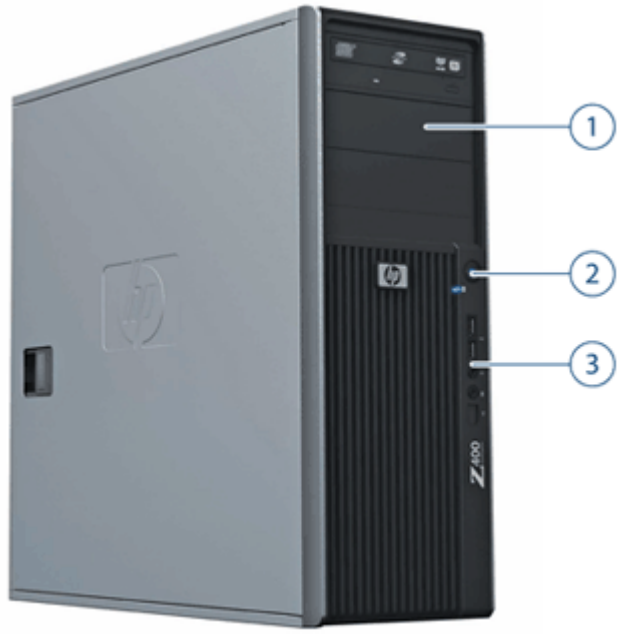
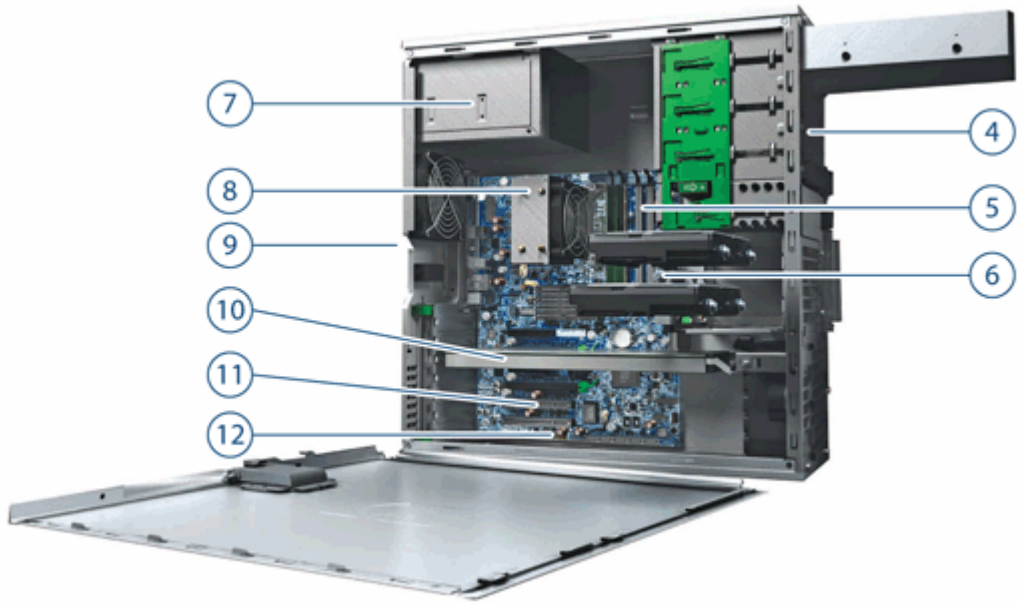
Overview

HP recommends Windows Vista®
Business



1. 3 External 5.25" Bays
2. Power Button
3. Front I/O: 2 USB 2.0, 1 IEEE 1394a (optional card required), Headphone, Microphone

Overview



4. 3 External 5.25" Bays
5. 4 DIMM Slots for DDR3 ECC Memory
6. 2 Internal 3.5" Bays
7. 475W, 85% efficient Power Supply
8. Dual/Quad Core Intel 3500 Series Processors
9. Rear I/O: 6 USB 2.0, PS/2 keyboard/mouse
   1 RJ-45 to Integrated Gigabit LAN
   1 Audio Line In, 1 Audio Line Out, 1 Microphone In
10. 2 PCIe x16 Gen2 Slots
11.. 1 PCIe x4 Gen2, 1 PCIe x4 Gen1, 2 PCI Slots
12 4 Internal USB 2.0 ports

Form Factor	Convertible Minitower
Compatible Operating Systems	Genuine Windows Vista® Business 32-bit* Genuine Windows Vista® Business 64-bit* Genuine Windows Vista® Business 32-bit with downgrade to Windows® XP Professional 32-bit custom installed** (expected available until August 2009) Genuine Windows Vista® Business 64-bit with downgrade to Windows® XP Professional x64 custom installed** (expected available until August 2009) HP Linux Installer Kit for Linux (includes drivers for both 32-bit & 64-bit OS versions of Red Hat Enterprise Linux WS4 and WS5 - see: http://www.hp.com/workstations/software/linux) Novell Suse SLED 11 (expected availability May 2009) *Certain Windows Vista product features require advanced or additional hardware. See http://www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and http://www.microsoft.com/windowsvista/getready/capable.mspx for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit http://www.windowsvista.com/upgradeadvisor. **Windows Vista Business disk may also be included for future upgrade if desired. To qualify for this downgrade an end user must be a business (including governmental or educational institutions) and is expected to order at least 25 customer systems with the same custom image.
Available Processors	Intel® Xeon® Processor W3503 2.40 GHz, 4MB cache, 1066 memory, 4.8GT/s QPI, Dual-Core Intel Xeon Processor W3505 2.53 GHz, 4MB cache, 1066 memory, 4.8GT/s QPI, Dual-Core

Overview

	Intel Xeon Processor W3520 2.66 GHz, 8MB cache, 1066 memory, 4.8 GT/s QPI, Quad-Core, HT, Turbo Intel Xeon Processor W3540 2.93 GHz, 8MB cache, 1066 memory, 4.8 GT/s QPI, Quad-Core, HT, Turbo Intel Xeon Processor W3570 3.20 GHz, 8MB cache, 1333 memory, 6.4 GT/s QPI, Quad-Core, HT, Turbo	
Available Processor Disclaimers	Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details. 64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information. Dual-Core and Quad-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies. Intel's numbering is not a measurement of higher performance.	
Color	Jack Black/Alloy metallic	
Convertibility	Yes. 5.25" drives rotate for Minitower or Desktop orientation.	
Expansion Slots (see system board section for more details)	• 2 PCI slots (full-height, full-length) • 1 PCI Express Gen2 slot x8 mechanical/x4 electrical • 1 PCI Express Gen1 slot x8 mechanical/x4 electrical • 2 PCI Express x16 Gen2 slots (one dedicated for graphics)	
Expansion Bays (see storage section for more details)	• 2 internal 3.5" bays • 3 external 5.25" bays NOTE: Third external 5.25" bay is not full depth; maximum depth 170 mm (6.7 inches)	
Front I/O	2 USB 2.0, 1 IEEE 1394 (requires optional PCI card to function), 1 audio out, and 1 microphone.	
Rear I/O	6 USB 2.0, 1 optional serial port, 2 PS/2, RJ-45 (NIC), 1 audio line in, 1 audio line out, 1 microphone in; audio ports can be retasked to function as line in, line out, microphone, or headphone.	
Interfaces Supported	22-in-1 Media Card Reader (optional)	
Chassis Dimensions (W x D x H)	Standard minitower orientation: 6.6 x 17.9 x 17.7 in (16.79 x 45.53 x 45.02 cm) Converted desktop orientation: 6.6 x 17.9 x 17.7 in (16.79 x 45.53 x 45.02 cm)	
Weight	Exact weights depend upon configuration Minimum: 29.8 lbs (13.5 kg) Standard: 33.2 lbs (15.1 kg) Maximum: 43.2 lbs (19.6 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 (non-pressurized)	Operating:	10,000 feet; 3,000 m
	Non-operating	30,000 feet; 9,100 m
Power Supply	475 watts wide-ranging, active Power Factor Correction, 85% Efficient	

