
Technical Reference Manual

Product Description - Vectra VL400

This technical reference and BIOS document for Vectra VL400 PCs contains summary information only. More detailed information on system hardware is available in the *Technical Reference Manual - Vectra Technology*.

HP Vectra VL400 PCs

About this Document

This technical reference and BIOS document for Vectra VL400 PCs contains summary information only. More detailed information on system hardware is available in the *Technical Reference Manual - Vectra Technology*.

VL400 Documentation

The following documentation is available for the HP Vectra VL400.

Quick User's Guide

This paper manual came with your PC but is also available at **www.hp.com/go/vectrasupport**.

Information CD-ROM

This CD-ROM contains extensive information about your PC. It can be ordered from **www.hp.com/go/vectrasupport**.

If you do not want to order this CD-ROM, you can also download individual documents and information modules from **www.hp.com/go/vectrasupport**.

The CD-ROM contains the following information modules:

- Setting up your PC
- Using your PC
- Installing components and accessories in your PC
- Solving problems (troubleshooting)
- Warranty information.

The CD-ROM also contains the following documents:

- Product Datasheet
- Corporate Evaluator's Guide
- Corporate Deployment Guide
- Technical Reference Manual (in 3 parts, the manual you are reading)
- Service Handbook chapters
- e-DiagTools User's Guide.

VL400 Bibliography

- ❑ HP Vectra VL400 user, troubleshooting and upgrading manuals at:
[**www.hp.com/go/vectrasupport**](http://www.hp.com/go/vectrasupport)
- ❑ *Technical Reference Manual -Vectra Technology*
[**www.hp.com/go/vectrasupport**](http://www.hp.com/go/vectrasupport)
- ❑ HP Vectra PC *Service Handbook* Chapter at:
[**www.hp.com/go/vectrasupport.**](http://www.hp.com/go/vectrasupport)

Data sheets can be obtained at:

- ❑ *Pentium Processors*
[**www.intel.com/design/pentiumIII/datashts**](http://www.intel.com/design/pentiumIII/datashts)
- ❑ *HP Product Data Sheet*
[**www.hp.com/desktops**](http://www.hp.com/desktops)

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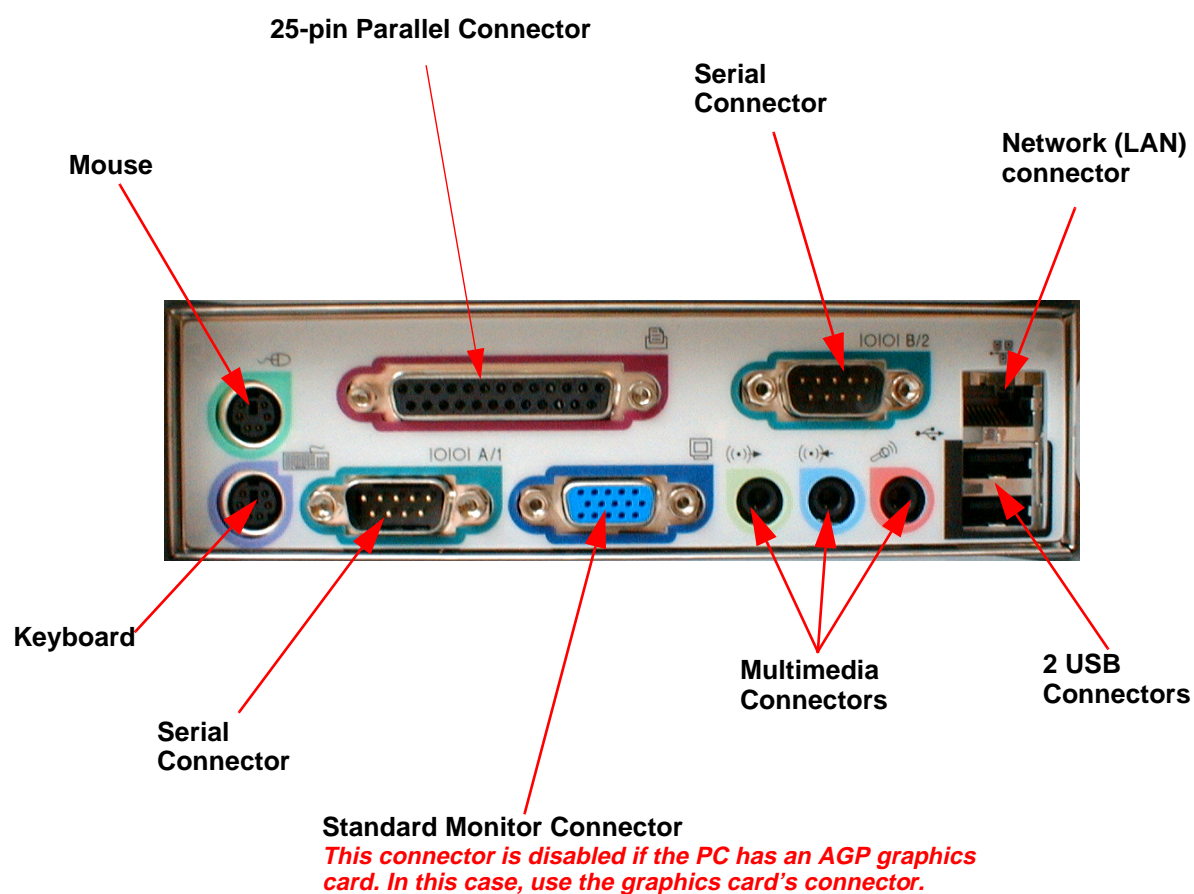
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System Overview

This chapter introduces the internal and external features, and lists the specifications of the HP Vectra VL400 PC models.

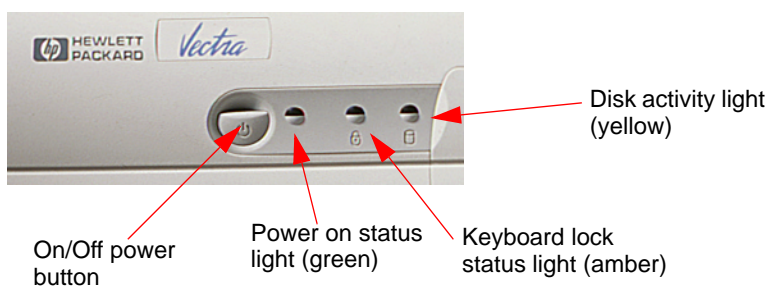
Package Features

Rear Connectors

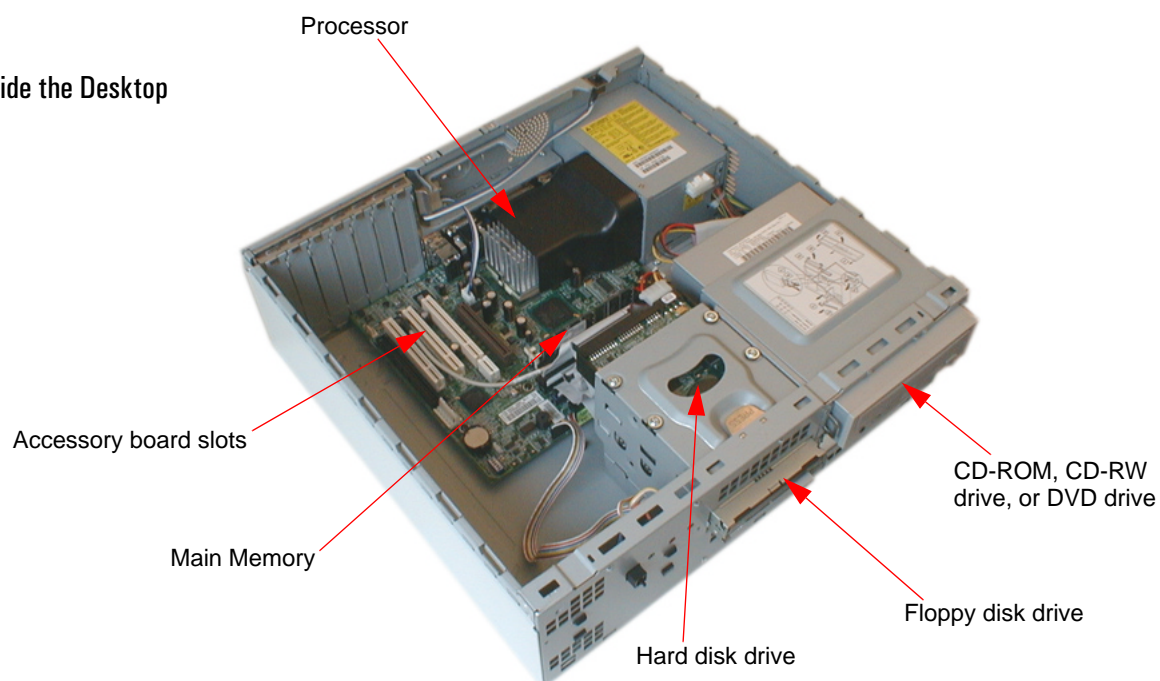


Desktop

Front panel



Inside the Desktop



1 System Overview

Package Features

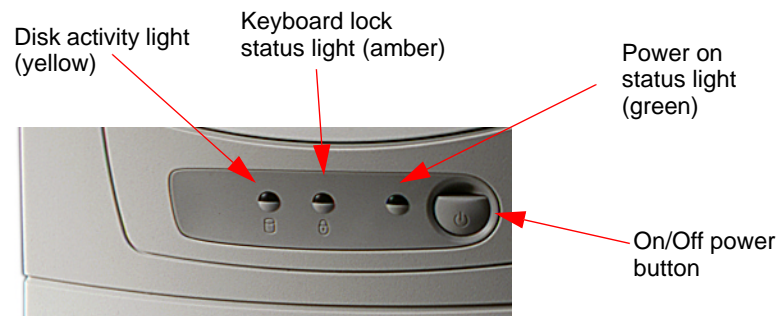
Rear view

Location of the voltage switch and power connector on the desktop.

