Buffer for faster write performances.
• Real-Time Clock, supporting: ❒ 256-byte battery-backed CMOS RAM. ❒ Hardware implementation to indicate Century Rollover.	• System TCO Reduction Circuits: ❒ Timers to Generate SMI# and Reset Upon. ❒ Timers to Detect Improper Processor Reset. ❒ Integrated Processor Frequency Strap Logic.
• Timers Based on 82C54: ❒ System Timer, Refresh Request, Speaker Tone Output.	• SMBus ❒ Host Interface allows processor to communicate via SMBus. ❒ Compatible with 2-wire I^2C bus.
• System Timer, Refresh Request, Speaker Tone Output.	• GPIO: ❒ TTL, Open-Drain, Inversion.
• Firmware Hub (FWH) interface.	• 3.3 V operation with 5 V Tolerant Buffers for IDE and PCI signals.
• 360 EBGA Package.	• Alert-On-LAN (AOL) support.

ICH2 Architecture

The ICH2 interface architecture ensures that the I/O subsystems, both PCI and the integrated input/output features (for example: IDE, AC'97 and USB) receive adequate bandwidths.

To achieve this, by placing the I/O bridge directly on the ICH2 interface, and no longer on the PCI bus, the ICH2 architecture ensures that both the input/output functions integrated into the ICH2 and the PCI peripherals obtain the bandwidth necessary for peak performance.

ICH2 PCI Bus Interface

The ICH2 PCI provides the interface to a PCI bus interface operating at 33 MHz. This interface implementation is compliant with PCI Rev 2.2 Specification, supporting up to five external PCI masters in addition to the ICH2 requests. The PCI bus can reach a data transfer rate of 133 MBytes/sec. The maximum PCI burst transfer can be between 256 bytes and 4 KB. It also supports advanced snooping for PCI master bursting, and provides a pre-fetch mechanism dedicated for IDE read.

Refer to the table page 75 for ICH2 interrupts.

SMBus Controller

The System Management (SM) bus is a two-wire serial bus which runs at a maximum of (100 kHz). The SMBus Host interface allows the processor to communicate with SMBus slaves and an SMBus Slave interface that allows external masters to activate power management events. The bus connects to sensor devices that monitor some of the hardware functions of the system board, both during system boot and run-time.

Refer to page 62 for a description of the devices on the SMBus, or to page 65 for information on the hardware monitoring ASIC.

Low Pin Count Interface

The ICH2 implements the LPC interface 1.0 specification.

Enhanced USB Controller

The USB (Universal Serial Bus) controller provides enhanced support for the Universal Host Controller Interface (UHCI). This includes support that allows legacy software to use a USB-based keyboard and mouse. The USB supports two stacked connectors on the back panel. These ports are built into the ICH2, as standard USB ports.

The ICH2 is USB revision 1.1 compliant.

USB works only if the USB interface has been enabled within the HP *Setup* program. Currently, only the Microsoft Windows 95 SR2.1, Windows 98 and Windows 2000 operating systems provide support for USB.

AC'97 CODEC

This is the single-chip CS4299 audio CODEC that provides the digital-analog conversion for the audio features for the Vectra VL800.

Refer to page 62 for information about the CS4299 audio solution.

IDE Controller

The IDE controller is implemented as part of the ICH2 chip and has PCI-Master capability. Two independent ATA/100 IDE channels are provided with two connectors per channel. Two IDE devices (one master and one slave) can be connected per channel. In order to guarantee data transfer integrity, Ultra-ATA cables must be used for Ultra-ATA modes (Ultra-ATA/33, Ultra-ATA/66 and Ultra-ATA/100).

The PIO IDE transfers of up to 14 Mbytes/sec and Bus Master IDE transfer rates of up to 66 Mbytes/sec are supported. The IDE controller integrates 16 x 32-bit buffers for optimal transfers.

It is possible to mix a fast and a slow device, such as a hard disk drive and a CD-ROM, on the same channel without affecting the performance of the fast device. The BIOS automatically determines the fastest configuration that each device supports.

DMA Controller

The seven-channel DMA controller incorporates the functionality of two 82C37 DMA controllers. Channels 0 to 3 are for 8-bit count-by-byte transfers, while channels 5 to 7 are for 16-bit count-by-word transfers (refer to table on page 119 for allocated DMA channel allocations). Any two of the seven DMA channels can be programmed to support fast Type-F transfers.

The ICH2 DMA controller supports the LPC (Low Pin Count) DMA. Single, Demand, Verify and Incremental modes are supported on the LPC interface. Channels 0-3 are 8-bit, while channels 5-7 are 16-bit. Channel 4 is reserved as a generic bus master request.

Interrupt Controller

The Interrupt controller is equivalent in function to the two 82C59 interrupt controllers. The two interrupt controllers are cascaded so that 14 external and two internal interrupts are possible. In addition, the ICH2 supports a serial interrupt scheme and also implements the I/O APIC controller. A table on page 74 shows how the master and slave controllers are connected.

Timer/Counter Block

The timer/counter block contains three counters that are equivalent in function to those found in one 82C54 programmable interval counter/timer. These three counters are combined to provide the system timer function, and speaker tone. The 14.318 MHz oscillator input provides the clock source for these three counters.

Advanced Programmable Interrupt Controller

Incorporated in the ICH2, the APIC can be used in either single-processor or multi-processor systems, while the standard interrupt controller supports only single-processor systems.

Real Time Clock

The RTC is 146818A-compatible, with 256 bytes of CMOS. The RTC performs two key functions: keeping track of the time of day and storing system data.

The RTC operates on a 32.768 kHz crystal and a separate 3V lithium battery that provides up to 6 years of protection for an unplugged system. It also supports two lockable memory ranges. By setting bits in the configuration space, two 8-byte ranges can be locked to read and write accesses. This prevents unauthorized reading of passwords or other security information. Another feature is a date alarm allowing for a schedule wake-up event up to 30 days in advance.

Enhanced Power Management

The ICH2's power management functions include enhanced clock control, local and global monitoring support for 14 individual devices, and various low-power (suspend) states. A hardware-based thermal management circuit permits software-independent entry points for low-power states.

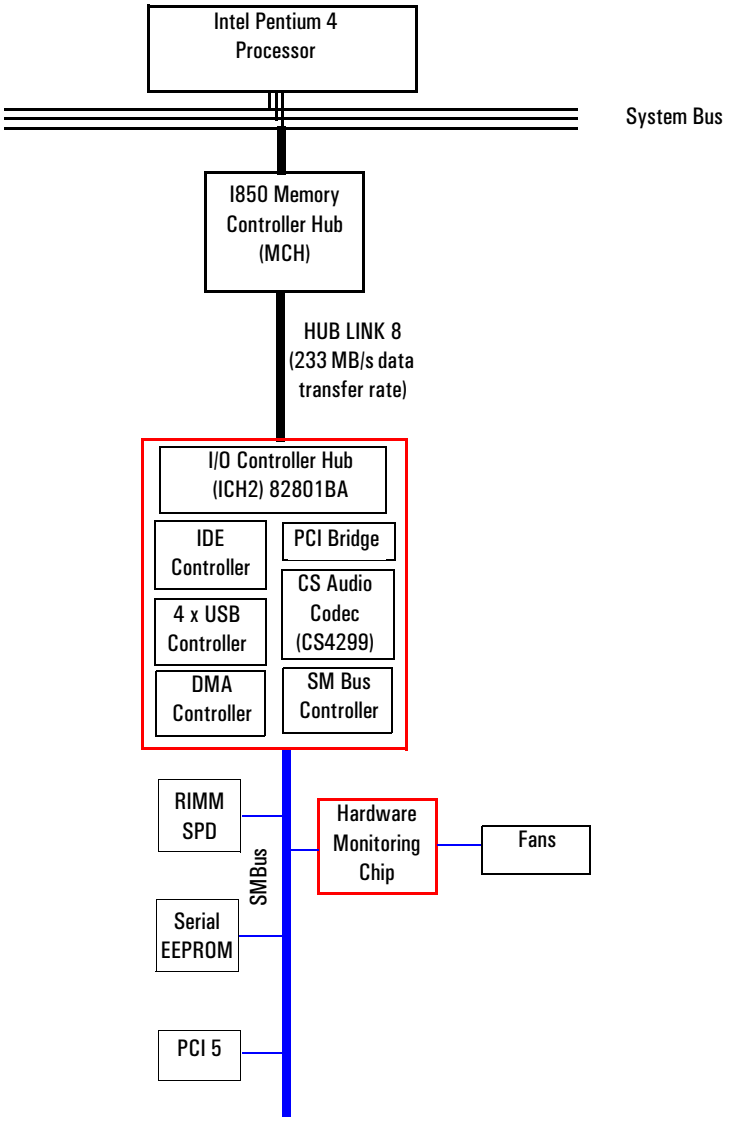
The ICH2 includes full support for the Advanced Configuration and Power Interface (ACPI) specifications.

Devices on the SMBus

The SMBus is a subset of the I^2C bus. It is a two-wired serial bus which runs at a maximum speed of 100 kHz. It is used to monitor some of the hardware functions of the system board (such as voltage levels, temperature, fan speed, memory presence and type), both at system boot and during normal run-time. It is controlled by the SMBus controller located in the ICH2.

The following devices are connected to the SMBus:

- One Serial EEPROM hardware monitoring (also includes backup values of CMOS settings)
- PCI slot 5, thus being ready for Alert-On LAN (AOL) from a hardware level
- ICH2 SMBus Master Controller 100 kHz maximum
- Hardware monitoring for hardware management, bus master controller
- RIMM serial EEPROM.



ICH2 SMBus Master Controller

The ICH2 provides a processor-to-SMBus controller. All access performed to the SMBus is done through the ICH2 SMBus interface. Typically, the processor has access to all the devices connected to the SMBus.

RIMM Sockets

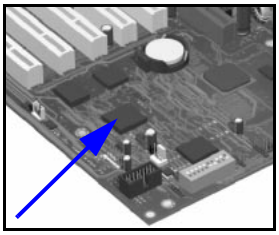
Each RIMM socket is connected to the SMBus. The 168-pin RIMM modules include a 256 byte I^2C Serial EEPROM. The first 128 bytes contain general information, including the RDRAM chip manufacturer's name, RIMM speed rating, RIMM type, etc. The second 128 bytes of the Serial EEPROM can be used to store data online.

Serial EEPROM

This is the non-volatile memory which holds the default values for the CMOS memory (in the event of battery failure).When installing a new system board, the Serial EEPROM will have a blank serial number field. This will be detected automatically by the BIOS, which will then prompt the user for the serial number which is printed on the identification label on the back of the PC.

The computer uses 16KBytes of Serial EEPROM implemented within one chip. Serial EEPROM is ROM in which one byte at a time can be returned to its unprogrammed state by the application of appropriate electrical signals. In effect, it can be made to behave like very slow, non-volatile RAM. It is used for storing the tatoo string, the serial number, and the parameter settings for the *Setup* program as well as hardware monitoring firmware.

HP Hardware Monitoring



The hardware monitoring chip is on the system board. Its responsibility includes status panel management (LEDs), early diagnostics (CPU, memory, PLLs, boot start), run-time diagnostics (CPU errors), fan speed regulation, and other miscellaneous functions.

The integrated microprocessor includes a Synopsys cell based on Dallas "8052" equivalent, a 2 KB boot ROM, 256 bytes of data RAM, an I^2C cell, an Analog-to-Digital (ADC) with 5 entries, and an additional glue logic for interrupt control, fan regulation, and a status panel control.

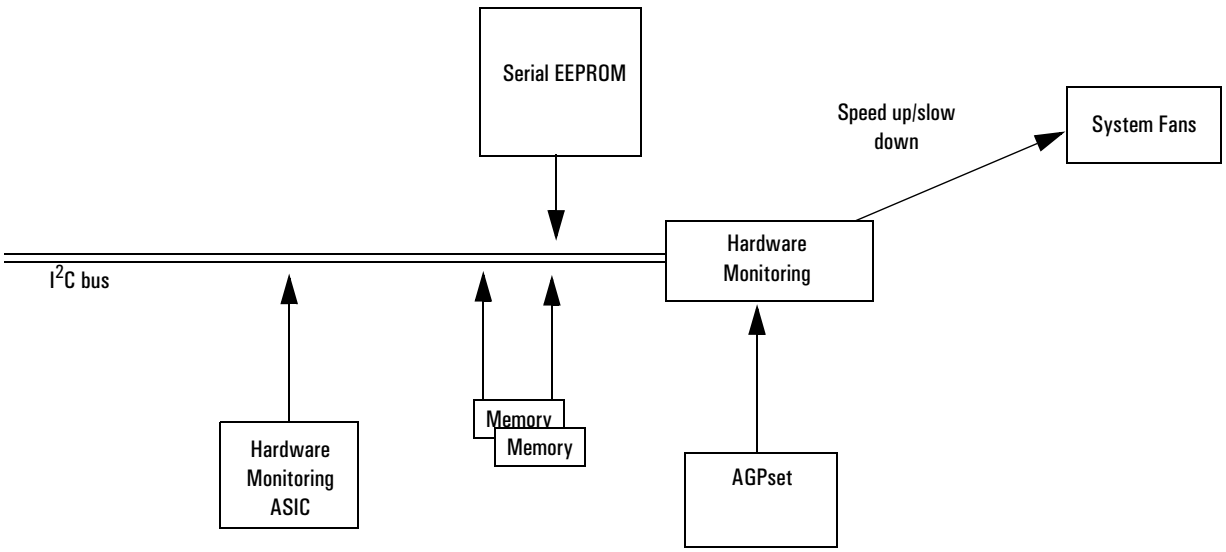
The hardware monitoring chip downloads its code in 96 milliseconds from an I^2C serial EEPROM. The total firmware (8051-code, running in RAM) size is 14 KB. As it exceeds the 2 KB program RAM space, a paging mechanism will swap code as it is required, based on a 512 byte buffer. The first 2 KB pages of firmware code is critical because it controls the initial power on/reset to boot the system. This initial page is checked with a null-checksum test and the presence of hardware monitoring markers (located just below the 2 KB limit).