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Quad-Core Intel® Xeon® Processor 3500 Series with Intel® 64 Architecture				
Intel Xeon W3503, 2.40GHz, 4MB cache, 1066 memory, 4.8GT/s QPI, Dual-Core	Y	N		
Intel Xeon W3505, 2.53GHz, 4MB cache, 1066 memory, 4.8GT/s QPI, Dual-Core	Y	N		
Intel Xeon W3520, 2.66GHz, 8MB cache, 1066 memory, 4.8GT/s QPI, Quad-Core, HT, Turbo	Y	N		
Intel Xeon W3540, 2.93GHz, 8MB cache, 1066 memory, 4.8GT/s QPI, Quad-Core, HT, Turbo	Y	N		
Intel Xeon W3570, 3.20GHz, 8MB cache, 1333 memory, 6.4GT/s, Quad-Core, HT, Turbo	Y	N		

When ordering two processors, the second processor must be the same as the first. Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.

Dual-Core and Quad-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies.

64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information.

Intel's numbering is not a measurement of higher performance.

Supported Components

Sub-Section Description/Notes

For hard drives, 1 GB = 1 billion bytes; TB = 1 trillion bytes. Actual formatted capacity is less. Up to 12 GB of hard drive (or system disk) is reserved for the system recovery software (XP and XP Pro). Up to 3 GB of system disk is reserved for system recovery software (Vista).

SAS Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations				
146 GB 15K rpm SAS 3.0 Gb/s 3.5" Hard Drive	Y	Y	EA330AA	
300 GB 15K rpm SAS 3.0 Gb/s 3.5" Hard Drive	Y	Y	EM174AA	
450 GB 15K rpm SAS 3.0 Gb/s 3.5" Hard Drive	Y	Y	FM803AA	

Sub-Section Description/Notes

Up to (4) 3.5-inch 7200 rpm SATA drives:160, 250, 320, 500, 1000, 1500 GB; 6.0 TB max
Up to (4) 2.5-inch 10K rpm SATA drives:160, 300 GB 1.2 TB max
Up to (4) 3.5-inch 15K rpm SAS devices: 146, 300, 450, 600 GB; 2.42 TB max

Removable Boot Drive option

SATA Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations				
160 GB 7,200 rpm SATA 3.0 Gb/s with NCQ 3.5" Hard Drive	Y	Y	PV944A	
250GB SATA 7200 rpm 3Gb/s 3.5" HDD (for HP Z-Workstations)	Y	Y	PY278AA	
320 GB 7,200 rpm SATA 3.0 Gb/s with NCQ 3.5" Hard Drive	Y	Y	FH963AA	
500 GB 7,200 rpm SATA 3.0 Gb/s with NCQ 3.5" Hard Drive	Y	Y	PV943A	
1 TB 7,200 rpm SATA 3.0 Gb/s with NCQ 3.5" Hard Drive	Y	Y	GE262AA	
160 GB 10K rpm SATA with NCQ 2.5" Hard Drive	Y	Y	EW222AA	
300 GB 10K rpm SATA with NCQ 2.5" Hard Drive	Y	Y	FM802AA	

NOTE: SAS Controller, not integrated, is required)

For hard drives, 1 GB = 1 billion bytes; TB = 1 trillion bytes. Actual formatted capacity is less. Up to 12 GB of hard drive (or system disk) is reserved for the system recovery software (XP and XP Pro). Up to 3 GB of system disk is reserved for system recovery software (Vista).

Supported Components

Hard Drive Controllers	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated SATA 3.0 Gb/s Controller				
Integrated SATA 3.0 Gb/s	Y	N		
Factory integrated RAID on motherboard for SATA drives				
RAID 0 Configuration - Striped Array	Y	N		See note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		See note 1
RAID 1 Configuration - Mirrored Array	Y	N		See note 1
LSI 3041E 4-Port SAS 3.0 Gb/s RAID Card				
LSI 3041E 4-Port SAS 3.0 Gb/s RAID Card	Y	Y	EH417AA	See note 2 and 3
LSI MegaRAID® SAS 8888ELP Host Bus Adapter (HBA)				
LSI 8888ELP 8-port SAS HW RAID Card	N	Y	GE258AA	

SATA hardware RAID is not supported on Linux systems. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00060684/c00060684.pdf for RAID capabilities with Linux.
All drives must be identical in type and capacity
All RAID arrays must be less than 2 TB
NOTE 1: Requires identical hard drives (speeds, capacity, interface. Specific user-configured hardware SAS RAID configurations are supported on this Linux system. Please visit: http://www.hp.com/support/linux_hardware_matrix for details.
NOTE 2: Specific user-configured hardware SAS RAID configurations are supported on this Linux system. Please visit: http://www.hp.com/support/linux_hardware_matrix for details.
NOTE 3: Not supported when HD drive 1 is SATA

Graphics	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported Multi Mixed
Professional 2D					
NVIDIA Quadro NVS 450 512 MB PCIe Graphics Card	Y	Y	FH519AA	2nd card must be NVS 295	1
NVIDIA Quadro NVS 295 256MB PCIe Graphics Card	Y	Y	FY943AA	2nd card must be NVS 295	2
NVIDIA Quadro NVS 290 256 MB PCIe Graphics Card with 'DMS-59 to Dual DVI cable' included - for Workstations	N	Y	GN502AA	1 or 2 of these cards are supported - 2nd card must be NVS 290 or NVS 440	2
Entry 3D					
NVIDIA Quadro FX 380 256MB PCIe Graphics Card	Y	Y	NB769AA		2
ATI FirePro V3700 256MB PCIe Graphics Card	Y	Y	FY944AA		2

Supported Components

NVIDIA Quadro FX 580 512MB PCIe Graphics Card	Y	Y	FY945AA	2
Mid-range 3D				
NVIDIA Quadro FX 1800 768MB PCIe Graphics Card	Y	Y	FY946AA	2
ATI FirePro V5700 512MB PCIe Graphics Card	Y	Y	FY947AA	2
High End 3D				
NVIDIA Quadro FX 3800 1.0GB PCIe Graphics Card (AVAILABLE JUNE 2009)	Y	Y	FY949AA	1
ATI FirePro V7750 1.0GB PCIe Graphics Card	Y	Y	FY948AA	1
NVIDIA Quadro FX 4800 1.5GB PCIe Graphics Card	Y	Y	FQ138AA	1
NVIDIA Quadro CX - The Accelerator for Creative Suite 4	Y	N		1

