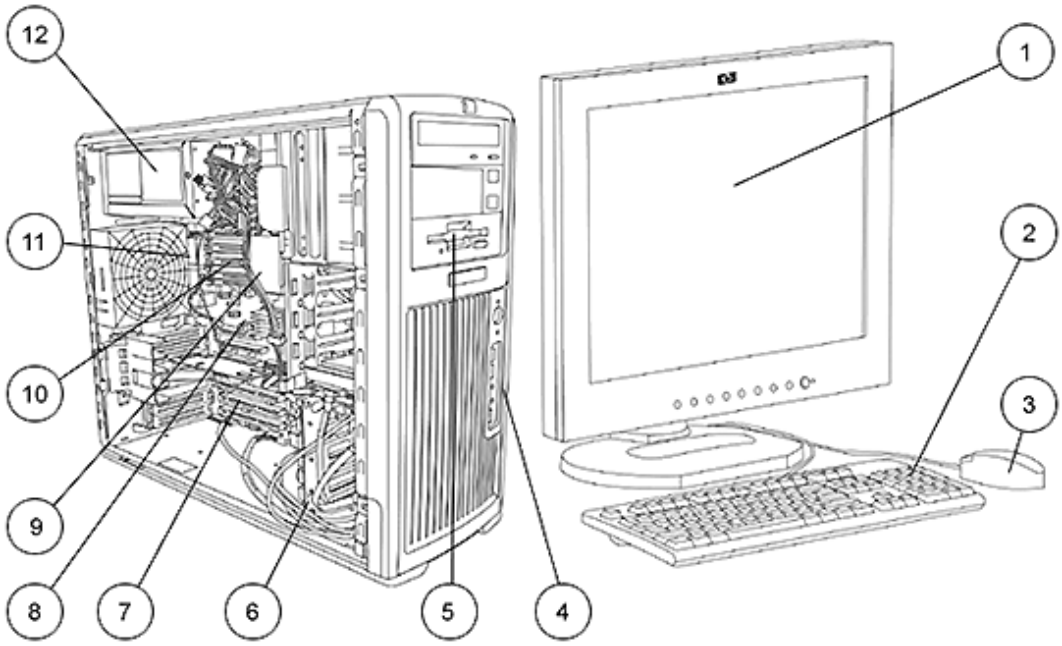
Overview



1. Monitor (sold separately)
2. 2004 Standard Keyboard
3. 2-Button Scroll Mouse
4. Front IO: 2 USB 2.0, IEEE-1394 (standard), headphone and microphone
5. 5.25"" external bay for optional diskette drive, optical drive or other 5.25"/3.5" device
6. 5 internal 3.5" bays, 3 external 5.25" bays
7. 2 PCI, 3 PCI-X, 1 PCI Express slots
8. 1 PCI Express x16 Graphics Bus
9. Dual 64-bit Intel® Xeon™ processors
10. 8 DIMM slots for DDR-2 memory
11. 6 USB 2.0, 1 standard serial port, 1 parallel port, 2 PS/2, 1 RJ-45, audio in/out, microphone
12. 600 watt power supply

At A Glance

- 64-bit Intel® Xeon™ processors
- Choice of operating systems:
  Microsoft Windows XP Professional
  Red Hat Enterprise Linux Workstation 3.0 (32- or 64-bit version)
  HP Linux Installer Kit (see http://www.hp.com/workstations/software/linux/ for details)
- Up to 16 GB of DDR-2 memory
- PCI-Express I/O and graphics
- Integrated Intel NetXtreme Gigabit ethernet
- 800 MHz processor front side bus support, depending on processor
- Intel Hyper-Threading technology support
- SATA and Ultra 320 SCSI drives
- Digital AC97 integrated audio with internal speaker
- Pre-loaded Manageability tools
- Energy Star compliance with energy-saving features
- Protected by HP Services, including a 3-3-3 standard warranty. Terms and conditions vary by country. Certain restrictions and exclusions apply.

Standard Features - Custom Components

Processor and Speed – One of the following

Intel Xeon Processor with 800 MHz Front Side Bus

2.8 GHz (1 MB L2 cache)
3.0 GHz (1 MB L2 cache)
3.0 GHz (2 MB L2 cache)
3.2 GHz (1 MB L2 cache)
3.2 GHz (2 MB L2 cache)
3.4 GHz (1 MB L2 cache)
3.4 GHz (2 MB L2 cache)
3.6 GHz (1 MB L2 cache)
3.6 GHz (2 MB L2 cache)

2nd Intel Xeon Processor with 800 MHz Front Side Bus

2.8 GHz (1 MB L2 cache)
3.0 GHz (1 MB L2 cache)
3.0 GHz (2 MB L2 cache)
3.2 GHz (1 MB L2 cache)
3.2 GHz (2 MB L2 cache)
3.4 GHz (1 MB L2 cache)
3.4 GHz (2 MB L2 cache)
3.6 GHz (1 MB L2 cache)
3.6 GHz (2 MB L2 cache)

Operating System – One of the following

Microsoft Windows XP Professional SP1a

Red Hat Enterprise Linux Workstation 3 Update 4 (32 & 64-bit available as pre-load and as an After Market Option)

HP Installer CD for Red Hat Linux 7.2, 7.3 and Workstation 3 Box Set (64 bit)
See http://www.hp.com/workstations/software/linux/.
Click on "Hardware support matrix" under "Related links" for details.

1st Hard Disk Drive – One of the following

40 GB 7200 rpm Serial ATA drive (2 MB cache)
80 GB 7200 rpm Serial ATA drive (8 MB cache)
160 GB 7200 rpm Serial ATA drive (8 MB cache)
250 GB 7200 rpm Serial ATA drive (8 MB cache)
400 GB 7200 rpm Serial ATA drive (8 MB cache)
74 GB 10K rpm Serial ATA drive (8 MB cache)
73 GB 10K Ultra320 SCSI drive
300 GB 10K Ultra320 SCSI drive
36 GB 15K Ultra320 SCSI drive
73 GB 15K Ultra320 SCSI drive
146 GB 15K Ultra320 SCSI drive

Standard Features - Custom Components

2nd Hard Disk Drive – One of the following	2nd hard drive, 40 GB 7200 rpm Serial ATA drive (2 MB cache) 2nd hard drive, 80 GB 7200 rpm Serial ATA drive (8 MB cache) 2nd hard drive, 160 GB 7200 rpm Serial ATA drive (8 MB cache) 2nd hard drive, 250 GB 7200 rpm Serial ATA drive (8 MB cache) 2nd hard drive, 400 GB 7200 rpm Serial ATA drive (8 MB cache) 2nd hard drive, 74 GB 10K rpm Serial ATA drive (8 MB cache) 2nd hard drive, 73 GB 10K Ultra320 SCSI drive 2nd hard drive, 300 GB 10K Ultra320 SCSI drive 2nd hard drive, 36 GB 15K Ultra320 SCSI drive 2nd hard drive, 73 GB 15K Ultra320 SCSI drive 2nd hard drive, 146 GB 15K Ultra320 SCSI drive
3rd Hard Disk Drive – One of the following	3rd hard drive, 160 GB 7200 rpm Serial ATA drive (8 MB cache) 3rd hard drive, 400 GB 7200 rpm Serial ATA drive (8 MB cache) 3rd hard drive, 74 GB 10,000 rpm Serial ATA drive (8 MB cache) 3rd hard drive, 73 GB 10K Ultra320 SCSI drive 3rd hard drive, 300 GB 10K Ultra320 SCSI drive 3rd hard drive, 36 GB 15K Ultra320 SCSI drive 3rd hard drive, 73 GB 15K Ultra320 SCSI drive 3rd hard drive, 146 GB 15K Ultra320 SCSI drive
4th Hard Disk Drive – One of the following	4th hard drive, 160 GB 7200 rpm Serial ATA drive (8 MB cache) 4th hard drive, 400 GB 7200 rpm Serial ATA drive (8 MB cache) 4th hard drive, 74 GB 10,000 rpm Serial ATA drive (8 MB cache) 4th hard drive, 73 GB 10K Ultra320 SCSI drive 4th hard drive, 300 GB 10K Ultra320 SCSI drive 4th hard drive, 73 GB 15K Ultra320 SCSI drive 4th hard drive, 146 GB 15K Ultra320 SCSI drive
5th Hard Disk Drive – One of the following	5th hard drive, 73 GB 10K Ultra320 SCSI drive 5th hard drive, 300 GB 10K Ultra320 SCSI drive 5th hard drive, 73 GB 15K Ultra320 SCSI drive 5th hard drive, 146 GB 15K Ultra320 SCSI drive
Factory Integrated RAID	RAID 0 Configuration – Striped Array RAID 1 Configuration – Mirrored Array **NOTE:** Requires 2 identical hard drives (speeds, capacity, interface)

Standard Features - Custom Components

Drive controllers	Integrated serial ATA controller Integrated dual channel Ultra320 SCSI controller with RAID (0 or 1) capability Optional Ultra 320 SCSI controller – basic Optional Ultra 320 SCSI controller – advanced, with RAID support and external connector Cable, 5 Part SCSI (required if 1st drive is SATA and any of the other drives are SCSI) Ultra320 back panel connect (uses HDCI connectors) Optional PCI SATA/150 Controller (SATA controller card required for 3rd and 4th SATA HDD, no SCSI drives allowed if ordered)
Memory – One of the following	512 MB DDR-2 PC3200 (400 MHz) ECC Registered (2 x 256 MB) 1 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (2 x 512 MB) 2 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (2 x 1 GB) 2 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (4 x 512 MB) 3 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (6 x 512 MB) 3 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (2 x 1GB + 2 x 512 MB) 4 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (8 x 512 GB) 4 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (4 x 1 GB) 4 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (2 x 2 GB) 6 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (6 x 1 GB) 8 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (8 x 1 GB) 16 GB DDR-2 PC2-3200 (400 MHz) ECC Registered (8 x 2 GB)
Removable Storage	1.44-MB Diskette Drive 48X CD-ROM Drive 48X/32X/48X CD-RW Drive 16X/40X DVD-ROM drive 48X/32X/48X/16X Combo CD-RW/DVD-ROM Drive 16X DVD+/-RW, Dual-Layer (Win and RHWS3) 16X DVD+/-RW, Dual-Layer, LightScribe (Windows)
2nd Removable Storage	48X/32X/48X CD-RW Drive 16X/40X DVD-ROM drive 48X/32X/48X/16X Combo CD-RW/DVD-ROM Drive 16X DVD+/-RW, Dual-Layer (Win and RHWS3) 16X DVD+/-RW, Dual-Layer, LightScribe (Windows)
Keyboard – One of the following	PS/2 Standard Keyboard USB Standard Keyboard
Mouse – One of the following	PS/2 2-Button Scroll Mouse PS/2 3-Button Mouse USB 2-Button Optical Scroll Mouse USB 3-Button Optical Mouse

Standard Features - Custom Components

Audio	Integrated Digital AC97 audio with internal speaker Sound Blaster Audigy 2 ZS PCI
NIC	Integrated Intel Pro MT 10/100/1000 LAN Broadcom BCM5751 NetXtreme™ Gigabit Ethernet Controller (PCI-E)
Graphics	NVIDIA Quadro NVS 280 PCI Express (64 MB, VGA & DVI) NVIDIA Quadro FX 330 PCI Express (64 MB) ATI FireGL V3100 PCI Express (128 MB) NVIDIA Quadro FX 540 PCI Express (128 MB) NVIDIA Quadro FX 1300 PCI Express (128 MB) NVIDIA Quadro FX 1400 PCI Express (128 MB) ATI FireGL V5100 PCI-Express (128 MB) NVIDIA Quadro FX 3400 PCI Express (256 MB)
Miscellaneous	Hood intrusion sensor Trusted Platform Module
Software	Symantec Norton AntiVirus 2004 (optional)* HP Performance Tuning Framework* Altiris Recovery* HP Client Manager Software v6.0* *Not available with a Linux Operating System

Standard Features - Specs

Operating System (choice)	Microsoft Windows XP Professional SP1a	
	OR Red Hat Enterprise Linux Workstation 3 Update 4 (32- or 64-bit version)	
	OR HP Installer Kit for Linux (includes drivers for both 32-bit & 64-bit OS versions on HP xw8200, xw6200 and xw4200 Workstations)	
Form factor	Minitower	
Color	Carbonite/Alloy metallic	
System Board Form Factor	E- ATX (12" x 13")	
Processor	Single or dual 64-bit Intel Xeon processors (Nocona) with Hyper-Threading Technology	
CPU Bus Speed Supported	800 MHz FSB	
Standard L2 Cache	1 MB L2 cache (non ECC) or 2 MB L2 cache	
Chipset	Intel Tumwater	
Memory Expansion Slots	8 DIMMs	
Memory Type Supported	DDR-2 (ECC registered)	
Memory Speed Supported	DDR-2 Synch DRAM PC2-3200 (400 MHz) Registered ECC	
Maximum Memory	8 GB (8 DIMMs slots with 1 GB DIMMS)	
Network controller	Integrated Intel Pro MT 10/100/1000 LAN	
Audio	Integrated AC'97 digital audio with S/PDIF 6-channel pass-through, stereo microphone, and Yamaha XG Lite Softsynth support	
PCI slots	2 full-length PCI slots (3 full-height PCI-X slots (one 133 MHz, two 100 MHz slots) 1 PCI Express (x8 mechanically, x4 electrically) 1 PCI Express x16 graphics	
AGP slot	None	
Bays	Total Bays = 8	
Internal Bays	• Five 3.5 inch bays (4 with acoustic dampening rail assemblies)	
External Bays	• Three 5.25 inch full length 2003 mm maximum device depth (top bay is limited to 198 mm depth when optional smart cover solenoid lock is installed. Bottom bay can be converted to an internal 3.5" 3rd Hard Drive bay using optional bracket • Floppy drive bay using optional bracket	
Parallel Port	1	
Serial Port	1	
Front I/O	2 USB 2.0, Headphone, Microphone, IEEE 1394	
Rear I/O	6 USB 2.0, 1 standard serial port, 1 parallel port, PS/2 keyboard and mouse, 1 RJ-45 to integrated Gigabit LAN, Audio In, Audio Out, Mic In	
USB Keyboard	Optional	
USB Mouse	Optional	
PS/2 Keyboard	1	
PS/2 Mouse	1	
Chassis Dimensions (H x W x D)	17.9 x 8.3 x 20.7 in (45.4 x 21.0 x 52.5 cm)	
System weight	Minimum config – 42 lb (19 kg) Standard config – 45 lb (20 kg) Maximum config – 54 lb (24 kg)	
Shipping weight	Standard config – 54 lb (24 kg)	
Temperature	Operating	40° to 95° F (5° to 35° C)
	Non-operating	-40° to 140° F (-40° to 60° C)
Humidity	Operating	8% to 85%
	Non-operating	8% to 90%
Maximum Altitude (nonpressurized)	Operating	10,000 ft (3,000 m)
	Non-operating	30,000 ft (9,100 m)
Power Supply	600W wide-ranging, active Power Factor Correction	
Interfaces Supported	2 SATA interface (2 serial-ATA connectors), 2 Ultra320 SCSI interface, 2 EIDE interface (2 EIDE connectors) supported for optical drives, optional multi-bay interface	
Hard Drive Controller (PCI) Supported	Ultra160 or Ultra320, or SATA RAID, or Ultra320 RAID	

Preinstalled Software
HP Performance Tuning Framework*
HP Client Manager Software v6.0*
Altiris Local Recovery*
Alert Standard Format specification*
CD/DVD software dependent on optical drive choices
* Not available on Linux