Hardware monitoring information is not accessible in I/O space or memory space of the system platform, but only through the SMBUS (which is a sub-set of the I^2C bus), via the ICH2. Its I^2C cell may operate either in Slave or Master mode, switched by firmware, or automatically in the event of 'Arbitration' loss.

Hardware monitoring reports critical errors at start-up, and is therefore powered by Vstandby (3.3V) power. For it to work, the PC must be connected to a grounded outlet. This enables the PC's hardware monitoring chip to be active, even if the system has been powered off.

Hardware Monitoring Architecture

The hardware monitoring chip continuously monitors temperature and voltage sensors located in critical regions on the system board. This chip receives data about the various system components via a dedicated I^2C bus, which is a reliable communications bus to control the integrated circuit boards.

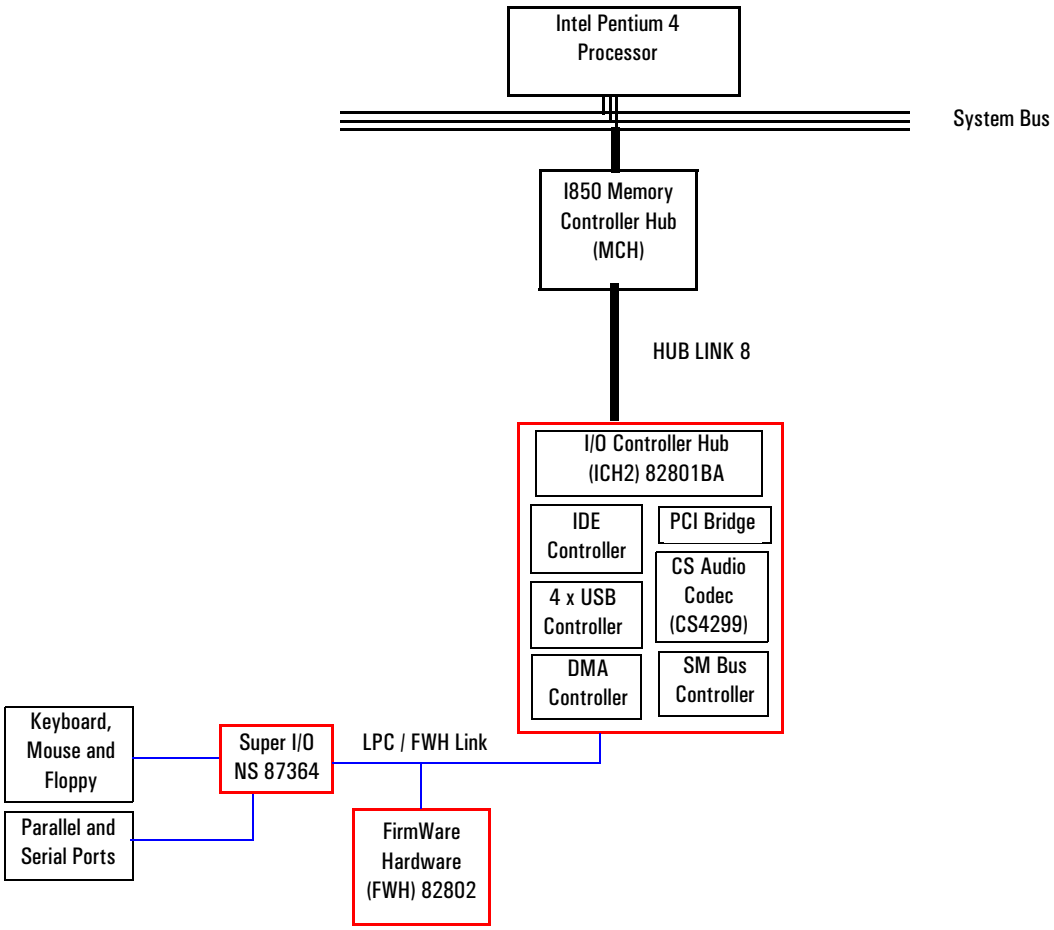


NOTE

Hardware monitoring is powered by VSTBY. This means that it is functional as soon as the power cord is plugged in.

Devices on the Low Pin Count Bus

The following devices are connected to the LPC bus.



The Super I/O Controller (NS 87364)

The *Super I/O* chip (NS 87364) provides the control for two FDD devices, two serial ports, one bidirectional multi-mode parallel port and a keyboard and mouse controller.

Serial / Parallel Communications Ports

The 9-pin serial ports (whose pin layouts are depicted on page 145) support RS-232-C and are buffered by 16550A UARTs, with 16-Byte FIFOs. They can be programmed as COM1, COM2, COM3, COM4, or disabled.

The 25-pin parallel port (also depicted on page 146) is Centronics-compatible, supporting IEEE 1284. It can be programmed as LPT1, LPT2, or disabled. It can operate in the four following modes:

- ❒ Standard mode (PC/XT, PC/AT, and PS/2 compatible)
- ❒ Bidirectional mode (PC/XT, PC/AT, and PS/2 compatible)
- ❒ Enhanced mode (enhanced parallel port, EPP, compatible)
- ❒ High speed mode (MS/HP extended capabilities port, ECP, compatible).

FDC

The integrated *floppy disk controller* (FDC) supports any combination of two of the following: tape drives, 3.5-inch flexible disk drives, 5.25-inch flexible disk drives. It is software and register-compatible with the 82077AA, and 100% IBM-compatible. It has an A and B drive-swapping capability and a non-burst DMA option.

Keyboard and Mouse Controller

The computer has an 8042-based keyboard and mouse controller. The connector pin layouts are shown on page 144.

FirmWare Hub (82802AB)

The FWH (also known as flash memory) is connected to the LPC bus. It contains 4 Mbit (512 kB) of flash memory.

The hardware features of the FWH include: five General Purpose Inputs (GPI), register-based block locking and hardware-based locking. An integrated combination of logic features and non-volatile memory enables better protection for the storage and update of system code and data, adds flexibility through additional GPIs, and allows for quicker introduction of security/manageability features.

The following table shows the available FWH features.

Feature	Feature
• Platform Compatibility: ❒ Enables security-enhanced platform infrastructure. ❒ Part of the Intel i850 chipset.	• Two Configurable Interfaces: ❒ FirmWare Hub interface for system operation. ❒ Address/Address Multiplexed (A/A Mux) interface.
• FirmWare Hub Interface Mode: ❒ Five signal communication interface supporting x8 reads and writes. ❒ Register-based read and write protection for each code/data storage blocks. ❒ Five additional GPIs for system design and flexibility. ❒ Integrated CUI (Command User Interface) for requesting access to locking, programming and erasing options. It also handles requests for data residing in status, ID and block lock registers. ❒ Operates with 33 MHz PCI clock and 3.3 V input/output.	• 4 Mbits of Flash Memory for system code/data non-volatile storage: ❒ Symmetrically blocked, 64 Kbyte memory sections. ❒ Automated byte program and block erase through an integrated WSM (Write State Machine).
• A/A Mux Interface/Mode, supporting: ❒ 11-pin multiplexed address and 8-pin data I/O interface. ❒ Fast on-board or out-of-system programming.	• Power Supply Specifications: ❒ Vcc: 3.3 V +/- 0.3 V. ❒ Vpp: 3.3 V and 12 V for fast programming, 80 ns.
• Industry Standard Packages: ❒ 32L PLCC.	• Case Temperature Operating Range.

The FWH includes two hardware interfaces:

- FirmWare Hub interface.
- Address/Address Multiplexed (A/A Mux) interface.

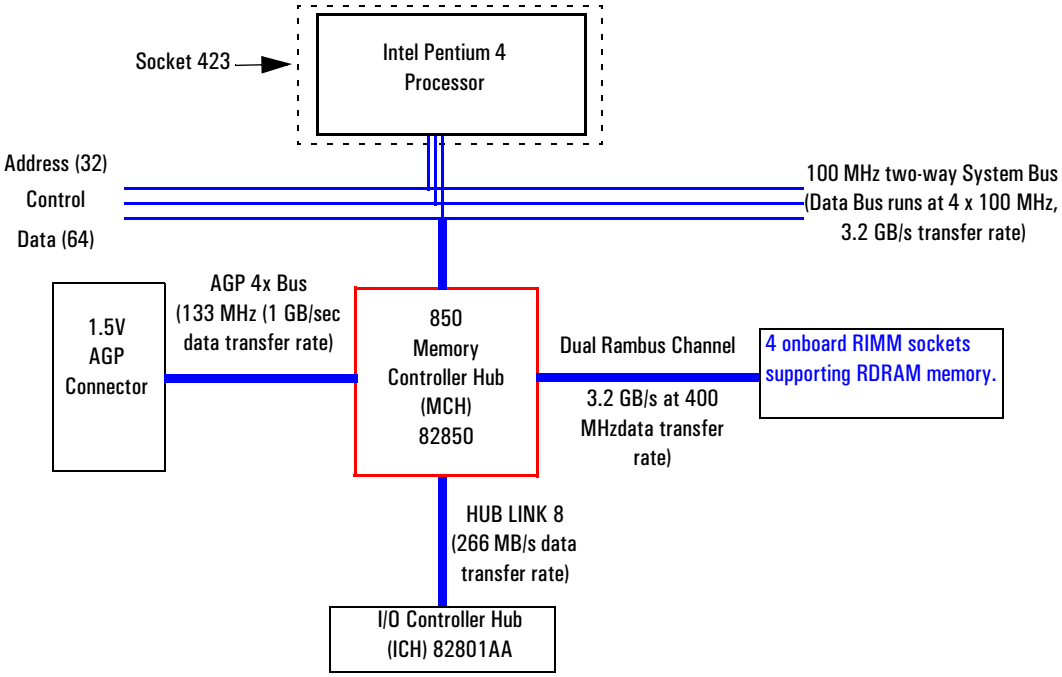
The IC (Interface Configuration) pin on the FWH provides the control between these interfaces. The interface mode needs to be selected prior to power-up or before return from reset (RST# or INIT# low to high transition).

The FWH interface works with the ICH2 during system operation, while the A/A Mux interface is designed as a programming interface for component pre-programming.

An internal CUI (Command User Interface) serves as the control center between the FWH and A/A Mux interfaces, and internal operation of the non-volatile memory. A valid command sequence written to the CUI initiates device automation. An internal WSM (Write State Machine) automatically executes the algorithms and timings necessary for block erase and program operations.

System Bus

The system bus of the Pentium 4 processor is implemented in the AGTL+ (Assisted Gunning Transceiver Logic)+ technology. This technology features open-drain signal drivers that are pulled up through resistors at bus extremities to the operating voltage of the processor core. These resistors also act as bus terminators, and are integrated in the processor and in the 82850 MCH.



The supported operating frequency of the AGTL+ bus for the Pentium 4 is 100 MHz. The width of the data bus is 64 bits, while the width of the address is 32 bits. Data bus transfers occur at four times the system bus, at 400 MHz. Along with the operating frequencies, the processor voltage is set automatically.

The control signals of the system bus allow the implementation of a *"split - transaction"* bus protocol. This allows the Pentium 4 processor to send its request (for example, for the contents of a given memory address) and then to release the bus, rather than waiting for the result, thereby allowing it to

accept another request. The MCH, as target device, then requests the bus again when it is ready to respond, and sends the requested data packet. Up to four transactions are allowed to be outstanding at any given time.

Intel Pentium 4 Processor

The Pentium 4 processor has several features that enhance performance:

- Data bus frequency of 400 MHz
- Dual Independent Bus architecture, which combines a dedicated 64-bit L2 cache bus (supporting 256 KB) plus a 64-bit system bus that enables multiple simultaneous transactions
- MMX2 technology, which gives higher performance for media, communications and 3D applications
- Dynamic execution to speed up software performance
- Internet Streaming SIMD Extensions 2 (SSE2) for enhanced floating point and 3D application performance
- Uses multiple low-power states, such as AutoHALT, Stop-Grant, Sleep and Deep Sleep to conserve power during idle times.

The Pentium 4 processor is packaged in a pin grid array (PGA) that fits into a PGA423 socket (423-pin Zero Insertion Force or ZIF socket).

Processor Clock

The 100 MHz System Bus clock is provided by a PLL. The processor core clock is derived from the System Bus by applying a “ratio”. This ratio is fixed in the processor. The processor then applies this ratio to the System bus clock to generate its CPU core frequency.

Bus Frequencies

There is a 14.318 MHz crystal oscillator on the system board. This frequency is multiplied to 100 MHz by a phase-locked loop. This is further scaled by an internal clock multiplier within the processor.

The bus frequency and the processor voltage are set automatically.

Voltage Regulation Module (VRM)

One VRM is integrated on the system board complying with VRM specification rev. 9.0. High-current and low voltage processors are supported.

The processor requires a dedicated power voltage to supply the CPU core and L2 cache. The processor codes through Voltage Identification (VID) pins with a required voltage level of 1.30 V to 2.05 V. The VID set is decoded

by the VRM on the system board that in return supplies the required power voltage to the processor. It should be noted, however, that voltage may vary from one processor model to another.

Cache Memory

The Pentium 4 integrates the following cache memories on the same die as the processor cache:

- A trace instruction and L1 data cache. The trace cache is 4-way set associative.
- A 256KB L2 cache. The L2 cache is 8-way associative.

The amount of cache memory is set by Intel at the time of manufacture, and cannot be changed.

Assigned Device Interrupts

PCI 32 and AGP Interrupts

PCI 32	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	AGP
int A	C	A	B	C	D	A
int B	D	B	C	D	A	B
int C	A	C	D	A	B	
int D	B	D	A	B	C	
ID	6	7	9	10	11	0
IDSEL	22	23	25	26	27	16
REQ/GNT	1	2	3	4	5	

Interrupt Controllers

The system has an Interrupt controller which is equivalent in function to that of two 82C59 interrupt controllers. The following table shows how the interrupts are connected to the APIC controller. The Interrupt Requests (IRQ) are numbered sequentially, starting with the master controller, and followed by the slave (both of 82C59 type).

Although the *Setup* program can be used to change some of the settings, the following address map is not completely BIOS dependent, but is determined partly by the operating system. Note that some of the interrupts are allocated dynamically.