Memory	CTO	Support Notes
	PC3-10600 DDR3-1333 ECC Unbuffered DIMMs CTO	
	1GB (1x1GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	2GB (2x1GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	3GB (3x1GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	4GB (4x1GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	4GB (2x2GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	6GB (3x2GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	8GB (2x4GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	8GB (4x2GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	12GB (3x4GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	16GB (4x4GB) DDR3-1333 ECC Unbuffered RAM 1-CPU	
	Sub-Section Description/Notes	
	NOTE: Configurations less than 1 GB are not supported on Windows Vista 64 or Vista 64 downgrade to XP 64. DIMMs should be distributed across all three memory channels for optimal performance. Each processor supports up to 3 channels of DDR3 memory. To realize full performance at least 1 DIMM must be inserted into each channel.	
	AMO	
	PC3-10600 DDR3-1333 ECC Unbuffered DIMMs AMO	
	1GB (1x1GB) DDR3-1333 ECC Unbuffered RAM	
	2GB (1x2GB) DDR3-1333 ECC Unbuffered RAM	
	4GB (1x4GB) DDR3-1333 ECC Unbuffered RAM	
	NOTE: Only unbuffered DDR3 DIMMs are supported.	

Supported Components

Multimedia and Audio Devices	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel/Realtek HD ALC262 Audio	Y	N		
HP Thin USB Powered Speakers	Y	Y	KK912AA	
Creative X-Fi Titanium PCIe Audio Card	Y	Y	NH222AA	

Optical and Removable Storage	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 16X DVD-ROM SATA Drive	Y	Y	AR629AA	See note 1
HP 16X DVD+-RW SuperMulti SATA Drive	Y	Y	AR630AA	
HP Blu-ray Writer	Y	Y	AR482AA	
1.44 MB Diskette Drive (1 only)	Y	Y	NK360AA	
HP 22-in-1 Media Card Reader Kit (Workstations)	Y	Y	NK361AA	

Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players. As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

NOTE 1: Not supported as a 2nd drive option.

Controller Cards	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP FireWire/IEEE 1394a PCI Card	Y	Y	PA997A	
HP IEEE 1394b FireWire PCIe Card	Y	Y	NK653AA	

Monitors	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP LP1965 19-inch LCD Monitor	Y	Y	RA373A	
HP LP2275w 22-inch Widescreen LCD Monitor	Y	Y	KE289A	
HP LP2475w 24-inch Widescreen LCD Monitor	Y	Y	KD911A	
HP DreamColor LP2480zx Professional Display	Y	Y	GV546A	
HP LP3065 30-inch Widescreen LCD Monitor	Y	Y	EZ320A	

NOTE: Supported by all Operating Systems available from HP (screen size diagonally measured)

Supported Components

Networking and Communications	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Broadcom 5764 PCIe LOM Controller	Y	N		
Broadcom NetXtreme Gigabit Ethernet Plus NIC (PCIe)	Y	Y	FS215AA	This is a PCI Express card based on the Broadcom 5761 chip.
Intel Gigabit CT Desktop NIC	N	Y	FH969AA	

NOTE 1: Certain Windows Vista product features require advanced or additional hardware. See http://www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and http://www.microsoft.com/windowsvista/getready/capable.mspx for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit http://www.windowsvista.com/upgradeadvisor.

"Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

Racking and Physical Security	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Security Cable with Kensington Lock	N	Y	PC766A	
HP Solenoid Hood Lock & Hood Sensor				
HP (CMT) Solenoid Lock	N	Y	DE618A	
HP xw4/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	EK729AA	

Input Devices	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Standard Keyboard	Y	Y	DT527A	
HP USB Standard Keyboard	Y	Y	DT528A	
HP PS/2 Optical Scroll Mouse	Y	Y	EY703AA	
HP USB 2-Button Optical Scroll Mouse	Y	Y	DC172B	
HP USB Laser Mouse	Y	Y	GW405AA	
HP USB Optical 3-Button Mouse	Y	Y	DY651A	
HP USB Smart Card Keyboard	N	Y	ED707AA	
HP 2.4GHz Wireless Keyboard & Mouse	N	Y	NB896AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	
HP SpaceExplorer 3D USB Controller	N	Y	RY429AA	
HP SpacePilot 3D USB Intelligent Controller	N	Y	EF390AA	

Supported Components

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Configure minitower in desktop orientation	Y	N		
HP ENERGY STAR 5.0 Enabled Configuration	Y	N		
HP Workstation Mouse Pad	Y	N		Japan only.
HP eSATA PCI Cable Kit	Y	Y	GM110AA	
HP Power Cord Kit	N	Y	DM293A	
HP 2nd Serial Port Adapter	N	Y	PA716A	
HP Internal USB Port Kit	N	Y	EM165AA	
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP Workstation to LTO SAS Int. Cable	N	Y	EH925A	
HP Fan and Front Card Guide Kit	N	Y	DY648A	

Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Tuning Framework	Y	N		
Roxio Easy Media Creator (CD or DVD burner)	Y	N		
Intervideo WinDVD with DVD player	Y	N		
HP Backup and Recovery	Y	N		Supported on Windows XP ONLY
PDF Complete	Y	N		
Microsoft Office 2007 Small Business Edition	Y	N		
Microsoft Office 2007 Trial Edition	Y	N		
HP Client Manager Software v6.2 (optional download)	Y	N		
HP ProtectTools Security	Y	N		Must select as a Configure to Order Option. Delivered as a "Drop in the Box" CD

Supported Components

Operating Systems	Support Notes
Genuine Windows Vista® Business 32-bit	Certain Windows Vista product features require advanced or additional hardware. See www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and www.microsoft.com/windowsvista/getready/capable.mspx for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit www.windowsvista.com/upgradeadvisor.
Genuine Windows Vista® Business 64-bit	Certain Windows Vista product features require advanced or additional hardware. See www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and www.microsoft.com/windowsvista/getready/capable.mspx for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit www.windowsvista.com/upgradeadvisor.
Genuine Windows Vista® Business 32-bit with downgrade to Windows® XP Professional 32-bit custom installed	Windows Vista Business disk may also be included for future upgrade if desired. To qualify for this downgrade an end user must be a business (including governmental or educational institutions) and is expected to order at least 25 customer systems with the same custom image.
Genuine Windows Vista® Business 64-bit with downgrade to Windows® XP Professional x64 custom installed	Windows Vista Business disk may also be included for future upgrade if desired. To qualify for this downgrade an end user must be a business (including governmental or educational institutions) and is expected to order at least 25 customer systems with the same custom image.
HP Linux Installer Kit	see: http://www.hp.com/workstations/software/linux

System Board		
System Board Form Factor	ATX 9.6 x 12 inches (243.84 x 304.8 mm)	
Processor Socket	Single LGA1366	
CPU Bus Speed	QPI: Up to 6.4GT/sec	
Chipset	Intel® X58 Express	
Super I/O Controller	SMSC SCH5327, Rev B	
Memory Expansion Slots	4 DDR3 memory slots	
Memory Type Supported	DDR3, UDIMM (Unbuffered), ECC	
Memory Modes	Channel Interleaved	
Memory Speed Supported	800MHz, 1066MHz and 1333MHz DDR3	
Memory Protection	ECC available on data, parity on address and command	
Memory		
Maximum Memory	NOTE: * Maximum memory capacities assume 64-bit operating systems, such as genuine Windows® Vista Business 64, XP Professional x64 Edition, Red Hat Linux 64-bit. Genuine Windows Vista Business 32 and XP Professional (32-bit) support up to 4 GB. 32-bit Linux supports up to 8 GB.	