After-Market Options

Processors	**2nd 64-bit Intel Xeon™ processor with Hyper-Threading**			
	64-bit Intel Xeon processor at 2.8 GHz with 800 MHz FSB & 1 MB of L2 cache			DY665A
	64-bit Intel Xeon processor at 3.0 GHz with 800 MHz FSB & 1 MB of L2 cache			DY666A
	64-bit Intel Xeon processor at 3.0 GHz with 800 MHz FSB & 2 MB of L2 cache			PQ903A
	64-bit Intel Xeon processor at 3.2 GHz with 800 MHz FSB & 1 MB of L2 cache			DY667A
	64-bit Intel Xeon processor at 3.2 GHz with 800 MHz FSB & 2 MB of L2 cache			PQ904A
	64-bit Intel Xeon processor at 3.4 GHz with 800 MHz FSB & 1 MB of L2 cache			DY668A
	64-bit Intel Xeon processor at 3.4 GHz with 800 MHz FSB & 2 MB of L2 cache			PQ905A
	64-bit Intel Xeon processor at 3.6 GHz with 800 MHz FSB & 1 MB of L2 cache			DY669A
	64-bit Intel Xeon processor at 3.6 GHz with 800 MHz FSB & 2 MB of L2 cache			PQ906A
Graphics	**Multi display solutions**	**PCI**	**PCI-Express**	
	NVIDIA Quadro NVS 280 (64 MB, VGA & DVI)	X		AA932A
	NVIDIA Quadro NVS 400 (64 MB, quad head, VGA & DVI)	X		AA605A
	Quadro NVS 400 DVI cables	NA		AA606A
	NVIDIA Quadro NVS 280 PCI-E (64 MB, VGA & DVI)		X	DY650A
	DMS-59 to Dual DVI Cable for NVS cards	X	X	DL139A
	NVIDIA Quadro FX 330 (64 MB)		X	PB332A
	ATI FireGL V3100 (128 MB)		X	PE949A
	NVIDIA Quadro FX 540 (128 MB)		X	PH791A
	NVIDIA Quadro FX 1300 (128 MB)		X	PB331A
	NVIDIA Quadro FX 1400 (128 MB)		X	PM979A
	ATI FireGL V5100 (128 MB)		X	PB330A
	NVIDIA Quadro FX 3400 (256 MB)		X	PB329A
Hard Drives	**SATA Hard Drives**			
	40 GB SATA/150 Hard Drive (7200 rpm)			PB371A
	80 GB SATA/150 Hard Drive (7200 rpm)			DE705A
	160 GB SATA/150 Hard Drive (7200 rpm)			DE706A
	250 GB SATA/150 Hard Drive (7200 rpm)			DS702A
	400 GB SATA/150 Hard Drive (7200 rpm)			PM254A
	74 GB SATA/150 Hard Drive (10,000 rpm)			DX760A
	SCSI Hard Drives			
	73 GB Ultra320 SCSI Hard Drive (10,000 rpm)			AA613A
	146 GB Ultra320 SCSI Hard Drive (10,000 rpm)			AA614A
	300 GB Ultra320 SCSI Hard Drive (10,000 rpm)			DY672A
	36 GB Ultra320 SCSI Hard Drive (15,000 rpm)			AA616A
	73 GB Ultra320 SCSI Hard Drive (15,000 rpm)			AA617A
	146 GB Ultra320 SCSI Hard Drive (15,000 rpm)			DY671A
	Bracket HDD 3.5 to 5.25			AA833A
	Cable, 5-port SCSI 8200			AA818A
	U320 SCSI Back Panel connector (Uses HDCI, HD68, or mini DB68 connectors)			AA658A

After-Market Options

Controllers	**SCSI Controllers**	**PCI**	**PCI-Express**	
	U320 SCSI Controller, RAID 0,1 & ext conn	X		DZ554A
	Ultra320 SCSI RAID Adaptec 2120S (Windows only)	X		AA850A
Input/Output Devices	**Keyboards**			
	HP PS/2 Standard Keyboard (Carbonite/Silver)			DT527A
	HP USB Standard Keyboard (Carbonite/Silver)			DT528A
	HP USB 2004 Modular keyboard			DT530A
	Smartcard adapter for modular keyboard			DT531A
	Pointing Devices			
	HP PS/2 2-Button Scroll Mouse (Carbonite)			DD440B
	HP USB 2-Button Optical Scroll Mouse (Carbonite/Silver)			DC172B
	HP PS/2 3-Button Mouse			AA778A
	HP USB Optical 3-button mouse			DY651A
	USB Spaceball 5000			DV675A
	USB SpaceMouse			DZ203A
Networking	**NICs**	**PCI**	**PCI-Express**	
	Intel Pro/1000MT	X		DC193A
	HP Gigabit by Broadcom (BCM5782)	X		DC194A
	Broadcom BCM5751 NetXtreme™ Gigabit Ethernet Controller (PCI-E)		X	DZ556A
Memory (DIMMs)	**400 MHz DDR-2 PC2-3200 ECC Registered DIMMs**			
	256 MB DDR-2 PC2-3200 (400 MHz) ECC Registered			DY656A
	512 MB DDR-2 PC2-3200 (400 MHz) ECC Registered			DY658A
	1 GB DDR-2 PC2-3200 (400 MHz) ECC Registered			DY655A
	2 GB DDR-2 PC2-3200 (400 MHz) ECC Registered – available winter 2005			PH201A
Monitors	**TFTs**			
	HP TFT L2335 (23-inch)			P9615W#
	HP TFT L2035 (20.1-inch)			P9614W#
	HP TFT L1955 (19.1-inch)			PD974A5
	HP TFT L1755 (17-inch)			PL777AA
	CRTs			
	HP P1230 (22-inch)			P9613A

After-Market Options

Optical Drives	**DVD-ROM Drive**	
	16X/40X DVD-ROM w/ +R read	AA620A
	CD-ROM Drive	
	48X Max CD-ROM Drive	DC143B
	CD-RW Drive	
	48X/32X/48X CD-RW Drive	DE205A
	Combo Drive	
	48X/32X Combo DVD-ROM/CD-RW Drive	DE206A
	DVD+/-RW Drive	
	16X DVD+/-RW, Dual-Layer (Win and RHWS3)	PH205A
	16X DVD+/-RW, Dual-Layer, LightScribe (Windows 2K and XP only)	DZ555A
Removable Storage	256 MB USB 2.0 II drive key	PH657A
	1.44 MB Internal Floppy Drive	DY670A
	HP DAT24i Internal DDS3 tape drive	C1555D
	HP 1.44MB Internal floppy drive	DY670A
	HP DAT24e External DDS3 tape drive	C1556D
	HP DAT40i Internal DDS4 tape drive	C5686B
	HP DAT40e External DDS4 tape drive	C5687C
	HP DAT72i Internal DAT72 tape drive	Q1522A
	HP DAT72e External DAT72 tape drive	Q1523A
Security	Chassis clamp lock, universal, no cable	DE817A
	Chassis clamp lock, universal, with cable	DE818A
Brackets/Stands	xw8200 slide rack kit IT/Broadcast	DY664A
	Fixed Rack Kit (IT/Broadcast)	AA640A
	Depth Adjustable Rails (stationary)	332558-B21
	Sliding Shelf kit	234672-B21
	Fixed shelf kit	253449-B21
Other Devices	IDE Cable Kit xw62/82 (2nd)	DY660A
	Front Card Guide and Fan Kit	DY648A
Operating Systems	Red Hat Enterprise Linux Workstation 3 Update 4 (32-bit)	PD862A
	Red Hat Enterprise Linux Workstation 3 Update 4 (64-bit)	PD863A
Software	HP Remote Graphics V2 LTU for HP WS	PE672A
	HP Remote Graphics V2 LTU for non-HP – available winter 2005	PE673A
	HP Remote Graphics V2 Receiver LTU	PE674A
	HP Remote Graphics V2 software media	PE675A
	HP Remote SW for HP 1 year Update Subscription	PN680A
	HP Remote SW for non-HP 1 year Update Subscription – available winter 2005	PN681A
	HP Remote SW Receiver 1 year Update Subscription	PN682A

E7525 chipset

DDR-2 SDRAM ECC REGISTERED MEMORY

Memory must be added in pairs. This chart does not represent all possible memory configurations. The Intel E7525 chipset supports ECC Registered 400 MHz (PC2-3200) DDR-2 memory only.

DIMM socket 1 is the furthest from the Memory Controller Hub at the top of the board. Additional DIMM slots should be populated consecutively; socket 2, 3, 4, etc. Speed mixing of memory DIMMs is not allowed. For efficient dual-channel performance, each pair of DIMMs must be same size and same DRAM technology. If mixing single sided and double sided memory, load the double sided DIMM pairs first. ECC Registered memory must be used.

If you have unused slots within a channel, chose the sockets closest to the memory controller (e.g. Sockets 7 & 8, then 5 and 6, and so on).

MAXIMUM MEMORY

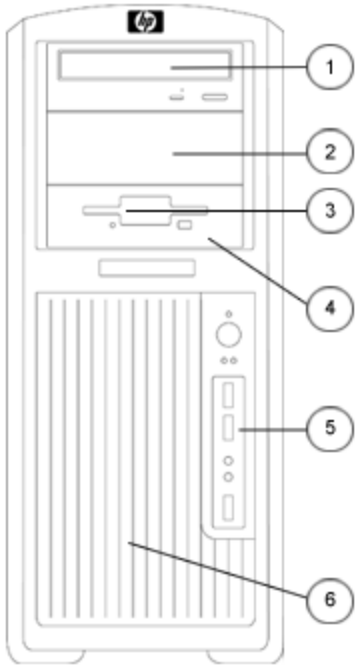
Supports up to 16 GB of DDR SDRAM.

POSSIBLE MEMORY CONFIGURATIONS

Not all memory configurations possible are represented below.

DIMM Size	Slot							
	1	2	3	4	5	6	7	8
256 MB								
512 MB								
512 MB	256 MB	256 MB						
1 GB								
1 GB	512 MB	512 MB						
1 GB								
2 GB	1 GB	1 GB						
2 GB	512 MB	512 MB	512 MB	512 MB				
4 GB	1 GB	1 GB	1 GB	1 GB				
4 GB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB	512 MB
6 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB		
8 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB	1 GB
16 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB	2 GB

Tower configuration



	Quantity Supported	Position Supported	Controller
Convertible Minitower			
Optional Diskette Drive	1	3	Diskette
5.25" Storage Drive Bays	3	1, 2, 3	IDE
3.5" Storage Drive Bays with acoustic dampening rail assemblies	5	4, 5, 6, 7, 8	SATA or SCSI

SCSI and SATA may be mixed in a Windows configuration, only the primary drive may be SATA.
SATA controller card required for 3rd and 4th SATA HDD; If SATA controller is ordered then no SCSI HDDs allowed; Linux does not support SATA controller or mixing SATA and SCSI drives.
Factory Integrated RAID*

*** NOTE:** Factory Integrated RAID 0 Configuration (Striped Array) and RAID 1 Configuration (Mirrored Array) requires 2 hard drives with identical speeds, capacity and interface.

Additional Technical Specifications

System Board	
Architecture	Xeon 64-bit/PCI-E
Chipset	Intel E7525/ICH5R Chipset
Super I/O Controller	SMSC LPC47B397
System Board Form Factor	E-ATX (12" x 13")
Processor Socket	Dual 604 Pin ZIF
DIMM Connectors (DDR2, 1.8V)	4
AGP Connector (1.5V)	None
Integrated Graphics	None
PCI Connectors (5.0V)	2 full length 33 MHz 32-bit
PCI-X Connectors	2 full length 100 MHz 64-bit 1 full length 133 MHz 64-bit
PCI card guide	Optional, tool-free support for all full-length cards with PCI extender
Flash ROM	Yes
AC97 integrated audio	Yes
CD ROM IN (Audio)	Yes
AUX IN (Audio)	Yes
Clear CMOS Button	Yes
CPU Fan Header	Yes
Chassis Fan Header	Yes
Chassis Speaker Header	Yes
CMOS Battery Holder – Lithium	Yes
Hood Lock Header	None
Hood Sensor Header	None
Multibay Header	Yes
Hard drive acoustic dampening rails	Standard in 4 internal 3.5" bays, tool-free
Integrated SATA RAID	• RAID 0 and RAID 1 • Supports one RAID array on 2 ports • Creation of 2 drive HDD array • RAID 0 Configuration – Striped Array • RAID 1 Configuration – Mirrored Array
Integrated Intel Gigabit Ethernet	Yes
Wake-On-Lan®	Yes
ASF 1.0 (Alert Standard Format)	Will be provided in a BIOS upgrade
Power Supply Header	Yes
Power Switch, Power LED & Hard Drive LED Header	Yes
Password Clear Header	Yes
Riser Connector	None
HDD activity LED Header	Yes
PCI extender that connects to System Board	None

Cooling	
Cooling Solutions Supported	Yes
Power Supply Fan	92 x 25 mm
Processor Fan-Heatsink	70 x 15 mm
Chassis Fan (front)	One 92 x 25 mm (optional)
Chassis Fan (rear)	One 120 mm x 28 mm (standard)
Internal Speaker	Standard

Power Supply			
Full Ranging Input	Yes		
Active Power Factor Correction (APFC) (Input Current is nearly 1/2 a non-APFC PS)	Yes		
Passive Power Factor Correction (PFC)	No		
Operating Voltage Range	90 – 264 VAC/118 VAC		
Rated Voltage Range	100 – 240 VAC		
Rated Line Frequency	50-60 Hz/400Hz		
Operating Line Frequency Range	47 – 66 Hz/393 – 407Hz		
Rated Input Current	10A/8.6A		
Maximum Rated Power	600 W		
Heat Dissipation	Typical 1206.2 btu/hr Maximum 2047.4 btu/hr		
PS Size (wide x high x deep)	92mm variable speed		
Energy Star Compliant	Yes		
Surge Tolerant Full Ranging Power Supply	Withstands power surges up to 2000V		
Typical configuration power consumption	2 processors (2x3.6GHz Xeon), 1 GB memory (2x512 MB) Two hard drives (2xSATA 40 GB), DVD-ROM drive PCI-Express Graphics Card (FX 1300) Floppy, Monitor		
	Input Power consumption	@ 120Vac/60Hz	
	Typical operating mode (system busy)	353.5W	= 1206.2 btu/hr
	Windows XP Idle	210.3 W	= 717.6 btu/hr
	Hibernate mode (S4)	5.9 W	= 20.1 btu/hr
	Power Off (S5)	5.9 W	= 20.1 btu/hr

ROM Features	Description
Instantly Available PC	Allows for very low power consumption with quick resume time
ROM Based F10 Setup and diagnostics	Review and customize BIOS settings
Remote System Installation via F12 (PXE) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system
System/Emergency ROM Flash Recovery with Video	Recovers corrupted system BIOS
ROM revision levels	• Identifies system ROM revision levels and reports in ROM-based F10 setup Version is stored in an industry standard memory location (SMBIOS) so that management SW applications can use and report this information
System board revision level	• Allows management SW to read the revision level of the system board Revision level is digitally encoded into the hardware and cannot be modified
Auto Setup when New Hardware Installed	System automatically detects addition of new hardware
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Enable or disables serial, parallel, USB, audio, and network ports
Removable Media Write/ Boot Control	Prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Prevents an unauthorized person from booting up the computer
Setup Password	Prevents an unauthorized person from changing the system configuration
Replicated Setup	Saves BIOS settings to diskette or USB disk-on-key in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering ROM-based F10 setup
Memory Change Alert (Requires HP Client Manager Software)	Alerts management console if memory is removed or changed
Thermal Alert (Requires HP Client Manager Software)	Monitors the temperature state within the chassis. Three modes: • NORMAL – normal temperature ranges • ALERTED – excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown • SHUTDOWN – excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs
Master Boot Record Security	Detects changes to MBR and optional restoration, useful in protecting from viruses
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console
Remote Wakeup/shutdown	• System administrators can power on, restart, and power off a client computer from a remote location. • Enables cost-effective power consumption when the administrator needs to distribute software, perform security management, or update the ROM
ACPI (Advanced Configuration and Power Interface)	• Allows the system to wake from a low power mode • Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system Supports ACPI 2.0 for full compatibility with 64-bit operating systems
Keyboard-less Operation	The system can be operated without a keyboard
SMBIOS	System Management BIOS 2.3.5, previously known as DMI BIOS, for system management information
Localized ROM Setup	Common BIOS image supports configuration (Setup) in 11 languages, with local keyboard mappings
Asset tag	Allows user or MIS to set unique tag string in ROM
Ownership tag	Allows user or MIS to set unique tag string in ROM
Memory Scrubbing	Allows memory controller to transparently correct transient ECC errors in the background
Memory Remapping	Allows system memory lost to PCI devices to be reclaimed above 4 GB, for use with operating systems that support more than 4 GB (Windows XP 64-bit edition, Linux)
Per-slot control	Allows individual slot configuration (option ROM., latency)
Adaptive cooling	Fan control parameters are set according to detected hardware configuration for optimal acoustics
Pre-boot diagnostics	Early (pre-video) critical errors are reported via beeps and blinks on the power LED