Interrupt Source	APIC Controller		Interrupt Signalling on	
	of device	Input	(PIC mode)	Pentium 4 Bus
AGP: int A Slot 1: int C Slot 2: int A Slot 3: int D Slot 4: int C Slot 5: int B	ICH2	INTA	INT	Pentium 4 bus instruction
AGP: int B Slot 1: int D Slot 2: int B Slot 3: int A Slot 4: int D Slot 5: int C	ICH2	INTB	INT	Pentium 4 bus instruction
Slot 1: int A Slot 2: int C Slot 3: int B Slot 4: int A Slot 5: int D	ICH2	INTC	INT	Pentium 4 bus instruction
Slot 1: int B Slot 2: int D Slot 3: int C Slot 4: int B Slot 5: int A	ICH2	INTD	INT	Pentium 4 bus instruction
Device on Primary IDE Channel	ICH2	IRQ14	INT	Pentium 4 bus instruction
Device on Secondary IDE Channel	ICH2	IRQ15	INT	Pentium 4 bus instruction
Serial Interrupt from Super I/O	ICH2	SERIRQ	INT	Pentium 4 bus instruction

There are three major interrupt modes available:

PIC mode: This mode uses only the “Legacy” interrupt controllers, so that only one processor can be supported.

Virtual wire mode: This mode is implemented with APIC controllers in the ICH2 and used during boot time. The virtual wire mode allows the transition to the “symmetric I/O mode”.

Symmetric I/O mode: This mode is implemented with APIC controllers in the ICH2.

NOTE

In “PIC mode” and “virtual wire mode”, the PCI interrupts are routed to the INT line. In the “symmetric I/O mode”, the PCI interrupts are routed to the I/O APIC controllers and forwarded over an GTL bus to the processor.

PCI Interrupt Request Lines

PCI devices generate interrupt requests using up to four PCI interrupt request lines (INTA#, INTB#, INTC#, and INTD#).

PCI interrupts can be shared; several devices can use the same interrupt. However, optimal system performance is reached when minimizing the sharing of interrupts. Refer to page 74 for a table of the PCI device interrupts.

4

Interface Cards

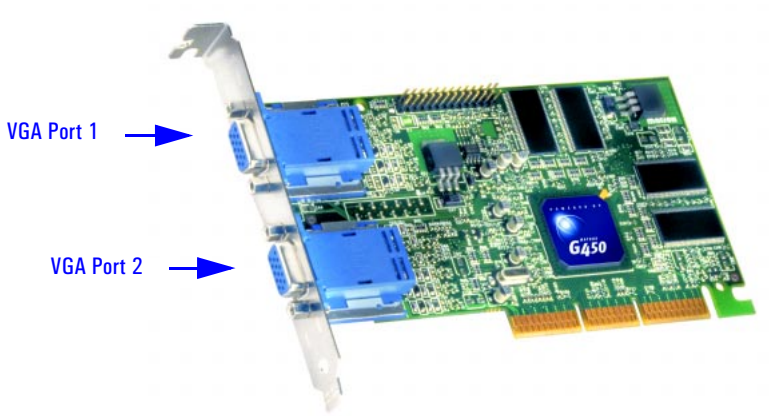
This chapter describes the graphics, network and SCSI devices that are supplied with the *HP Vectra VL800 PC*.

Graphics Cards

HP Vectra VL800 PC models are supplied with a graphics card. This graphics card is one of the following, depending on the PC model:

- Matrox Millennium G450
- nVIDIA GeForce2 GTS.

Matrox Millennium G450 Graphics Card



The Matrox Millennium G450 Dual Head AGP graphics card has a total of 16MB of installed video memory (non-upgradeable). Main features include:

- Powered by the 256-bit DualBus Matrox G450 chip
- Matrox DualHead technology for connecting two monitors
- Matrox DualHead technology with PowerDesk desktop manager:
  - ❒ Easy multiple resolutions support
  - ❒ Simple dialog box
  - ❒ Effortless multiple-window management
- TV output (composite video and S-video, NTSC and PAL)
- Full AGP 2X/AGP 4X support (up to 1GB/s bandwidth)
- 360MHz main RAMDAC and 230MHz secondary RAMDAC
- Support for all VESA standards:
  - ❒ VBE 2.0 (Super VGA modes)
  - ❒ DPMS energy saving
  - ❒ DDC2B support for Plug & Play detection of monitor
- Support for true 32-bit color (16.7 million colors) at resolutions up to 2048 x 1536 on the main display.
- Support for monitors with 16/10 aspect ration, at resolutions up to 1920 x 1200 on the main display.

3D Features

- VCQ^2 or Vibrant Color Quality^2
- Supports 32-bit Z buffering for exceptional rendering precision
- Environment-mapped bump mapping for more realistic 3D images
- Stencil buffering
- Bilinear, trilinear, and anisotropic filtering
- Single, double and triple buffering
- texture mapping
- MIP mapping
- Gouraud shading
- Alpha blending, anti-aliasing, fogging, specular highlighting.

NOTE

If only one monitor is used, then Port 1 must be used.

If a second monitor is connected, it is detected by the driver during the operating system startup. This means that both monitors must be connected to the graphics card *before* startup.

If only one monitor is detected, then only the mono head settings will be available in the Driver Configuration screens.

Available Video Resolutions

The number of colors supported is limited by the graphics device and the video memory. The resolution/color/refresh-rate combination is limited by a combination of the display driver, the graphics device, and the video memory. If the resolution/refresh-rate combination is set higher than the display can support, you risk damaging the display.

The following table summarizes the maximum supported resolutions.

Maximum Display Resolution		
Aspect Ratio	**Main Display**	**Second Display**
Traditional 4:3 / 5:4 aspect ratio	2048 x 1536	1600 x 1200
Wide screen 16:9 / 16:10 aspect ratio	1920 x 1200	1600 x 1024

The following table summarizes the maximum supported refresh rates.

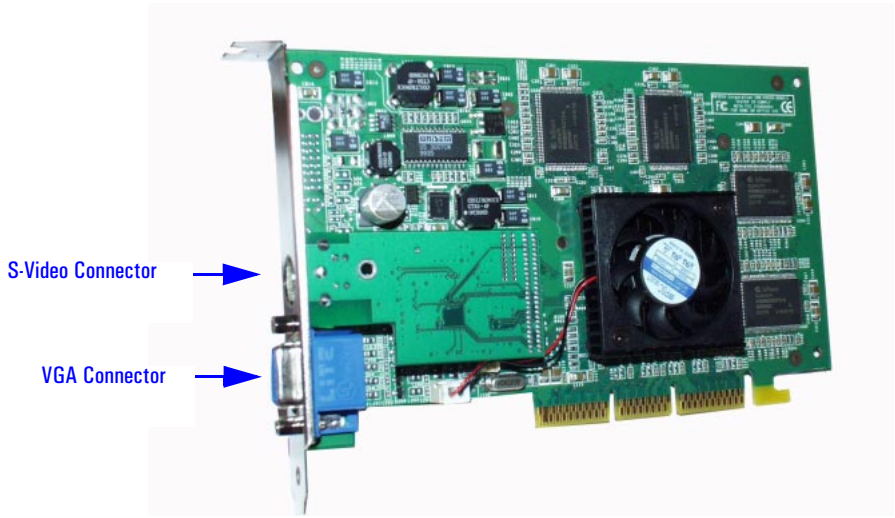
The maximum refresh rates are always attainable with 8-bit or 16-bit color but may not be attainable with 24-bit or 32-bit color.

Maximum Refresh Rates (Hz)			
Aspect Ratio	**Resolution**	**Main Display (360MHz RAMDAC)**	**Second Display (230MHz RAMDAC)**
Traditional 4:3 / 5:4 aspect ratio	640x480	200	200
	800x600	200	200
	1024x768	160	160
	1152x864	140	150
	1280x1024	120	120
	1600x1200	100	75
	1800x1440	85	–
	1920x1440	85	–
	2048x1536	85	–
Wide screen 16:9 / 16:10 aspect ratio	856x480	200	200
	1280x720	160	140
	1600x1024	120	90
	1920x1080	110	–
	1920x1200	100	–

Limitations

- When using Windows 95 or Windows 98 in dual display mode, the graphics memory is equally between the two displays. In this case each display has 16 MB graphics memory.
- The second display supports only 16-bit and 32-bit color.
- 3D acceleration is only available when using 16-bit and 32-bit color.

nVIDIA GeForce2 GTS



The nVIDIA GeForce2 GTS graphics card includes these features:

- VGA connector and S-Video connector for TV and video capability
- Resolutions of up to 2048 × 1536 pixels at 60Hz in 32-bit color
- 32 MB DDR SDRAM memory
- Supports AGP 2×/4×, AGP texturing and fast writes
- 256-bit 2D and 3D graphics engine
- 350 MHz RAMDAC
- 2.8 GB/s memory bandwidth
- High performance hardware anti-aliasing for smoother edges
- High quality HDTV/DVD playback
- High definition video processor
- Compatible with:
  - ❒ OpenGL 1.2 (Windows 98, Windows NT4.0, Windows 2000 and Linux)
  - ❒ Microsoft DirectX 7.0 (Windows 98 and Windows 2000)
- Standards: VESA DPMS, DDC2B, Plug & Play

3D Features

- Second Generation Transform and Lighting Engines
  Dedicated, graphics-specific GPU frees PC's main processor for other tasks and provides faster transform and lighting processing.
- nVIDIA Shading Rasterizer
  Provides natural visual properties such as cloud, smoke, water, textiles, plastic to images.
- 32-bit Z/Stencil Buffer
  Eliminates "polygon popping" problems in high-polygon 3D imaging.
- Cube environment mapping
- DirectX and S3TC texture compression
- 1600 Mtexel fill rate
- 25+ Mtriangles/second through T/L and setup.

Available Video Resolutions

The values in the table below are maximums, and may not be achievable under all operating systems and conditions. If the resolution/refresh-rate combination is set higher than the display can support, you risk damaging the display.

The table below summarizes resolution and refresh rates with true color.

Resolution (true colour)	Max. Refresh Rates
640 x 480	120 Hz
800 x 600	120 Hz
1024 x 768	120 Hz
1152 x 864	120 Hz
1280 x 960	120 Hz
1280 x 1024	120 Hz
1600 x 1024	100 Hz
1600 x 1200	100 Hz
1920 x 1080	100 Hz
1920 x 1440	75 Hz
2048 x 1536	60 Hz

Network Cards

The following network cards are supported:

- 3COM NIC LAN card
  Most PC models are supplied with this card.
- Intel NIC LAN card.

3COM NIC (Network Interconnect) LAN Card

3COM NIC LAN Card Features

Feature	Description
Interface	32-bit 10/100 BT full duplex RJ LAN Port.
LED	Three LEDs: • activity, • 10 MB/s speed, • 100 MB/s speed.
Labels	PCI 2.2 Specification, PC 99, Intel WfM 2.0.
Power Management[1]	• RPO and RWU for APM Windows 95 and Windows 98, • RWU for ACPI Windows 98 and Windows 2000, • RPO for Windows NT 4, • OnNow 1.0, APM 1.2, • PCI power management. 1.1, • WOL, PCI VccAux 3.3 V.
Manageability	DMI 2.0 Component Code.
Diagnostic	• Mac address DOS report tool, • User Diag for DOS, Windows NT 4, Windows 95 and Windows 98.
Drivers	Major OSes, Minor OSes.
Boot ROM	Multiboot BootROM (BIOS or socket).
Remote Wake Up (RWU)	This feature enables a host computer to remotely (over the network) power on computers and wake computers up from energy-saving Sleep mode. For these features to work, use the Setup program to configure the BIOS.

3COM LAN Card LED Descriptions

LED	Description	Flashing	Steady	Off
10 LNK	**GREEN:** Link integrity	Reversed polarity	Good 10 Base-T connection between NIC and hub.	No connection between NIC and hub
100 LNK	**GREEN:** Link integrity	Reversed polarity	Good 100 TX connection between NIC and hub.	No connection between NIC and hub
ACT	**Yellow:** Port traffic for either speed	Network traffic present	Heavy network traffic	No traffic

INTEL NIC (Network Interconnect) LAN Card

INTEL NIC LAN Card Features

Feature	Description
Interface	IEEE802.3 100 Base-TX IEEE802.3 10 Base-T 32-bit 10/100 BT full duplex RJ LAN Port
LED	Two LEDs: • one for act/lnk (activity and link) • one for 10 MB operation (on = 100 MB, off = 10MB).
Labels	PCI 2.2 Specification, PC 99.
Power Management	• Wfm 2.0 compliant • RPO and RWU for APM Windows 95 and Windows 98 • OnNow 1.0, APM 1.2 • PCI power management 1.1 • VccAux s3.3 V support via PCI bus 2.2 • VccAux 5 V support via 3-pin WOL.
Manageability	DMI 2.0 and DMI 2.0 SNMP mapper
Diagnostic	• Windows and DOS based • Mac address DOS report tool • User Diag for DOS, Windows NT 4, Windows 95 and Windows 98.
Drivers	Major OSes, Minor OSes
Boot ROM	Onboard flash ROM
Remote Wake Up (RWU)	This feature enables a host computer to remotely (over the network) power on computers and wake computers up from energy-saving Sleep mode. For these features to work, use the Setup program to configure the BIOS.