	CPU0			
Capacity	DIMM1	DIMM2	DIMM3	DIMM4
1GB	1GB			
2GB	1GB	1GB		
3GB	1GB	1GB	1GB	
4GB	1GB	1GB	1GB	1GB
4GB	2GB	2GB		
6GB	2GB	2GB	2GB	
8GB	2GB	2GB	2GB	2GB
8GB	4GB	4GB		
12GB	4GB	4GB	4GB	
16GB	4GB	4GB	4GB	4GB

Memory Configuration (Supported)	• The 4GB DIMM for Z400 and Z600 is NOT compatible with the 4GB DIMMs offered on the Z800. • They are NOT interchangeable. • Only ECC DIMMs are supported.	
PCI Express Connectors (Gen2 Rev 0.7 connectors)	1 x8 PCIe (x4)	
PCI Connectors (5.0V)	2 PCI	
Interfaces Supported	SATA	Integrated 6-channel SATA 3.0Gb/sec controller with RAID 0, 1, 5, 10 and NCQ. (Factory integrated RAID is Microsoft Windows only)
Serial Attached SCSI	Hardware RAID is not supported on Linux systems. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00060684/c00060684.pdf for RAID capabilities with Linux.	
Integrated RAID	NOTE: Requires identical hard drives (speeds, capacity, interface)	
Integrated Graphics	No	
Network Controller	Integrated HP Gbit LAN by Broadcom	
External SATA (eSATA)	4 ports are eSATA configurable with optional eSATA After-Market Option cable kit.	

System Technical Specifications

IDE connector	No	
Floppy connector	Yes	
Network Controller	Management capabilities WOL, PXE 2.1 and ASF 2.0	
Serial	1 internal header (requires optional Serial Port Adaptor)	
2nd Serial	No	
Parallel	No	
Audio	High Definition Integrated Realtek ALC262 Audio with Line in, Line Out, Microphone, Headphone	
CD-ROM input/Audio	No	
AUX INPUT; Audio	Yes	
IEEE 1394 Connector(s)	Front	1 IEEE 1394a (requires optional PCI card to function)
	Rear	No
	Internal	No
USB Connector(s)	Front	2 USB 2.0
	Rear	6 USB 2.0
	Internal	2 USB 2.0 headers
HD Integrated Audio	High Definition Integrated Realtek ALC262 Audio with Line in, Line Out, Microphone, Headphone	
Flash ROM	Yes	
Clear Fan Header	No	
CPU Fan Header	Yes	
Chasiss Fan Header	1 Rear System Chassis Fan Header, 1 Optional Front Chassis Fan Header	
Front PCI Fan Header	Yes	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 1.2	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	Yes	
Serial Port	1 internal header (requires optional Serial Port Adaptor)	
Parallel Port	No	
Keyboard/Mouse	USB or PS/2	
Power Supply	475w 80+ BRONZE, Custom	
Operating Voltage Range	90-269 VAC	
Rated Voltage Range	118V	
Rated Line Frequency	400 Hz	
Operating Line Frequency Range	393-407 Hz	
Rated Input Current	10A @ 118 VAC	
Heat Dissipation	Maximum 2027 btu/hr (511 kg-cal/hr)	

Power Supply Fan	92x25 mm variable speed
ENERGY STAR® qualified (Config Dependent)	Yes
80 PLUS Compliant	Yes, Bronze
FEMP Standby Power Compliant 115V (Wake-on LAN disabled) (<2W in S5 - Power Off)	Yes
Power consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3)	<5W
Built-in Self Test (BIST) LED	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes
Hood Lock Header	Yes
Hood Sensor Header	Yes
ASF 2.0 (Alert Standard Format)	Yes

Z400 Required Power Supply Info		
Power Supply	475 watt custom power supply - (Wide Ranging Active PFC)	
Operating Voltage Range	90 - 269 VAC	
Rated Voltage Range	100 - 240 VAC	118 VAC
Rated Line Frequency	50-60 Hz	400 Hz
Operating Line Frequency Range	47 - 66 Hz	393 - 407 Hz
Rated Input Current	10 A @ 110-127 VAC 6 A @ 200-240 VAC	10 A @118 VAC
Heat Dissipation (Configuration and software dependent)	Typical 954 btu/hr (240.3 kg-cal/hr) Maximum 1977 btu/hr (498.2 kg-cal/hr)	
Power Supply Fan	92x25 mm variable speed	
Energy Star Compliant (config dependent)	YES	
80 PLUS® Compliant	Yes, Bronze	
FEMP Standby Power Compliant@115V (Wake-on LAN disabled)(<2W in S5-Power Off)	YES	
EuP Compliant@230V (<1 W in S5-Power Off)	YES	
Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC) measured at 115V.	<6W	
Built-in Selft Test LED	YES	
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V	YES	
	*Input Voltage Restrictions	

System Configuration

Example Configuration #1

Processor Info	1x Intel Xeon W3503
Memory Info	1x1GB DDR3 1333 (UDIMM)
Graphics Info	NVS295
Disks/Optical/Floppy	1x160GB SATA / 1 Optical / 0 Floppy
PSU	475W 80 PLUS® BRONZE

Energy Consumption

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	86.23 W		85.26 W		85.90 W	
Windows Busy Typ (S0)	140.90 W		137.85 W		140.40 W	
Windows Busy Max (S0)	153.20 W		152.96 W		155.00 W	
Sleep (S3)	4.17 W	3.96 W	4.03 W	3.79 W	4.14 W	3.90W
Off (S5)	1.25 W	1.14 W	1.51 W	1.35 W	1.23 W	1.12 W
Zero Power Mode (EuP)	0.31 W		0.61 W		0.29W	

Heat Dissipation**

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	294.30 btu/hr		290.99 btu/hr		293.18 btu/hr	
Windows Busy Typ (S0)	480.89 btu/hr		470.48 btu/hr		479.19 btu/hr	
Windows Busy Max (S0)	522.87 btu/hr		522.05 btu/hr		529.02 btu/hr	
Sleep (S3)	14.2 btu/hr	13.5 btu/hr	13.8 btu/hr	12.9 btu/hr	14.1 btu/hr	13.3 btu/hr
Off (S5)	4.27 btu/hr	3.89 btu/hr	5.15 btu/hr	4.61 btu/hr	4.20 btu/hr	3.82 btu/hr
Zero Power Mode (EuP)	1.04 btu/hr		2.06 btu/hr		0.98 btu/hr	