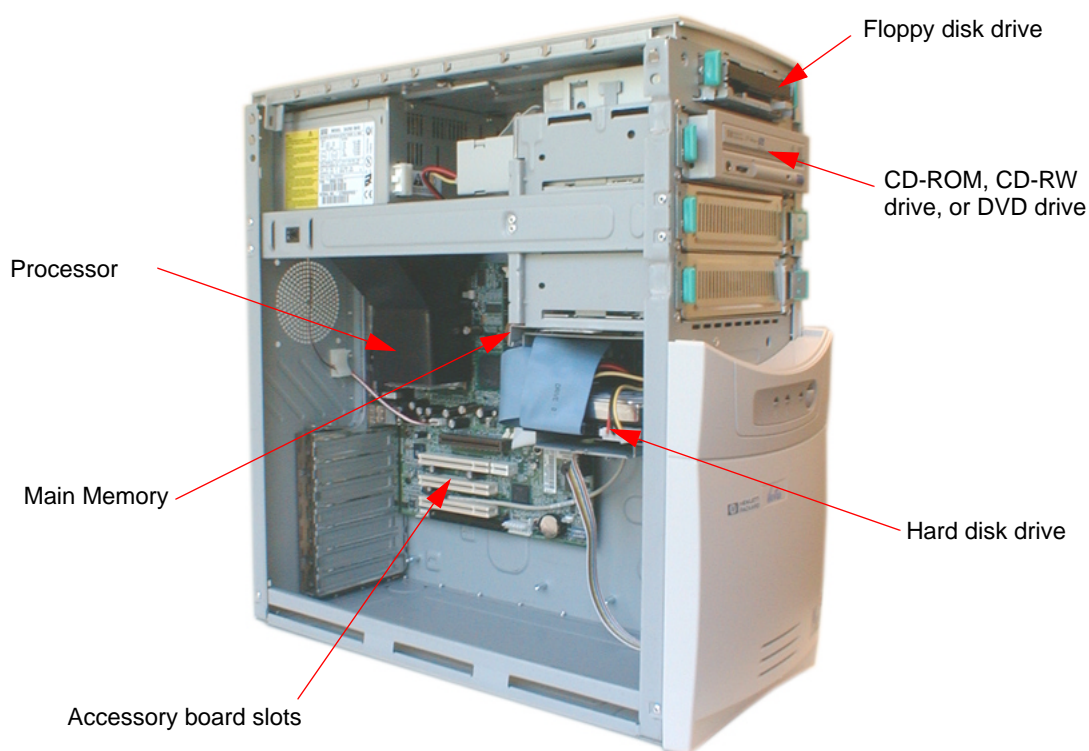


Minitower

Front view



Inside the Minitower



Rear view

Location of the voltage switch and power connector on the minitower.

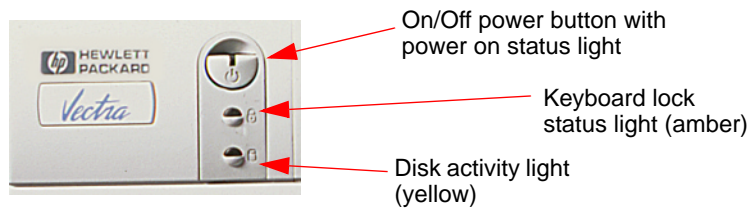


1 System Overview

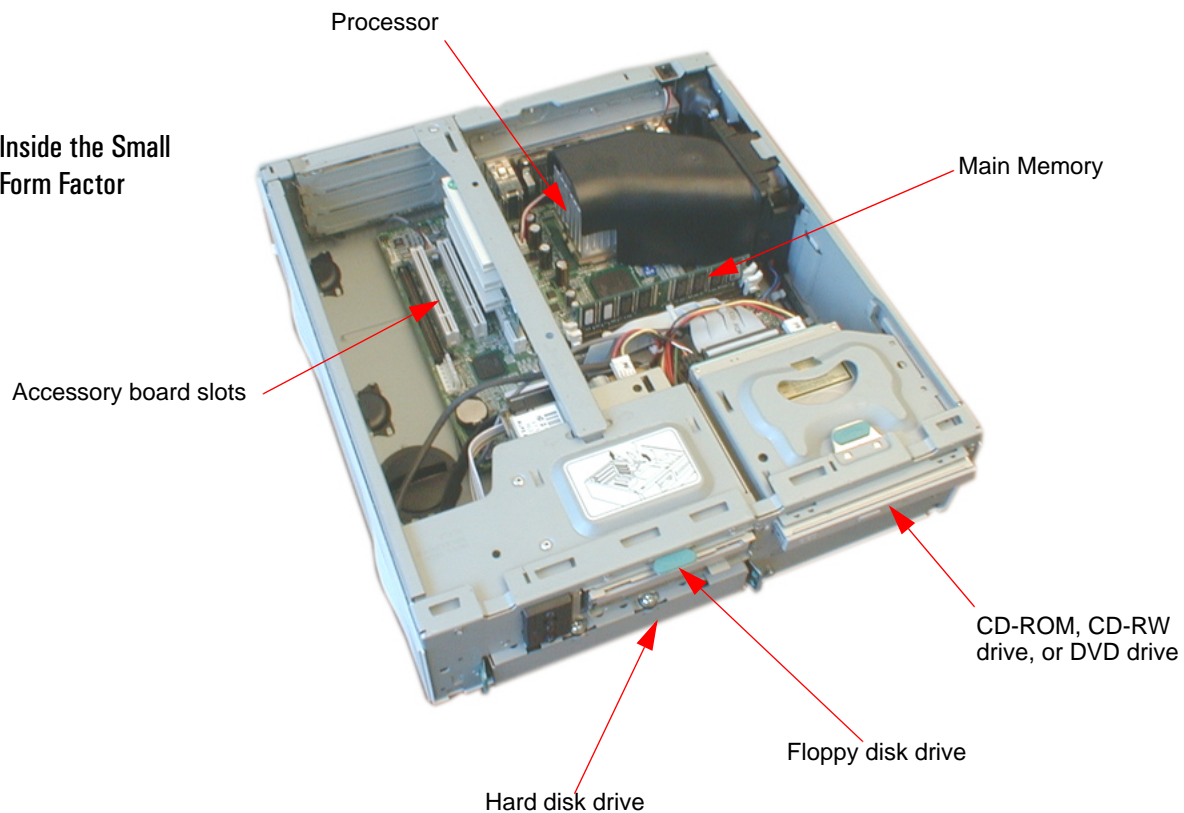
Package Features

Small Form Factor

Front panel

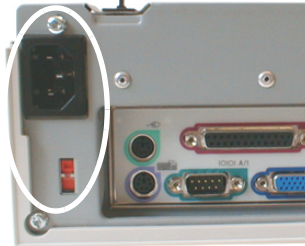


Inside the Small Form Factor



Rear view

Location of the voltage switch and power connector on the small form factor.



Specifications

Physical Characteristics

| Characteristics | VL400 Desktop PC | VL400 Minitor PC | VL400 SFFactor PC |
|--|--|--|--|
| Weight (configuration with 1 CD-ROM drive, excluding keyboard and display) | 10 kg (22 pounds) | 13.4 kg (29.5 pounds) | 8 kg (17.6 pounds) |
| Dimensions | Width: 43.5cm (17.13in.) Height: 13.5cm (5.32in.) Depth: 43cm (16.93in.) | Width: 20.6cm (8.15in.) Height: 46.9cm (18.46in.) Depth: 45.5cm (17.9in.) | Width: 36.6cm (14.4in.) Height: 10.1cm (3.98in.) Depth: 40.7cm (16.14in.) |
| Footprint | 0.187 m ² (2.01 ft ²) | 0.094 m ² (1.01 ft ²) | 0.15 m ² (1.61 ft ²) |
| Acoustic noise emission (IS 07779) | Sound power level LwA ≤ 3.5 BA (35 dBA) | | |
| Operating (idle): | Sound pressure level at the operator position LpA ≤ 26 dBA | | |
| Power Supply | Input Voltage: 100-127 V 4A, 200-240V 2A ac (voltage selection switch) Input Frequency: 50/60 Hz Maximum output power: 120W continuous | Input Voltage: 100-127 V 6A, 200-240V 3A ac (voltage selection switch) Input Frequency: 50/60 Hz Maximum output power: 200W continuous | Input Voltage: 100-127 V 2500mA, 200-240V 1300mA ac (voltage selection switch) Input Frequency: 50/60 Hz Maximum output power: 100W continuous |
| Power consumption | 115V/60Hz and 230V/50Hz | 115V/60Hz and 230V/50Hz | 115V/60Hz and 230V/50Hz |
| Typical: | 40 W | 40 W | 40 W |
| Suspend to RAM (ACPI s3): | 4.8 W | 4.8 W | 4.8 W |
| Storage Humidity | 8% - 85% (relative), non-condensing at 40°C (104°F) | | |

As an ENERGY STAR partner, HP has determined that this product meets the ENERGY STAR guidelines for energy efficiency (Windows 2000, Windows 98 and Windows 95 only).