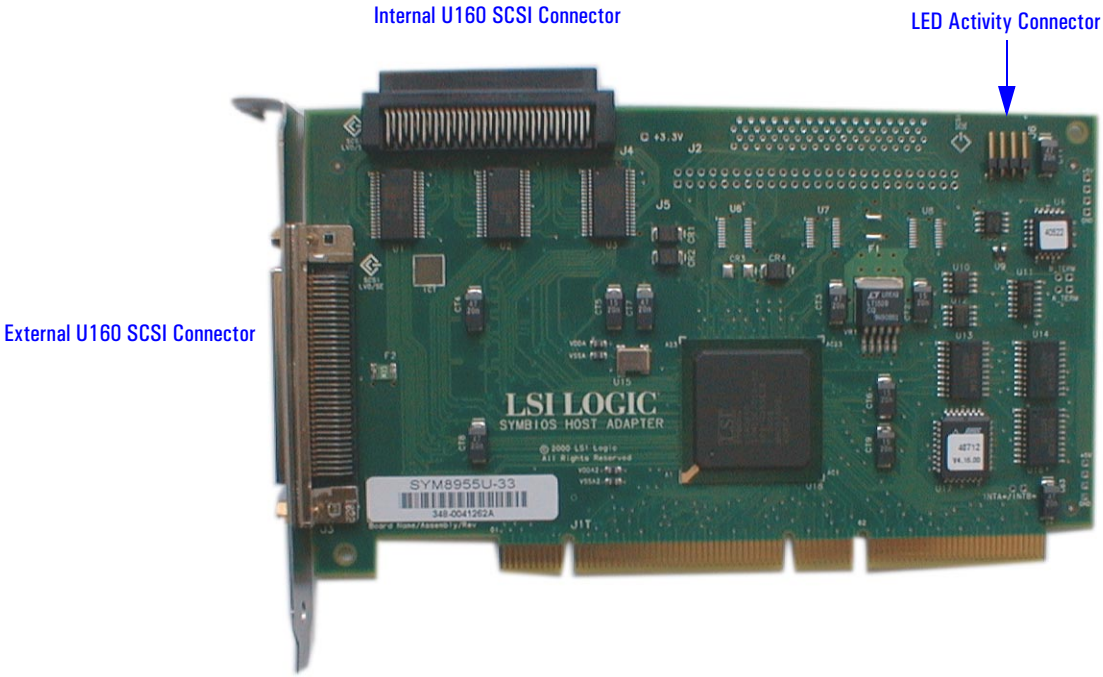
INTEL NIC LAN Card LED Descriptions

LED	On	Flashing	Off
ACT/LNK	Adapter and hub are receiving power. Cable connection is good.	Receiving or sending packets	Adapter and hub are not receiving power. Cable connection could be faulty or there is a driver configuration problem.
100 TX	Operating at 100 Mbps	N/A	Operating at 10 Mbps

SCSI Adapter Cards

Some PC models are supplied with an Ultra 160 SCSI PCI adapter card. Up to a total of 15 devices (internal and external) can be supported by this controllers via 16-bit Wide SCSI 68-pin high-density connectors.

Ultra 160 SCSI PCI Adapter Card



The functionality and performance of the Ultra 160 SCSI PCI Adapter card comes from the on-board LSI Logic SYM53C1010 PCI to Ultra 160 multifunction controller with LVD link universal transceivers.

The ability to automatically switch from a single-ended (SE) operation for legacy Fast/Ultra devices to universal low voltage differential (LVD) operation when Ultra 160 devices are connected is also provided by this controller.

Hardware Features

Feature	Description
PCI Bus Interface	• Complies with PCI 2.2 Specification • PCI is 64-bit, 33 MHz (runs at 32 bits in vl800) • Bus Mastering • Universal PCI signaling: operates on 3.3 V or 5 V buses.
SCSI Bus	• 16-bit Wide SCSI bus • LVD/SE SCSI bus.
Supported SCSI Rates	• 160 MB/s (Synchronous) — Ultra 160 SCSI • 80 MB/s (Synchronous) — Wide Ultra2 SCSI • 40 MB/s (Synchronous) — Wide Ultra SCSI • 20 MB/s (Synchronous) — Fast Wide SCSI • Asynchronous.
Number of SCSI Devices	• 15 on one SCSI channel
SCSI Connectors	• One internal 68-pin high-density Wide SCSI connector • One external 68-pin high-density Wide SCSI connector.
LED Connectors	• One 4-pin LED Activity connector
BIOS	• On-board, upgradeable BIOS in Flash ROM
Serial EEProm	• On-board serial EEProm for SCSI bus configuration storage
Operating Systems	• Windows 9x, Windows NT4, Windows 2000

Performance

- DMA bus mastering for low overhead with 64-bit burst data transfers at PCI data transfer rates
- Zero wait state PCI transfers
- Up to 128-word PCI burst size to maximize PCI data transfer rate.

Ultra 160 SCSI PCI Adapter Card Installation

The Ultra 160 SCSI PCI Adapter card can be installed in any PCI slot. It includes an internal SCSI cable.

A maximum of three devices can be connected inside the chassis. You can also install external SCSI devices, for a total of up to 15 SCSI devices.

Connectivity

Enables both internal and external connection.

Internal Connection

The internal connector is a Wide SCSI 68-pin high-density connector. The internal ribbon cable has to be connected to this connector.

External Connection

The external connector is located on the PCI bracket. It is a shielded Wide SCSI 68-pin high-density connector. Any cable connected to this connector must be shielded.

- When running in LVD mode, the external cable should not exceed 12 m
- When running in SE mode, the external cable should not exceed 1.5 m.

NOTE

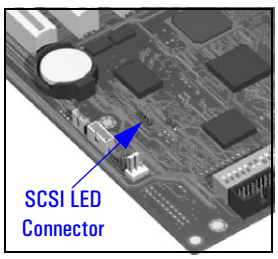
When connecting an external SCSI device, you must terminate the SCSI bus by fitting an external terminator.

Cables

Internal SCSI cable

The internal SCSI cable is supplied with an embedded multi-mode terminator at one end of it.

LED Activity cable



The LED cable supplies SCSI LED activity to the front panel hard disk LED. For this to work, the SCSI LED cable must be connected to the LED Activity connector on the Ultra 160 SCSI PCI Adapter card (refer to graphic on page 87) and the SCSI LED connector on the system board.

The connectors on both ends of the cable are identical, hence they can be connected to either connector.

SCSI Controller

The SCSI controller characteristics are as follows:

- PCI 64-bit 33 MHz.
- SCSI Multimode LVD/SE.

SCSI Bus

- LVDlink™ transceivers meet all of the SPI-2 standard requirements.
- Uses LSI Logic TolerANT® active negation technology for improved single-ended SCSI signal integrity.
- Pre-fetches up to 8 words of SCSI SCRIPTS® instructions to save PCI bus overhead.
- Supports multithreaded I/O algorithms in SCSI SCRIPTS with fast I/O context switching.

- Includes 8 KB of internal RAM for SCRIPTS instruction storage to reduce or eliminate instruction fetches over the PCI bus.
- Provides data reliability and cable distance of differential SCSI without cost of external differential transceivers.
- Improves connectivity (up to 15 LVD devices) and cable lengths (up to 12 meters with LVD SCSI bus). Longer cables may be possible in point-to-point connections.
- Supports SURElink (Ultra 160 SCSI Domain Validation) to ensure link integrity at Ultra 160 transfer rates and to renegotiate to lower speed and bus width if necessary.

PCI connector

- One 64-bit universal connector (supports both 5 V and 3.3 V signaling).
- Configured as a 15 W board (PRSNT1 and PRSNT2 grounded).
- The SCSI Adapter Card sink current on the 5 V power supplies lines. The 3.3 V is supplied by an on-board regulator.

PCI Bus

- Complies with PCI Specification 2.2.
- Supports 64-bit, 33 MHz PCI Bus.
- Supports PCI write and invalidate, read line and read multiple commands.
- Functions as full 64-bit PCI DMA Bus Master.
- Operates on 3.3 V or 5 V PCI buses.

Terminators

- Three multi-mode SE/LVD active, auto-terminating terminators
- Auto-termination: terminators are active when one of the tow connectors is used. If both connectors are used at the same time, terminators will automatically switch to high impedance mode.
- The terminator will automatically detect the bus type (LVD or SE) and switch to the right mode.

Flash memory

The flash memory stores the SCSI BIOS. Refer to the following section for information about the Symbios SCSI Configuration Utility.

Symbios Configuration Utility (Ultra 160 Card)

The Symbios Configuration Utility lets you view and change the default configuration for the host adapter, and all SCSI devices connected to it, or for individual SCSI devices. If, while using this utility, you accidentally disable all the controllers, pressing **`Ctrl-C`** during the POST (after the memory test) lets you recover and configure settings.

Default Settings You Can Change

The following two tables show the configuration settings that can be changed. The first table shows the global settings which impact the host adapter and all SCSI devices connected to it (Adapter Properties menu). The second table shows the device settings which apply to individual devices (Device Properties menu).

Field	Default Settings	Description
SCSI Parity	Yes	Indicates whether SCSI parity is enabled for an adapter. When disabled, it is also necessary to disable disconnects for all devices, as parity checking for the reselection phase is not disabled. If a non-parity generating device disconnects, its operation will never complete because the reselection fails due to parity error.
Host SCSI ID	7	Indicates the SCSI identifier of an adapter. It is not recommended to change the host adapter ID from the default value of 7.
SCSI Bus Scan Order	Low to High (0 to Max)	Indicates the order in which to scan SCSI identifiers on an adapter. Changing this item will affect drive letter assignment(s) if more than one device is attached to an adapter.
Removable Media Support	None	Specifies the removable media support option for an adapter. Removable media support only applies to devices that report themselves as a hard drive. It does not apply to CD-ROM devices or Magnetic Optical devices. None indicates no removable media support whether the drive is selected as first (BBS), or is first in the scan order (non-BBS). Boot Drive Only provides removable media support for a removable hard drive if it is first in the scan order. With Media Installed provides removable media support regardless of the drive number assignment.

Field	Default Settings	Description
CHS Mapping	SCSI Plug and Play Mapping	Defines the cylinder head sector (CHS) values that are mapped onto an un-partitioned disk. SCSI Plug and Play Mapping automatically determines the most efficient and compatible mapping. Alternate CHS Mapping utilizes an alternate, possibly less efficient mapping that may be required if a device is moved between adapters from different vendors. **Caution:** Neither of these options has any effect after a disk has been partitioned using the FDISK command. The FDISK utility is a tool that the user can use to delete partition entries, one or all of them. If all partition entries are deleted, it is necessary to reboot to clear memory or the old partitioning data will be reused, thus nullifying the previous operation. Use care to ensure that the correct disk is the target of an FDISK command.
Spinup Delay (secs.)	2	Indicates the delay in seconds between spinups of devices attached to an adapter. Staggered spinups balance the total electrical current load on the system during boot. The default value is 2 seconds.
Secondary Cluster Server	No	Indicates whether an adapter has one or more devices attached that are shared with one or more other adapters and therefore, the Symbios SCSI BIOS should avoid SCSI bus resets as much as possible. This option allows the user to enable an adapter to join a cluster of adapters without doing any SCSI bus resets. This is a requirement for Microsoft Cluster Server. The default value is No with an alternate option of Yes.
Termination Control	Auto	If available, the field indicates whether an adapter has automatic termination control. Auto means that the adapter automatically determines whether it should enable or disable its termination. Auto is the default state unless termination is done manually, in which case, the configuration is Off.
MT/Sec	80	Indicates the maximum synchronous data transfer rate in megatransfers per second.
Data Width	16	Maximum data width in bits.
Scan ID	Yes	Indicates whether to scan for this SCSI identifier at boot time. Utilizing this setting allows you to ignore a device. This decreases boot time by disabling inquiry of unused SCSI identifiers. Set this option to No if there is a device that you do not want to be available to the system. Also, on a bus with only a few devices attached, the user can speed up boot time by changing this setting to No for all unused SCSI IDs.
Scan LUNs	Yes	Indicates whether to scan for LUNs greater than zero for a device. LUN 0 is always queried. This option should be used if a multi-LUN device responds to unoccupied LUNs or if it is desired to reduce the visibility of a multi-LUN device to LUN 0 only. Set this option to No if you have problems with a device that responds to all LUNs whether they are occupied or not. Also, if a SCSI device with multiple LUNs exists on your system but you do not want all of those LUNs to be available to the system, then set this option to No. This will limit the scan to LUN 0.

Field	Default Settings	Description
Disconnect	On	Indicates whether to allow a device to disconnect during SCSI operations. Some (usually newer) devices run faster with disconnect enabled, while some (usually older) devices run faster with disconnect disabled.
SCSI Timeout	10	Indicates the maximum allowable time for completion of a SCSI operation in seconds. Since time-outs provide a safeguard that allows the system to recover should an operation fail, it is recommended that a value greater than zero be used. A value of zero allows unlimited time for an operation to complete and could result in the system hanging (waiting forever) should an operation fail. **Note:** This field is executable and must be selected with the Enter key. You also input the new value with the number keys from the keyboard, not the number pad.
Queue Tags	On	This field indicates whether to allow the use of queue tags for a device. Currently the BIOS does not use queue tags. This item specifies queue tag control to higher level device drivers.

Starting the Symbios Configuration Utility

You access the Symbios Configuration Utility by pressing **`Ctrl-C`** when the message **`Press Ctrl-C to start Symbios Configuration Utility...`** is displayed during the PC's start-up routine. A further message is then displayed: **`Please wait, invoking Symbios Configuration Utility...`** before the Main menu of the Symbios Configuration utility appears.