Example Configuration #2

Processor Info	1 x Intel Xeon W3570
Memory Info	4x4GB DDR3 1333MHz (UDIMM)
Graphics Info	1xFX4800
Disks/Optical/Floppy	4x450GB SAS / 1 Optical / 0 Floppy
PSU	475W 80 PLUS® BRONZE

Energy Consumption

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	180.70 W		178.30 W		181.00 W	
Windows Busy Typ (S0)	404.60 W		393.20 W		407.50 W	
Windows Busy Max (S0)	482.80 W		469.10 W		488.60 W	
Sleep (S3)	4.84 W	4.65 W	5.13 W	4.94 W	4.85 W	4.66 W
Off (S5)	1.18 W	1.07 W	1.61 W	1.37 W	1.16 W	1.05W
Zero Power Mode (EuP)	0.32 W		0.61 W		0.29 W	

Heat Dissipation**

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	616.73 btu/hr		608.54 btu/hr		617.75 btu/hr	
Windows Busy Typ (S0)	1380.90 btu/hr		1341.99 btu/hr		1390.80 btu/hr	
Windows Busy Max (S0)	1647.80 btu/hr		1601.04 btu/hr		1667.59 btu/hr	
Sleep (S3)	16.5 btu/hr	15.9 btu/hr	17.5 btu/hr	16.9 btu/hr	16.6 btu/hr	15.9 btu/hr
Off (S5)	4.03 btu/hr	3.65 btu/hr	5.49 btu/hr	4.68 btu/hr	3.96 btu/hr	3.58 btu/hr
Zero Power Mode (EuP)	1.08 btu/hr		2.06 btu/hr		0.98 btu/hr	

System Technical Specifications

Example Configuration #3

Processor Info	1 x Intel Xeon W3520
Memory Info	3x1GB DDR3 1333MHz (UDIMM)
Graphics Info	1xFX1800
Disks/Optical/Floppy	1x250GB SATA / 1 Optical / 0 Floppy
PSU	475W 80 PLUS® BRONZE

Energy Consumption

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	96.70 W		95.10 W		97.71 W	
Windows Busy Typ (S0)	237.99 W		233.03 W		239.04 W	
Windows Busy Max (S0)	268.79 W		267.95 W		274.90 W	
Sleep (S3)	3.89 W	3.65 W	4.20 W	3.96 W	3.83 W	3.61 W
Off (S5)	1.20 W	1.06 W	1.51 W	1.35 W	1.17 W	1.02 W
Zero Power Mode (EuP)	0.31 W		0.60 W		0.29 W	

Heat Dissipation**

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)	330.04 btu/hr		324.58 btu/hr		333.48 btu/hr	
Windows Busy Typ (S0)	812.26 btu/hr		795.33 btu/hr		815.84 btu/hr	
Windows Busy Max (S0)	917.38 btu/hr		914.51 btu/hr		938.23 btu/hr	
Sleep (S3)	13.3 btu/hr	12.5 btu/hr	14.3 btu/hr	13.5 btu/hr	13.1 btu/hr	12.3 btu/hr
Off (S5)	4.10 btu/hr	3.60 btu/hr	5.15 btu/hr	4.61 btu/hr	3.99 btu/hr	3.48 btu/hr
Zero Power Mode (EuP)	1.05 btu/hr		2.05 btu/hr		0.97 btu/hr	

System Technical Specifications

Example Configuration #4 (Energy Star Compliant)

Processor Info	1x Intel Xeon W3570
Memory Info	4x2GB DDR3 1333MHz (UDIMM)
Graphics Info	1 x FX4800
Disks/Optical/Floppy	2x1000GB SATA / 1 Optical / 1 Floppy
I/O	1xBroadcom 5761 Gigabit PCIe NIC
PSU	475W 80PLUS® BRONZE

Energy Consumption

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
On-Idle (ENERGY STAR® Idle (S0))	99.8 W		97.7 W		100.3 W	
ENERGY STAR® P_{MAX} Windows running Linpack and Viewperf	323.1 W		316.6 W		325.4 W	
ENERGY STAR® "Sleep" (S3)	4.6 W	-	4.8 W	-	4.6 W	-
ENERGY STAR® "Standby" (Off) (S5)	1.8 W	-	2.1 W	-	1.7 W	-

Heat Dissipation**

	115 VAC		230 VAC		100 VAC	
	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
On-Idle (ENERGY STAR® Idle (S0))	340.6 btu/hr		333.5 btu/hr		342.3 btu/hr	
ENERGY STAR® P_{MAX} Windows running Linpack and Viewperf	1102.7 btu/hr		1080.6 btu/hr		1110.6 btu/hr	
ENERGY STAR® "Sleep" (S3)	15.7 btu/hr	-	16.4 btu/hr	-	15.7 btu/hr	-
ENERGY STAR® "Standby" (Off) (S5)	1.8 btu/hr	-	2.1 btu/hr	-	1.7 btu/hr	-

NOTES:

* Energy Star low energy mode

** Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

This product is in compliance with US executive order 13221, WOL (wake on LAN) disabled.

Declared Noise Emissions (Entry-level and High-end configurations)		
System Configuration (Entry level)	Processor Info	Intel Xeon Processor W3505 2.53 GHz
	Memory Info	4 x 1GB DDR3 1333 MHz
	Graphics Info	NVIDIA Quadro NVS 295
	Disks/Optical/Floppy	1 x 160 GB 7200 RPM SATA / DVD-ROM / No Floppy

System Technical Specifications

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure
	Idle	3.9 Bels	23 dB
	SATA Hard drive Operating (random reads)	4.2 Bels	25 dB
	Floppy Drive Operating (continuous copy)	4.7 Bels	29 dB
	DVD-ROM Operating (sequential reads)	5.1 Bels	38 dB

System Configuration (High-end)		
	Processor Info	Intel Xeon Processor W3570 3.20 GHz
	Memory Info	4 x 1GB DDR3 1333 MHz
	Graphics Info	NVIDIA Quadro FX 4600
	Disks/Optical/Floppy	2 x 450 GB 15K SAS / DVD-ROM / No Floppy

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure
	Idle	4.6 Bels	27 dB
	SATA Hard drive Operating (random reads)	5.2 Bels	35 dB
	Floppy Drive Operating (continuous copy)	5.0 Bels	32 dB
	DVD-ROM Operating (sequential reads)	5.3 Bels	38 dB

Environmental Requirements		
	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% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 10,000 feet (3,000 m) Non-operating: 30,000 feet (9,100 m)
	Dynamic (new)	Shock Operating: ½-sine: 40g, 2-3ms Non-operating: ½-sine: 160 cm/s, 2-3ms (~100g) square: 422 cm/s, 20g NOTE: Values represent individual shock events and do not indicate repetitive shock events. Vibration Operating random: 0.5g (rms), 5-300 Hz Non-operating random: 2.0g (rms), 10-500 Hz NOTE: Values do not indicate continuous vibration.
	Cooling	Above 5000 ft (1524 m) altitude, maximum operating temperature is de-rated by 1.8° F (1° C) per 1000 ft (305 m) elevation increase