Low power consumption (4.8W in suspend mode) can be achieved when Suspend to RAM is activated. This can be done with ACPI operating systems only (Windows 98 and Windows 2000). To activate Suspend to RAM, enter your BIOS Setup by pressing **F2** during startup, then go to the **Power** menu and make sure that the field **Suspend to RAM** is set to **enabled**.

When Suspend to RAM is not activated, or if it is activated in non-ACPI operating systems, the power consumption in suspend mode will be around 25W.

Notes

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

The power consumption and acoustics figures given in the tables above are valid for the standard configuration as shipped. For more information, refer to the product's data sheet at HP's web site: www.hp.com/desktop

When the computer is turned off with the power button on the front panel, the power consumption falls below 3W, but it is not zero. The special on/off method used by these computers considerably extends the lifetime of the power supply. To reach zero power consumption in "off" mode, either unplug the power outlet or use a power block with a switch.

Environmental Specifications

| Environmental Specifications (System Processing Unit, with Hard Disk) | |
|---|--|
| Operating Temperature | + 10°C to + 35°C (+ 50°F to 95° F) |
| Storage Temperature | -40°F to + 70°F (-40°C to + 158°C) |
| Operating Humidity | 15% to 80% (relative) |
| Storage Humidity | 8% to 85% (relative), non-condensing at 40°C (104°F) |
| Operating Altitude | 10000 ft (3100m) max |
| Storage Altitude | 15000ft (4600m) max |

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.

1 System Overview

Specifications

System Features

This chapter describes core components of the PC such as processors, chipsets, mass storage devices, graphics controllers, audio controllers, network features and input devices.

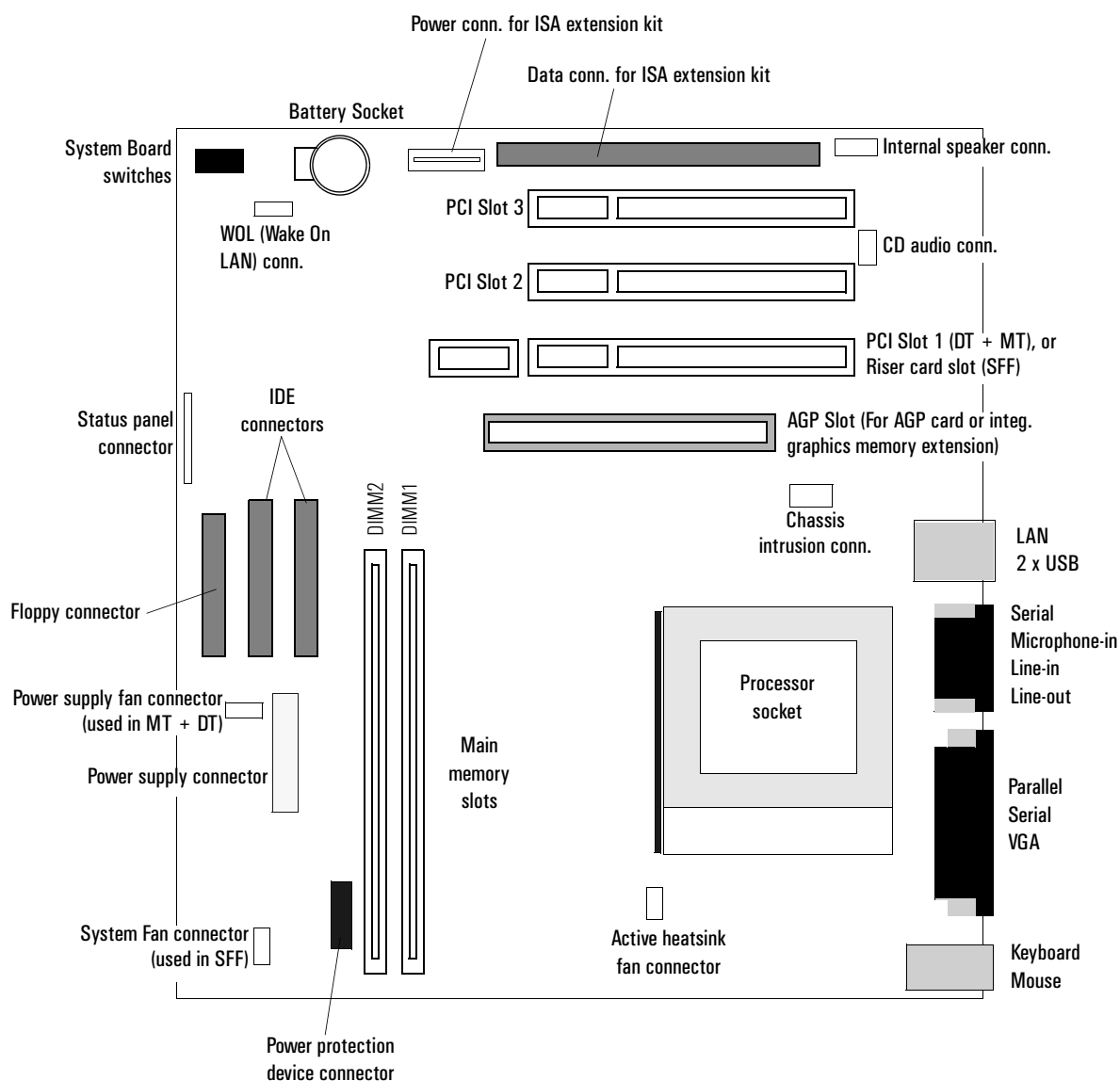
2 System Features

VL400 System Board Layout

VL400 System Board Layout

All *HP Vectra VL400 PC* system boards have a Socket 370 for a compatible Celeron or Pentium III processor.