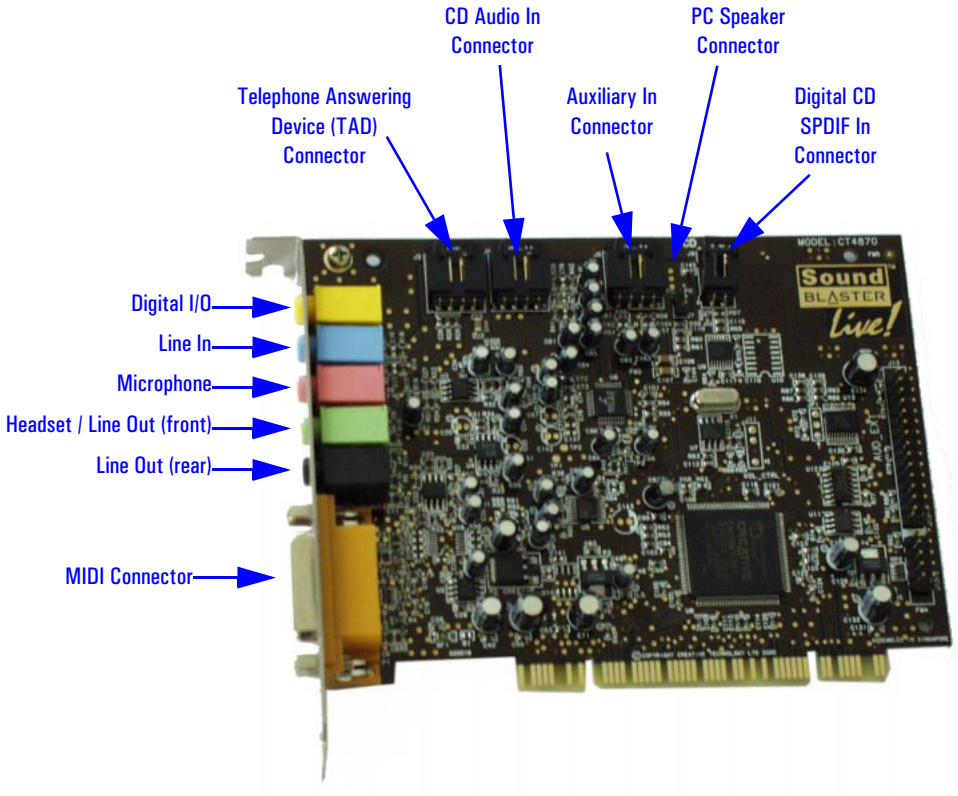
NOTE

During PC startup, the PC reports the presence of two SCSI channels. (Similarly, you will see two SCSI channels in the System configuration of the Windows Control Panel.)
This is because there are two SCSI channels present in the SCSI card chip logic, although only the first SCSI channel is active and usable with this model of SCSI card.

Audio Card

Sound Blaster Live!

Some PC models have a Sound Blaster Live! audio card.



Features

- **Cinema-Quality Audio Playback**
  The Sound Blaster Live audio card, when coupled with the appropriate digital audio equipment, can rival the audio playback quality of cinemas with digital sound.

- **Powerful Audio Processing Engine**
  The audio processor chip integrates music, audio and effects and is the most powerful of its type. Audio signals are processed at 32-bit, 48kHz with 8-point interpolation (which helps smoothen the sound).
- **EAX™ Enhancement**
  Enhances existing audio (in applications, music, games) for increased depth and realism.
- **Multiple Speaker Output**
  Produces surround sound audio with support for 2 or 4 speakers. For full 3D audio, a 4.1 speaker system (satellites and a subwoofer) can be connected.
- **Digital I/O**
  The digital I/O connector can be used to carry a digital PCM signal (Pulse Code Modulation, a standard way of encoding analog audio signals in digital format), or for outputting AC-3 (also called Dolby Digital, encoding for multi-channel audio) to a AC-3 decoder.
- **1024-Voice Music Synthesis**
  Enables the Sound Blaster card to produce better quality sound by using multi-layering of instruments, playback of more instrument notes simultaneously, and the “sustain effect”.

Connector Information

- **Line Out Connectors**
  Speakers connected to the Line Out (front and rear) connectors must be amplified. Headphones can alternatively be connected to the Line Out (front) connector.
- **TAD Connector**
  A voice-enabled internal modem with the appropriate software can be connected to the Telephone Answering Device connector to provide an answering machine service. (Cable is not provided.)
- **Auxiliary In Connector**
  This is like an additional CD-In connector for analog audio input. It can be used, for example, to connect another CD or DVD drive. (Cable is not provided.)
- **Digital CD SPDIF Connector**
  This connector can be used to record digital audio, from an audio CD for example. (Cable is not provided.)

Audio Specifications

Line Out full scale output	2.0 Vrms
Frequency response at -1dB	10 Hz – 47 kHz
Signal-to-noise ratio	94 dB
THD (Total Harmonic Distortion) + noise (A-weighted)	0.006%
Microphone input impedance	5.0 kΩ
Line In impedance	10 kΩ
CD audio input impedance	10 kΩ
CD audio input sensitivity	2.0 mV
Noise Floor (with all inputs on at rated power): Front channel Rear channel	 -115 dB -130 dB

5

Mass Storage Devices

This chapter describes the mass storage devices that are supplied with the PC. For the position of the different mass storage devices, refer to page 13 for the Desktop and to page 31 for the Minitower.

HP product numbers and replacement part numbers for mass storage devices are listed in the Service Handbook Chapters, which can be accessed from HP's web site at the following address:
www.hp.com/go/vectrasupport.

Information about available accessories can be obtained from:
www.hp.com/go/pcaccessories

Flexible Disk Drives

A 3.5-inch, 1.44 MB flexible disk drive is supplied in the front-access shelf.

Hard Disk Drives

The following table lists the 3.5-inch (1-inch high) hard disk drives that can be supplied in the *HP Vectra VL800 Desktop PC*. Hard disk drives are connected to the SCSI or IDE controller. The hard drive information and hard drives themselves are subject to change. Type and quantity depends on model.

NOTE

Connect any ATA/33 or ATA/66 devices to the second channel of the PC's IDE controller. If you connect a ATA/33 or ATA/66 device to the same channel as the ATA/100 hard disk drive, the whole channel will slow down to match the speed of the slower device.

IDE Hard Disk Drives

	IBM Deskstar™, Maxtor DiamondMax® or Seagate Barracuda IDE HDD (7.2 krpm)	**IBM Deskstar™, Maxtor DiamondMax® or Seagate Barracuda IDE HDD (7.2 krpm)**
Capacity	20.5 GB	40 GB
Interface	UltraIDE ATA/100	UltraIDE ATA/100
External peak transfer rate	100 MB/s	100 MB/s
Average seek time (read)	8.5 ms	8.5 ms
Media transfer rate (Mb/s)	444 Mb/s max.	444 Mb/s max.
Number of discs/heads	2/3	3/6
Buffer size	2 MB	2 MB

SCSI Hard Disk Drives

This information is subject to change.

	Quantum Atlas 10K II SCSI (10 krpm)	Quantum Atlas 10K II SCSI (10 krpm)	Quantum Atlas 10K II SCSI (10 krpm)
Capacity	9.2 GB	18.4 GB	36.7 GB
Interface	Ultra160 SCSI	Ultra160 SCSI	Ultra160 SCSI
External peak transfer rate	160 MB/s	160 MB/s	160 MB/s
Average seek time (read)	4.7 ms	4.7 ms	4.7 ms
Internal data rate (Mb/s)	280 Mb/s min. to 478 Mb/s max.	280 Mb/s min. to 478 Mb/s max.	280 Mb/s min. to 478 Mb/s max.
Number of discs/heads	2/3	3/6	5/10
Buffer size	8 MB	8 MB	8 MB

Optical Drives

IDE 48X CD-ROM Drive

Some models[1] have a 48X IDE CD-ROM drive supplied in a 5.25-inch front-access shelf, supporting ATAPI commands. It can read any CD-ROM (data) disc. It also has audio playback capability and can play and standard audio CDs. It conforms to optical and mechanical standards as specified in the Red, Yellow, Orange and Green Books.

Some of the 48X IDE CD-ROM features include:

- Application Disk type (confirmed by Red, Yellow, Green, Orange Book)
- CD-ROM data disk (Mode 1 and Mode 2)
- Photo-CD Multisession
- CD Audio disc
- Mixed mode CD-ROM disc (data and audio)
- CD-ROM XA, CD-I, CD-Extra, CD-R, CD-RW

	Description
Data capacity	650 MB
Data transfer rate	Sustained transfer rate (1X = 150 KB/s); Outerside: 7,200 KB/s Burst transfer rate: PIO mode 4 - 16.6 Mbytes/s maximum Single Word DMA Mode 2 - 8.3 Mbytes/s maximum Multi Word DMA Mode 2 - 16.6 Mbytes/s maximum
Buffer memory size	128 Kbytes
Access time	Average Stroke (1 / 3) 110 ms Full Stroke 180 ms
Rotational speed	2,048 bytes (Mode-1) 2,336 bytes (Mode-2)
Interface	ATAPI
Power requirements	5V, 1.2A 12V, 0.8A

1. Refer to the Service Handbook chapter (available at **www.hp.com/go/vectrasupport**) to find out which models are installed with this optical drive.

12X Video IDE DVD-ROM Drive

Some models[1] have a DVD-ROM (Read Only) drive. It can play any standard audio CDs and DVD movies (with the same regional code). It can read any CD-ROM and DVD-ROM (data) discs. It also has audio playback capability and can play and standard audio CDs. It conforms to optical and mechanical standards as specified in the Red, Yellow, Orange and Green Books.

	Description
Data capacity	DVD-R/DVD-RAM: Up to 4.7 Gbytes/side CD-ROM: 650 MB
Sustained data transfer rate	DVD-ROM: 16.6 Mbytes/s (DVD single layer) 11.0 Mbytes/s (DVD dual layer) CD-ROM: 6.0 Mbytes/s max. DVD-RAM: 2.77 Mbytes/s typical
Buffer memory size	512 Kbytes
High Speed Access	DVD-ROM: Random access time 120 ms typical (DVD single layer) CD-ROM: Random access time 90 ms typical DVD-RAM: 210 ms typical (1/3 stroke)
Rotational speed	DVD-ROM: 5 to 12X max. full CAV (DVD single layer) 3.3 to 8X max. full CAV (DVD dual layer) CD-ROM: 17 to 40X max. full CAV DVD-RAM: 2X ZCLV
Interface	ATAPI
Power requirements	+5V ±5% +12V ±10%

1. Refer to the Service Handbook chapter (available at **www.hp.com/go/vectrasupport**) to find out which models are installed with this optical drive.

8X IDE CD-Writer Plus Drive

Some models[1] have a CD-RW (ReWritable) drive supplied in a 5.25-inch front-access shelf, supporting ATAPI commands. It can read any CD-ROM (data) disc. It also has audio playback capability and can play and standard audio CDs. It can record both write-once (CD-R) and CD-RW optical media. It conforms to optical and mechanical standards as specified in the Red, Yellow, Orange and Green Books.

	Description
Data capacity	650 MB or up to 74 minutes of audio per disc 547MB in CD-UDF data format
Performance	Typical: 110 ms (random, 1/3 access including latency) Maximum: 130 ms (random, 1/3 access including latency)
	Data transfer rate: Read: Up to 32X (1X = 150 KB/s) Write: 8X (CD-R); 4X (CD-RW)
Burst transfer rate	16.67 Mbytes/sec.
Spin-up time	3.2 seconds (disk stop to high speed)
Spin-down time	2.5 seconds (disk high speed to stop)
Corrected error rate	ECC On (max. 32X): 1 block/10^{12} bits ECC Off (max. 32X): 1 block/10^{9} bits
Data Buffer Capacity	2 MB
Write methods	- Track at once - Session at once - Disc at once - Variable packet writing - Fixed packet writing - Multisession
Format and EEC standard	Red, Yellow, Orange, Green books
MTBF	120,000 POH
Interface	E-IDE and ATAPI

1. Refer to the Service Handbook chapter (available at **www.hp.com/go/vectrasupport**) to find out which models are installed with this optical drive.

6

HP BIOS

This chapter describes the *Setup* program and BIOS. The POST routines are described in the next chapter.

Introducing the Vectra VL800 BIOS

The BIOS is based on the core Phoenix BIOS, which includes 4 Mbits of flash memory, support for PCI 2.2 Specification, suspend to RAM and RIMM memory modules.

The BIOS includes a Boot ROM for the 3COM 3C905C LAN card.

The system ROM contains the POST (Power-On Self-Test) routines, and the BIOS, which consists of the system BIOS, video BIOS, and low option ROM. This and the next chapter give an overview of the following:

- Menu-driven *Setup* with context-sensitive help
- The address space, with details of the interrupts used
- The Power-On Self-Test or POST, which is the sequence of tests the computer performs to ensure that the system is functioning correctly.

The system BIOS is identified by the version number *IQ.01.xx.yy*, where:

- *IQ* indicates that it is for the HP Vectra VL800
- *01* indicates that it is a Vectra PC
- *xx* is the BIOS release version
- yy indicates the language of the BIOS, for example, US for international English, IT for Italian.

An example of a released version would look similar to the following the example: IQ.01.04.US.

The procedure for updating the system ROM firmware is described on page 113.

Using the HP *Setup* Program

To run the *Setup* program, press **F2** while the initial HP logo is displayed, immediately after restarting the PC.

Alternatively, press **Esc** to view the summary configuration screen. By default, this remains on the screen for 15 seconds, but pressing any key will override this delay. It is not possible to hold the summary configuration screen indefinitely on the screen.

The following menus appear at the top of the screen: Main, Advanced, Security, Boot, Power and Exit. These are selected using the left and right arrow keys.

The following screens are examples of a BIOS configuration.

Main Screen

The Main Screen presents a list of fields. To change a value press either the F7 or F8 keys.

PhoenixBIOS Setup Utility								
Main	**Advanced**	**Security**	**Boot**	**Power**	**Exit**			
						Item-Specific Help		
BIOS Version:		IQ.01.06				.		
PnP OS		[No]						
Reset Configuration Data:		[No]						
System Time:		[14:42:33]						
System Date:		[02/08/2000]						
Key Click:		[Disabled]						
Keyboard auto-repeat rate		[21.8 per Second]						
speed:								
Delay before auto-repeat:		[0.50 Second]						
Numlock at Power-on:		[On]						
F1	**Help**	**↑ ,**	**Select Item**	**F7/ F8**	**Change Values**		**F9**	**Setup Defaults**
ESC	**Exit**	**← →**	**Select Menu**	**Enter**	**Select > Sub-Menu**		**F10**	**Previous Values**

Advanced Screen

The Advanced Screen does not have the same structure as the Main Screen and Power Screen. Instead of presenting a list of fields, it offers a list of sub-menus.

The Advanced screen is for advanced users who wish to carry out special system configurations.