Other deployment & management features	
HP Client Management Solutions	HP Client Management Solutions help simplify management of Workstations and significantly reduce total ownership costs. These solutions share a common design and are highly integrated due to the extensive work between HP and its partner Altiris. HP Client Manager Software is included free with all HP business PCs and Workstations. It enables central tracking, monitoring, and management of the hardware aspects of HP client systems: ● Get valuable hardware information such as CPU, memory, video, and security settings ● Monitor system health to fix problems before they occur ● Install drivers and BIOS updates without visiting each PC ● Remotely configure BIOS and security settings ● Automate processes to quickly resolve hardware problems Additional Altiris solutions (fee-based) are available to address Workstation management challenges through the entire IT lifecycle including: ● Inventory assessment ● Software license compliance ● Personality migration ● Software image deployment ● Software distribution ● Asset management ● Client backup and recovery ● Problem resolution Visit http://www.hp.com/go/easydeploy for more information, to download HP Client Manager Software, and to evaluate the Altiris solutions.
System Software Manager (free)	A free utility that detects and updates BIOS, device drivers, and management agent versions on your networked PCs and workstations
Altiris Local Recovery	Provides data and system file protection for HP business PCs to enable fast recovery of information that is accidentally deleted or if the system becomes corrupted. Designed for disconnected or seldom-connected users, Local Recovery protects your HP computer's data and system state by taking scheduled snapshots, which are then stored in a protected area on the local hard disk. System backup and disaster recovery is now simple and fast for all users, regardless of connectivity
Replicated Setup	Saves BIOS settings to diskette or USB disk-on-key in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering ROM-based F10 setup
Software Restore CD	Restores computer to its original factory shipping image
Asset Tag	● Repository for storing company-specific property asset numbers for easy tracking ● Initially set equal to the system serial number ● Stored in a protected section of non-volatile memory that can be accessed and modified with the F10 Setup program
DIMM Serial Presence Detect	Detects whether or not memory DIMMs are present and their type
Hard drive serial number, model, and manufacturer	Hard drive manufacturer, model, and serial number is stored in the hard drive firmware and reported in ROM-based F10 setup
Memory Change Alert (Requires HP Client Manager Software)	Alerts management console if memory is removed or changed
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen
Ultra ATA Integrity Monitoring (CRC Checking)	A feature of SATA and SCSI, Cyclic Redundancy Checking provides data transfer verification and proactive notification of hard drive data transmission problems with recommendations for enhancing system performance. It detects all the following errors' types: ● single bit errors ● double bit errors ● an odd number of errors ● error bursts up to 32-bits long
Drive Self Tests (DPS)	● Drive Protection System (Adaptec and LSI SCSI controllers do not offer DPS) ● A diagnostic hard drive self test. It scans critical physical components and every sector of the hard drive for physical faults and then reports any faults to the user. Running independently of the operating system, it can be accessed through the computer's setup procedure. It

	produces an evaluation on whether the hard drive is the source of the problem and needs to be replaced. The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures. DPS Access through F10 Setup during Boot (F10 diagnostic access not available with SCSI drives)
SMART Technology (Self-Monitoring, Analysis and Reporting Technology)	Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count. By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure. SMART I – Drive Failure Prediction SMART II – Off-Line Data Collection SMART III – Off-Line Read Scanning with Defect Reallocation

Security Features	
Access panel key lock (standard)	Prevents removal of the access panel and all internal components including optical and floppy drives
Padlock (optional)	Prevents entire system theft and discourages access panel removal. 7mm diameter padlock loop at rear of system.
Kensington Cable Lock (optional)	Prevents entire system theft only. 3mm x 7mm slot at rear of system.
Universal chassis clamp lock (optional)	The version without a cable discourages access panel removal and prevents theft of IO devices. The version with a cable additionally prevents entire system theft and allows multiple systems to be secured with a single cable.

Serviceability Features of System	
Access panel	Tool-less, one-handed
Optical drives	Tool-less
Floppy drive	Tool-less
Hard drives	Tool-less
Expansion cards	Tool-less
Green user touch points	Yes, on tool-free internal chassis mechanisms
Color-coordinated cables and connectors	Yes
Memory	Tool-less, can be upgraded without removing any internal components
CPUs	Tool-less, can be upgraded without removing any internal components
Chassis fan removal	Tool-less
Power supply diagnostic LED	Yes, dual function: AC OK & power OK
Power Button	Yes, ACPI multi-function
Power LED	Yes, dual color LED indicates normal operation and faults.
Hard drive activity LED	Yes
Internal speaker	Yes, used for pre-boot diagnostic beep codes
Dual Color Power and HD LED on Front of Computer (Indicates Normal Operations and Fault Conditions)	green – normal red – fault
System/Emergency ROM Flash Recovery with Video	Recovers corrupted system BIOS.
Configuration Record SW	Yes
Over-Temp Warning on Screen (Requires IM Agents)	Yes
OS CD (Restore OS CD)	Restores computer to its original factory shipping image
Restore CD	Restores the computer to its original factory shipping image
Flash ROM	Yes
3.3V Aux Power LED on System PCA	Yes
Dual Function 5V Aux Power LED (ON)/PS_ON LED (OFF) on System PCA	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder for easy Replacement	Yes
Processor ZIF Socket for easy Upgrade	Yes
DIMM Connectors for easy Upgrade	Yes
NIC LEDs (integrated) (Green & Amber)	Used to determine NIC status
ASF 1.0 support (Alert Standard Format)	Industry-standard specification for network alerting in operating system-absent environments
Dual function front power switch	Causes a fail-safe power off when held for 4 seconds

Service and Support	On-site Warranty and Service (Note 1): This three-year, limited warranty and service offering delivers three years of on-site, next business-day (Note 2) service for parts and labor and includes free telephone support (Note 3) 24 x 7. Global coverage (Note 2) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.
	NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply.
	NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.
	NOTE 3: Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24 x 7 support may not be available in some countries.

Technical Specifications - Audio

AC97 Integrated ADI 1981B Audio	**Type**	Integrated
	AC '97 Stereo Codec	Yes
	FM Synthesis Support	Yes – Yamaha XG Lite
	OPL3 FM Synthesis Support	Yes
	Sound Blaster Compatibility	Yes
	SPDIF 6-channel pass-through	Yes
	Audio Jacks	Microphone-In (20-K ohm Input Impedance); rear stereo and front analog microphone ports Line-In (12-K ohm Input Impedance) Line-Out * (less than 800 ohms Output Impedance, expects at least a 10-K ohm load) Headphone-Out (2.5 Ohms Output Impedance, expects at least a 32 ohm load)
	NOTE: *Internal Speaker Amplifier is for Internal Speaker only. External Speakers need to be powered externally.	
	Sampling	7 kHz – 48 kHz
	Wavetable Syntheses (software)	Yes – GM and FM Midi Support, Direct Music and Down Loadable Soundset (4 Meg DLS Level 1 and 2 Support)
	3D Positional Sound	No
	Digital Audio	Yes
	Analog Audio	Yes
	Number of Channels on Line-Out (mono/stereo)	Stereo (Left & Right channels)
	Internal Audio Speaker Power Rating	3W
	Internal Speaker	Yes
	Hardware Equalizer for Internal Speaker	Fixed 7 Band ParametricEQ
	External Speaker Jack (Line-Out)	Yes

Technical Specifications - Communications

Integrated Intel Pro/1000MT Lan-on-Motherboard	**Connector**	RJ-45
	Controller	Intel 82540EM Gigabit Controller
	Memory	Integrated 96Kb frame buffer memory
	Data rates supported	10/100/1000 Mbps
	Compliance	IEEE 802.1A, 802.1P, 802.1P, 802.1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	Bus architecture	PCI 2.2
	Data transfer mode	Bus-master DMA
	Hardware certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
	Power requirement	1.48 watts @ +3.3V AUX supply with 5V tolerance
	Boot ROM support	Yes
	Network transfer rate	10BASE-T (half-duplex) 10 Mbps
		10BASE-T (full-duplex) 20 Mbps
		100BASE-TX (half-duplex) 100 Mbps
		100BASE-TX (full-duplex) 200 Mbps
		1000BASE-T, 1000 Mbps
	Operating system driver support	Microsoft Windows NT 4.0, Microsoft Windows 98, Microsoft Windows 2000, Microsoft Windows XP, Linux 2.2, Linux 2.4
	Management capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Intel PROset II utility

HP Gigabit by Broadcom (BCM5782) **NIC**	**Connector**	RJ-45	
	Controller	Broadcom 5782 PCI LAN Controller	
	Memory	Integrated 96Kb frame buffer memory	
	Data rates supported	10/100/1000 Mbps	
	Compliance	IEEE 802.1A, 802.1P, 802.1P, 802.1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control	
	Bus architecture	PCI 2.2	
	Data path width	32-bit, 33/66 MHz bus interface	
	Data transfer mode	Bus-master DMA	
	Hardware certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union	
	Power requirement	1.48 watts @ +3.3V AUX supply with 5V tolerance	
	Boot ROM support	Yes	
	Network transfer rate	10BASE-T (half-duplex) 10 Mbps	
		10BASE-T (full-duplex) 20 Mbps	
		100BASE-TX (half-duplex) 100 Mbps	
		100BASE-TX (full-duplex) 200 Mbps	
		1000BASE-T, 1000 Mbps	
	Environmental	**Operating temperature**	32° to 131° F (0° to 55° C)
		Operating humidity	85% at 131° F (55° C)
	Dimensions	4.7 x 2.0 x 0.08 in (12 x 5 x 1.9 cm)	
	Operating system driver support	Microsoft Windows NT 4.0, Microsoft Windows 98, Microsoft Windows 2000, Microsoft Windows XP, Linux 2.2, Linux 2.4	
	Management capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility	
	Alerting	ASF 1.0	
	Kit contents	Broadcom 5782, CD, Broadcom Gigabit Ethernet for HP, drivers, quick install guide, product warranty statement	

Technical Specifications - Communications

Broadcom BCM5751 NetXtreme Gigabit Ethernet Controller (PCI-E)	**Connector**	RJ-45	
	Controller	Broadcom 5751 PCI-E 1.0a LAN Controller	
	Memory	Integrated 96Kb frame buffer memory	
	Data rates supported	10/100/1000 Mbps	
	Compliance	IEEE 802.3, 802.3AB and 802.3u compliant, 802.3x flow control	
	Bus architecture	PCI-E 1.0a	
	Data path width	X1	
	Data path speed	2.5Gbit per sec per direction transfer rate	
	Data transfer mode	Bus-master DMA	
	Hardware certifications	FCC class B, NRTL Mark Canada and United States, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia	
	Power requirement	3.1 watts @ +3.3V AUX supply	
	Boot ROM support	Yes	
	Network transfer rate	10BASE-T (half-duplex) 10 Mbps	
		10BASE-T (full-duplex) 20 Mbps	
		100BASE-TX (half-duplex) 100 Mbps	
		100BASE-TX (full-duplex) 200 Mbps	
		1000BASE-T, 1000 Mbps	
	Environmental	**Operating temperature**	32° to 131° F (0° to 55° C)
		Operating humidity	85% at 131° F (55° C)
	Dimensions	4.4 x 2.2 x 0.08 in (11.2 x 5.5 x .2 cm)	
	Operating system driver support	Microsoft Windows 2000 and XP, Red Hat Linux 7.2, 7.3 and Red Hat Enterprise Linux 3	
	Management capabilities	WOL, PXE , Remote cable management	
	Alerting	ASF 2.0	
	Kit contents	Broadcom 5751, CD, Broadcom NetXtreme Gigabit Ethernet PCI NIC, drivers, quick install guide, product warranty statement	

Intel Pro 1000 MT Gigabit NIC	**Connector**	RJ-45
	Controller	Intel 82540EM Gigabit Controller
	Memory	Integrated 96Kb frame buffer memory
	Data rates supported	10/100/1000 Mbps
	Compliance	IEEE 802.1A, 802.1P, 802.1P, 802.1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	Bus architecture	PCI 2.2
	Data path width	32-bit, 33/66 MHz bus interface
	Data transfer mode	Bus-master DMA
	Hardware certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
	Power requirement	1.48 watts @ +3.3V AUX supply with 5V tolerance
	Boot ROM support	Yes
	Network transfer rate	10BASE-T (half-duplex) 10 Mbps
		10BASE-T (full-duplex) 20 Mbps
		100BASE-TX (half-duplex) 100 Mbps
		100BASE-TX (full-duplex) 200 Mbps
		1000BASE-T, 1000 Mbps
	Environmental	**Operating temperature** 32° to 131° F (0° to 55° C)
		Operating humidity 85% at 131° F (55° C)
	Dimensions	6.4 x 4.8 x 0.8 in (16.3 x 12.1 x 1.9 cm)
	Operating system driver support	Microsoft Windows NT 4.0, Microsoft Windows 98, Microsoft Windows 2000, Microsoft Windows XP, Linux 2.2, Linux 2.4
	Management capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Intel PROset II utility
	Kit contents	The Intel Pro 1000 MT NIC, CD containing Intel PROset II NIC drivers, quick install guide, product warranty statement

Technical Specifications - Controllers

LSI Logic LSI20320 Ultra320 SCSI single channel host adapter	Bus architecture	PCI-X (backward compatible with PCI)
	Number of supported devices	Up to 15 SCSI devices
	Interface protocol	64 bit, 133MHz PCI-X
	Host bus transfer rate	Up to 1MB/s
	SCSI data transfer rate	Up to 320MB/s per channel
	SCSI Bus	Wide Ultra320, Low Voltage Differential, and Ultra Wide Single-Ended
	Internal connector	68-pin HD
	External connector	68 pin
	Total connectors	2
	Plug and Play Support	No
	Dimensions (H x L)	6.6 x 2.5 in (16.9 x 6.4 cm)
	Approvals	CE, VCCI, Canada, C-Tick, FCC class B, UL 94VO
	Operating system support	Microsoft® Windows® XP
	Kit contents	Controller card, driver CD, LED cables, user documentation and warranty card.

Adaptec SCSI RAID 2120S Card	Dimensions (H x D)	2.5 x 6.6 in (6.4 x 16.8 cm) Low profile card
	RAID level	0, 1, 10, 5, 50, JBOD
	Data Transfer Rate	Up to 320 MB/s
	Cache Memory	64 MB (onboard)
	Device Support	Up to 15 SCSI devices
	Bus Type	64-bit/66 MHz PCI (Also support 32-bit/33 MHz PCI)
	Internal Connectors	One 68-pin high-density
	External Connectors	One 68-pin VHDCI
	System Requirements	Intel PC or equivalent with available PCI slot
	Operating Temperature	32° to 131° F (0° to 55° C)
	Power Requirements	4 amps @ +5V
	Operating System Support	Windows® 2000 Professional, Windows XP Professional
	Other	Optimized disk utilization Online RAID Level Migration Online capacity expansion Immediate RAID availability (background initialization) S.M.A.R.T. support
	Kit Contents	Controller card, driver CD, LED cables, user documentation and warranty card.

Serial ATA Hard Drives (7200 rpm)	**40 GB**	**Capacity**	40,020,664,320 bytes	
		Height	1 in (2.6 cm)	
		Width	Media diameter: 3.5 in (8.9.x cm) Physical size: 4 in (10.2 cm)	
		Interface	Serial ATA	
		Synchronous Transfer Rate (Maximum)	150 MB/s	
		Buffer	2 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.0 ms
			Average	8.5 ms
			Full-Stroke	18.0 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	78,165,360	
		Operating Temperature	32° to 140° F (0° to 60° C)	
	80 GB	**Capacity**	80,026,361,856 bytes	
		Height	1 in (2.6 cm)	
		Width	Media diameter: 3.5 in (8.9.x cm) Physical size: 4 in (10.2 cm)	
		Interface	Serial ATA	
		Synchronous Transfer Rate (Maximum)	150 MB/s	
		Buffer	8 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.0 ms
			Average	8.5 ms
			Full-Stroke	18 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	156,301,488	
		Operating Temperature	32° to 140° F (0° to 60° C)	
	160 GB	**Capacity**	160,041,885,696 bytes	
		Height	1 in (2.6 cm)	
		Width	Media diameter: 3.5 in (8.9.x cm) Physical size: 4 in (10.2 cm)	
		Interface	Serial ATA	
		Synchronous Transfer Rate (Maximum)	150 MB/s	
		Buffer	8 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.0 ms
			Average	8.5 ms
			Full-Stroke	18 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	312,581,808	
		Operating Temperature	32° to 140° F (0° to 60° C)	

	250 GB	**Capacity**	250,059,350,016 bytes	
		Height	1 in (2.6 cm)	
		Width	Media diameter: 3.5 in (8.9 cm) Physical size: 4 in (10.2 cm)	
		Interface	Serial ATA	
		Synchronous Transfer Rate (Maximum)	150 MB/s	
		Buffer	8 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.8 ms
			Average	<9.0 ms
			Full-Stroke	≤17 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	488,397,168	
		Operating Temperature	41° to 131°F (5° to 55°C)	
	400 GB	**Capacity**	400,088,457,216 bytes	
		Height	1 in (2.6 cm)	
		Width	Media diameter: 3.5 in (8.9.x cm) Physical size: 4 in (10.2 cm)	
		Interface	Serial ATA	
		Synchronous Transfer Rate (Maximum)	150 MB/s	
		Buffer	8 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.8 ms
			Average	<11.0 ms
			Full-Stroke	≤15 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	781,422,768	
		Operating Temperature	41° to 131°F (5° to 55°C)	
SATA Hard Drives (10,000 rpm)	**74 GB**	**Capacity**	74,355,769,344 bytes	
		Height	1.0 in (2.54 mm)	
		Width	Media diameter: 3.3 in (84mm) Physical size: 4 in (10.2 cm)	
		Interface	Serial ATA	
		Synchronous Transfer Rate (Maximum)	150 MB/s	
		Buffer	8 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 ms
			Average	4.5 ms
			Full-Stroke	10.2 ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	145,226,112	
		Operating Temperature	41° to 140° F (5 to 60° C)	