System Board



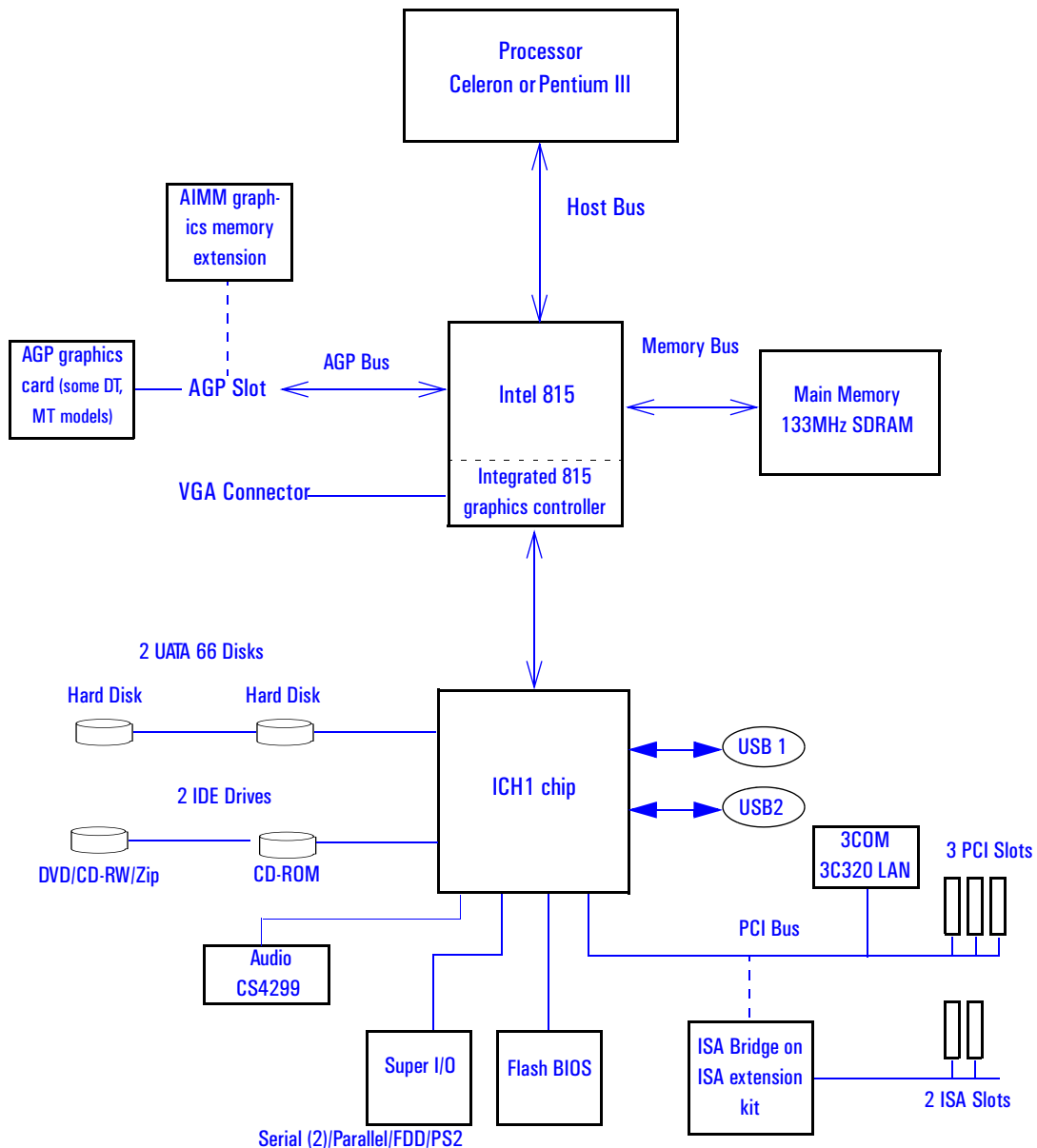
PCI Mapping

| VL400 PCI Mapping Table | | | |
|-------------------------|--------|----------------------------------|----------|
| Bus | Device | PCI Device | Slot# |
| 0 | 0 | GMCH: Host bridge | |
| 0 | 2 | GMCH: AGP bridge | |
| 0 | 30 | ICH: Hub interface to PCI bridge | |
| 0 | 31 | ICH: PCI to LPC bridge | |
| 0 | 31 | ICH: IDE controller | |
| 0 | 31 | ICH: USB controller | |
| 0 | 31 | ICH: SMBUS controller | |
| 0 | 31 | ICH: AC97 audio controller | |
| 1 | 2 | PCI slot 1 | 1 |
| 1 | 1 | PCI slot 2 | 2 |
| 1 | 0 | PCI slot 3 | 3 |
| 2 | 0 | AGP device | AGP slot |

2 System Features

Architectural View

Architectural View



This block diagram applies primarily to Desktop and Minitower configurations.

Main Memory

There are two 168-pin DIMM slots on the system board for installing main memory. You can install 133MHz SDRAM modules. These are available in 64, 128, 256 and 512 MB memory modules. You can install only one 512 MB module. A maximum of 512 MB is supported.

You can use ECC or non-ECC memory modules. However, single/multiple bit-error processing is not done by the 815 chipset.

Processors

The VL400 is equipped with either a single Socket 370 Intel Celeron or socket 370 Intel Pentium III processor. Socket 370 is a conversion of Slot 1 (used previously by Celerons and Pentium IIs) to a socket, running at the same bus protocol as the Pentium II (the GTL+ bus protocol). The processor is connected to the system board through a Plastic Pin Grid Array (PPGA) 370 Socket. The reduction in size achieved by the Socket 370 Celeron is due to the integration of the L2 cache on the processor die. Like the Celeron processor, the Pentium III comes in a 370-pin socket (PGA370) package.

To find out more about Socket 370 Celeron technology, refer to the *Technical Reference Manual - Vectra Technology*.

Mass Storage Devices

Hard Disk Drives

A 3.5-inch hard disk drive is supplied on an internal shelf in some models. These hard drives can be provided with the PC. To see which other hard disk drives can be purchased as accessories for the VL400, refer to www.hp.com/go/pcaccessories.

| | 10 GB Ultra-ATA 66 | 15 GB Ultra-ATA 66 | 30 GB Ultra-ATA 66 | 9.1 GB Ultra-SCSI |
|----------------------------|-----------------------|-----------------------|-----------------------|----------------------|
| Typical Seek Times (ms) | | | | |
| Average | 9.5 | 8.5 | < 9.0 | 6.8 |
| Track-to-Track | 2.0 | 0.8 | < 1.0 | 0.9 |
| Full Stroke | 18.0 | 15.0 | < 20.0 | 15.0 |
| Rotational Speed (RPM) | 5 400 | 7 200 | 7 200 | 7 200 |
| Internal Data Rate (Mb/s) | Up to 194 | 235 | 191 to 298 | Up to 257 |
| Buffer Size (KB) Ultra ATA | 512 | 512 | 2048 | 2048 |

To find out about Ultra-ATA DMA/ 66 hard disk drive technology, refer to the *Technical Reference Manual - Vectra Technology*.

Floppy Disk Drives

All models are supplied with a 3.5-inch floppy disk drive.

CD-ROM and DVD Drives

Models may be fitted with a 48X Max IDE CD-ROM drive. It can play standard CD-ROM discs, conforming to optical and mechanical standards as specified in the Red and Yellow Book. This drive can also be purchased as an accessory. Refer to www.hp.com/go/pcaccessories.

To find out about CD-ROM and DVD drive technology, refer to *Technical Reference Manual - Vectra Technology*.

**Features of the
CD-ROM Drive
(D9444A)**

- CD-ROM Mode-1 data disc.
- CD-ROM Mode-2 data disc (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 |
|-------------------------|---|
| HP product number | D9444A |
| Disc Diameter | 120 mm |
| Data Block Size | 2,055 bytes (14X, Mode-1) 4,800 bytes (32X, Mode-2) |
| Storage Capacity | 650 Mbytes (Mode-1) 742 Mbytes (Mode-2) |
| Sustained Transfer Rate | Outerside: 7,200 KB/s (48X) |
| 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. |
| Access Time | Average Stroke (1 / 3) 110 ms Full Stroke 180 ms |
| Buffer Memory Size | 128 kbytes |
| Rotational speed | Approx. 11,100 rpm maximum |

2 System Features

Mass Storage Devices

Features of the CD-RW Drive (D9524A)

- CD-ROM Mode-1 data disc.
- CD-ROM Mode-2 data disc (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 |
|---------------------|---|
| HP product number | D9524A |
| Disc Diameter | 120 mm |
| Data Block Size | 2,055 bytes (14X, Mode-1) 4,800 bytes (32X, Mode-2) |
| Storage Capacity | 650 Mbytes (Mode-1) 742 Mbytes (Mode-2) |
| Write Mode | 4X (CD-R) and 4X (CD-RW) |
| Read Mode | Full CAV ¹ 10.3X to 24X |
| 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. |
| Access Time | Average Stroke (1 / 3) 110 ms Full Stroke 180 ms |
| Buffer Memory Size | 128 kbytes |
| Rotational speed | Approx. 7,300 rpm maximum |

¹-CAV = Constant Angular Velocity

Features of the DVD-ROM Drive (D7521A)

- CD-ROM Mode-1 data disc.
- CD-ROM Mode-2 data disc (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.
- DVD-ROM, DVD-Video, DVD Audio, DVD-RAM.

| | Description |
|---------------------|---|
| HP product number | D7521A |
| Disc Diameter | 120 mm |
| Storage Capacity | 650 MB to 17 GB (depending on disk type) |
| Read Mode | 8 X max (DVD), 40X max CD-ROM |
| 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. |
| Access Time | Average Stroke (1 / 3) 110 ms Full Stroke 180 ms |
| Buffer Memory Size | 128 kbytes |
| Rotational speed | Approx. 7,300 rpm maximum |

NOTE

If a disk is still in the drive after power failure or drive failure, the disk can be reclaimed by inserting a straightened paper-clip into the small hole at the bottom of the door.

DVD Region Codes

The DVD-ROM drive is only able to play DVD video discs from regions 1 and 2 (see table below). DVD region settings can be changed up to 5 times.

| Region Codes | Region | Supported by the D4388A DVD Drive |
|--------------|------------------------------|--------------------------------------|
| 1 | USA & Canada | Yes |
| 2 | Europe & Japan | Yes |
| 3 | South East Asia | No |
| 4 | Latin America & Australia | No |
| 5 | Russia, Rest of Asia, Africa | No |
| 6 | China | No |

2 System Features

Integrated Graphics Controller

Integrated Graphics Controller

Some models use the integrated Intel® 815 graphics controller for 2D and 3D graphics. The Intel® 815 graphics controller uses Direct AGP and Dynamic Video Memory technology.

The controller uses 9-10 MB of system memory for graphics purposes. You can also install a 4 MB graphics memory extension (in the AGP slot) for a total of 12 MB memory (8 MB system memory is used in this case). The 4 MB memory extension can improve 2D and 3D graphics performance significantly.