Main	Advanced	Security	Boot	Power	Exit
					Item-Specific Help
> Processors, Memory and Cache					.
> Floppy Disk Drives					
> IDE Devices					
> Integrated USB Interface					
> Integrated I/O Ports					
> Integrated Audio Device					
> AGP Configuration (Video)					
> PCI Device, slot #1					
> PCI Device, slot #2					
> PCI Device, slot #3					
> PCI Device, slot #4					
> PCI Device, slot #5					

Processors, Memory and Cache

Advanced		
Processors, Memory and Cache		Item-Specific Help
Processor Type	Pentium (R) 4	
CPU Speed	1400 MHz	
Microcode version	F07/7	
Memory Caching	[Enabled]	
Memory Error Checking[1]	[Disabled]	

1. Only if ECC modules are detected.

Floppy Disk Drives

Advanced		
Floppy Disk Drives		Item-Specific Help
Floppy Disk Controller	[Enabled]	
Floppy Disk Drive A	[1.44, 3½"]	
Floppy Disk Drive B	[Not installed]	

IDE Devices

Advanced		
IDE Devices		Item-Specific Help
> IDE Primary Master Device	[None]	
> IDE Primary Slave Device	[None]	
> IDE Secondary Master Device	[None]	
> IDE Secondary Slave Device	[None]	
> Large Disk Access Method	[NT/DOS]	
> Integrated IDE Controller	[Both Enabled]	

IDE Primary Master Device

Advanced	
IDE Primary Master Device (HD 2564)	Item-Specific Help
Type Multisector transfer LBA Mode Control 32 bit I/O Transfer Mode ULTRA DMA Mode	

Integrated USB Interface

Advanced		
Integrated USB Interface		Item-Specific Help
USB Controller	[Auto]	
Legacy Keyboard Emulation	[Disabled]	

Integrated I/O Ports

Advanced		
	Integrated I/O Ports	Item-Specific Help
Parallel Port	[Auto]	
Parallel Port Mode	[ECP]	
Serial Port A	[Auto]	
Serial Port B	[Auto]	

Integrated Audio Device

Advanced		
	Integrated Audio Device	Item-Specific Help
Integrated Audio	[Auto]	

AGP Configuration (Video)

Advanced		
	AGP Configuration (Video)	Item-Specific Help
Graphic Aperture	[64 MB]	

PCI Device, Slot #1

Advanced		
	PCI Device, Slot 1[1]	Item-Specific Help
Option ROM Scan	[Auto]	
Bus Master	[Disabled]	
Bus Latency Timer	[0040h]	

1. Other PCI slots have the same options as above. PCI Device, slot 1 is only used as an example.

Security Screen

Sub-menus are presented for changing the characteristics and values of the System Administrator Password, User Password, Power-on Password, boot device security and Hardware Protection.

Main	Advanced	Security	Boot	Power	Exit	
						Item-Specific Help
	Administrator Password	Clear				
	Set Administrator Password	[Enter]				
	Clear Both Passwords	[Enter]				
	User Password	Clear				
	Set User Password	[Enter]				
	Power-on Password	[Disabled]				
	Start from Floppy	[Enabled]				
	Start from CD-ROM	[Enabled]				
	Start from HDD	[Enabled]				
>	Hardware Protection					

Hardware Protection

Security		
Hardware Protection		Item-Specific Help
Integrated Flexible Disk Controller		
Flexible Disks	[Unlocked]	
Write on Floppy Disks	[Unlocked]	
Integrated IDE Controller		
Hard Disks / CD-ROM	[Unlocked]	
Hard Disk Boot Sector	[Unlocked]	
Integrated Data Communications Ports		
Serial Port A	[Unlocked]	
Serial Port B	[Unlocked]	
Parallel Port	[Unlocked]	
Secured Setup Configuration	[No]	

Boot Screen

This screen allows you to select the order of the devices which the PC attempts to boot from:

- Hard disk drives
- Removable devices.

The operating system assigns drive letters to these devices in the order you specify. During POST, if the BIOS is unsuccessful at booting from one device, it will then attempt to boot from the next device on the *Boot Device Priority* list until an operating system is found.

Main	Advanced	Security	Boot	Power	Exit
					Item-Specific Help
	Quickboot Mode	[Enabled]			
	Display Option ROM Messages	[Enabled]			
>	Boot Device Priority				
>	Hard Disk Drives				
>	Removable Devices				

Power Screen

This screen allows you to set the standby delay and suspend delay. Standby mode slows down the processor, while the suspend mode saves a maximum of energy.

Modem ring enables or disables the system to return to full speed when an IRQ is generated. Network interface enables or disables the system to return to full speed when a specific command is received by the network interface.

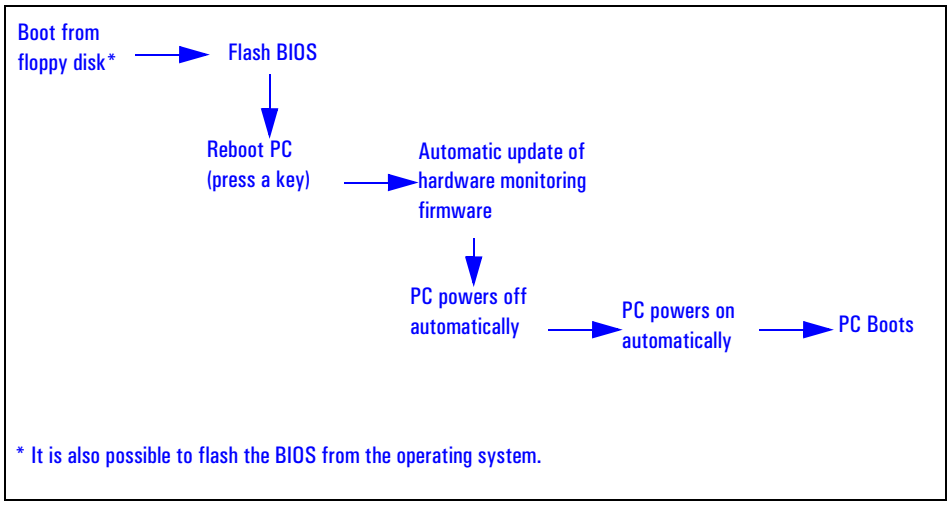
Main	Advanced	Security	Boot	Power	Exit
					Item-Specific Help
Power-on Integrated Network		[Disabled]			

Updating the System BIOS

The latest system BIOS (standard flash operation) can be downloaded from HP's Support Web site at: **www.hp.com/go/vectrasupport**. Then select HP Vectra VL800 PC.

Instructions on updating the BIOS are supplied with the downloaded BIOS files and a BIOS flash utility (phlash.exe).

The BIOS update not only flashes the BIOS, but also updates hardware monitoring firmware. How the System BIOS flash is carried out is shown below.



Do not switch off the computer until the system BIOS update procedure has completed, successfully or not, otherwise irrecoverable damage to the system board may be caused.

Restoring BIOS Default Settings

Suspected hardware errors may be caused by BIOS and configuration issues. If the BIOS settings are suspected to be wrong, do the following steps to restore the BIOS to its default setting:

1 Press F2 while the initial HP logo is displayed immediately after restarting the PC to access the *Setup* program.
2 Press F9 to load the default settings from the *Setup* program.
3 Set the “Reset Configuration Data” to Yes in the Main menu.
It is recommended that before you make any modifications to the BIOS you take note of the system setup.

If You Forgot the Administrator Password

1 Switch off the PC and remove the power cord.

2 Remove the PC's cover.

3 Set switch 9 on the system board switch block to the ON position.

4 Replace the power cord and restart the PC.

5 When the message *Passwords have been cleared* appears on screen, switch off the PC.

6 Remove the power cord and reset switch 9 back to the OFF position.

7 Replace the PC's cover.

8 Switch on the PC and allow it to complete its startup routine.

9 After the Power-On-Self-Test has completed, press **F2** when prompted to use the *Setup* program.

10 Set the Administrator and new User passwords.

11 Press **Esc,** or **F3**, or select **Exit Menu,** to save the new Password and exit *Setup*.

Clearing the CMOS

1 Turn off the PC, disconnect the power cord and all cables, then remove the cover.
2 Set the system board switch 8 to the ON position.
3 Replace the cover, and reconnect the power cord and video cable.
4 Reboot the PC. A message similar to the following will be displayed:

"Configuration has been cleared, set switch Clear to the ON position before rebooting."

5 Turn off the PC, disconnect the power cord and video cable, and remove the cover.
6 Set the system board switch 8 to the OFF position.
7 Replace the cover, and reconnect the power cord and data cables.
8 Switch on the PC. Run the *Setup* program by pressing **F2**. Then press **F9**, the CMOS default values will be automatically downloaded and saved.
9 Press **Esc** to save the configuration and exit from the *Setup* program.

Recovering the BIOS (Crisis Mode)

If for some reason the BIOS is corrupted and the standard flash cannot be used, use the BIOS Recovery Mode (exceptional BIOS recovery operation) to restore the BIOS. To do this:

1 Obtain a bootable DOS floppy disk.
2 Copy the BIOS files on to the floppy disk.
How to download the system BIOS is described on page 113.
3 Create (or edit) the file, AUTOEXEC.BAT
This should contain a single line of text:
"**`phlash /c /mode=3 /s IQ0105US.FUL`**"
(rename the BIOS filename with the one on the floppy disk).
4 Power off the PC and remove the power cord.
5 Remove the cover.
6 Set switch 7 to the ON position.
7 Insert the floppy disk into the floppy disk drive.
8 Reconnect the power cord and switch on the PC.
9 The PC boots from the floppy disk, then flashes the BIOS. However, it should be noted, that during the flash process, the screen remains blank.
10 The recovery process is finished when there is one very long beep.
11 Power off the PC. Remove the floppy disk from the drive.
Remove the power cord.
12 Set switch 7 back to the OFF position.
13 Replace the cover, reconnect the power cord, then reboot the PC.

BIOS Addresses

This section provides a summary of the main features of the HP system BIOS. This is software that provides an interface between the computer hardware and the operating system.The procedure for updating the System ROM firmware is described on page 113.

HP I/O Port Map (I/O Addresses Used by the System[1])

Peripheral devices, accessory devices and system controllers are accessed via the system I/O space, which is not located in system memory space. The 64 KB of addressable I/O space comprises 8-bit and 16-bit registers (called I/O ports) located in the various system components. When installing an accessory board, ensure that the I/O address space selected is in the free area of the space reserved for accessory boards (100h to 3FFh).

Default Values for I/O Address Ports	Function
0000 - 000F	DMA controller 1
0020 - 0021	Master interrupt controller (8259)
002E - 002F	Super I/O
0040 - 0043	Timer 1
0060, 0064	Keyboard controller (reset, slow A20)
0061	Port B (speaker, NMI status and control)
0070	Bit 7: NMI mask register
0081 - 0083, 008F	DMA low page register
0092	PS/2 reset and Fast A20
00A0 - 00A1	Slave interrupt controller
00C0 - 00DF	DMA controller 2
00F0 - 00FF	Co-processor error
0170 - 0177	Free (IDE secondary channel)
01F0 - 01F7	IDE primary channel
0278 - 027F	LPT 2
02E8 - 02EF	Serial port 4 (COM4)
02F8 - 02FF	Serial port 2 (COM2)
0372 - 0377	Free (IDE secondary channel, secondary floppy disk drive)

1.If configured.

Default Values for I/O Address Ports	Function
0378 - 037F	LPT1
03B0 - 03DF	VGA
03F0 - 03F5	Floppy disk drive controller
03F6	IDE primary channel
03F7	Floppy disk drive controller
03F8 - 03FF	COM1
04D0 - 04D1	Interrupt edge/level control
0778 - 077F	LPT1 ECP
0CF8 - 0CFF	PCI configuration space
C000 -	Power Management I/O space and ACPI Registers

DMA Channel Controllers

Only “I/O-to-memory” and “memory-to-I/O” transfers are allowed. “I/O-to-I/O” and “memory-to-memory” transfers are disallowed by the hardware configuration.

The system controller supports seven DMA channels, each with a page register used to extend the addressing range of the channel to 16 MB.

The following table summarizes how the DMA channels are allocated.

DMA controller	
Channel	Function
DMA 0	Free
DMA 1	Free if not used for parallel port in *Setup*
DMA 2	Floppy disk drive controller
DMA 3	Free if not used for parallel port in *Setup*
DMA 4	Used to cascade DMA channels 0-3
DMA 5	Free
DMA 6	Free
DMA 7	Free

Interrupt Controllers

The system has an Interrupt controller which is equivalent in function to that of two 82C59 interrupt controllers. The following table shows how the interrupts are connected to the APIC controller. The Interrupt Requests (IRQ) are numbered sequentially, starting with the master controller, and followed by the slave (both of 82C59 type).

I/O APIC Input	IRQ	Interrupt Request Description
INTIN0	ICH	
INTIN1	IRQ1	Super I/O Keyboard Controller
INTIN2	IRQ0	ICH System Timer
INTIN3	IRQ3	Super I/O - Used by serial port if enabled
INTIN4	IRQ4	Super I/O - Used by serial port if enabled
INTIN5	IRQ5	Free if not used for parallel port or audio
INTIN6	IRQ6	Super I/O - Floppy Disk Controller
INTIN7	IRQ7	Super I/O - LPT1
INTIN8	IRQ8	ICH - RTC
INTIN9	IRQ9	Available for PCI devices
INTIN10	IRQ10	Available for PCI devices
INTIN11	IRQ11	Available for PCI devices
INTIN12	IRQ12	Super I/O - Mouse
INTIN13	IRQ13	Co-processor
INTIN14	IRQ14	ICH - Integrated IDE Controller (primary)
INTIN15	IRQ15	ICH - Integrated IDE Controller (secondary).
INTIN16	PCINTA	
INTIN17	PCINTB	
INTIN18	PCINTC	
INTIN19	PCINTD	
INTIN20	TFPC IRQ	
INTIN21	SCI IRQ	
INTIN22	not connected	
INTIN23	ICH SMI (not used)	

There are three major interrupt modes available:

- **PIC mode**
  This “Legacy” mode uses only the interrupt controllers. This mode can be selected upon installation of Windows NT.
- **Virtual wire mode**
  This mode is implemented using the 82C59 interrupt and the I/O APIC controller and is used during boot time. The virtual wire mode allows the transition to the “symmetric I/O mode”.
- **Symmetric I/O mode**
  This mode is implemented using the I/O APIC controller.

NOTE

In “PIC mode” and “virtual wire mode”, the PCI interrupts are routed to the INT line. In the “symmetric I/O mode”, the PCI interrupts are routed to the I/O APIC controllers and forwarded over an GTL bus to the processor.