Physical Security and Serviceability	
Access Panel	Tool-less Includes system board and memory information
Optical Drive	Tool-less
Floppy Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on tool-free internal chassis components
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Tool-less
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes
Restore CD Set	Restores the computer to its original factory shipping image - Can be obtained via HP Support
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 0.22-in diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
Solenoid Lock and Hood Sensor	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
Rear Port Control Cover	Yes, locks rear IO cables to prevent cable theft
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes

System Technical Specifications

NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
Power supply diagnostic LED	Yes
Power Button	Yes, ACPI multi-function
Power LED	Yes, blue (normal), red (fault)
Hard drive activity LED	Yes, green
Internal speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
OS CD (Restore OS CD)	Restores computer to its original factory shipping Operating System - No recovery CDs will ship with Windows XP, Vista or Linux - an ISO image will be available on an HD partition.
ASF 2.0 support (Alert Standard Format)	Industry-standard specification for network alerting in operating system-absent environments
Cooling Solutions	Air cooled forced convection, liquid cooling (optional)
Power Supply Fans	92 mm x 92 mm x 25 mm 2-wire (non-serviceable)
CPU Heatsink Fan(s)	Mainstream (<=95W): 80 mm x 80 mm x 15 mm 5-wire PWM Performance (>95W): 92 mm x 92 mm x 25 mm 5-wire PWM
Chassis Fans	92 mm x 92mm x 25 mm 4-wire PWM
Memory Fans	No
Insight Diagnostics	HP Insight Diagnostics Offline Edition The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to: ● Run diagnostics ● iew the hardware configuration of the system Key features and benefits HP Insight Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest insight into potential system issues, is the configuration of the system. Insight Diagnostics helps provide higher system availability. Typical uses of the Insight Diagnostics are: ● Testing and diagnosing apparent hardware failures ● Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance ● Sending configuration information to another location for more in-depth analysis
Access Panel Key Lock	No
ACPI-Ready Hardware	Advanced Configuration and Power Management Interface (ACPI). ● 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

Trusted Platform Module Chip with optional ProtectTools Software	Yes, Infineon SLB9635TT1.2
Integrated Chassis Handles	No
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (none), front (full-length cards with extender)
Flash ROM	Yes
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder for easy Replacement	Yes
DIMM Connectors for easy Upgrade	Yes
HP ProtectTools Security Manager	Yes - Not supported on Microsoft XP x64 or Linux

BIOS	
BIOS 32-bit Services	Standard BIOS 32-bit Service Directory Proposal v0.4
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01.
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.6, for system management information.
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	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
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	• Allows the system to enter and resume from low power modes (sleep states).] • Enables an operating system to control system power consumption based on the dynamic workload. • Makes 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.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
ASF 2.0 Compliant	Allows workstation status to be monitored on a remote console.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (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 HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
Industry Standard Specification Support	
Industry Standard	Revision Supported by the BIOS
ACPI	Advanced Configuration and Power Management Interface, Version 2.0c
ASF	Alert Standard Format Specification, Version 2.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	• Enhanced Disk Drive Specification Version 1.1 • BIOS Enhanced Disk Drive Specification Version 3.0

EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	• PCI Local Bus Specification, Revision 2.3 • PCI Power Management Specification, Revision 1.1 • PCI Firmware Specification, Revision 3.0, Draft .7
PCI Express	PCI Express Base Specification, Revision 2.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	• Serial ATA Specification, Revision 1.0a • Serial ATA 3.0Gb/s: Extensions to Serial ATA 1.5Gb/s, Revision 1.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB 1.1	Universal Serial Bus Revision 1.1 Specification
USB 2.0	Universal Serial Bus Revision 2.0 Specification
SMBIOS	System Management BIOS Reference Specification, Version 2.6

System Software Management and Updating	
HP Client Management Solutions	Visit: http://www.hp.com/go/easydeploy
Product Change	• Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile. • PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition. • Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.
Support Software CD & WWW	Yes
HP Client Manager	Visit: http://www.hp.com/go/easydeploy
System Software Manager (free)	Visit: http://www.hp.com/go/ssm
Social and Environmental Responsibility	
Eco-Label Certifications & Declarations	This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks: • ENERGY STAR® (energy-saving features available on selected configurations -Windows only) • US Federal Energy Management Program (FEMP) • China Energy Conservation Program • IT ECO declaration • Japan PC Green label* *This product conforms to the examination standards (2003 version) under JEITA's 'PC Green Label System.'
Batteries	This product complies with ISO standards: • EU Directive 91/ 157/ EEC • EU Directive 93/ 86/ EEC • EU Directive 98/ 101/ EEC

	Batteries used in the product do not contain: • Mercury greater than 5ppm by weight • Cadmium greater than 10ppm by weight • Lead greater than 4000ppm by weight Battery size: CR2032 (coin cell) Battery type: Lithium
Restricted Material Usage	This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html): • Asbestos • Batteries - Mercury • Batteries - Cadmium • Batteries - Lead (non-rechargeable) • Batteries - Non-rechargeable Alkaline and Carbon-Zinc Batteries • Batteries - Classification as "Not Restricted" for Transport • Brominated Flame Retardants (PBBs, PBDEs, including DecaBDE) • Brominated Flame Retardants (all BFRs in external case plastic parts) • Cadmium and its compounds • Certain Azo Colorants • Chlorinated Hydrocarbons • Chlorinated Paraffins • Formaldehyde • Formaldehyde - emissions • Hexavalent Chromium and its compounds in metallic applications • Hexavalent Chromium and its compounds in non-metallic applications • Lead and its compounds • Lead in paint • Lead in Polyvinyl Chloride (PVC) coating of external cables, wires and cords • Mercury and its compounds • Nickel on external surfaces • Ozone Depleting Substances (ODS) • Polycyclic Aromatic Hydrocarbons (PAH) • Perfluorooctane sulfonates (PFOS) in parts • Perfluorooctane sulfonates (PFOS) in preparations • Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs) • Polychlorinated Naphthalenes • Polyvinyl Chloride (PVC) in external case plastic parts • Radioactive Substances • Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)
Packaging	HP Workstation product packaging meets the following (refer to the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html: • Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment (see link above). • Does not contain ozone-depleting substances (ODS). • Design packaging materials for ease of disassembly. • Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed.