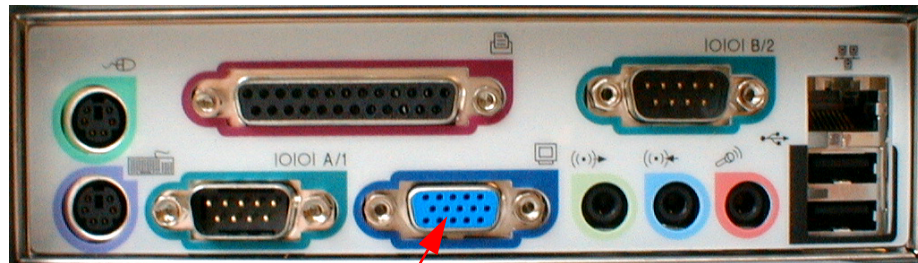
Supported Resolutions

The following non-interlaced resolutions are supported:

| Mode | Colors | Refresh |
|-------------|--------|--------------------|
| 640 x 480 | 256 | 60, 70, 72, 75, 85 |
| 640 x 480 | 65K | 60, 70, 72, 75, 85 |
| 640 x 480 | 16.8M | 60, 70, 72, 75, 85 |
| 800 x 600 | 256 | 60, 70, 72, 75, 85 |
| 800 x 600 | 65K | 60, 70, 72, 75, 85 |
| 800 x 600 | 16.8M | 60, 70, 72, 75, 85 |
| 1024 x 768 | 256 | 60, 70, 75, 85 |
| 1024 x 768 | 65K | 60, 70, 75, 85 |
| 1024 x 768 | 16.8M | 60, 70, 75, 85 |
| 1152 x 864 | 256 | 60, 70, 72, 75, 85 |
| 1152 x 864 | 65K | 60, 70, 72, 75, 85 |
| 1152 x 864 | 16.8M | 60, 75, 85 |
| 1280 x 1024 | 256 | 60, 70, 72, 75, 85 |
| 1280 x 1024 | 65K | 60, 70, 72, 75, 85 |
| 1280 x 1024 | 16.8M | 60, 70, 75, 85 |
| 1600 x 1200 | 256 | 60, 70, 72, 75 |

Connectors

A 15-pin VGA DB connector is located on the rear panel of the PC.



15-pin VGA DB Monitor Connector

This connector is disabled if the PC has an AGP graphics card. In this case, use the graphics card's connector.

2 System Features

Matrox Millennium G450 AGP 4X or PCI Graphics Card

Matrox Millennium G450 AGP 4X or PCI Graphics Card

Some *Vectra VL400 PC* models are supplied with a Matrox Millennium G450 AGP 4X graphics controller. Also, there is a PCI version of this graphics card available for the VL400 Small Form Factor.

The Matrox Millennium G450 is a very high performance 2D/3D graphics card.

For more information, refer to the *Technical Reference Manual - HP Vectra Technology* available in PDF (Acrobat) format from www.hp.com/go/vectrasupport.

Key Features

- Dual monitor output
- TV-out encoder
- 64-bit Double Data Rate (DDR) memory interface
- Maximum resolution:
On main display, 2048 × 1536, true color at 85 Hz.
On second display, 1600 × 1200, true color at 85 Hz.
- Environment-Mapped Bump Mapping for greater 3D realism
- VCQ2 rendering for improved color and text
- 3D Rendering Array Processor for fast, advanced 3D graphics
- 256-bit DualBus graphics chip
- AGP 4X host interface with 1GB/s bandwidth and Symmetrical Rendering Architecture
- High-speed 360 MHz RAMDAC with ultra sharp image quality. Provides fast screen refresh to eliminate screen flicker
- Second RAMDAC at 200MHz
- 16 MB video memory (non-upgradeable).

Maximum Supported Refresh Rates

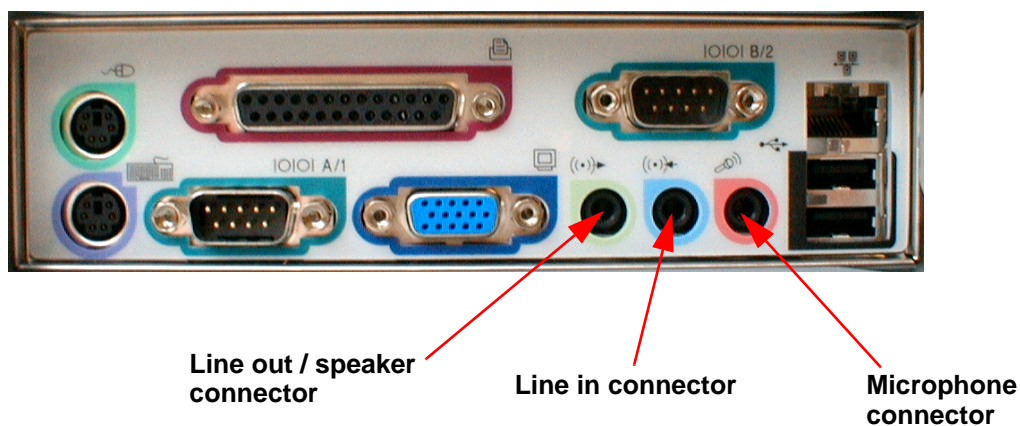
| Aspect Ratio | Display Resolution | Main Display 360MHz RAMDAC Horizontal / Vertical | Secondary Display 200MHz RAMDAC Horizontal / Vertical |
|-----------------------------------|--------------------|--|---|
| 4:3/5:4 Standard | 640 x 480 | 130kHz / 200Hz | 130kHz / 200Hz |
| | 800 x 600 | 130kHz / 200Hz | 130kHz / 200Hz |
| | 1024 x 768 | 130kHz / 160Hz | 130kHz / 160Hz |
| | 1152 x 864 | 130kHz / 140Hz | 125kHz / 140Hz |
| | 1280 x 1024 | 130kHz / 120Hz | 110kHz / 100Hz |
| | 1600 x 1200 | 130kHz / 100Hz | 90kHz / 70Hz |
| | 1800 x 1440 | 130kHz / 85Hz | — |
| | 1920 x 1440 | 130kHz / 85Hz | — |
| | 2048 x 1536 | 130kHz / 85Hz | — |
| 16:9/16:10 Wide Screen | 856 x 480 | 130kHz / 200Hz | 130kHz / 200Hz |
| | 1280 x 720 | 130kHz / 160Hz | 110kHz / 120Hz |
| | 1600 x 1024 | 130kHz / 120Hz | 90kHz / 85Hz |
| | 1920 x 1090 | 130kHz / 110Hz | — |
| | 1920 x 1200 | 130kHz / 100Hz | — |

2 System Features

Audio

The Crystal[®] integrated PCI audio solution (not upgradeable) in your PC is a CrystalClear[™] CS4299 Audio Codec '97 version 2.1. The CS4299 interfaces directly with the South Bridge chip and performs all digital operations, such as sample rate conversions and synthesis, as well as mixing and processing all the analog signals.

All models have a Line In jack, Line Out jack and Mic In jack connector located on the rear panel. These external jacks are standard connectors.



Adding an Audio Accessory Board

The integrated PCI audio can be disabled in the **Advanced** menu of the *Setup* program, if an audio accessory board is installed.

For more information on audio technology, refer to the *Technical Reference Manual - Vectra Technology*.

Network

All models have an integrated 3COM 3C920 Fast Etherlink 10/100 Base-TX LAN controller.

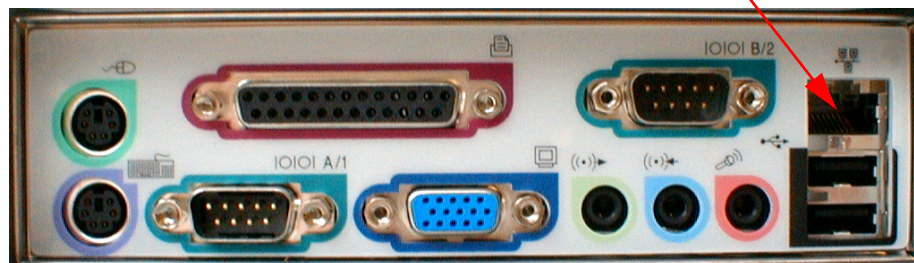
The integrated 3COM 3C920 is a full duplex LAN controller with automatic 10/100 BT port selection. It supports both AMP and ACPI power management features, such as WOL (Wake On LAN).

If you install a LAN card, you can disable the integrated LAN controller in the PC's *Setup* program.

Connectors

The 10/100BT connector is located on the rear of the PC.

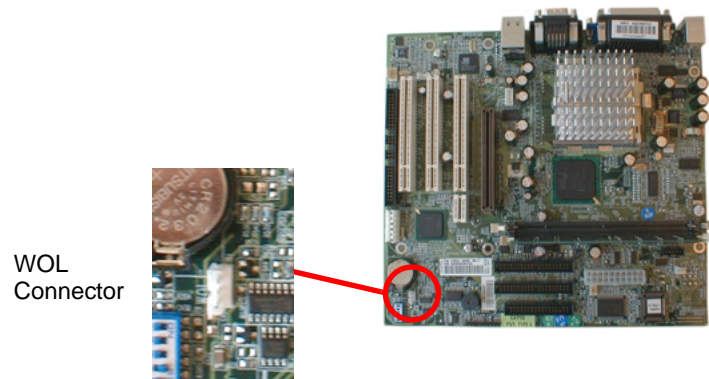
10/100BT LAN connector



2 System Features

Network

A Wake On LAN (WOL) connector is located on the system board as shown here. It is not required for PCI 2.2-compliant LAN cards such as the 3Com 3C905CTX LAN card but can be useful for other cards for Remote Wake Up (in a token ring environment for example).