Technical Specifications - Hard Drives

Ultra320 SCSI Hard Drives (10,000 rpm)	**73 GB**	**Capacity**	73,407,865,856 bytes	
		Height	1.0 in (2.54 cm)	
		Width	3.5 in (8.9 cm)	
		Interface	68 pin LVD SCSI	
		Synchronous Transfer Rate (Maximum)	320 MB/s	
		Buffer	8 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 msec
			Average	<4.5 msec
			Full-Stroke	<11.0 msec
		Rotational Speed	10,000 rpm	
		Logical Blocks	143,374,738	
		Operating Temperature	40° to 130° F (5° to 55° C)	
	146 GB	**Capacity**	146,815,737,856 bytes	
		Height	1.0 in (2.54 cm)	
		Width	3.5 in (8.9 cm)	
		Interface	68 pin LVD SCSI	
		Synchronous Transfer Rate (Maximum)	320 MB/s	
		Buffer	8 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 msec
			Average	<4.5 msec
			Full-Stroke	<11.0 msec
		Rotational Speed	10,000 rpm	
		Logical Blocks	286,749,488	
		Operating Temperature	40° to 130° F (5° to 55° C)	
	300 GB	**Capacity**	300,000,000,000 bytes	
		Height	1.0 in (2.54 cm)	
		Width	3.5 in (8.9 cm)	
		Interface	68 pin LVD SCSI	
		Synchronous Transfer Rate (Maximum)	320 MB/s	
		Buffer	8 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 msec
			Average	<4.5 msec
			Full-Stroke	<11.0 msec
		Rotational Speed	10,000 rpm	
		Logical Blocks	585,937,500	
		Operating Temperature	40° to 130° F (5° to 55° C)	

Technical Specifications - Hard Drives

Ultra320 SCSI Hard Drives (15,000 rpm)	**36 GB**	**Capacity**	36,420,075,520 bytes	
		Height	1.0 in (2.54 cm)	
		Width	3.5 in (8.9 cm)	
		Interface	68 pin LVD SCSI	
		Synchronous Transfer Rate (Maximum)	320 MB/s	
		Buffer	8 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 msec
			Average	<4.5 msec
			Full-Stroke	<11.0 msec
		Rotational Speed	15,000 rpm	
		Logical Blocks	71,132,960	
		Operating Temperature	40° to 130°F (5° to 55°C)	
	73 GB	**Capacity**	73,407,865,856 bytes	
		Height	1.0 in (2.54 cm)	
		Width	3.5 in (8.9 cm)	
		Interface	68 pin LVD SCSI	
		Synchronous Transfer Rate (Maximum)	320 MB/s	
		Buffer	8 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 msec
			Average	<4.5 msec
			Full-Stroke	<11.0 msec
		Rotational Speed	15,000 rpm	
		Logical Blocks	143,374,738	
		Operating Temperature	40° to 130°F (5° to 55° C)	
	146 GB	**Capacity**	146,815,737,856 bytes	
		Height	1.0 in (2.5 cm)	
		Width	3.5 in (8.9 cm)	
		Interface	68 pin LVD SCSI	
		Synchronous Transfer Rate (Maximum)	320 MB/s	
		Buffer	8 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 msec
			Average	<4.5 msec
			Full-Stroke	<11.0 msec
		Rotational Speed	15,000 rpm	
		Logical Blocks	143,374,738	
		Operating Temperature	40° to 130°F (5° to 55°C)	

Technical Specifications - Removable Storage

USB Disk on Key	**Dimensions** (HxWxD)	0.9 x 0.7 x 3.9 in (2.3 x 1.8 x 9.8 cm)
	Weight	0.05 lb (0.02 kg)
	USB Specification	2.0
	Transfer Rate	Read-1023 KB/Sec; Write-850 KB/Sec
	Storage Media	Solid state flash memory, no moving parts
	Power Supply	USB Bus-powered, no external power required
	Capacity	256 MB

PS/2 OR USB '04 Standard Keyboard	Physical characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
		Dimensions (L x W x H)	18.0 x 6.4 x 0.98 in (45.8 x 16.3 x 2.5 cm)
		Weight	2 lb (0.9 kg) minimum
	Electrical	Operating voltage	+ 5VDC ± 5%
		Power consumption	50-mA maximum (with three LEDs ON)
		ESD	CE level 4, 15-kV air discharge
		EMI - RFI	Conforms to FCC rules for a Class B computing device
		MicrosoftPC 99 - 2001	Functionally compliant
	Mechanical	Languages	38 available
		Keycaps	Low-profile design
		Switch actuation	55-g nominal peak force with tactile feedback
		Switch life	20 million keystrokes (using Hasco modified tester)
		Switch type	Contamination-resistant switch membrane
		Key-leveling mechanisms	For all double-wide and greater-length keys
		Cable length	6 ft (1.8 m)
		Microsoft PC 99 - 2001	Mechanically compliant
		Acoustics	43-dBA maximum sound pressure level
	Environmental	Operating temperature	50° to 122° F (10° to 50° C)
		Non-operating temperature	-22° to 140° F (-30° to 60° C)
		Operating humidity	10% to 90% (non-condensing at ambient)
		Non-operating humidity	20% to 80% (non-condensing at ambient)
		Operating shock	40 g, six surfaces
		Non-operating shock	80 g, six surfaces
		Operating vibration	2-g peak acceleration
		Non-operating vibration	4-g peak acceleration
		Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
		Drop (in box)	42 in (107 cm) on concrete, 16-drop sequence
	Operating system support	Windows 2000 and Windows XP	
	Approvals	UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC	
	Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	
	Kit contents	Keyboard, keyboard software media, installation guide, warranty card, safety and comfort	

USB Modular Keyboard	Physical characteristics	Keys	104, 105, 106, 107, 109 layout (depending upon country)
		Dimensions (L x W x H)	18.59 x 6.73 x 0.90 in (472 x 170 x 23 mm) with numeric pad attached
		Weight	2 lb (0.9 kg) minimum
	Electrical	Operating voltage	+ 5VDC ±5%
		Power consumption	50-mA maximum (with three LEDs ON)
		System interface	USB Type A plug connector
		ESD	CE level 4, 15-kV air discharge
		EMI - RFI	Conforms to FCC rules for a Class B computing device
		MicrosoftPC 99 - 2001	Functionally compliant
	Mechanical	Languages	38 available
		Keycaps	Low-profile design
		Switch actuation	55-g nominal peak force with tactile feedback
		Switch life	20 million keystrokes (using Hasco modified tester)
		Switch type	Contamination-resistant switch membrane
		Key-leveling mechanisms	For all double-wide and greater-length keys
		Cable length	6 ft (1.8 m)
		Microsoft PC 99 - 2001	Mechanically compliant
		Acoustics	43-dBA maximum sound pressure level
	Environmental	Operating temperature	50° to 122°F (10° to 50°C)
		Non-operating temperature	-22° to 140°F (-30° to 60°C)
		Operating humidity	10% to 90% (non-condensing at ambient)
		Non-operating humidity	20% to 80% (non-condensing at ambient)
		Operating shock	40 g, six surfaces
		Non-operating shock	80 g, six surfaces
		Operating vibration	2-g peak acceleration
		Non-operating vibration	4-g peak acceleration
		Drop (out of box)	26 in (66 cm) on carpet, six-drop sequence
		Drop (in box)	442 in (107 cm) on concrete, 16-drop sequence
	Operating system support	Windows 2000 and Windows XP	
	Approvals	UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC, USB-IF	
	Ergonomic compliance	ANSI HFS 100, ISO 9241-4, and TUVGS	
	Kit contents	Keyboard, numerical keypad, USB cable, I/O Security Software & Documentation CD including Modular Access Keyboard software & installation guide, warranty card, safety and comfort guide	

Technical Specifications - Input/Output Devices

2-Button Scroll Mouse (PS/2)	**Scroll Wheel**	8 mm	
	Maximum Rotation Speed	30 mm/s	
	Switch Type	Light force micro-switch	
	Switch Life	1 million operations	
	Mechanical Life	Minimum 200,000 revolutions	
	Environmental	**Operating Temperature**	50° to 122° F (10° to 50° C)
		Non-operating Temperature	-22° to 140° F (-30° to 60° C)
		Operating Humidity	10% to 90% (non condensing at ambient)
		Non-operating Humidity	20% to 80% (non condensing at ambient)
		Operating Shock	40 g, 6 surfaces
		Non-operating Shock	80 g, 6 surfaces
		Operating Vibration	2 g peak acceleration
		Non-operating Vibration	4 g peak acceleration
	Mechanical	**Resolution**	400 ± 20% DPI
		Tracking Speed	10 in/s maximum
		Acceleration	100 in/s
		Switch Actuation	85 g nominal peak force
		Switch Life	1,000,000 operations (using Hasco modified tester)
		Cable Length	2 m
		PC98-99	Mechanically compliant
	Regulatory Approvals	UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BCIQ, C-Tick	
HP Optical Scroll Mouse (USB)	**Dimensions** (H x L x W)	1.5 x 4.5 x 2.5 in (3.8 x 11.6 x 6.3 cm)	
	Weight	0.27 lb (0.12 kg)	
	Cable length	72.8 in (185 cm)	
	System requirements	Microsoft Windows 95, 98, 2000, Me, and XP	
HP 3-Button Mouse (PS/2)	**Dimensions/Weight**	**Height**	1.42 in (3.6 cm)
		Length	4.17 in (10.7 cm)
		Width	2.87 in (7.4 cm)
		Weight	5.20 oz (150 g)
	Environmental	**Operating temperature**	32° to 104° F (0° to 40° C)
		Non-operating temperature	-4° to 140° F (-20° to 60° C)
		Operating humidity	10% to 90% (non condensing at ambient)
	Mechanical	**Resolution**	400 20% DPI
		Tracking speed	10 in/s Maximum
		Switch life	1,000,000 operations (using Hasco modified tester)
		Switch type	Micro-switches
		Tracking mechanism life	155 miles (250 km) at average speed of 10 in/s
		Cable length	6 ft (1.8 m)
		PC98-99	Mechanically compliant

Spaceball 5000 (USB)	**Physical characteristics**	**Dimensions** (H x W x D)	3.0 x 6.0 x 8.4 in (7.6 x 15.2 x 21.3 cm)
		Ball Diameter	2.2 in (5.6 cm)
		Weight	2.1 lb (9.94 kg)
		Features	Six degrees of freedom motion control through the X, Y, Z axis (pitch, roll, yaw) Certified for leading CAD and DCC applications
	Environmental	**Operating temperature**	50° to 104° F (10° to 40° C)
		Non-operating temperature	43° to 140° F (6° to 60° C)
		Operating humidity	8% to 80% (non-condensing at ambient)
		Non-operating humidity	5% to 80% (non-condensing at ambient)
	Mechanical	**Buttons**	12 programmable (unshifted)
		Ball Force Range	0.5 - 8.2N/1.8 - 29.5 oz
		Ball Torque Range	0.085 – 0.33 oz-in. (6.91 Nmm)
		Resolution	10 bits
	Serial Specifications	**Connector**	USB 1.1 or greater
		Cable Length	12.8 ft. (3.9 m)
		Data Rate	USB model – 16 msec
		Flow Control	Xon/Xoff (on PS/2 model only)
	Software Drivers Available	**USB model**	Microsoft Windows XP
	System Requirements	**Disk Space**	10 MB free disk space
	Regulatory Approvals	UL, cUL, EN 950, EN 60950, CSA, FCC, CE Mark, TUV, CISPR 22, EN 50082, IEC 1000 4-2, IEC 1000-4-3, AS/NZS, VCCI, BSMI, C-Tick	

HP SpaceMouse Plus USB	**Physical characteristics**	**Dimensions** (H x W x D)	7.4 x 4.72 x 1.73 in (18.8 x 12.0 x 4.4 cm)
		Cap Diameter	2 x 6.5 x 6.6 mm
		Weight	1.5 lb (0.68 kg)
		Features	Six degrees of freedom motion control through the X, Y, Z axis (pitch, roll, yaw) Certified for leading CAD and DCC applications
	Environmental	**Operating temperature**	41° to 140° F (5° to 60° C)
		Non-operating temperature	-13° to 158° F (-25° to 70° C)
		Operating humidity	10 to 98 % RH (non-condensing)
		Non-operating humidity	10 to 98 % RH (non-condensing)
	Mechanical	**Buttons**	11 programmable (unshifted)
		Cap Force Range	0.2 N – 4.5 N
		Cap Torque Range	4 Nmm to 100 Nmm
		Resolution	8 bit
	USB Specifications	**Connector**	USB 1.1 or greater
		Cable Length	2 m
		Data Rate	16 msec
	Software Drivers Available	Microsoft Windows XP	
	System Requirements	**Disk Space**	10 MB free disk space
	Regulatory Approvals	UL, cUL, EN 950, EN 60950, CSA, FCC, CE Mark, TUV, CISPR 22, EN 50082, IEC 1000 4-2, IEC 1000-4-3, AS/NZS, VCCI, BSMI, C-Tick	

Technical Specifications - Optical Devices

48X CD-ROM Drive	Capacity	700 MB CD disc	
	Dimensions (HxWxD)	1.63 x 5.83 x 7.27 in (4.13 x 14.6 x 18.5 cm)	
	Weight	1.76 lb (0.8 kg)	
	Interface	ATAPI/EIDE	
	Mounting Orientation	Horizontal or vertical	
	Data Transfer Rates - Read	Digital audio extraction (minimum) – 1,200 KB/s (8X) CD read – up to 7,200 KB/s (48X)	
	Media and Formats - Read	Formats: CD-DA, CD-ROM (Mode 1 and 2), CD-XA Ready, Photo CD (Single and Multi-session), Mixed Mode (Audio and Data combined), CD-I (FMV), CD Plus, CD-Extra; Media: stamped, CD-R, CD-RW	
	Data Transfer Modes	PIO Mode 4 (16.6 MB/s); Multi-word DMA mode 2 (16.6 MB/s); UltraDMA Mode 0 (16.7 MB/s); UltraDMA Mode 2 (33.3 MB/s)	
	Access Times (typical)	Random	< 75 ms @ 48x
		Full-Stroke	< 150 ms
	Start-up Time (typical)	< 7 s (single session)	< 30 s (multisession)
	Stop Time (typical)	< 4 s	
	Read Buffer size	128 KB (minimum)	
	Audio Output	Line-Out	0.7 VRMS
		Signal-to-Noise Ratio	80 dB
		Channel Separation	65 dB
	Configuration Jumper Block	Master, slave, and cable select modes	
	Operating Conditions	Temperature	41° to 122° F (5° to 50° C)
		Humidity	10% to 80%
	Approvals/ Environmental	UL 1950 (US and Canada), CSA, SEMKO, TUV; CE, FDA, FCC, IC, C-TICK	
	Operating Systems Supported	Microsoft Windows 2000 and Microsoft Windows XP	
	Supplied Software	None	

16X/40X DVD-ROM Drive with +R Read Support	**Height**	5.25-in, half-height, tray load	
	Interface Type	ATAPI/EIDE	
	Dimensions (W x H x D)	5.88 x 1.71 x 7.87 [max] in (149.5 x 43.25 x 200.0 [max] mm) (external, excluding bezel)	
	Disc Formats	DVD-ROM (single and dual layer); DVD-video; DVD-R version 1.0 and 2.0; DVD-RW version 1.0 and 1.1; DVD-R multi-border; DVD+RW; DVD+R ; CD-ROM Mode 1 and 2; CD-DA; CD-ROM XA Mode 2, Form 1 and 2; CD-extra; CD-text; CD-I Mode 2, Form 1 and 2; CD-I ready; video CD, CD-bridge; PhotoCD (single and multi-session); CD-R; CD-RW	
	Disc Capacity	**DVD-ROM**	4.7 GB (DVD-5), 8.54 GB (DVD-9), 9.4 GB (DVD-10), 3.95 GB (DVD-R version 1.0), 4.7 GB (DVD-R version 2.0), 4.7 GB (DVD-RW version 1.0 and 1.1), 4.7 GB (DVD+RW), 4.7G (DVD+R)
		CD-ROM	540 MB (Mode 1, 12 cm), 640 MB (Mode 2, 12 cm), 700 MB (80 minimum CD-R and CD-RW), 180 MB (8 cm)
	Access Times (typical reads, including settling)	**DVD-ROM Single Layer**	120 ms
		CD-ROM Mode 1	90 ms
		Full Stroke DVD	240 ms (seek)
		Full Stroke CD	160 ms (seek)
		Startup Time	< 10 seconds (typical)
		Stop Time	< 4 seconds
		Data Transfer Modes	PIO Mode 4 (16.6 MB/s); Multi-word DMA mode 2 (16.6 MB/s); UltraDMA Mode 3 (44.4 MB/s)
	Maximum Data Transfer Rates	**CD-ROM Read**	6000 KB/s (40X) Max
		DVD-ROM Read	21,600 KB/s (16X) Max
		Digital Audio Extraction	6000 KB/s (40X) Max
	Power	**Source**	Four-pin, DC power receptacle
		DC Power Requirement	5 VDC ± 5% – 100 mV ripple p-p
			12 VDC ± 5% – 200 mV ripple p-p
		DC Current	5 VDC – <800 mA typical, < 1000 mA maximum
			12 VDC – < 870 mA typical, <1800 mA maximum
	Audio Output	**Line-Out**	0.7 VRMS
		Signal-to-Noise Ratio	85 dB
		Channel Separation	65 dB
	Configuration Jumper Block	Master, slave, and cable select modes	
	Data Interface Connector	40-pin, shrouded and keyed, flat ribbon	
	Operating Environmental (all conditions non-condensing)	**Temperature** (operating)	41° to 122° F (5° to 50° C)
		Relative Humidity (operating)	10% to 85%
		Maximum Wet Bulb Temperature (operating)	86° F (30° C)
	Certifications, Approvals	MMC II support, multi-read certification, Microsoft WHQL certification, ACA AS/NZS 3548 class B, CNS 13438, C.I.S.P.R. Pub 22, TUV or VDE EN60950, EN 55022, EN55024, EMKO EN60950, EN 60825-1, UL 60950, CSA C22.2 60950-2000, CFR 21 part 1040 class 1, CFR 47 C.I.S.P.R. Pub 22 Class B, DHHS/FDA, ANSI C63.4-1992	
	Operating Systems Supported	Microsoft Windows 2000, Windows XP Professional	
	Kit Contents	16X/40X DVD-ROM Drive, InterVideo WinDVD MPEG Movie Playback software, audio cable, and installation guide.	