	• Maximizes the use of post-consumer recycled content materials in packaging materials. • All packaging material is recyclable. • Reduces size and weight of packages to improve transportation fuel efficiency. • Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

Longevity and Upgrading	This product is designed to be upgraded, possibly extending its useful life by several years. Spare parts are available throughout the warranty period and for up to 5 years after the end of production. Upgradeability features contained in the product include:
	
	Intel LGA775 processor socket
	
	• 12 USB ports
	  ○ 7 rear
	  ○ 3 internal - 1 Type A
	  ○ 2 front
	• 3 PCI slots
	• 4 PCI Express slots
	  ○ 1 PCI Express ×1 slot
	  ○ 2 Gen2 PCI Express ×16 slots

Packaging Materials	
External	Cardboard carton and insert: 1.536 kg
Internal	LDPE Foam: .366 kg
End-of-Life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.
Hewlett-Packard Corporate Environmental Information	For more information about HP's commitment to the environment: [link to new HP white paper now in progress] Global Citizenship Report: http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html Eco-label certifications: http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html ISO 14001 certificates: http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html
Service, Support and Warranty	On-site Warranty and Service (Note 1): One and three-years, limited warranty and service offering delivers on-site, next business-day (Note 2) service for parts and labor and includes free telephone support (Note 3) 8am - 5pm. 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. HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at http://www.hp.com/hps/carepack. Service levels and response times for HP Care Packs may vary depending on your geographic location
Additional Information	• This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC. • This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE)

	Directive - 2002/96/EC. • Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. • This product contains 0% recycled materials (by weight) • This product is >90% recycle-able when properly disposed of at end of life.

Processors	Intel Xeon W3503, 2.40GHz, 4MB cache, 1066 memory, 4.8GT/s QPI, Dual-Core
	Intel Xeon W3505, 2.53GHz, 4MB cache, 1066 memory, 4.8GT/s QPI, Dual-Core
	Intel Xeon W3520, 2.66GHz, 8MB cache, 1066 memory, 4.8GT/s QPI, Quad-Core, HT, Turbo
	Intel Xeon W3540, 2.93GHz, 8MB cache, 1066 memory, 4.8GT/s QPI, Quad-Core, HT, Turbo
	Intel Xeon W3570, 3.20GHz, 8MB cache, 1333 memory, 6.4GT/s, Quad-Core, HT, Turbo

Introduction

Intel's latest-generation microarchitecture represents the next step in unprecedented processor performance and dynamic scalability. Designed from the ground up to take advantage of hafnium-based Intel® 45nm hi-k metal gate silicon technology, Intel® Microarchitecture (Nehalem) unleashes parallel processing performance enabled by Intel® QuickPath technology providing an integrated memory controller and high-speed interconnect per independent processing core.

Performance and Features

Maximum multitasking performance Intel® Microarchitecture (Nehalem) offers the latest in processor innovation, including:

- 'Dynamic scalability, managed cores, threads, cache, interfaces, and power for energy-efficient performance on demand.
- Design and performance scalability for servers, workstations, notebooks and desktops with support for 2-8+ cores and up to 16+ threads with Intel® Hyper-Threading Technology (Intel® HT Technology), and scalable cache sizes, system interconnects, and integrated memory controllers.
- Intel® Turbo Boost Technology delivers additional performance automatically when needed by taking advantage of the processor's power and thermal headroom. This enables increased performance of both multi-threaded and single-threaded workloads.
- Intel Hyper-Threading Technology brings high-performance applications into mainstream computing with 1-16+ threads optimized for a new generation multi-core processor architecture.
- Scalable shared memory of Intel® QuickPath technology features memory distributed to each processor with integrated memory controllers and high-speed point-to-point interconnects to unleash the performance of future versions of next-generation Intel® multi-core processors.
- Multi-level shared cache improves performance and efficiency by reducing latency to frequently used data.

Turbo Boost Technology

This technology now built into Xeon 3500 Series Quad-Core processors will increase the speed of your processor on demand (from OS) if the CPU is operating below power / thermal specifications:

- Benefit of Turbo Boost (how much CPU speed up) depends on number of active cores
- Likelihood of Turbo Boost operation increases when less cores are active
- Likelihood of Turbo Boost operation increases when dynamic power mgt is enabled

HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations	300 GB (15K)	Capacity	300 GB	
		Height	1 in; 2.5 cm	
		Width	Media Diameter	3.5 in; 8.9 cm
			Physical Size	4 in; 10.2 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	3.0 Gb/s	
		Buffer	16 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.5 ms
			Full Stroke	6.7 ms
		Rotational Speed	15,000 rpm	
		Logical Blocks	585,937,500 - 512 byte blocks	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	146 GB (15K)	Capacity	146 GB	
		Height	1 in; 2.5 cm	
		Width	Media Diameter	3.5 in; 8.9 cm
			Physical Size	4 in; 10.2 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	3.0 Gb/s	
		Buffer	16 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.5 ms
			Full Stroke	6.7 ms
		Rotational Speed	15,000 rpm	
		Logical Blocks	86,749,488 - 512 byte blocks	
		Operating Temperature	50° to 95° F (10° to 3°5 C)	
	450 GB (15K)	Capacity	450 GB	
		Height	1 in; 2.5 cm	
		Width	Media Diameter	3.5 in; 8.9 cm
			Physical Size	4 in; 10.2 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	3.0 Gb/s	
		Buffer	16 MB	

Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2 ms	
	Average	3.6 ms	
	Full Stroke	6.6 ms	
Rotational Speed	15,000 rpm		
Logical Blocks	879, 097, 968 - 512 byte blocks		
Operating Temperature	50° to 95° F (10° to 35° C)		

SATA (Serial ATA) Hard Drives for HP Workstations	160,041,885,696 bytes (10K)	**Capacity**	160,041,885,696 bytes	
		Height	1 in; 2.5 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.2 cm
		Interface	Serial ATA (1.5 Gb/s), Native Command Queuing enabled	
		Synchronous Transfer Rate (Maximum)	Up to 150 MB/s	
		Buffer	16 Mbytes	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.3 ms
			Average	4.6 ms
			Full Stroke	10.2 ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	312,581,808	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	1,000,204,886,016 bytes (7,200)	**Capacity**	1,000,204,886,016 bytes	
		Height	1 in; 2.5 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.2 cm
		Interface	Serial ATA (3.0 Gb/s), Native Command Queuing enabled	
		Synchronous Transfer Rate (Maximum)	Up to 300 MB/s	
		Buffer	32 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
			Average	11 ms
			Full Stroke	21 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	1,953,525,168	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	500,107,862,016	**Capacity**	500,107,862,016 bytes	

Technical Specifications - Hard Drives

bytes (7,200)	Height	1 in; 2.5 cm	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4 in; 10.2 cm
	Interface	Serial ATA (3.0 Gb/s), Native Command Queuing enabled	
	Synchronous Transfer Rate (Maximum)	300 MB/s	
	Buffer	16 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
250 GB (7200 rpm, for HP Z-Workstations)	Capacity	250 GB	
	Height	1 in; 2.54 cm	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (3.0 Gb/s), Native Command Queuing enabled	
	Synchronous Transfer Rate (Maximum)	300 MB/s	
	Buffer	8 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	488,397,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
160,041,885,696 bytes (7,200)	Capacity	160,041,885,696 bytes	
	Height	1 in; 2.5 cm	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4 in; 10.2 cm
	Interface	Serial ATA (3.0 Gb/s), Native Command Queuing enabled	
	Synchronous Transfer Rate (Maximum)	300 MB/s	
	Buffer	8 MB	