For more information on network technology, refer to the *Technical Reference Manual - Vectra Technology*.

Accessory Boards

The VL400 has four accessory board slots: three PCI slots and one AGP slot (refer to the system board diagram on page 18 for their location). In the minitower and desktop, you can also install the HP Two ISA Slot Extension Kit (available as an accessory) for two ISA slots.

Some models have a high-end graphics card installed in the AGP slot.

Small Form Factor PCs In the VL400 SF, the PCI slots on the system board are not used for accessory boards. Instead, there is a riser card installed in the special PCI-riser slot. The standard riser card provides 3 PCI slots. An alternative riser card is also available that provides one PCI slot and one combo PSI-ISA slot.

PCI Slot Numbers Your PC uses logical slot numbers in the BIOS *Setup* program. You need to know these logical slot numbers if you want to change the PCI slot configuration in the *Setup* program (refer to the system board diagram on page 18 for their location). PCI slot numbers are also indicated on the system board itself.

2 System Features

Accessory Boards

Serviceability

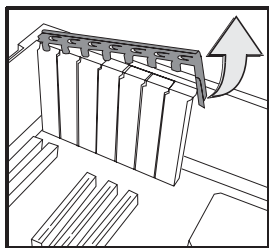
This chapter introduces the enhanced serviceability features of the *HP Vectra VL400* PC. It shows how easily you can open the PC and remove or add system components using the serviceability features developed for these PC models.

VL400 Desktop

Removing the cover

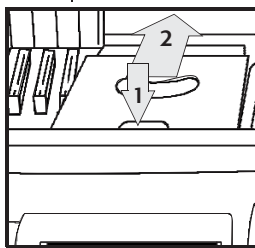


Shows how to remove the retaining clip

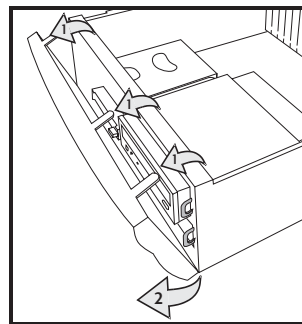


EXPANSION CARDS

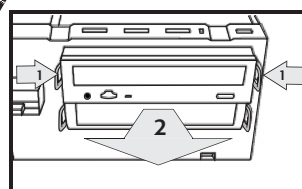
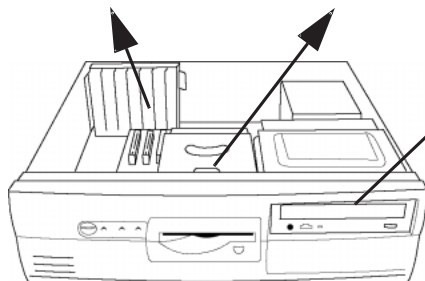
Shows how to remove the drive bay



HARD DISK / FLOPPY



Shows how to remove the front panel



CD / DVD

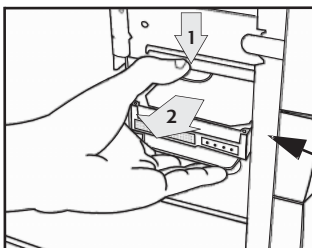
Shows how to remove the DVD, CD-RW, or CD-ROM drive

VL400 Minitower

Removing the cover

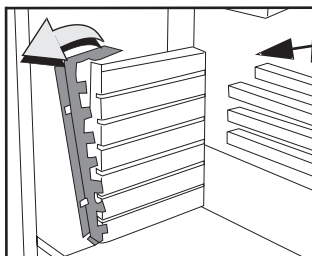
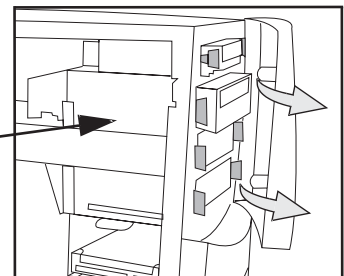


Shows how to remove
the hard disk



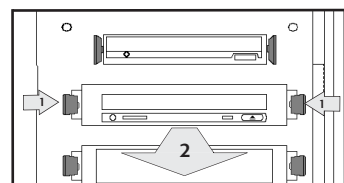
HARD DISK

Shows how to remove
the front panel



EXPANSION CARDS

Shows how to remove the
retaining clip



Shows how to remove the DVD,
CD-RW, or CD-ROM drive

VL400 Small Form Factor

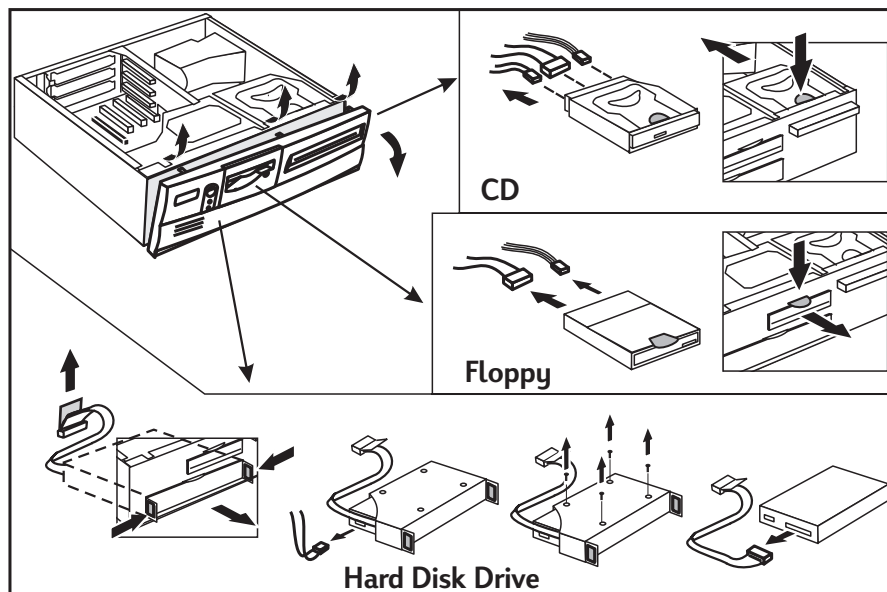
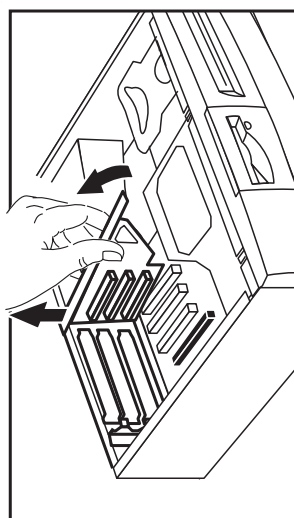
Removing the cover



Shows how to remove the front panel

Shows how to remove the DVD, CD-RW, or CD-ROM drive (top) and floppy drive (middle)

Shows how to remove the accessory board bracket



Shows how to remove the hard disk drive

BIOS Overview

This chapter describes the BIOS features for the *HP Vectra VL400 PC* models.

BIOS Summary

HP Vectra VL400 PCs contain a Phoenix BIOS (Basic Input Output System), which was customized by Phoenix for use on the VL400. The system ROM contains the POST (power-on self-test) routines, and the BIOS: the System BIOS, video BIOS, and 3Com LAN boot ROM.

The system BIOS is identified by the version number **IP.xx.xx**. The latest BIOS version for your PC and instructions for updating the BIOS can be downloaded from the HP's Support Web site at:

www.hp.com/go/vectrasupport.

This section covers:

- The BIOS Setup program
- Power saving
- BIOS addresses
- The order in which POST tests are performed
- Beep codes.

Using the HP Setup Program

Press **F2** to run the *Setup* program, when the HP logo is displayed immediately after restarting the PC.

Press **F8** to enter the *Boot* menu. Use the boot menu to select the order of the devices the PC will use to start (boot) from.

Press **F12** to boot (start) on the network. This option will only work if your PC and the network is configured correctly.

Alternatively, press **Esc** to view the summary configuration screen. By default, this remains on the screen for 20 seconds, but by pressing the **Pause** key once, it can be held on the screen indefinitely until any key is pressed.

The *Setup* screen offers five menus: Main, Advanced, Security, Boot, Power and Exit. These are selected using the left and right arrow keys.

Help Information

The HP *Setup* Program provides detailed help information. To get help on any field, simply highlight the chosen field using the keyboard arrow keys. The right hand portion of the *Setup* window will provide help information for that field.

Main Menu

The Main Menu contains the following fields:

- System date
- System time
- BIOS version
- CPU Type
- CPU Speed
- Cache RAM
- Base Memory
- Extended Memory

The Main Menu also contains the *Keyboard Features* sub-menu, which enables you to set Numlock and auto-repeat features.