HP 48X CD-RW	**Height**	5.25-inch, half-height, tray-load	
	Mounting Orientation	Horizontal or vertical	
	Interface	ATAPI/EIDE	
	Dimensions (HxWxD)	1.63 x 5.75 x 7.27 [max] in (4.13 x 14.6 x 18.5 [max] cm) (external, excluding bezel)	
	Weight (max)	2.0 lb (0.9 kg)	
	Read Only Disc Parameters	**Data Transfer Rates – Read**	Digital audio extraction (minimum) – 1,800 KB/s (12X) CD read – up to 7,200 KB/s (48X)
		Media and Formats – Read	**Formats:** CD-DA, CD-ROM (Mode 1 and 2), CD-ROM XA (Mode 2, Form 1 and 2), Mixed Mode, CD-Plus, CD-Extra, CD-I FMV, Video CD, CD-Text, Photo CD (single and multisession) **Media:** stamped, CD-R, CD-RW
	Writeable Disc Parameters	**Data Transfer Rates – Write**	CD-R write – 2100 KB/s (14X) to 7200 KB/s (40X) CD-RW write – 600 KB/s (4X) CD-RW write (high speed) – 1500 KB/s (10X) to 1800 KB/s (12X) CD-RW write (ultra high speed) – 2400 KB/s (16X) to 4800 KB/s (32X)
		Media and Formats – Write	**Formats:** CD-DA, CD-ROM (Mode 1 and 2), CD-ROM XA (Mode 2, Form 1 and 2), Mixed Mode, CD-Plus, CD-Extra, CD-I FMV, Video CD, CD-Text **Media:** CD-R, CD-RW (including ultra-speed)
		Write Methods	Disc-at-once, session-at-once,, track-at-once, incremental fixed and variable packet, multisession
	Access Times (typical reads, including settling)	**CD-ROM Mode 1**	125 ms
		Full Stroke CD	210 ms (seek)
		Start-up Time (typical)	<7 s (single session), <30 s (multisession)
		Stop Time (typical)	<4 s
		Write Buffer Size	2 MB
		Data Transfer Modes	PIO Mode 4 (16.6 MB/s); Multi-word DMA mode 2 (16.6 MB/s); UltraDMA Mode 2 (33.3 MB/s)
	Power	**Source**	Four-pin, DC power receptacle
		DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
		DC Current	5 VDC (< 1000 mA typical, < 1600 mA maximum) 12 VDC (< 600 mA typical, < 1400 mA maximum)
		Total Drive Power (standby mode)	< 2.5 Watt
	Audio Output	**Line-Out**	0.7 VRMS
		Signal-to-Noise Ratio	74 dB
		Channel Separation	65 dB
	Configuration Jumper Block	Master, slave, and cable select modes	
	Operating Conditions	**Temperature**	41° to 122° F (5° to 50° C)
		Humidity	10% to 90%10% to 90%

Approvals/ Environmental	MPC-3 compliant, multi-read requirements, ATA Spec X3T9.2, ATAPI Spec SFF-8020, ANSI C63.4-1992, UL 1950, ACA AS/NZS 3548, CB Bulletin No. 96A, CSA C22.2 No. 950-1995, CFR 47 C.I.S.P.R. Pub 22 Class B, DHHS/FDA, EMKO-TSE 07/94, TUV EN60950, EN60825-1, MIC, BSMI-CNS 13438, CE, Microsoft PC2001 certification, Microsoft Logo for Windows XP and 2000.	
Operating Systems Supported	Microsoft Windows 2000, Windows XP Professional	
Supplied software	Roxio Easy CD & DVD Creator: Create or copy CDs and DVDs, including music and data CDs, and data DVDs	
	Dantz Retrospect Express: Back up systems to CD, DVD, or tape media.	

48X Combo CD-RW/DVD-ROM	**Height**	5.25-inch, half-height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	ATAPI/EIDE	
	Dimensions (W x H x D)	5.77 x 1.71 x 7.87 [max] in (14.66 x 4.34 x 20.0 [max] cm) (external, excluding bezel)	
	Weight (max)	2.6 lb (1.2 kg)	
	Read Only Disc Parameters	**Formats and Modes Supported**	CD-ROM-Mode 1; CD-ROM XA-Mode 2 (forms 1 and 2); CD-Bridge; CD digital audio; CD Extra; CD-I-Mode 2 (forms 1 and 2) and CD-I-Ready; Photo CD (single and multi-session); video CD; DVD (single- and double-layer); DVD-R; DVD-RW; DVD-RW Multi-Border; DVD+R; DVD+R Multisession , and DVD+RW
		Capacity	180 MB (mode 2, 8 cm); 540 MB (mode 1, 12 cm); 650 MB (mode 2, 12 cm); 700 MB (Mode 2, 12 cm); 4.7 GB (DVD-5); 8.54 GB (DVD-9); 9.4 GB (DVD-10)
		CD-ROM, CD-R, CD-RW read	7200 KB/s (48X) Max
		DVD ROM read	21,632 KB/s (16X) Max
	Writeable Disc Parameters	**Disc Type**	CD-R and CD-RW
		Write Methods	Disc at Once, Track at Once, Session at Once, Variable Packet, Fixed Packet
		Format and Modes Supported	CD-ROM (mode 1); CD-ROM XA (mode 2, forms 1 and 2); CD digital audio, CD-I (mode 2, forms 1 and 2); video CD; CD-Bridge; Video CD
		Capacity	180 MB (mode 2, 8 cm); 540 MB (mode 1, 12 cm); 650 MB (mode 2, 12 cm); 700 MB (mode 2, 12 cm)
		CD-R write	7200 KB/s (48X) Max
		CD-RW write	4800 KB/s (32X) Max
	Access Times (typical reads, including settling)	**Random DVD**	< 140 ms (typical)
		Random CD	< 125 ms, (typical)
		Full Stroke DVD	< 250 ms (seek)
		Full Stroke CD	< 210 ms (seek)
		Startup Time (single)	< 7 seconds (typical)
		Startup Time (multi-session)	< 30 seconds (typical)
		Stop Time	< 4 seconds
		Cache Buffer	2 MB (minimum)
		Data Transfer Modes	ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s); ATA UltraDMA Mode 3 44 Mbytes/s (default)

Power	**Source**	Four-pin, DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
	DC Current	5 VDC (< 1000 mA typical, < 1600 mA maximum) 12 VDC (< 600 mA typical, < 1400 mA maximum)
	Total Drive Power (standby mode)	< 2.5 Watt
Audio Output	**Line-Out**	0.7 VRMS
	Signal-to-Noise Ratio	74 dB
	Channel Separation	65 dB
Configuration Jumper Block	Master, slave, and cable select modes	
Data Interface Connector	40-pin, shrouded and keyed, flat ribbon	
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative humidity	10% to 90%
	Maximum wet bulb temperature	86° F (30° C)
Certifications, Requirements	MPC-3 compliant, multi-read requirements, ATA Spec X3T9.2, ATAPI Spec SFF-8020, ANSI C63.4-1992, UL 1950, ACA AS/NZS 3548, CB Bulletin No. 96A, CSA C22.2 No. 950-1995, CFR 47 C.I.S.P.R. Pub 22 Class B, DHHS/FDA, EMKO-TSE 07/94, TUV EN60950, EN60825-1, MIC, BSMI-CNS 13438, CE, Microsoft PC2001 certification, Microsoft Logo for Windows XP and 2000.	
Operating Systems Supported	Microsoft Windows 2000, Windows XP Professional	
Option Kit Contents	48X Combo CD-RW/DVD-ROM Drive, Roxio Easy CD & DVD Creator, InterVideo WinDVD MPEG Movie Playback software, Dantz Retrospect Express Backup software, audio cable, and installation guide.	

Technical Specifications - Optical Devices

16X DVD+/-RW, Dual-Layer (Win and RHWS3)	**Height**	5.25-inch, half-height, tray-load	
	Orientation	Either horizontal or vertical	
	Interface Type	ATAPI/EIDE	
	Disc Recording Capacity	4.7 GB (single-layer), 8.5 GB (double-layer)	
	Dimensions (W x H x D)	5.9 x 1.7 x 7.9 in (15.0 x 4.4 x 20.0 cm)	
	Weight (maximum)	2.6 lb (1.2 kg)	
	Recording Method	Disc-at-once, Track-at-once, and Session-at-once; Variable Packet and Fixed Packet	
	Write Support	DVD+R (1.3), DVD+R DL (1.0), DVD+RW (1.2), DVD-R (2.0), DVD-RW (1.1), CD-R (OBII Vol2.0 Rev 1.2), CD-RW (LS, HS, US)	
	Read Support	DVD-ROM (single- and dual-layer), DVD-Video, DVD+R (include multisession), DVD+RW, DVD-R (incl. multiborder), DVD-RW, DVD-MRW; CD-ROM Mode 1, CD-ROM XA (Mode 2, forms 1 and 2), CD-TEXT, Photo CD single- and multi-session), CD-DA (Audio CD), CD-Extra, CD-R, CD-RW (supports AM2), VCD, CD-I, UDF (1.02 and 1.50), CD-MRW	
	Write Speed (maximum)	**DVD+R**	16X CAV (21,600 KB/s), 8x ZCLV (10,800 KB/s), 2.4-8x CLV (3250-10,800 KB/s)
		DVD+RW	2.4-4X CLV (3250-5400 KB/s)
		DVD-R	2-4X CLV (2700-5400 KB/s), 8X ZCLV (10,800 KB/s)
		DVD-RW	2-4X CLV (2700-5400 KB/s)
		CD-R	16-40X CAV (2400-6000 KB/s)
		CD-RW (US)	4-24X CLV (600-3600 KB/s)
	Read Speed (maximum)	**DVD-ROM**	5-16X CAV (6750 - 21,600 KB/s)
		DVD+R, DVD+RW, DVD-R, DVD-RW	4-8X CAV (5400 - 10,800 KB/s)
		CD-ROM, CD-R, CD-RW, CD-Audio	16-40X CAV (2400 to 6000 KB/s)

Access Time (typical reads, including settling)	**Random DVD**	< 130 ms (typical)
	Random CD	< 120 ms, (typical)
	Full Stroke DVD	< 240 ms (seek)
	Full Stroke CD	< 200 ms (seek)
	Startup Time (single)	< 7 seconds (typical)
	Startup Time (multi-session)	< 30 seconds (typical)
	Stop Timex	< 4 seconds
	Cache Buffer	2 MB (minimum)
	Data Transfer Modes	ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s); ATA UltraDMA Mode 3 (44.4 MB/s) (default on most HP xw workstations)
Power	**Source**	Four-pin, DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p
		12 VDC ± 10%-200 mV ripple p-p
	DC Current	5 VDC (< 2000 mA typical, < 2500 mA maximum)
		12 VDC (< 700 mA typical, < 2000 mA maximum)
	Total Drive Power (standby mode)	< 2.5 Watt
Audio Output	**Line-Out**	0.7 VRMS
	Signal-to-Noise Ratio	74 dB
	Channel Separation	65 dB
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative humidity	10% to 90%
	Maximum wet bulb temperature	86° F (30° C)
System Configuration	Intel Pentium IV Processor or later with 128 MB of memory (required); 256 MB recommended 2-D or 3-D graphics cards on primary disk drive for operating system and application software; second disk drive for audio and video data	
Operating Systems Support	Windows XP Professional and Linux. (Red Hat Linux 7.2, 7.3, 8, 9.0 may require additional third party software to make full use of this device)	
Regulatory Approvals	MPC-3 and MMC-4 compliant, multi-read certified, ATA Spec X3T9.2, ATAPI Spec T13.1153D, ANSI C63.4-1992, UL 60950, ACA AS/NZS 3548, CB Bulletin No. 96A, CSA C22.2 No. 60950, CFR 47 C.I.S.P.R. Pub 22 Class B, DHHS/FDA, EMKO-TSE 07/94, TUV EN60950, EN60825-1, MIC Class B, BSMI-CNS 13438, CE EN60950, EN55022:1998 and EN55024, Microsoft Logo for Windows XP, relevant parts of IEC 61000-4.	
Option Kit contents	16X DVD±R/±RW Drive, InterVideo WinDVD, InterVideo WinDVD Creator, Roxio Easy Media Creator, Dantz Retrospect Express Backup Software, installation guide, and DVD+R media. **NOTE:** This DVD writer kit does not include any software for burning DVDs on Linux. DVD burning is supported with the 'growisofs' command. CD burning is supported with the 'cdrecord' command. Red Hat Enterprise Linux WS 3 distribution includes both 'cdrecord' and 'growisofs'. Red Hat Linux 7.2, 7.3, 8, 9.0 distributions only include 'cdrecord'. Therefore DVD burning is only supported on WS 3.	

Technical Specifications - Optical Devices

16X DVD+/-RW LightScribe drive	**Height**	5.25-inch, half-height, tray-load	
	Orientation	Either horizontal or vertical	
	Interface Type	ATAPI/EIDE	
	Disc Recording Capacity	8.5 GB DL or 4.7 GB standard	
	Dimensions (W x H x D)	5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm)	
	Weight (maximum)	2.6 lb (1.2 kg)	
	Write Speed (maximum)	DVD+R	Up to16X
		DVD+RW	Up to 4X
		DVD+R DL	Up to 2.4X
		DVD-R	Up to 8X
		DVD-RW	Up to 4X
		CD-R	Up to 40X
		CD-RW	Up to 24X
	Read Speed (maximum)	DVD+R/-R/+RW/ -RW/+R DL	Up to 8X
		DVD-ROM	Up to 16X
		CD-ROM, CD-R	Up to 40X
		CD-RW	Up to 32X

Access Time (typical reads, including settling)	**Random**	DVD: < 130 ms (typical), CD: < 120 ms (typical)
	Full Stroke	DVD: < 240 ms (seek), CD: < 200 ms (seek)
	Startup Time	Single-session: < 15 seconds (typical), Multi-session: < 30 seconds (typical)
	Stop Time	< 4 seconds
	Cache Buffer	2 MB (minimum)
	Data Transfer Modes	ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s); ATA UltraDMA Mode 3 (44.4 MB/s - default)
Power	**Source**	Four-pin, DC power receptacle
	DC Power Requirement	5 VDC ± 5%-100 mV ripple p-p
		12 VDC ± 10%-200 mV ripple p-p
	DC Current	5 VDC (< 2000 mA typical, < 2500 mA maximum)
		12 VDC (< 700 mA typical, < 2000 mA maximum)
	Total Drive Power (standby mode)	< 2.5 Watt
Audio Output	**Line-Out**	0.7 VRMS
	Signal-to-Noise Ratio	74 dB
	Channel Separation	65 dB
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative humidity	10% to 90%
	Maximum wet bulb temperature	86° F (30° C)
System Configuration	Intel® Pentium® III Processor or later with 128 MB of memory (required); 256 MB recommended 2-D or 3-D graphics cards on primary disk drive for operating system and application software; second disk drive for audio and video data	
Operating Systems Support	Microsoft Windows 2000, Windows XP Professional, Windows XP Home	
Regulatory Approvals	MPC-3 compliant, multi-read requirements, ATA Spec X3T9.2, ATAPI Spec T13.1153D, ANSI C63.4-1992, UL 1950, ACA AS/NZS 3548, CB Bulletin No. 96A, CSA C22.2 No. 950-1995, CFR 47 C.I.S.P.R. Pub 22 Class B, DHHS/FDA, EMKO-TSE 07/94, TUV EN60950, EN60825-1, MIC, BSMI-CNS 13438, CE, Microsoft PC2001 certification, Microsoft Logo for Windows XP and 2000.	
Option Kit contents	16X DVD+/-RW LightScribe drive, LightScribe software, InterVideo WinDVD, InterVideo WinDVD Creator, Roxio Easy Media Creator 7, Dantz Retrospect Express Backup Software, installation guide, and DVD+R media.	