PCI Interrupt Request Lines

PCI devices generate interrupt requests using up to four PCI interrupt request lines (INTA#, INTB#, INTC#, and INTD#).

PCI interrupts can be shared; several devices can use the same interrupt. However, optimal system performance is reached when minimizing the sharing of interrupts. Refer to page 74 for a table of the PCI device interrupts.

7

Tests and Error Messages

This chapter describes the firmware test sequences and error messages, the pre-boot diagnostics error codes, the Power-On Self-Test (POST) routines, which are contained in the computer's ROM BIOS, the error messages which can result, and the suggestions for corrective action.

Test Sequence and Error Messages

When the PC is turned on (pressing the ON/OFF button), the system initiates the normal startup sequence which is composed of the following steps:

- Basic pre-boot diagnostics
- BIOS launch
- POST phase
- Operating System boot phase

If any errors are detected during the startup sequence, the PC will not necessarily come to a halt or 'freeze'. However, some critical hardware errors are fatal to the system and prevent the system from starting (for example, 'CPU Socket' and 'Power Supply' are serious malfunctions that prevent the system from working correctly).

Errors that are not critical are detected both during pre-boot diagnostics and POST where the BIOS boot process returns an error code. Some errors are only detected during POST sequence, and produce the same process.

Finally, while the PC is working, fan status and PC temperature can be reported (for example, a fan error will be reported if a fan cable is not connected). This type of error disappears as soon as the problem is fixed (for example, the fan cable has been reconnected).

The diagnostic test are described below.

Basic Pre-boot Diagnostics

The first diagnostic test (called basic pre-boot diagnostics) is run to check the presence of the processor or terminators, power supply, hardware monitoring and thermal sensors. Simply having a power cord connected to the PC activates the Basic Pre-boot Diagnostics.

The pre-boot diagnostic tests are run in order of priority with respect to their importance to computer functions.

The following diagram shows how the Pre-boot Diagnostics works when it encounters an error.

Pre-boot Diagnostics Error Codes (Beep Codes)

When a failure occurs prior to operating system loading, the PC emits a distinctive modulated sound (repeated three times), followed by a series of beeps. These beeps identify the part that needs troubleshooting or replacement.

Number of beeps	Problem
1	Absent or incorrectly connected processor
2	Power supply is in protected mode
3	Memory modules not present, incompatible or not functioning
4	Video controller failure
5	PnP/PCI initialization failure
6	Corrupted BIOS. You need to activate crisis recovery procedure
7	System board failure

Post Test Sequence and Post Error

In this phase, the PC waits for any error messages that the BIOS may issue. If such an error occurs, then an error code is displayed on the monitor screen.

The following diagrams show the different BIOS-generated errors.

Test	Beep Codes	Action to Take
Incompatible memory modules	3	• Check that the memory modules are of the same speed and type • Check that the RDRAM continuity modules are installed • Check that the installed RDRAM modules have the same speed ratings • Check that the memory modules are correctly installed
Presence of continuity modules in the RIMM sockets		
Compatibility speed rating of installed RDRAM modules		
Compatibility of installed RDRAM modules		
Presence of memory modules		
Availability of video controller. It is checked by the BIOS. If an error is detected, it is not a fatal one and the BIOS will continue its execution normally.	4	Check that the video controller is correctly installed. Note: No error is detected if a monitor is not connected to an installed video controller. This is not a fatal error and the BIOS will continue its normal execution.

Order in Which POST Tests Are Performed

Each time the system is powered on, or a reset is performed, the POST is executed. The POST process verifies the basic functionality of the system components and initializes certain system parameters.

The POST starts by displaying the HP PC logo when the PC is restarted. If you wish to view the POST details, press **Esc** to get the HP Summary Screen.

If the POST detects an error, the screen switches to text mode, and a detailed error message is displayed inside a view system errors screen, in which the error message utility (EMU) not only displays the error diagnosis, but the suggestions for corrective action (refer to page 134 for a brief summary).

Devices such as memory and newly installed hard disks, are configured automatically. The user is not requested to confirm the change.

During the POST, the BIOS and other ROM data are copied into high-speed shadow RAM. The shadow RAM is addressed at the same physical location as the original ROM in a manner which is completely transparent to applications. It therefore appears to behave as very fast ROM. This technique provides faster access to the system BIOS firmware.

The following table lists the POST checkpoint codes and their associated beeps. Refer to page 124 for more details about pre-boot diagnostics error codes.

Checkpoint Code	POST Routine Description	Beep Code
02h	Verify Real Mode	
03h	Disable Non-Maskable Interrupt (NMI)	
04h	Get CPU type	
06h	Initialize system hardware	
08h	Initialize chipset with initial POST values	
09h	Set IN POST flag	

Checkpoint Code	POST Routine Description	Beep Code
0Ah	Initialize CPU registers	
0Bh	Enable CPU cache	
0Ch	Initialize caches to initial POST values	
0Eh	Initialize I/O component	
0Fh	Initialize the local bus IDE	
10h	Initialize Power Management	
11h	Load alternate registers with initial POST values	
12h	Restore CPU control word during warm boot	
13h	Initialize PCI Bus Mastering devices	
14h	Initialize keyboard controller	
16h	BIOS ROM checksum	
17h	Initialize cache before memory autosize	
18h	8254 timer initialization	
1Ah	8237 DMA controller initialization	
1Ch	Reset Programmable Interrupt Controller	
20h	Test RDRAM refresh	
22h	Test 8742 keyboard controller	
24h	Set ES segment register to 4 GB	
26h	Enable A20 line	
28h	Autosize RDRAM	3
29h	Initialize POST Memory Manager	
2Ah	Clear 512 KB base RAM	
2Ch	RAM failure on address line [1]	
2Eh	RAM failure on data bits *xxxx*[1] of low byte of memory bus	
2Fh	Enable cache before system BIOS shadow	

Checkpoint Code	POST Routine Description	Beep Code
30h	RAM failure on data bits *xxxx*[1] of high byte of memory bus	
32h	Test CPU bus-clock frequency	
33h	Initialize POST Dispatch Manager	
36h	Warm start shut down	
38h	Shadow system BIOS ROM	
3Ah	Autosize cache	
3Ch	Advanced configuration of chipset registers	
3Dh	Load alternate registers with CMOS values	
42h	Initialize interrupt vectors	
45h	POST device initialization	
46h	Check ROM copyright notice	
48h	Check video configuration against CMOS	
49h	Initialize PCI bus and devices	5
4Ah	Initialize all video adapters in system	4
4Bh	Display QuietBoot screen (optional)	
4Ch	Shadow video BIOS ROM	
4Eh	Display BIOS copyright notice	
50h	Display CPU type and speed	
51h	Initialize EISA board	
52h	Test keyboard	
54h	Set key click if enabled	
56h	Enable keyboard	
58h	Test for unexpected interrupts	
59h	Initialize POST display service	
5Ah	Display prompt “Press F2 to enter SETUP”	

Checkpoint Code	POST Routine Description	Beep Code
5Bh	Disable CPU cache	
5Ch	Test RAM between 512 and 640 KB	
60h	Test extended memory	
62h	Test extended memory address lines	
64h	Jump to UserPatch1	
66h	Configure advanced cache registers	
68h	Enable external and CPU caches	
69h	Setup System Management Mode (SMM) area	
6Ah	Display external L2 cache size	
6Ch	Display shadow-area message	
6Eh	Display possible high address for UMB recovery	
70h	Display error messages	
72h	Check for configuration errors	
76h	Check for keyboard errors	
7Ch	Set up hardware interrupt vectors	
7Eh	Initialize coprocessor if present	
80h	Disable onboard Super I/O ports and IRQs	
81h	Late POST device initialization	
82h	Detect and install external RS 232 ports	
83h	Configure non-MCD IDE controllers	
84h	Detect and install external parallel ports	
85h	Initialize PC-compatible PnP ISA devices	
86h	Re-initialize onboard I/O ports	
87h	Configure System Board Configurable Devices (optional)	
88h	Initialize BIOS Data Area	

Checkpoint Code	POST Routine Description	Beep Code
89h	Enable Non-Maskable Interrupts (NMIs)	
8Ah	Initialize Extended BIOS Data Area	
8Bh	Test and initialize PS/2	
8Ch	Initialize floppy controller	
8Fh	Determine number of ATA drives (optional)	
90h	Initialize hard disk controllers	
91h	Initialize local-bus hard disk controllers	
92h	Jump to UsersPatch2	
95h	Install CD-ROM for boot	
96h	Clear huge ES segment register	
98h	Search for option ROMs.	
99h	Check for SMART drive	
9Ah	Shadow option ROMs	
9Ch	Set up Power Management	
9Dh	Initialize security engine (optional)	
9Eh	Enable hardware interrupts	
9Fh	Determine number of ATA and SCSI drives	
A0h	Set time of day	
A2h	Check key lock	
A4h	Initialize typematic rate	
A8h	Erase F2 prompt	
AAh	Scan for F2 key stroke	
ACh	Enter SETUP	
AEh	Clear Boot flag	
B0h	Check for errors	

Checkpoint Code	POST Routine Description	Beep Code
B2h	POST done - prepare to boot operating system	
B5H	Terminate QuietBoot (optional)	
B6h	Check password (optional)	
B7h	ACPI tables initialized	
B8h	Clear global descriptor table	
B9h	Prepare Boot	
BAh	Initialize DMI parameters	
BBh	Initialize PnP Option ROMs	
BCh	Clear parity checkers	
BDh	Display MultiBoot menu	
BEh	Clear screen (optional)	
BFh	Check virus and backup reminders	
C0h	Try to boot with INT 19	
C1h	Initialize POST Error Manager (PEM)	
C2h	Initialize error logging	
C3h	Initialize error display function	
C4h	Initialize system error handling	
C5h	PnPnd dual CMOS (optional)	
C6h	Initialize notebook docking (optional)	
C7h	Initialize notebook docking late	
C8h	Force check (optional)	
C9h	Extended checksum (optional)	
D2h	Unknown Interupt	
The following are for boot block in Flash ROM		
E0h	Initialize the chipset	

Checkpoint Code	POST Routine Description	Beep Code
E1h	Initialize the bridge	
E2h	Initialize the CPU	
E3h	Initialize system timer	
E4h	Initialize system I/O	
E5h	Check force recovery boot	
E6h	Checksum BIOS ROM	
E7h	Go to BIOS	
E8h	Set Huge Segment	
EAh	Initialize OEM special code	
EBh	Initialize PIC and DMA	
ECh	Initialize Memory type	
EDh	Initialize Memory size	
EEh	Shadow Boot Block	
EFh	System memory test	
F0h	Initialize interrupt vectors	
F1h	Initialize Run Time Clock	
F2h	Initialize video	
F3h	Initialize System Management Mode	
F4h	Output one beep before boot	
F5h	Boot to Mini DOS	
F6h	Clear Huge Segment	
F7h	Boot to Full DOS	

1. If the BIOS detects error 2C, 2E, or 30 (base 512K RAM error), it displays an additional word-bitmap (*xxxx*) indicating the address line or bits that failed.For example:
   "2C 0002" means line 1 (bit one set) has failed.
   "2E 1020" means data bits 12 and 5 (bits 12 and 5 set) have failed in the lower 16 bits.
   The BIOS also sends the bitmap to the port-80 LED display. It first displays the checkpoint code, followed by a delay, the high-order byte, another delay, and then the low-order byte of the error. It repeats this sequence continuously.

Error Message Summary

In the event of an error generated in POST (Power-On-Self-Test) during the boot process, the Error Setup Manager gives access to one or more detected errors. Each EMU error is displayed as a 4-digit code with an associated text message on the monitor screen.

Further details can be accessed by pressing ENTER. A detailed description of the reason for the failure and how to solve the problem is displayed. The following examples give the different types of error categories.

Category #1:	If the error is only a warning (i.e. key stuck), the POST should prompt:
WARNING[1]	
00100	Keyboard Error

1. After a time-out period of five seconds without any intervention, the system resumes to boot.

Category #2:	If the error is serious, the POST should prompt:
00xx	The BIOS has detected a serious problem that prevents your PC from booting
	Press <Enter> to view more information about error

Code #	Cause / Symptom	Displayed Message
0000h	Any POST error that is not listed below	System error
0010h	CMOS Checksum error (if no Serial EEProm)	Incorrect CMOS Checksum
0011h	Date and Time (CMOS backed up from SE2P)	Date and Time Lost
0012h	PC configuration lost (both SE2P and CMOS lost)	Incorrect PC Configuration
0020h	Any POST error regarding an AT option ROM	Option ROM Error
0040h	Serial number corrupted (bad checksum or null #)	Invalid PC Serial Number
0041	Product flag not initialized or bad	Invalid Internal product type
0060h	RPO initialization failure	Remote Power On Error
0100h	Keyboard stuck key	Keyboard Error
0101h	Keyboard self-test failure	Keyboard Error
0102h	Keyboard controller I/O access failure	Keyboard Error
0103h	Keyboard not connected	Keyboard Error
0300h	Floppy A: self-test failure	Flexible Disk Drive A Error
0301h	Floppy B: self-test failure	Flexible Disk Drive B Error
0310h	Floppy A: not detected (but configured in CMOS)	Flexible Disk Drive Error
0311h	Floppy B: not detected (but configured in CMOS)	Flexible Disk Drive Error
0306h	General failure on floppy controller	Flexible Disk Drive Error
0400h	CD-ROM test failure	CD-ROM Error
0401h	CD-ROM not detected (but configured in CMOS)	CD-ROM Error
0500h	General failure on HDD onboard primary ctrl	IDE Device Error
0501h	General failure on HDD onboard secondary ctrl	IDE Device Error
0510h	HDD # 0 self-test error	IDE Device # 0 Error
0520h	HDD # 0 not detected (but configured in CMOS)	IDE Device # 0 Error
0521h	HDD # 1 not detected (but configured in CMOS)	IDE Device # 1 Error
0522h	HDD # 2 not detected (but configured in CMOS)	IDE Device # 2 Error
0523h	HDD # 3 not detected (but configured in CMOS)	IDE Device # 3 Error

Code #	Cause / Symptom	Displayed Message
0530h	Found a drive on slave connector only (primary)	IDE Device Error
0531h	Found a drive on slave connector only (secondary)	IDE Device Error
0600h	Found less video memory than configured in CMOS	Video Memory Error
0700h	Found less RDRAM memory than at previous boot	System Memory Error
0711h	Defective SIMM (module 1, bank 1)	System Memory Error
0800h	Found lower cache size than configured	System Cache Error
0801h	Cache self-test failure	System Cache Error
0A00h	Plug and Play video auto-setting failure (DDC hang)	DDC Video Error

The following table summarizes the most significant of the problems that can be reported.