Advanced Menu

The Advanced menu contains the following fields:

- CPU Bus Ratio
- Plug & Play O/S
- Reset Configuration Data
- Memory Hole at 15M-16M
- Processor serial number

These additional fields can be used to disable the integrated facilities (useful when you install an accessory card that performs these functions):

- Integrated USB Interface
- Integrated Network Interface
- Integrated Audio Interface

The Advanced menu also contains the following sub-menus:

- *Cache Options*. To set the state of the processor memory cache.
- *Flexible Disk Drives*. To set the on-board floppy disk drive configuration.
- *IDE Devices*. Configure IDE Primary and Secondary devices.
- *Video Options*. To configure video options, such as which video controller to use.
- *Integrated I/O Ports*. Configure, enable or disable the on-board parallel and serial ports.
- *PCI Configuration*. Configure a specific PCI device.

4 BIOS Overview

BIOS Summary

- *CPU Microcode Update.* To update the CPU microcode. You must have Administrator rights to use this facility.

Security

There are sub-menus for changing the characteristics and values of the system administrator password, user password, Hardware Protection and Boot Device Security, the amount of protection against the system's drives and network connections, and the amount of protection for booting from the system's drives and network connections.

The Security Menu contains the following sub-menus:

- *User and Administrator Password.*
The user password can only be set when an administrator password has been set. The user password prevents unauthorized use of the computer, protects stored data.
The administrator password prevents unauthorized access to the computer's configuration. It can also be used to start the computer.
- *Hardware protection.* Allows you to enable, disable or write protect the following devices: hard disk, parallel port, serial ports, and boot sector. Write protect helps to prevent users from copying confidential data (to floppy disk for example).
- *Boot Devices Security.* Allows you to prevent or authorize users from booting from devices such as the network, CD-ROM, floppy disk, and hard disk.

Protection Against Viruses

The VL400 has several features to protect it from viruses:

- **Hard Drive Master Boot Sector Protection:** It is impossible to write on the boot sector or to format the hard disk when this feature is enabled. This protection is enabled in the *Security - Hardware protection* menu of the Setup program.
- **PC Boot Block Protection:** The boot block is protected by a physical switch on the system board (switch 4) and a software switch. When flashing the BIOS, the switch must be closed; HP's BIOS flash program closes the software switch before flashing the BIOS.
- **BIOS Flash Protection:** BIOS flashing is protected by two software switches.

Boot Menu

The *QuickBoot Mode* option allows the system to skip certain tests while booting. This decreases the time needed to boot the system.

The *Boot-time Diagnostics* screen enables the user to display *either* the HP logo *or* diagnostic's screen during POST.

Boot Device Priority allows you to select the order of the devices from which the BIOS attempts to boot the operating system. During POST, if the BIOS is unsuccessful at booting from one device, it will then try the next one on the list until an operating system is found.

Hard Disk Drives allows you to choose the hard drive you want to boot from.

Removable Devices allows you to choose which drive letters you want to assign to removable devices.

Power Menu

The Power menu has the following fields:

- *State After Power Failure*. This field allows you to select the state that the PC will place itself into after a power failure. For example, if you set this field to Off, the PC will not start up after a power failure. Setting this value to Auto means that the PC will return to the state it was in before the power failure took place.
- *Advanced Power Management (APM)* fields. These fields allow you to set APM features, such as the timeout before the PC goes into suspend mode, and whether the PC will wake up (or power on) from modem or network card activity.
- *Advanced Configuration and Power Management (ACPI)* field. It allows you to enable or disable the Suspend to RAM feature available with ACPI operating systems (such as Windows 2000).

Power Saving and Ergonometry

Soft Power Down

Soft Power Down is available with the Windows NT operating system. If users want to shut down their PC, they are able to do so directly from the Windows NT interface. There is no longer any need to physically switch off the PC.

The hardware to do this is contained in the ICH chipset. This chipset is described in detail in *Technical Reference Manual - HP Vectra Technology*.

Safe Off

Safe Off is available with the Windows 95 and Windows 98 operating systems. If users attempt to shut down the operating system when an application is open and has not been saved, they are requested to save their work before the computer can be powered off.

In Windows 2000, the equivalent to HP's *Safe Off* is provided by the operating system.

The hardware to do this is contained in the ICH chipset. This chipset is described in detail in *Technical Reference Manual - HP Vectra Technology*.

Power Management

You can reduce the PC's overall power consumption by using Power Management to slow down the PC's activity when it is idle.

Operating System Power Management

Operating systems such as Windows 98 SE, Windows NT 4.0 and Windows 2000 differ in their power management capabilities. Refer to your operating system documentation for more information.

APM Power Management Modes

- Suspend
In Windows 95 for example, you can enter this low power state by clicking **Start** ⇒ **Suspend**. You can also set the timeout value (time of inactivity before going into Suspend mode) in the PC's *Setup* Program. In this mode, the LED on the PC's front panel blinks green.

ACPI Power Management Modes (Windows 2000 and Windows98 SE only)

- Standby
In Windows 2000 for example, you can enter this low power state by clicking **Start** ⇒ **Shut Down**, then selecting **Stand by** and clicking **OK**. In this mode, the LED on the PC's front panel blinks green.
There are two forms of Standby: normal (s1) and Suspend to RAM (s3), which is a lower power consumption state than normal Standby. You can use Suspend to RAM by enabling this feature in the PC's *Setup* Program. To do this, press **F2** during startup, then set **Suspend to RAM** in the **Power** menu to **enabled**. If this feature is disabled, the normal (s1) Standby is used.
- Hibernate (s4)
This is available in Windows 200 only and is lower power state than Standby. In Windows 2000, you can enter this low power state by clicking **Start** ⇒ **Shut Down**, then selecting **Hibernate** and clicking **OK**. In this mode, the LED on the PC's front panel is off.

4 BIOS Overview

BIOS Addresses

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.

System Memory Map

Reserved memory used by accessory boards must be located in the area from C8000h to EFFFFh.

| | |
|-----------------------|---|
| 0000 0000 - 0000 03FF | Real-mode IDT |
| 0000 0400 - 0000 04FF | BIOS Data Area |
| 0000 0500 - 0009 FC00 | Used by OS |
| 0009 FC00 - 0009 FFFF | Extended BIOS Data Area |
| 000A_0000 - 000B_FFFF | Video RAM or SMRAM (not visible unless in SMM) |
| 000C 0000 - 000C 7FFF | Video ROM |
| 000C 8000 - 000F FFFF | Adapter ROM, RAM, memory-mapped registers |
| 000E 0000 - 000F FFFF | System BIOS (Flash/Shadow) |
| 10 0000 - FF FFFF | Memory (1 MB to 16 MB) |
| 100 0000 - 1FF FFFF | Memory (16 MB to 32 MB) |
| 200 0000 - 3FF FFFF | Memory (32 MB to 64 MB) |
| 400 0000 - 1FFF FFFF | Memory (64 MB to 512 MB) |
| FFF80000 - FFFF FFFF | 512 KB BIOS (Flash) |

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

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).

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 I/O addresses are allocated dynamically.

| I/O Address Ports | Function |
|-------------------|--|
| 0000 - 000F | DMA controller 1 |
| 0020 - 0021 | Master interrupt controller (8259) |
| 002E - 002F | NS364 Configuration registers |
| 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 |
| 0070 - 0071 | RTC and CMOS data |
| 0080 | Manufacturing port (POST card) |
| 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 | 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 | IDE secondary channel, secondary floppy disk drive |
| 0378 - 037A | LPT1 |
| 03B0 - 03DF | VGA |
| 03E8 - 03EF | COM3 |
| 03F0h- 03F5 | Floppy disk drive controller |
| 03F6 | IDE primary channel |
| 03F7 | Floppy disk drive controller |
| 03F8 - 03FF | COM1 |
| 04D0 - 04D1 | Interrupt edge/level control |
| 0678 - 067B | LPT2 ECP |
| 0778 - 077B | LPT1 ECP |
| 0CF8 - 0CFF | PCI configuration space |

4 BIOS Overview

BIOS Addresses

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 |
| 0 | Free |
| 1 | Free if not used for parallel port in <i>Setup</i> |
| 2 | Floppy disk controller |
| 3 | Free if not used for parallel port in <i>Setup</i> |
| 4 | Used to cascade DMA channels 0-3 |
| 5 | Free |
| 6 | Free |
| 7 | Free |

Interrupt Controllers

The Interrupt Requests (IRQ) are numbered sequentially, starting with the master controller, and followed by the slave

| IRQ (Interrupt Vector) | Interrupt Request Description |
|---------------------------|---|
| INTR | |
| IRQ0 | System Timer |
| IRQ1 | Keyboard Controller |
| IRQ3 | Used by serial port if enabled |
| IRQ4 | Used by serial port if enabled |
| IRQ5 | Free if not used for parallel port or audio |
| IRQ6 | Floppy Disk Controller |
| IRQ7 | LPT1 |
| IRQ8 | RTC |
| IRQ9 | Available for PCI devices, if not used by ISA board or USB port |
| IRQ10 | Available for PCI devices, if not used by ISA board or USB port |
| IRQ11 | Available for PCI devices, if not used by ISA board or USB port |
| IRQ12 | Mouse |
| IRQ13 | Co-processor |
| IRQ14 | IDE Primary channel |
| IRQ15 | IDE Secondary channel. Free unless disabled |

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.