Technical Specifications - Graphics

NVIDIA Quadro NVS 280 (PCI)	**Form Factor**	ATX
	Graphic Controller	Integrated Quadro 280 2-D graphics processor unit (GPU)
	VGA controller	Integrated into the Quadro GPU
	Bus type	PCI
	RAMDAC	Dual 350 MHz
	Memory	64 MB DDR with frame buffer and Texture storage
	Connector	Single High-density Flex Connector
	Dimensions	Low-profile, 2.586 x 6.6 in (6.57 x 16.76 cm)
	Controller clock speed	275 MHz
	Color planes	32-bit color buffer
	Overlay planes	1 16-bit Video overlay plane
	Maximum vertical refresh rate	120 Hz
	Maximum pixel clock	350 MHz
	Multi-monitor support	Dual analog or digital monitors
	Single DVI Support	Yes
	Dual DVI Support	Yes
	High-definition Video Processor (HDVP)	Full-screen, full-frame video playback of HDTV and DVD content
		DVD-ready motion compensation for MPEG-2
		Independent hardware color controls for video overlay
		Hardware color-space conversion (YUV 4:2:2 and 4:2:0)
		IDCT motion compensation
		5-tap horizontal by 3-tap vertical filtering
		8:1 up/down scaling
	Available graphics drivers	Microsoft Windows 2000 and Microsoft Windows XP (Provides full native Dual View mode, Span or Big Desktop mode, and Clone mode)
		Red Hat Linux
		HP qualified drivers may be preloaded or available from the HP support web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum resolution	2048 x 1536 Analog
		1600 x 1200 Digital

NVIDIA Quadro NVS 280 Graphics Card (PCI-Express)	**Form Factor**	ATX	
	Graphics Controller	Integrated Quadro 280 2-D graphics processor unit (GPU)	
	VGA controller	Integrated into the Quadro GPU	
	Bus Type	PCI-Express x16 or PCI	
	RAMDAC	Dual 350 MHz integrated	
	Memory	64 MB 000 MHz DDR SDRAM unified frame buffer, Z-buffer and Texture storage	
	Connectors	Single High-density Flex Connector	
	Multi-monitor support	Dual integrated analog display controllers supporting up to two analog displays at 1920 x1200 @ 85Hz or two digital displays at 1600x1200 @ 60Hz	
	Additional product features	**Controller clock speed**	250 MHz
		Color planes	32-bit color buffer
		Overlay planes	1 16-bit Video overlay plane
		Maximum vertical refresh rate	120 Hz
		Maximum pixel clock	350 MHz
		Single DVI Support	Yes
		Dual DVI Support	Yes
		High-definition Video Processor (HDVP)	Full-screen, full-frame video playback of HDTV and DVD content
			DVD-ready motion compensation for MPEG-2
			Independent hardware color controls for video overlay
			Hardware color-space conversion (YUV 4:2:2 and 4:2:0)
			IDCT motion compensation
			5-tap horizontal by 3-tap vertical filtering
			8:1 up/down scaling
	PCI-Express	Supports X16 PCI-E	
	Available graphics drivers	Microsoft Windows® XP or Windows 2000 (Provides full native Dual View mode, Span or Big Desktop mode, and Clone mode)	
		HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.	
	Maximum resolution	2048 x 1536 Analog	
		1600 x 1200 Digital	

Technical Specifications - Graphics

NVIDIA Quadro FX 330 Graphics Card	Form Factor	ATX
	Graphics Controller	NVIDIA Nv37GL
	Bus Type	PCI-Express x16
	Memory	64 MB 000 MHz DDR SDRAM unified frame buffer, Z-buffer and Texture storage
	Connectors	DMS-59 output supporting up to two analog or digital (with optional cable) displays
	Multi-monitor support	Dual integrated analog display controllers supporting up to two analog displays at 2048 x1536 @ 60Hz or two digital displays at 1600x1200 @ 60Hz
	RAMDAC	Dual 350 MHz integrated
	Architecture features	64-bit memory interface 128-bit IEEE floating-point precision graphics pipeline 128-bit color precision 12-bit sub-pixel precision 4x FSAA at 1024x768 Hardware accelerated antialiased points and lines Hardware OpenGL overlay planes Hardware accelerated two-sided lighting Hardware accelerated clipping planes Hardware accelerated occlusion culling 3D volumetric texture support
	Shading architecture	Fully programmable GPU Optimized compilers for Cg, OpenGL shading language, and Microsoft HLSL
	Supported graphics APIs	OpenGL 1.5 DirectX 9.0
	Available graphics drivers	HP-tested: Microsoft Windows® XP, Windows 2000, and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	Dual DVI-I output with optional cable – drives dual digital displays at resolutions up to 1600x1200 @ 60Hz Internal 350MHz RAMDACs – drives dual analog displays up to 2048x1536 @ 60Hz each

ATI FireGL V3100 Graphics Card	Form Factor	ATX
	Graphics Controller	RV370
	Bus Type	PCI-Express x16
	Memory	128MB 200MHz DDR unified frame buffer, Z-buffer and Texture storage
	Connectors	1 DVI-I analog/digital and 1 VGA analog monitor output
	Multi-monitor support	Dual integrated display controllers supporting up to 2048x1536 @ 85Hz on both displays
	RAMDAC	Dual 400 MHz integrated
	Architecture features	128-bit memory interface 128-bit IEEE floating-point precision 24-bits per RGBA color precision 4-bit sub-pixel precision 2 parallel geometry engines 4 parallel pixel pipelines 2x/4x/6x FSAA Hardware accelerated antialiased points and lines Hardware OpenGL overlay planes Hardware accelerated two-sided lighting Hardware accelerated clipping planes Hardware accelerated occlusion culling Hardware accelerated clip planes
	Shading architecture	Smartshader™ technology Programmable pixel and vertex shaders 16 textures per pass Pixel shaders up to 160 instructinos with 32-bit floating point precision for each RGBA component Multiple render target support Shadow volume rendering acceleration High precision 10-bit per channel frame buffer support
	Supported graphics APIs	OpenGL 1.5 DirectX 9.0
	Available graphics drivers	HP-tested: Microsoft Windows XP, Windows 2000, and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	DVI-I output – drives digital display at resolutions up to 1600x1200 Internal 400MHz RAMDACs – drives dual analog displays up to 2048x1536 @ 85Hz each

Technical Specifications - Graphics

NVIDIA Quadro FX 540 PCI-Express Graphics Card	Form Factor	ATX, 4.376" x 7.0" Single slot
	Graphics Controller	NVIDIA NV43GL
	Bus Type	PCI-Express x16, <75W power consumption
	RAMDAC	Dual 400 MHz integrated
	Memory	128 MB 275 MHz DDR SDRAM unified frame buffer, Z-buffer and Texture storage 8.8 GB/sec graphics memory bandwidth
	Connectors	DVI-I + VGA + 10-pin HDTV Out (HD cable purchased separately)
	Multi-monitor support	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 75Hz, one digital display at 1600x1200 @ 60Hz.
	Additional product features	128 KB BIOS 3.3V Flash ROM reprogrammable by SW Hardware accelerated Overlay Planes Hardware accelerated two-sided lighting Hardware accelerated antialiased points and lines 3D Volumetric Texture support Hardware accelerated Occlusion Culling Compliant with Microsoft/Intel PC2001 Workstation requirements Video Timings compliant with VESA DMT 1.0 and VESA GTF 1.0 specifications DDC2B+ Monitor support on all OS platforms ACPI Version 1.0b Power Management support (all modes)
	Shading architecture	Fully programmable GPU (OpenGL1.5/DirectX 9.0c class) Long fragment programs (up to 65,536 instructions) Long vertex programs (up to 65,536 instructions) Looping and subroutines (up to 256 loops per vertex program) Dynamic flow control Conditional execution Optimized compilers for Cg, OpenGL shading language, and Microsoft HLSL
	Supported graphics APIs	OpenGL 1.5 ICD with immediate mode support for all OGL primitive types DirectX 9.0c
	Available graphics drivers	HP-tested: Microsoft Windows XP, Windows 2000, and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	DVI-I output - drives digital display at resolutions up to 1600x1200 @ 60Hz Internal 400MHz RAMDACs - drives dual analog displays up to 2048x1536 @ 75Hz each

Technical Specifications - Graphics

NVIDIA Quadro FX 1300 Graphics Card	Form Factor	ATX
	Graphics Controller	NVIDIA NV38GL
	Bus Type	PCI-Express x16
	Memory	128 MB 275 MHz DDR SDRAM unified frame buffer, Z-buffer and Texture storage
	Connectors	2 DVI-I analog/digital monitor outputs, 1 3-pin Mini DIN stereo output
	Multi-monitor support	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 60Hz on both displays or dual digital displays at 1600x1200 @ 60Hz NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft Windows
	RAMDAC	Dual 400 MHz integrated
	Architecture features	256-bit memory interface 128-bit IEEE floating-point precision graphics pipeline 128-bit color precision 12-bit sub-pixel precision 4x FSAA at 1280x1024 Hardware accelerated antialiased points and lines Hardware OpenGL overlay planes Hardware accelerated two-sided lighting Hardware accelerated clipping planes Hardware accelerated occlusion culling 3D volumetric texture support Quad-buffered stereo
	Shading architecture	Fully programmable GPU Optimized compilers for Cg, OpenGL shading language, and Microsoft HLSL
	Supported graphics APIs	OpenGL 1.5 DirectX 9.0
	Available graphics drivers	HP-tested: Microsoft Windows® XP, Windows 2000, and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	Dual DVI-I output – drives dual digital displays at resolutions up to 1600x1200 @ 60Hz Internal 400MHz RAMDACs – drives dual analog displays up to 2048x1536 @ 75Hz each

Technical Specifications - Graphics

NVIDIA Quadro FX 1400 PCI-Express Graphics Controller	Form Factor	ATX, 4.376" x 8.5" Single slot
	Graphics Controller	NVIDIA NV41GL
	Bus Type	PCI-Express x16, <75W power consumption
	RAMDAC	Dual 400 MHz integrated
	Memory	128 MB 300 MHz DDR SDRAM unified frame buffer, Z-buffer and Texture storage 19.2 GB/s graphics memory bandwidth
	Connectors	2 DVI-I analog/digital monitor outputs, 1 3-pin Mini DIN stereo output
	Multi-monitor support	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays.
	Additional product features	128 KB BIOS 3.3V Flash ROM reprogrammable by SW Hardware accelerated Overlay Planes Hardware accelerated two-sided lighting Hardware accelerated antialiased points and lines Quad-buffered Stereo 3D Volumetric Texture support Hardware accelerated Occlusion Culling Scalable Link Interface (SLI) technology Compliant with Microsoft/Intel PC2001 Workstation requirements Video Timings compliant with VESA DMT 1.0 and VESA GTF 1.0 specifications DDC2B+ Monitor support on all OS platforms ACPI Version 1.0b Power Management support (all modes)
	Shading architecture	Fully programmable GPU (OpenGL1.5/DirectX 9.0c class) Long fragment programs (up to 65,536 instructions) Long vertex programs (up to 65,536 instructions) Looping and subroutines (up to 256 loops per vertex program) Dynamic flow control Conditional execution Optimized compilers for Cg, OpenGL shading language, and Microsoft HLSL
	Supported graphics APIs	OpenGL 1.5 ICD with immediate mode support for all OGL primitive types DirectX 9.0c
	Available graphics drivers	HP-tested: Microsoft Windows XP, Windows 2000 and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	Dual DVI-I output – drives dual digital displays at resolutions up to 1900x1200 @ 60Hz Internal 400MHz RAMDACs – drives dual analog displays up to 2048x1536 @ 85Hz each

Technical Specifications - Graphics

ATI FireGL V5100 PCI-Express Graphics Controller	Form Factor	ATX
	Graphics Controller	RV423
	Bus Type	PCI-Express x16
	Memory	128 MB 350MHz DDR unified frame buffer, Z-buffer and Texture storage
	Connectors	2 DVI-I analog/digital monitor outputs, 1 3-pin Mini DIN stereo output
	Multi-monitor support	Dual integrated display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays.
	RAMDAC	Dual 400 MHz integrated
	Architecture features	256-bit memory interface 128-bit IEEE floating-point precision 24-bits per RGBA color precision 8-bit sub-pixel precision 6 parallel geometry engines 12 parallel pixel pipelines 2x/4x/6x FSAA Hardware accelerated antialiased points and lines Hardware OpenGL overlay planes Hardware accelerated two-sided lighting Hardware accelerated clipping planes Hardware accelerated occlusion culling Hardware accelerated clip planes Quad-buffered stereo
	Shading architecture	Smartshader™ technology Programmable pixel and vertex shaders 16 textures per pass Pixel shaders up to 160 instructions with 32-bit floating point precision for each RGBA component Multiple render target support Shadow volume rendering acceleration High precision 10-bit per channel frame buffer support
	Supported graphics APIs	OpenGL 1.5 DirectX 9.0
	Available graphics drivers	HP-tested: Microsoft Windows XP, Windows 2000, and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	DVI-I output – drives digital displays at resolutions up to 1600x1200 Internal 400MHz RAMDAC – drives dual analog displays up to 2048x1536 @ 85Hz each

NVIDIA Quadro FX 3400 Graphics Card	Form Factor	ATX
	Graphics Controller	NVIDIA NV45GL
	Bus Type	PCI-Express x16
	Memory	256 MB 450 MHz GDDR3 SDRAM unified frame buffer, Z-buffer and Texture storage
	Connectors	2 DVI-I (one dual-link/one single-link) analog/digital monitor outputs, 1 3-pin Mini DIN stereo output
	Multi-monitor support	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays or dual digital displays at 1600x1200 (single-link) and 3840x2400 (dual-link). NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft Windows
	RAMDAC	Dual 400 MHz integrated
	Architecture features	256-bit memory interface 128-bit IEEE floating-point precision graphics pipeline 128-bit color precision 12-bit sub-pixel precision 8x FSAA at 1920x1200, 4x at 2048x1536, rotated grid FSAA sampling algorithm Hardware accelerated antialiased points and lines Hardware OpenGL overlay planes Hardware accelerated two-sided lighting Hardware accelerated clipping planes 3rd generation occlusion culling 3D volumetric texture support Quad-buffered stereo Dual Link DVI enabling driving digital displays up to 3840x2400 (24Hz)
	Shading architecture	Fully programmable GPU Long fragment programs (up to 65,536 instructions) Long vertex programs (up to 65,536 instructions) Looping and subroutines (up to 256 loops per vertex program) Dynamic flow control Conditional execution
	Supported graphics APIs	OpenGL 1.5 DirectX 9.0
	Available graphics drivers	HP-tested: Microsoft Windows XP, Windows 2000, and Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/eng/software_drivers.html.
	Maximum Resolution	Dual DVI-I output – drives dual digital displays at resolutions up to 1600x1200 @ 60Hz (single-link) and 3840x2400 @ 24Hz (dual-link). Internal 400MHz RAMDACs – drives dual analog displays up to 2048x1536 @ 75Hz each

HP CRT Monitor p1230	Tube	Type	Diamondtron NF Aperture Grille CRT
		Tube Size (diagonal)	22 in (55 cm)
		Viewable Image Area (diagonal)	20 in (51 cm)
		Aperture Grille Pitch	0.24 mm
		Screen Curvature	Flat
	Signal Interface/ Performance	Horizontal Frequency	30 to 140 kHz
		Vertical Frequency	50 to 160 Hz
		Maximum Resolution	2048 x 1536 @ 85 Hz (GTF)
		Recommended Resolution	1600 x 1200 @ 85 Hz or 1280 x 1024 @ 85 Hz
		Preset VESA Graphic Modes (non-interlaced)	1920 x 1440 @ 60 Hz, 75 Hz 1792 x 1344 @ 60 Hz, 75 Hz 1600 x 1200 @ 75 Hz, 85 Hz 1280 x 1024 @ 60 Hz, 75 Hz, 85 1024 x 768 @ 75 Hz, 85 Hz 800 x 600 @ 75 Hz, 85 Hz 640 x 480 @ 60 Hz, 85 Hz
		Preset MAC Mode	1152 x 870 @ 75 Hz
		Preset VGA Mode	640 x 480 @ 60 Hz and 720 x 400 @ 70 Hz
		Maximum Pixel Clock Speed	420 MHz
		User Programmable Modes	15 (10 preset modes and 5 additional modes)
		Anti-Glare	Yes
		Anti-Static	Yes
		AssetControl	Yes
		Default Color Temperature	9300 K
	On Screen Display (OSD) Controls	Buttons or Switches	OSD menu, brigthness, contrast, Super Bright, dual input, power on/off
		Languages	English, Spanish, French, German, Italian, Japanese
		User Controls	Brightness, contrast, pincushion, pincushion balance, trapezoid, tilt (rotation), color temperature, degauss, parallelogram, individual color control, zoom, moiré cancellation, convergence, corner purity, image control, language, OSD control, factory reset
	Video Input	Plug and Play	Yes, DDC/CI compatible
		Input Signal	Two 15-pin D-sub connections
		Input Impedance	75 ohms
		Sync Input	Separate sync (HSYNC/VSYNC)
		Video Cable	Detachable 15-pin D-sub mini connector (included)
		Video Cable Length	70 in (1.8 m); non-captive
	Power	Power Supply	Universal 100-120/220-240 VAC
		Frequency	50/60 Hz
		Maximum	135 watts
		Power Saving	2 watts maximum
		Off Mode	0 watts
		Power Cable Length	70 in (1.8 m); non-captive