Message	Explanation or Suggestions for Corrective Action
Operating system not found	Check whether the disk, HDD, FDD or CD-ROM disk drive is connected. If it is connected, check that it is detected by POST. Check that your boot device is enabled on the Setup Security menu. If the problem persists, check that the boot device contains the operating system.
Missing operating system	If you have configured HDD user parameters, check that they are correct. Otherwise, use HDD type “Auto” parameters.
Resource Allocation Conflict -PCI device 0079 on system board	Clear CMOS.
Video Plug and Play interrupted or failed. Re-enable in Setup and try again	You may have powered your computer Off/On too quickly and the computer turned off Video plug and play as a protection.
System CMOS checksum bad - run Setup	CMOS contents have changed between 2 power-on sessions. Run Setup for configuration.
No message, system “hangs”	Check that the main memory modules are correctly set in their sockets.
Other	An error message may be displayed and the computer may “hang” for 20 seconds and then beep. The POST is probably checking for a mass storage device which it cannot find and the computer is in Time-out Mode. After Time-out, run Setup to check the configuration.

8

Connectors and Sockets

Internal Connector Pin Layouts

IDE Drive Connectors

IDE Connectors			
Pin	**Signal**	**Pin**	**Signal**
1	Reset#	2	Ground
3	HD7	4	HD8
5	HD6	6	HD9
7	HD5	8	HD10
9	HD4	10	HD11
11	HD3	12	HD12
13	HD2	14	HD13
15	HD1	16	HD14
17	HD0	18	HD15
19	Ground 7	20	orientation key
21	DMARQ	22	Ground 2
23	DIOW#	24	Ground 3
25	DIOR#	26	Ground 4
27	IORDY	28	CSEL
29	DMACK#	30	Ground 5
31	INTRQ	32	IOCS16#
33	DA1	34	PDIAG#
35	DA0	36	DA2
37	CS1FX#	38	CS3FX#
39	DASP#	40	Ground 6

Flexible Disk Drive Data Connector			
Pin	**Signal**	**Pin**	**Signal**
1	Ground	2	LDENSEL#
3	Ground	4	Microfloppy
5	Ground	6	EDENSEL
7	Ground	8	INDX#
9	Ground	10	MTEN1#
11	Ground	12	DRSEL0#
13	Ground	14	DRSEL1#
15	Ground	16	DTEN0#
17	Ground	18	DIR#
19	Ground	20	STP#
21	Ground	22	WRDATA#
23	Ground	24	WREN#
25	Ground	26	TRK0#
27	Ground	28	WRPRDT#
29	Ground	30	RDDATA#
31	Ground	32	HDSEL1#
33	Ground	34	DSKCHG#

SCSI LED Connector

Additional SCSI LED Connector (4-pin)	
Pin	**Signal**
1	Not used
2	LED Out
3	LED Out
4	Not used

Power Supply Connector (20-pin)

Power Supply Connector for System Board (20-pin)			
Pin	**Signal**	**Pin**	**Signal**
11	3V3_MAINSENSE	1	3V3_2
12	12V_NEG	2	3V3_3
13	GROUND_1	3	GROUND2
14	_PSON	4	5V_1
15	GROUND3	5	GROUND4
16	GROUND5	6	5V_2
17	GROUND6	7	GROUND7
18	5V_NEG	8	PWOK
19	5V_3	9	5VSB
20	5V_4	10	12V

Wake On LAN Connector

Wake On LAN (WOL)	
Pin	**Signal**
1	5V STDBY
2	Ground
3	LAN_WAKE

Rear Fan Connector

Fan Connector	
Pin	**Signal**
1	Ground
2	12V Power
3	Sense

Internal Audio Connectors on System Board

This infomation refers to the integrated audio only. For information about the Sound Blaster audio card refer to page 94 and page 147.

CD AUDIO Connector		
Pin	**Signal**	**I/O**
1	Analog Ground	-
2	CD Left Channel	IN
3	Analog Ground	-
4	CD Right Channel	IN

AUX Connector		
Pin	**Signal**	**I/O**
1	Analog Ground	-
2	AUX Left Channel	IN
3	Analog Ground	-
4	AUX Right Channel	IN

Internal Speaker	
Pin	**Signal**
1	SPK1
2	Tst1
3	Tst2
4	SPK2

Chassis Intrusion

There are two connectors, one for the Desktop chassis and one for the Minitower chassis. The pinouts for each are identical.

Intrusion	
Pin	**Signal**
4	CLOSE
3	COMMON
1	OPEN

DT Status Panel

DT Status Panel			
Pin	**Signal**	**Pin**	**Signal**
1	B1_LCD1	2	B1_LCD2
3	Ground	4	PWR_LED_A
5	HDD_LED_K	6	BACKLIGHT
7	ON_OFF	8	RED-LED_A
9	GROUND2	10	HDD_LED_A
11	_RESET	12	SDA
13	VSTDBY_3V	14	SCL

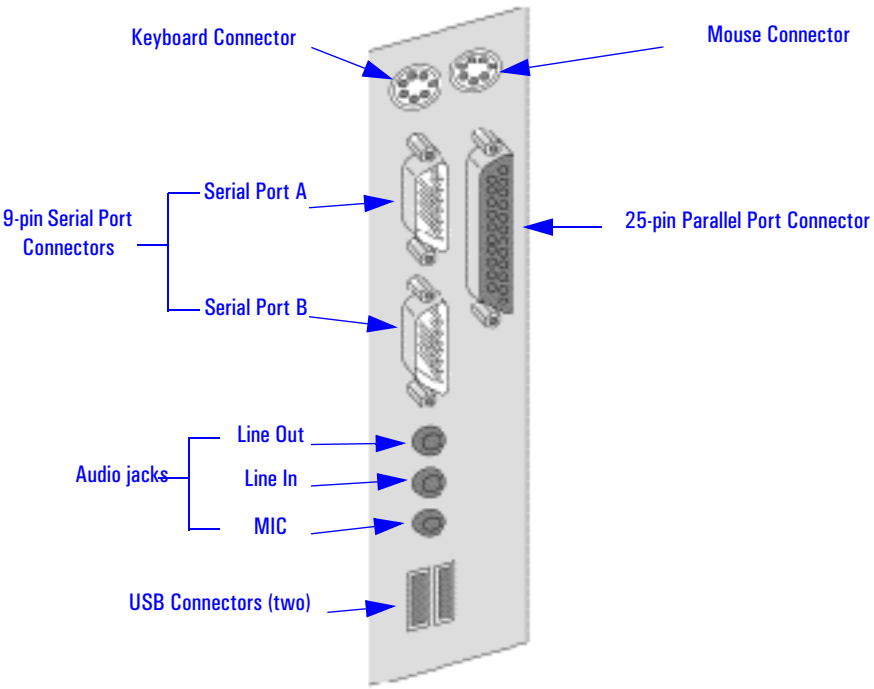
MT Status Panel

MT Status Panel	
Pin	**Signal**
1	Red LED
2	Ground
3	Green LED
4	KEY
5	HDD LED+
6	HDD LED-
7	GND
8	Power Button
9	Not Used
10	Not Used

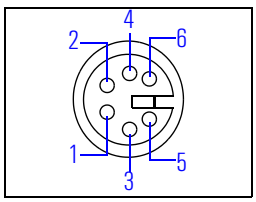
VGA DB15 Connector on AGP Card

VGA DB Connector Pins		
Pin	**Standard VGA**	**DDC2B**
1	Analog RED	Analog RED
2	Analog GREEN	Analog GREEN
3	Analog BLUE	Analog BLUE
4	Monitor ID2	Monitor ID2
5	n/c	DDC return
6	Analog RED return	Analog RED
7	Analog GREEN return	Analog GREEN
8	Analog BLUE return	Analog BLUE
9	n/c	V_{CC} supply (optional)
10	Digital ground	Digital ground
11	Monitor ID 0	Monitor ID 0
12	Monitor ID 1	Data:SDA
13	HSYNC	HSYNC
14	VSYNC	VSYNC
15	n/c	Clock:SCL

External Rear Panel Connector Pin Layouts



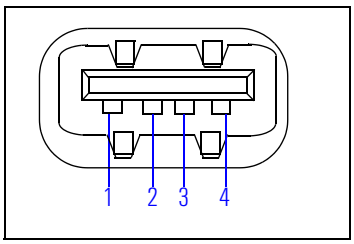
Keyboard (bottom) and Mouse (top) Connectors



Keyboard and Mouse Connectors			
Pin	**Signal**	**Pin**	**Signal**
1	Data	2	Not Used
3	Ground	4	+5 V dc
5	Clock	6	Not Used

USB Stacked Connector

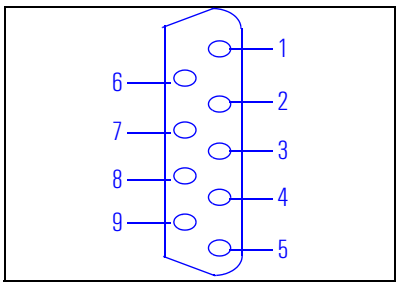
The USB graphic and pinout table for a USB connector. However, the information is also valid for a USB Stacked Connector.



USB Connector	
Pin	**Signal**
1	VBus
2	D-
3	D+
4	GND
Shell	Shield

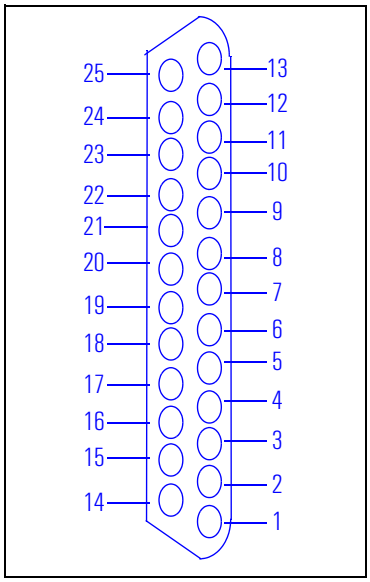
Serial Ports

The information is valid for both serial port A and serial port B.



9-pin Serial Port Connector			
Pin	**Signal**	**Pin**	**Signal**
		1	(DCD) CF
6	(DSR) CC	2	(RD) BB
7	(RTS) CA	3	(TD) BA
8	(CTS) CB	4	(DTR) CD
9	(R) CE	5	(GND) AB

25-pin Parallel Connector



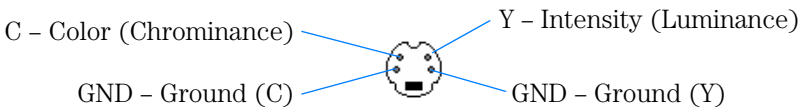
25-pin Parallel Connector			
Pin	**Signal**	**Pin**	**Signal**
		13	SLCT
25	Ground	12	PE
24	Ground	11	BUSY
23	Ground	10	ACK
22	Ground	9	D7
21	Ground	8	D6
20	Ground	7	D5
19	Ground	6	D4
18	Ground	5	D3
17	SLIN	4	D2
16	INIT	3	D1
15	ERROR	2	D0
14	AUTO-FD	1	Strobe

External Audio Jacks

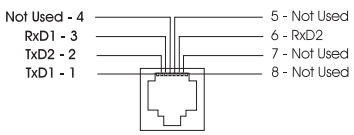
There is a Line In jack, Line Out jack and Mic In jack located on the rear panel. These external jacks are standard connectors.

S-Video Connector

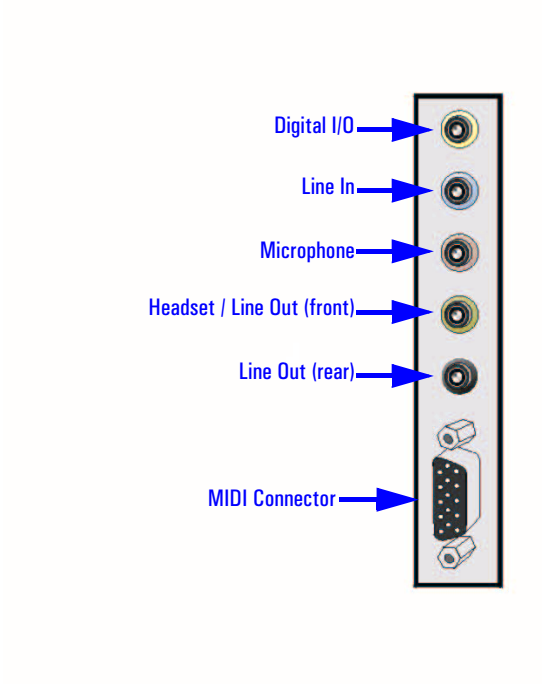
This connector is on the nVIDIA GeForce2 GTS graphics card.



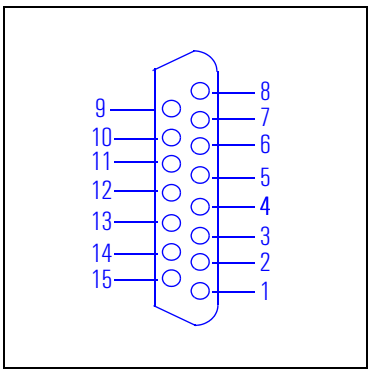
LAN Ethernet UTP Connector



Sound Blaster Audio Card Connectors



MIDI Connector on Sound Blaster Audio Card



MIDI Connector			
Pin	**Signal**	**Pin**	**Signal**
		8	+5 V
9	+5 V	7	A-2
10	B-1	6	A-Y
11	B-X	5	Ground
12	MIDI-OUT	4	Ground
13	B-Y	3	A-X
14	B-2	2	A-1
15	MIDI-IN	1	+5 V