4 BIOS Overview

Order in Which the POST Tests are Performed

Order in Which the 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 a graphic screen of the Hewlett-Packard logo when the PC is started.

Devices, such as memory and newly installed hard disks, are configured automatically. The user is not requested to confirm the change. Newly removed hard disks are detected, and the user is prompted to confirm the new configuration by pressing (F4). Note, though, that the POST does not detect when a hard disk drive has been otherwise changed.

During the POST, the BIOS and other ROM data is 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 written at the start of each test.

| Checkpoint Code | POST Routine Description |
|-----------------|---|
| 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 |
| 0Ah | Initialize CPU registers |
| 0Bh | Enable CPU cache |
| 0Ch | Initialize caches to initial POST values |
| 0Eh | Initialize I/O component |

| Checkpoint Code | POST Routine Description |
|-----------------|---|
| 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 |
| 17h | Initialize cache before memory autosize |
| 18h | 8254 timer initialization |
| 1Ah | 8237 DMA controller initialization |
| 1Ch | Reset Programmable Interrupt Controller |
| 24h | Set ES segment register to 4 GB |
| 26h | Enable A20 line |
| 28h | Autosize DRAM |
| 29h | Initialize POST Memory Manager |
| 2Ah | Clear 512 KB base RAM |
| 32h | Test CPU bus-clock frequency |
| 33h | Initialize POST Dispatch Manager |
| 34h | Test CMOS RAM |
| 35h | Initialize alternate chipset registers |
| 36h | Warm start shutdown |
| 37h | Reinitialize the chipset (MB only) |
| 38h | Shadow system BIOS ROM |
| 39h | Reinitialize the cache (MB only) |
| 3Ah | Autosize cache |
| 3Ch | Configure advanced chipset registers |

4 BIOS Overview

Order in Which the POST Tests are Performed

| Checkpoint Code | POST Routine Description |
|-----------------|---|
| 3Dh | Load alternate registers with CMOS values |
| 40h | Set initial CPU speed |
| 42h | Initialize interrupt vectors |
| 44h | Initialize BIOS interrupts |
| 45h | POST device initialization |
| 47h | Initialize manager for PCI Option ROMs (Rel. 5.1 and earlier) |
| 48h | Check video configuration against CMOS |
| 49h | Initialize PCI bus and devices |
| 4Ah | Initialize all video adapters in system |
| 4Bh | Display QuietBoot screen |
| 4Ch | Shadow video BIOS ROM |
| 4Eh | Display BIOS copyright notice |
| 50h | Display CPU type |
| 51h | Initialize EISA board |
| 52h | Test keyboard |
| 54h | Set key click if enabled |
| 56h | Enable keyboard |
| 59h | Initialize POST display service |
| 5Ah | Display prompt "Press F2 to enter SETUP" |
| 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 |

| Checkpoint Code | POST Routine Description |
|------------------------|--|
| 67h | Initialize Multi Processor APIC |
| 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 |
| 74h | Test real-time clock |
| 76h | Check for keyboard errors |
| 7Ah | Test for key lock on |
| 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 Motherboard Configurable Devices |
| 88h | Initialize BIOS Data Area |
| 89h | Enable Non-Maskable Interrupts (NMIs) |
| 8Ah | Initialize Extended BIOS Data Area |
| 8Bh | Test and initialize PS/2 |

4 BIOS Overview

Order in Which the POST Tests are Performed

| Checkpoint Code | POST Routine Description |
|-----------------|---|
| 8Ch | Initialize floppy controller |
| 8Fh | Determine number of ATA drives |
| 90h | Initialize hard disk controllers |
| 91h | Initialize local-bus hard disk controllers |
| 92h | Jump to UsersPatch2 |
| 93h | Build MPTABLE for multi-processor boards |
| 94h | Disable A20 address line (Rel. 5.1 and earlier) |
| 95h | Install CD ROM for boot |
| 96h | Clear huge ES segment register |
| 97h | Fixup Multi Processor table |
| 99h | Check for SMART drive |
| 9Ah | Shadow option ROMs |
| 9Ch | Set up Power Management |
| 9Eh | Enable hardware interrupts |
| 9Fh | Determine number of ATA 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 IN POST flag |
| B0h | Check for errors |
| B2h | POST done - prepare to boot operating system |
| B5H | Terminate QuietBoot |

| Checkpoint Code | POST Routine Description |
|--|-------------------------------------|
| B6h | Check password (optional) |
| B8h | Clear global descriptor table |
| B9h | Clean up all graphics |
| 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 |
| The following are for boot block in Flash ROM | |
| E0h | Initialize the chipset |
| 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 |
| E9h | Initialize Multi Processor |

4 BIOS Overview

Order in Which the POST Tests are Performed

| Checkpoint Code | POST Routine Description |
|-----------------|------------------------------|
| 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 beeper |
| F4h | Initialize boot |
| F5h | Clear Huge segment |
| F6h | Boot to Mini DOS |
| F7h | Boot to Full DOS |

HP e-DiagTools Preboot Diagnostic (Beep Codes)

When your PC starts up, its BIOS performs a Power-on Self Test (POST) to test your hardware configuration for any problems. If a problem is detected during the POST, an error is displayed on your PC's monitor.

If, however, your PC is unable to display an error message (for example, when you graphics controller has failed), it will emit a buzzing sound. This is the e-DiagTools preboot diagnostic. Immediately after the buzzing sound, a series of beeps is emitted.

If you hear a series of beeps, you should count them as this will help you detect the cause of the problem.

| Number of Beeps | Meaning |
|-----------------|--|
| 0 | System OK |
| 1 | Processor absent, not correctly connected or ZIP socket not closed |
| 2 | Power supply is in protected mode |
| 3 | No memory, bad memory modules, incompatible memory module |
| 4 | Graphics card problem |
| 5 | PnP/PCI initialization problem |
| 6 | Corrupted BIOS. You need to activate crisis recovery procedure. |
| 7 | Defective system board |

Note that for Memory (code 3), Video Card (code 4), and PnP/PCI (code 5) errors, e-DiagTools preboot diagnostic will only detect them after a 15-second timeout.

If you miss the beep code, turn off the PC. Then press the on/off power button for five seconds or more, then listen for the signal again.

The e-DiagTools preboot diagnostic, as well as emitting a beep sequence, also encodes troubleshooting information (such as the PC models, serial number, and failing component) into a coded audio signal. During a support call, this coded signal can then be decoded by the HP Service Provider to provide immediate and effective assistance.

4 BIOS Overview

HP e-DiagTools Preboot Diagnostic (Beep Codes)

Drivers and Software

This chapter describes the drivers and software preloaded with *HP Vectra VL400* PCs.

Drivers

You can download up-to-date versions of drivers required for VL400 PCs from the “Software and Drivers” section of HP’s Support web site at **www.hp.com/go/vectrasupport**.

Software

VL400 models come preloaded with the following software. You can download the most up-to-date versions from the “Software and Drivers” section of HP’s Support web site at **www.hp.com/go/vectrasupport**.

Operating Systems

Either Windows 2000 (with Windows NT4 SP6 as alternative on CD-ROM), or Windows 95 (with Windows 98 SE as alternative on CD-ROM).

Software

- e-DiagTools 3.0
- NT Lock
- CD-R/W or DVD software
- Soft Power Down (Windows NT4)
- TopTools
- Safe Off
- Anti-Virus software (on CD-ROM).

e-DiagTools

HP e-DiagTools, the hardware diagnostics utility can help you diagnose hardware-related problems on your HP PC. For more information about this utility, refer to the *e-Diagtools User's Guide*. The *e-Diagtools User's Guide* is available on the *HP Information CD-ROM* for the VL400, or on HP’s support web site (**www.hp.com/go/vectrasupport**).

e-DiagTools is installed on the Utility Partition on the PC’s hard disk drive, is provided on one of the CD-ROMS that came with the PC (*HP Image Library and Diagnostics System CD-ROM*), and is available on the *HP e-DiagTools CD* (you can order this CD-ROM from HP’s Support web site).

BIOS Updates

The system BIOS is identified by the version number **IP.xx.xx**. The latest BIOS version for your PC and instructions for updating the BIOS can be downloaded from the HP support Web site at:

www.hp.com/go/vectrasupport.

5 Drivers and Software

BIOS Updates

The Technical Reference Manual contains the following documents available on the *HP Information CD-ROM* or downloadable from the Web in PDF format:

- **Introduction & HP Vectra Product Line Overview**
Describes how to use the Technical Reference Manual and provides a brief overview of the Vectra product line.
- **Product Description**
The document you are reading. A separate document exists for VEi7, VEi8, VL400, VL600, VLi8, VLi8SF, and e-Vectra PCs, providing detailed BIOS information and summary information on the hardware components in the PC.
- **HP Vectra Technology**
A detailed look at the hardware components in all the PCs in the product line. Includes information on processors, chipsets, graphics controllers, network cards, connectors and sockets.