Mechanical	**Dimensions** (H x W x D)	Unpacked (including pedestal)	19.1 x 19.5 x 18.8 in (48.6 x 49.5 x 47.7 cm)
		Packaged	25.6 x 25.0 x 25.4 in (65.1 x 63.6 x 64.6 cm)
		Unpacked	66.1 lb (30 kg)
		Packaged	77.1 lb (35 kg)
	Tilt Range	10° upward and 5° downward	
	Swivel Range	90°either side of center	
Environmental	**Temperature - Operating**	41° to 90° F (5° to 35° C) non-condensing	
	Temperature - Non-operating	-4° to 140° F (-20 to 60° C)	
	Humidity - Operating	10% to 90% non-condensing	
	Humidity - Non-operating	10% to 90%	
	Altitude - Operating	0 to 7,200 ft (0 to 2,195 m)	
	Altitude - Non-operating	0 to 30,000 ft (0 to 9,144 m)	
Other	**Accessories Included**	Power cable, video cable (D-sub to D-sub), documentation kit	
	User Guide Languages	English, French, German, Spanish, Italian, Dutch, Brazilian Portuguese, Danish, Finnish, Greek, Japanese, Korean, Latin American Spanish, Norwegian, Polish, Russian, Slovenian, Turkish, Swedish, Traditional Chinese, Simplified Chinese	
	Warranty Languages	English, French, Spanish, Brazilian Portuguese, Danish, German, Castilian Spanish, French, Italian, Dutch, Norwegian, Finnish, Swedish, Bahasa Indonesian, Japanese, Korean, T. Chinese, S. Chinese	
	Color	Carbon and silver	
Certification and Compliance	MPR-II (Low Emissions), TCO '03, *Energy Star Compliant, UL Listing, ISO9241-3 VOT Guidelines Approval, FCC Approval, CE Mark (including PFC), GS Mark * Energy Star Compliant available summer of 2004.		
Service and Warranty	Limited three-year parts and repair labor, service provider labor, and on-site service. Next business day advanced exchange direct replacement service available during warranty period. Certain restrictions and exclusions apply.		

HP L1755 Flat Panel Monitor	**Panel**	**Type**	Active matrix, thin film transistor (TFT)
		Viewable Image Area (diagonal)	17 in (43.2 cm) maximum viewable
		Screen Opening (WxH)	13.4 x 10.7 in (33.9 x 27.2 cm)
		Viewing Angle (typical)	176 degrees horizontal/176 degrees vertical (10:1 minimum contrast ratio)
		Brightness (typical)	Up to 250 nits (cd/m^2)
		Contrast Ratio (typical)	Up to 1000:1 (typical)
		Response Rate (typical)	25 ms (typical rise + fall)
		Pixel Pitch	0.264 mm
		Color Depth Support	16.7 million colors
	Video/Other Inputs	**Plug and Play**	Yes (supports VESA DDC2B; PC2001 compliant)
		Self Powered USB 2.0 Hub	One upstream, four downstream ports (cable included)
		Input Signal	Two connectors: one 15-pin mini D-sub analog VGA; and one DVI-I (VGA analog or digital)
		Input Impedance	75 ohms ± 2%
		Sync Input	Separate sync (HSYNC/VSYNC); composite sync, Sync on Green (activated through on-screen display)
		Video Cable	VGA to VGA, DVI-D to DVI-D, and DVI-I to VGA
		Video Cable Length	78 in (2.0 m)
	Signal Interface/ Performance	**Horizontal Frequency**	30 to 82 kHz
		Vertical Frequency	56 to 75 Hz
		Native Resolution	1280 x 1024 @ 60 Hz analog
			1280 x 1024 @ 60 Hz digital
		Maximum Resolution (Analog)	1280 x 1024 @ 75 Hz analog
		Maximum Resolution (Digital)	1280 x 1024 @ 75 Hz digital
		Preset VESA Graphic Modes (non-interlaced)	640 x 480 @ 60 Hz, 72 Hz, 75 Hz 720 x 400 @ 70 Hz
			800 x 600 @ 60 Hz, 72 Hz, 75 Hz
			1024 x 768 @ 60 Hz, 70 Hz, 75 Hz
			1280 x 1024 @ 60 Hz, 75 Hz
		Preset MAC Mode	832 x 624 @ 75 Hz
			1152 x 870 @75 Hz
		Preset VGA Mode	640 x 480 @ 60 Hz, 72 Hz
		Preset SUN Mode	1152 x 900 @ 76 Hz
		Fail Safe Mode	Yes (limits out of range signal messages)
		Maximum Pixel Clock Speed	140 MHz
		User Programmable Modes	Yes, 15
		Anti-Glare	Yes
		Anti-Static	Yes
		AssetControl	Yes (accessible on HP Compaq Business Desktops featuring Intelligent Manageability)
		Default Color Temperature	Yes (6500k, 9300k, SRGB, Custom User)
	On Screen Display (OSD) **Controls**	**Buttons or Switches**	Power on/off; 3-button OSD; second level OSD buttons include dual-input switch, dedicated auto adjust switch

	Languages	English, Spanish, French, German, Italian, Japanese, Simplified Chinese	
	User Controls	Size and positioning, contrast, brightness, clock, clock phase, selectable color temperature, serial number, mode displayed, sleep timer, input selection, factory reset, individual color contrast, full-screen resolution	
Power	Power Supply	Auto-ranging, 90 to 265 VAC; internal power supply	
	Input Power	100 ~ 240 VAC	
	Nominal Current	1.5 A maximum	
	Frequency	50 ~ 60 Hz	
	Average	33 watts when displaying standard office software	
	Typical Power Consumption	< 40 watts	
	Maximum	< 60 watts	
	Power Saving	< 2 W	
	Off Mode	0 watts (when master power switch is in the off position)	
	Power Cable Length	70 in (1.8 m); non-captive	
Mechanical	Dimensions (H x W x D)	Unpacked with stand	16.1 (minimum) to 21.2 (maximum) x 14.4 x 8.3 in (40.9 (minimum) to 42.2 (maximum) x 36.5 x 21.1 cm)
		Base Area (Footprint D x W)	8.3 x 12.2 in (21.1 x 30.9 cm)
		Panel only (without stand) (H x W x D)	11.8 x 14.4 x 2.9 in (30.1 x 40.9 x 7.3 cm)
	Weight	Unpacked with stand	14.7 lb (6.7 kg)
		Unpacked without stand	8.1 lb (3.7 kg)
		Packaged	20.2 lb (9.2 kg)
	Bezel Width	13 mm left and right, 14 mm top, and 15 mm bottom	
	Tilt Range	-5° to +35°	
	Swivel Range	± 50° horizontal swivel	
	Height Adjustable	Yes (5.1 in/13 cm adjustment range)	
	Pivot Rotation	Yes, 90 °	
	Base	Ships detached and is removable after installation	
Environmental	Temperature – Operating	41° to 95° F (5° to 35° C)	
	Temperature – Non-operating	-4° to 140° F (-20° to 60° C)	
	Humidity – Operating	20% to 80%	
	Humidity – Non-operating	5% to 95%	
	Altitude – Operating	0 to 13,000 ft (0 to 4,000 m)	
	Altitude – Non-operating	0 to 40,000 ft (0 to 12,192 m)	
Options	HP Desktop Access Center – Part number: DK985A	Features integrated microphone/headset jacks, dual function headset for phone/PC support, a MultiBay slot for adding an optical drive (sold separately), and four USB ports for easy integration of third-party digital solutions. Sold separately. For more information, refer to the HP Desktop Access Center QuickSpec document.	
	HP Flat Panel Speaker Bar – Part number: PF804AA	Powered directly by the monitor, seamlessly attaches to the monitor's bezel to bring full multimedia support to select HP flat panel monitors. Features dual speakers with full sound range and external jack for headphones. Sold	

		separately. For more information, refer to the HP Flat Panel Speaker Bar QuickSpec document.
	HP Compaq 7000 Series Ultra-slim Desktop Integrated Work Center Stand – Part number: DL641B	Allows mounting of a 15-, 17- or 19-inch HP flat panel monitor and an HP Compaq dc7100 Ultra-slim Desktop PC on a single stand for the convenience of an "all-in-one" form factor. Sold separately. For more information, refer to this product's QuickSpec document
Other	Accessories Included	VGA to VGA cable, DVI-D to DVI-D cable, DVI-I to VGA cable, USB cable, user CD-ROM with Pivot Pro software
	Software	Pivot Pro software from Portrait Displays, Inc. interacts with your PC's native graphics driver to enable seamless portrait screen redraws with a simple mouse-click or keyboard command. Pivot Pro supports 90-degree portrait and landscape views. Language support is available in English, Japanese, French, German, Spanish, Italian, and Traditional and Simplified Chinese.
	Software	HP Display LiteSaver feature lets you schedule Sleep mode at preset times to help protect the display against image retention, drastically lower power consumption and energy costs, and extend the lifespan of the monitor.
	User Guide Languages	English, Latin America Spanish, Brazilian Portuguese, Danish, Dutch, Finnish, French, German, Italian, Norwegian, Swedish, Greek, Polish, Russian, Slovenian, Turkish, Simplified Chinese, Traditional Chinese, Korean, and Japanese
	Warranty Languages	English, Canadian French, Latin America Spanish, Brazilian Portuguese, Danish, Dutch, Finnish, French, German, Italian, Norwegian, Spanish, Swedish, Bahasa Indonesian, Simplified Chinese, Traditional Chinese, and Korean
	Color	Carbonite, two-tone carbonite and silver (EMEA only)
	VESA Mounting	Yes (swing arm/wall mount not included); base must be removed for mounting options)
	VESA External Mounting	Yes (standard 4 hole pattern, 100 mm)
	Kensington Lock-ready	Yes
Certification and Compliance	Australian ACA Approval, Canadian Requirements/CSA, CE Marking, China CCC Approval, CISPR Requirements, Eastern European Approvals, Energy Star Compliant, FCC Approval, German Ergonomic (TUV and GS Mark), ISO 13406-2 Compliant (Pixel Defect Guidelines), Mexican NOM Approval, MPR-II Compliant, PC2001 Compliant, PC99 Certified, S. Korean MIC Approval, Taiwan BSMI Approval, TCO 99 or 03 depending on region (emissions, ergonomics, environment), TUV-Ergo, UL Listed, VCCI Approvals, Microsoft Windows Certification	
Compatibility	VESA Video Signal Standard (VSIS) Compliant video cards have been tested and proven compatible for use with the HP L1755 Flat Panel Monitor. Recommended for use with HP products.	
Service and Warranty	Limited three-year parts and repair labor, service provider labor, and on-site service. Next business day advanced exchange direct replacement service available during warranty period. Certain restrictions and exclusions apply. For details, contact HP Customer Support.	

HP L1955 Flat Panel Monitor	**Panel**	**Type**	Active matrix, thin film transistor (TFT)
		Viewable Image Area (diagonal)	19 in (48.25 cm) maximum viewable
		Screen Opening (WxH)	14.9 x 12.0 in (38.0 x 30.5 cm)
		Viewing Angle (typical)	176 degrees horizontal/176 degrees vertical (10:1 minimum contrast ratio)
		Brightness (typical)	Up to 250 nits (cd/m^2)
		Contrast Ratio (typical)	Up to 1000:1 (typical)
		Response Rate (typical)	<16 ms (typical rise + fall)
		Pixel Pitch	0.294 mm
		Color Depth Support	16.7 million colors
	Video/Other Inputs	**Plug and Play**	Yes (supports VESA DDC2B; PC2001 compliant)
		Self Powered USB 2.0 Hub	One upstream, four downstream ports (cable included)
		Input Signal	Two connectors: one 15-pin mini D-sub analog VGA; and one DVI-I (VGA analog or digital)
		Input Impedance	75 ohms ± 2%
		Sync Input	Separate sync (HSYNC/VSYNC); composite sync, Sync on Green (activated through on-screen display)
		Video Cable	VGA to VGA, DVI-D to DVI-D, and DVI-I to VGA
		Video Cable Length	78 in (2.0 m)
	Signal Interface/ Performance	**Horizontal Frequency**	30 to 82 kHz
		Vertical Frequency	56 to 75 Hz
		Native Resolution	1280 x 1024 @ 75 Hz analog
			1280 x 1024 @ 60 Hz digital
		Maximum Resolution (Analog)	1280 x 1024 @ 75 Hz analog
		Maximum Resolution (Digital)	1280 x 1024 @ 75 Hz digital
		Preset VESA Graphic Modes (non-interlaced)	640 x 480 @ 60 Hz, 72 Hz, 75 Hz 720 x 400 @ 70 Hz
			800 x 600 @ 60 Hz, 72 Hz, 75 Hz
			1024 x 768 @ 60 Hz, 70 Hz, 75 Hz
			1280 x 1024 @ 60 Hz, 75 Hz
		Preset MAC Mode	832 x 624 @ 75 Hz
			1152 x 870 @75 Hz
		Preset VGA Mode	640 x 480 @ 60 Hz, 72 Hz
		Preset SUN Mode	1152 x 900 @ 76 Hz
		Fail Safe Mode	Yes (limits out of range signal messages)
		Maximum Pixel Clock Speed	140 MHz
		User Programmable Modes	Yes, 15
		Anti-Glare	Yes
		Anti-Static	Yes
		AssetControl	Yes (accessible on HP Compaq Business Desktops featuring Intelligent Manageability)
		Default Color Temperature	Yes (6500k, 9300k, SRGB, Custom User)
	On Screen Display (OSD) **Controls**	**Buttons or Switches**	Power on/off; 3-button OSD; second level OSD buttons include dual-input switch, dedicated auto adjust switch

	Languages	English, Spanish, French, German, Italian, Japanese, Simplified Chinese	
	User Controls	Size and Positioning	
		Contrast	
		Brightness	
		Clock, Clock Phase	
		Selectable Color Temperature	
		Serial Number	
		Mode Displayed	
		Sleep Timer	
		Input Selection	
		Factory Reset	
		Individual Color Contrast	
		Full-screen Resolution	
Power	**Power Supply**	Auto-ranging, 90 to 265 VAC; internal power supply	
	Input Power	100 ~ 240 VAC	
	Nominal Current	1.5 A maximum	
	Frequency	50 ~ 60 Hz	
	Average	33 watts when displaying standard office software	
	Typical Power Consumption	< 40 watts	
	Maximum	< 60 watts	
	Power Saving	< 2 watts	
	Off Mode	0 watts (when master power switch is in the off position)	
	Power Cable Length	70 in (1.8 m); non-captive	
Mechanical	**Dimensions** (H x W x D)	**Unpacked with stand**	16.8 (minimum) to 22.3 (maximum) x 15.9 x 8.3 in (42.7 (minimum) to 56.6 (maximum) x 40.4 x 21.1 cm)
		Base Area (Footprint D x W)	8.3 x 12.2 in (21.1 x 30.9 cm)
		Panel only (without stand) (H x W x D)	13.2 x 15.9 x 3.1 in (33.5 x 40.4 x 7.9 cm)
	Weight	**Unpacked with stand**	16.5 lb (7.5 kg)
		Unpacked without stand	10.5 lb (4.75 kg)
		Packaged	23.5 lb (10.7 kg)
	Bezel Width	13 mm left and right, 14 mm top, and 15 mm bottom	
	Tilt Range	-5° to +35°	
	Swivel Range	± 50° horizontal swivel	
	Height Adjustable	Yes (5.1 in/13 cm adjustment range)	
	Pivot Rotation	Yes, 90 °	
	Base	Ships detached and is removable after installation	
Environmental	**Temperature – Operating**	41° to 95° F (5° to 35° C)	
	Temperature – Non-operating	-4° to 140° F (-20° to 60° C)	
	Humidity – Operating	20% to 80%	
	Humidity – Non-operating	5% to 95%	
	Altitude – Operating	0 to 13,000 ft (0 to 4,000 m)	

		Altitude – Non-operating	0 to 40,000 ft (0 to 12,192 m)
	Options	**Desktop Access Center**	Features integrated microphone/headset jacks, dual function headset for phone/PC support, a MultiBay slot for adding an optical drive (sold separately), and four USB ports for easy integration of third-party digital solutions. Sold separately; part number DK985A. For more information, refer to the HP Desktop Access Center QuickSpecs.
		HP Flat Panel Speaker Bar	Powered directly by the monitor, seamlessly attaches to the monitor's bezel to bring full multimedia support to select HP flat panel monitors. Features dual speakers with full sound range and external jack for headphones. Sold separately, part number PF804AA. For more information, refer to the HP Flat Panel Speaker Bar QuickSpecs.
	Other	**Accessories Included**	VGA to VGA cable, DVI-D to DVI-D cable, DVI-I to VGA cable, USB cable, user CD-ROM with Pivot Pro software
		Software	Pivot Pro software from Portrait Displays, Inc. interacts with your PC's native graphics driver to enable seamless portrait screen redraws with a simple mouse-click or keyboard command. Pivot Pro supports 90-degree portrait and landscape views. Language support is available in English, Japanese, French, German, Spanish, Italian, and Traditional and Simplified Chinese.
		Software	HP Display LiteSaver feature lets you schedule Sleep mode at preset times to help protect the display against image retention, drastically lower power consumption and energy costs, and extend the lifespan of the monitor.
		User Guide Languages	English
		Warranty Languages	English
		Color	Carbonite, two-tone carbonite and silver (EMEA only)
		VESA Mounting	Yes (swing arm/wall mount not included); base must be removed for mounting options)
		VESA External Mounting	Yes (standard 4 hole pattern, 100 mm)
		Kensington Lock-ready	Yes
	Certification and Compliance	Australian ACA Approval, Canadian Requirements/CSA, CE Marking, China CCIB/CCEE Approval, CISPR Requirements, Eastern European Approvals, Energy Star Compliant, FCC Approval, German Ergonomic (TUV and GS Mark), ISO 13406-2 Compliant (Pixel Defect Guidelines), Mexican NOM Approval, MPR-II Compliant, PC2001 Compliant, PC99 Certified, S. Korean MIC Approval, Taiwan BSMI Approval, TCO 99 or 03 depending on region (emissions, ergonomics, environment), TUV-Ergo, UL Listed, VCCI Approvals, Microsoft® Windows® Certification	
	Compatibility	VESA Video Signal Standard (VSIS) Compliant video cards have been tested and proven compatible for use with the HP L1955 Flat Panel Monitor. Recommended for use with HP products.	
	Service and Warranty	Limited three-year parts and repair labor, service provider labor, and on-site service. Next Business Day advanced exchange direct replacement service available during warranty period. Certain restrictions and exclusions apply. For details, contact HP Customer Support.	
HP Flat Panel Monitor L2035	**Panel**	**Type**	20-inch Active Matrix TFT (thin film transistor)
		Viewable Image Area (diagonal)	20.1 in (51 cm)
		Screen Opening (W x H)	16.2 x 12.17 in (41.1 x 30.9 cm)
		Viewing Angle (typical)*	Up to 170° H/170° V (10:1 minimum contrast ratio)
		Brightness (typical*	Up to 250 nits (cd/m^2)

	Contrast Ratio (typical)*	Up to 400:1
	Response Rate (typical)*	16 ms (typical, rise + fall)
	Pixel Pitch	0.255 mm
	Color Depth Support	16.7 million colors
	*All specifications are provided by the component manufacturers. Performance specifications represent the highest specification of all HP's component manufacturers' typical level specifications for performance. Actual performance may vary either higher or lower.	
On Screen Display (OSD) **Controls**	**Buttons or Switches**	PiP (Picture in Picture), Input select, auto adjust, OSD up, OSD down, OSD menu select, power
	Languages	English, French, German, Spanish, Italian
	User Controls	Brightness, contrast, positioning, color temperature, individual color control, serial number display, full screen resolutions, clock, clock phase, video picture-in-picture (size and position), input selection (includes separate direct access key for dedicated swap between inputs 1 and 2), factory reset
Signal Interface/ Performance	**Horizontal Frequency**	30 to 94 kHz (VGA input); 30 to 92 KHz (DVI input) (for modes with pixel clock less than 157 MHz)
	Vertical Frequency	48 to 85 Hz (VGA input); 30 to 92 KHz (DVI input) (for modes with pixel clock less than 157 MHz)
	Graphics Controller	Pixelworks PW171
	Native Resolution	1600 x 1200 @ 60 Hz (recommended)
	Preset VESA Graphic Modes (non-interlaced)	1600 x 1200 @ 60 Hz, 75 Hz (VGA input) 1280 x 1024 @ 60 Hz, 75 Hz, 85 Hz 1280 x 960 @ 60 Hz 1152 x 900 @ 66 Hz 1024 x 768 @ 60 Hz, 75 Hz, 85 Hz 800 x 600 @ 60 Hz, 85 Hz 640 x 480 @ 60 Hz, 75 Hz, 85 Hz
	Text Mode	720 x 400 @ 70 Hz
	Mac Mode	1152 x 870 @ 75 Hz and 832 x 624 @ 75 Hz
	Sun Mode	1152 x 900 @ 66 Hz
	Maximum Pixel Clock Speed	202 MHz (VGA input); 162 MHz (DVI input)
	User Programmable Modes	Yes, 10
	Anti-Glare	Yes
	Anti-Static	Yes
	Default Color Temperature	6500 K
Video Input	**Plug and Play**	Yes
	Input Signal	Four connectors, including one 15-pin mini D-sub VGA, one DVI-I (VGA analog and digital input), one composite video, and one s-video
	Input Impedance	75 ohms ± 10%
	Sync Input	Separate sync (HSYNC/VSYNC); composite sync, Sync on Green
	Video Cable	VGA to VGA; VGA to DVI-I; DVI-D to DVI-I
	Video Cable Length	5.9 ft (1.8 m)
Power	**Input Power**	Auto-Ranging, 90 to 132 VAC and 195 to 265 VAC; internal power supply, 50 Hz/60 Hz

	Frequency	47.5 to 63 Hz	
	Maximum	< 75 W	
	Power Saving	< 5 W	
	Power Cable Length	5.9 ft (1.8 m)	
Mechanical	Dimensions (H x W x D)	Unpacked with stand	17.36 to 20.9 x 17.8 x 8.27 in (44.1 to 53.1 x 45.2 x 21.0 cm)
		Unpacked without stand (head only)	14.29 x 17.8 x 3.19 in (36.3 x 45.2 x 8.1 cm)
		Packaged	11.5 x 21.9 x 23.9 in (29.2 x 55.6 x 60.6 cm)
	Weight	Unpacked	With stand: 20.28 lb (9.2 kg); Without stand: 12.35 lb (5.6 kg)
		Packaged	26.9 lb (12.2 kg)
	Tilt Range	-5° to + 25° vertical	
	Swivel Range	-35° to + 35°	
	Height Adjustable	Yes, range 3.54 in (9.0 cm)	
	Pivot Rotation	Yes	
	Base	Attached	
Environmental	Temperature – Operating	46° to 95° F (10° to 35° C)	
	Temperature – Non-operating	6° to 140° F (-10° to 60° C)	
	Humidity – Operating	20% to 80% non-condensing	
	Humidity – Non-operating	5% to 85%	
	Altitude – Operating	+12,000 ft (+3,657.6 m)	
	Altitude – Non-operating	+40,000 ft (+12,192 m)	

Options	**HP Desktop Access Center**	Sold separately, the HP Desktop Access Center features integrated microphone/headset jacks, dual function headset for phone/PC support, a MultiBay slot for adding an optical drive (sold separately), and four USB ports for easy integration of third-party digital solutions; part number DK985A. For more information, refer to the HP Desktop Access Center QuickSpecs.
Other	**Accessories Included**	VGA to VGA cable – connects the graphic card's VGA analog connector to the monitor's input #1 (VGA analog) connector VGA to DVI-I cable – connects the graphic card's VGA connector to the monitor's input #2 (DVI-I analog) connector DVI-D to DVI-I cable – connects the graphic card's DVI-D digital connector to the monitor's input #2 (DVI-I digital) connector
	User Guide Languages	English, B. Portuguese, French, LA Spanish, Korean, S. Chinese, T. Chinese, Bahasa, Japanese, Danish, Finnish, German, Norwegian, Spanish, Swedish, Greek, Polish, Russian, Slovenian, Turkish
	Warranty Languages	English, Canadian French, LA Spanish, Brazilian Portuguese, Danish, German, Castilian Spanish, French, Italian, Dutch, Norwegian, Finnish, Swedish, Bahasa Indonesian, Korean, T. Chinese, S. Chinese
	Color	Carbonite/Silver
	VESA External Mounting	Yes (Standard 4 hole pattern, 100 mm)
	Kensington Lock-Ready	Yes
Certification and Compliance		Australian ACA Approval, Canadian Requirements/CSA, CE Marking, China CCIB/CCEE Approval, CISPR Requirements, Eastern European Approvals, *Energy Star Compliant, FCC Approval, German Ergonomic (TUV and GS Mark), ISO 9241-3,7,8 VDT Guidelines, ISO 13406-2 Pixel Defect Guidelines, Mexican NOM Approval, MIC Requirements (New Zealand), MPR-II Compliant, Nordic Approvals (Nemko, Fimko, Demko, Semko), PC2001 Compliant, PC99 Certified, S. Korean MIC Approval, Taiwan BSMI Approval, TCO 03 (emissions, ergonomics, environment), TUV-Ergo, UL Listed, VCCI Approvals, Windows Certification (Microsoft® Windows® 98, Microsoft Windows 2000, and Microsoft Windows XP) * Energy Star Compliant available summer 2004.
Service and Warranty		Limited three years parts, labor, and on-site service, including backlight. Availability varies by region. Certain restrictions and exclusions apply. Consult HP Customer Service for details.

HP Flat Panel Monitor L2335	**Panel**	**Type**	23-inch Active Matrix TFT (thin film transistor)
		Viewable Image Area (diagonal)	23 in (58.4 cm)
		Screen Opening (W x H)	19.53 x 12.24 in (49.6 x 31.1 cm)
		Viewing Angle (typical)*	Up to 170° H/170° V (10:1 minimum contrast ratio)
		Brightness (typical)*	Up to 250 nits (cd/m2)
		Contrast Ratio (typical)*	Up to 500:1
		Response Rate (typical)*	16 ms (typical, rise + fall)
		Pixel Pitch	0.258 mm
		Color Depth Support	16.7 million colors
		* All specifications are provided by the component manufacturers. Performance specifications represent the highest specification of all HP's component manufacturers' typical level specifications for performance. Actual performance may vary either higher or lower.	
	On Screen Display (OSD) Controls	**Buttons or Switches**	PiP (Picture in Picture), Input Select, Auto Adjust, OSD Up, OSD Down, OSD Menu Select, Power
		Languages	English, French, German, Spanish, Italian
		User Controls	Brightness, contrast, positioning, color temperature, individual color control, serial number display, full screen resolutions, clock, clock phase, video picture-in-picture (size and position), input selection (includes separate direct access key for dedicated swap between inputs 1 and 2), factory reset
	Signal Interface/ Performance	**Horizontal Frequency**	30 to 94 kHz (VGA input); 30 to 92 KHz (DVI input) (for modes with pixel clock less than 157 MHz)
		Vertical Frequency	48 to 85 Hz (VGA and DVI input)
		Graphics Controller	Pixelworks PW172
		Native Resolution	1920 x 1200 @ 60 Hz (recommended)
		Preset VESA Graphic Modes (non-interlaced)	1920 x 1200 @ 60Hz 1600 x 1200 @ 60 Hz, 75 Hz 1280 x 1024 @ 60 Hz, 75Hz, 85 Hz 1280 x 960 @ 60 Hz 1152 x 900 @ 66 Hz 1024 x 768 @ 60 Hz, 75 Hz, 85 Hz 800 x 600 @ 60 Hz, 75Hz 640 x 480 @ 60 Hz, 75 Hz
		Text Mode	720 x 400 @ 70 Hz
		Mac Mode	1152 x 870 @ 75 Hz and 832 x 624 @ 75 Hz
		Sun Mode	1152 x 900 @ 66 Hz
		Maximum Pixel Clock Speed	202 MHz (VGA input); 162 MHz (DVI input)
		User Programmable Modes	Yes, 10
		Anti-Glare	Yes
		Anti-Static	Yes
		Default Color Temperature	6500 K

Video Input	Plug and Play	Yes	
	Input Signal	Five connectors, including one 15-pin mini D-sub VGA, one DVI-I (VGA analog and digital input), one composite video, one s-video, component video	
	Input Impedance	75 ohms ± 10%	
	Sync Input	Separate sync (HSYNC/VSYNC); composite sync, Sync on Green	
	Video Cable	VGA to VGA; VGA to DVI-I; DVI-D to DVI-I	
	Video Cable Length	5.9 ft (1.8 m)	
Power	Input Power	Auto-Ranging, 90 to 132 VAC and 195 to 265 VAC; internal power supply, 50 Hz/60 Hz	
	Frequency	47.5 to 63 Hz	
	Maximum	< 100 W	
	Power Saving	< 5 W	
	Power Cable Length	5.9 ft (1.8 m)	
Mechanical	Dimensions (H x W x D)	Unpacked	17.36 (min) to 20.9 (max) x 21.46 x 8.27 in (44.1 (min) to 53.1 (max) x 54.5 x 21.0 cm)
		Unpacked withou stand (head only)	14.57 x 21.46 x 3.35 in (37.0 x 54.5 x 8.5 cm)
		Packaged	11.5 x 25.75 x 23.86 in (29.2 x 65.4 x 60.6 cm)
	Weight	Unpacked	22.27 lb (10.1 kg)
		Packaged	30.87 lb (14.0 kg)
	Tilt Range	-5° to + 25° vertical	
	Swivel Range	-35° to + 35°	
	Height Adjustable	Yes, range 3.54 in (9.0 cm)	
	Pivot Rotation	Yes	
	Base	Attached	
Environmental	Temperature – Operating	46° to 95° F (10° to 35° C)	
	Temperature – Non-operating	6° to 140° F (-10° to 60° C)	
	Humidity – Operating	20% to 80% non-condensing	
	Humidity – Non-operating	5% to 85%	
	Altitude – Operating	+12,000 ft (+3,657.6 m)	
	Altitude – Non-operating	+40,000 ft (+12,192 m)	
Options	HP Desktop Access Center	Sold separately, the HP Desktop Access Center Features integrated microphone/headset jacks, dual function headset for phone/PC support, a MultiBay slot for adding an optical drive (sold separately), and four USB ports for easy integration of third-party digital solutions; part number DK985A. For more information, refer to the HP Desktop Access Center QuickSpecs.	

Other	**Accessories Included**	VGA to VGA cable – connects the graphic card's VGA analog connector to the monitor's input #1 (VGA analog) connector VGA to DVI-I cable – connects the graphic card's VGA connector to the monitor's input #2 (DVI-I analog) connector DVI-D to DVI-I cable – connects the graphic card's DVI-D digital connector to the monitor's input #2 (DVI-I digital) connector
	User Guide Languages	English, B. Portuguese, French, LA Spanish, Korean, S. Chinese, T. Chinese, Bahasa, Japanese, Danish, Finnish, German, Norwegian, Spanish, Swedish, Greek, Polish, Russian, Slovenian, Turkish
	Warranty Languages	English, Canadian French, LA Spanish, Brazilian Portuguese, Danish, German, Castilian Spanish, French, Italian, Dutch, Norwegian, Finnish, Swedish, Bahasa Indonesian, Korean, T. Chinese, S. Chinese
	Color	Carbonite/silver
	VESA External Mounting	Yes (Standard 4 hole pattern, 100 mm)
	Kensington Lock-Ready	Yes
Certification and Compliance	Australian ACA Approval, Canadian Requirements/CSA, CE Marking, China CCIB/CCEE Approval, CISPR Requirements, Eastern European Approvals, *Energy Star Compliant, FCC Approval, German Ergonomic (TUV and GS Mark), ISO 9241-3,7,8 VDT Guidelines, ISO 13406-2 Pixel Defect Guidelines, Mexican NOM Approval, MIC Requirements (New Zealand), MPR-II Compliant, Nordic Approvals (Nemko, Fimko, Demko, Semko), PC2001 Compliant, PC99 Certified, S. Korean MIC Approval, Taiwan BSMI Approval, TCO 03 (emissions, ergonomics, environment), TUV-Ergo, UL Listed, VCCI Approvals, Windows Certification (Microsoft® Windows® 98, Microsoft Windows 2000, and Microsoft Windows XP). * Energy Star Compliant available summer 2004.	
Service and Warranty	Limited three years parts, labor, and on-site service, including backlight. Availability varies by region. Certain restrictions and exclusions apply. Consult HP Customer Service for details.	