	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	312,581,808	
	Operating Temperature	41° to 131° F (5° to 55° C)	
300,069,052,416 bytes (10K)	**Capacity**	300,069,052,416 bytes	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (3.0Gb/s), Native Command Queuing enabled	
	Synchronous Transfer Rate (Maximum)	Up to 300 MB/s	
	Buffer	16 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms (maximum)
		Average	4.4 ms
		Full Stroke	9.5 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	586,072,368	
	Operating Temperature	41° to 131° F (5° to 55° C)	
320,072,933,376 bytes (7,200)	**Capacity**	320,072,933,376 bytes	
	Height	0.98 in; 2.5 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (3.0 Gb/s), Native Command Queuing enabled	
	Synchronous Transfer Rate (Maximum)	300 MB/s	
	Buffer	8 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2
		Average	12
		Full Stroke	21
	Rotational Speed	7,200 rpm	
	Logical Blocks	625,142,448	
	Operating Temperature	41° to 131° F (5° to 55° C)	

LSI 3041E 4-Port SAS 3.0 Gb/s RAID Card	PCI Bus	PCI-Express x4 lanes	
	PCI Modes	Bus Master DMA	
	RAID Levels	RAID 0, 1, 1E and 10E	
	PCI Data Burst Transfer Rate	250 MB/s per lane half duplex 500 MB/s per lane full duplex 1,000 MB/s 4-lane half duplex	
	SAS Bandwidth	Half Duplex	Single lane – 300 MB/s Wide Port (2 lanes) – 600 MB/s Wide Port (4 lanes) – 1200 MB/s
		Full Duplex	Single SAS Lane – 600 MB/s Wide Port (2 lanes) –1200 MB/s Wide Port (4 lanes) – 2400 MB/s
	PCI Card Type	3.3 volt add-in c	
	PCI Voltage	12 V ± 10%	
	PCI Power	7.5 Watts	
	Bracket	Full height and Low-profile	
	Certification Level	PCI-Express 1.0a	
	IO Bus	Four 3 Gb/s SAS/SATA ports	
	SAS Processor	LSISAS1064E	
	Internal Connectors	Four- SATA x1 connectors	
	External Connectors	None	
	Maximum Number of SCSI Devices	122	
	LED Indicators	On-board activity and fault LEDs	
	Integrated Mirroring	Integrated Mirroring option available	

LSI MegaRAID® SAS 8888ELP Host Bus Adapter (HBA)	PCI Bus	PCI-Express x8 lanes
	PCI Modes	Bus Master DMA
	RAID Levels	RAID 0, 1, and 5 RAID spans 10 and 50
	PCI Data Burst Transfer Rate	Up to 3Gb/s per port
	Full Duplex	Up to 1.5 GB/s
	PCI Voltage	+3.3V Add-in Card
	PCI Power	7.5 Watts
	Certification Level	PCI-Express 1.0a
	IO Bus	Eight 3Gb/s SAS/SATA ports
	Internal Connectors	Two SAS SFF8087 x4
	External Connectors	Two SAS SFF8088 x4
	Maximum Number of SCSI DeviceS	32

LED Indicators	Connector LEDs indicate whether the internal or external connector is active for ports 0-3 and 4-7

NVIDIA Quadro NVS 450 512 MB PCIe Graphics Card	Form Factor	ATX Full Height, 1/2 length Passive cooling
	Bus Type	PCI Express x16, Generation 2.0
	Memory	512 MB GDDR3 (256MB per GPU)
	Connectors	Four DisplayPort; Four DisplayPort to DVI-D adapters included. ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	DisplayPort connectors support ultra-high-resolution panels (up to 2560 x 1600)
	Supported Graphics APIs	OpenGL 3.0 Direct X 10.0
	Available Graphics Drivers	Genuine Microsoft Windows Vista(64-bit and 32-bit), Microsoft Windows XP Professional(64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support web site: http://welcome.hp.com/country/us/eng/software_drivers.html. Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power consumption	35 Watts

NVIDIA Quadro NVS 295 256MB Graphics Card	Form Factor	2.731 inches (H) × 6.600 inches (L), Half-Height
	Graphics Controller	NVIDIA Quadro NVS 295 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	256 MB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort Comes with 2 DisplayPort to DVI-D Adapters ('DisplayPort to VGA' and 'DisplayPort to DL DVI' adapters available as an accessory)
	Maximum Resolution	Two DisplayPort outputs drive two digital displays up to 2560 x 1600
	Display Output	• Drives DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking • Drives DVI enabled digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking (through DisplayPort to DVI-D (single link) cable)
	Supported Graphics APIs	OpenGL 3.0 DirectX 10.0
	Available Graphics Drivers	Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may be obtained from:

		ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power consumption	22.69 Watts
NVIDIA Quadro NVS 290 256 MB PCIe Graphics Card	Form Factor	Low Profile
	Bus Type	PCIe x16
	Memory	256 MB 400MHz DDR2 SDRAM unified frame buffer, Z-buffer and Texture storage
	Connectors	DMS-59, includes DMS-59 to Dual DVI-I cable. DMS-59 to Dual VGA cable available as an option.
	Maximum Resolution	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays or dual digital displays at 1920x1200 (single-link). NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft® Windows®
	RAMDAC	Integrated dual 400MHz
	Image Quality Features	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
	Programmable Video Processor	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
	Display Output	Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays or dual digital displays at 1920x1200 (single-link). NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft® Windows®
	Supported Graphics APIs	OGL 2.1 & DX10 Support; Shader Model 4.0
	Available Graphics Drivers	Genuine Windows Vista Business(64-bit and 32-bit), Microsoft Windows XP Professional(64-bit and 32-bit)(Provides full native Dual View mode, Span or Big Desktop mode, and Clone mode) Red Hat Enterprise Linux(RHEL) WS3, WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support web site: http://welcome.hp.com/country/us/eng/software_drivers.html. Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	High-Resolution AntiAliasing	Color planes: 32-bit color buffer Overlay planes: Hardware supported

	CUDA™ Parallel Processor Cores	NVIDIA Quadro NVS 290 (256 MB DH) PCIe Graphics Card with full height bracket attached, DMS-59 to Dual DVI cable, Workstation Software Driver CD, documentation.
NVIDIA Quadro FX 380 256MB Graphics Card	Form Factor	4.376 inches (H) × 6.60 inches (L)
	Graphics Controller	NVIDIA Quadro FX 380 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	256 MB GDDR3 SDRAM unified graphics memory
	Connectors	2 Dual Link DVI-I Two DVI-I to VGA adapters included
	Maximum Resolution	Two dual-link DVI-I outputs drive two digital displays at resolutions up to 2560 x 1600 @ 60Hz or two analog displays at resolutions up to 2048 x 1536 @ 85Hz
	RAMDAC	Dual Internal 400 MHz DAC
	Shading architecture	Full Shader Model 4.0 (OpenGL 2.1/DirectX 10 class) • Long fragment programs (unlimited instructions) • Long vertex programs (unlimited instructions) • Looping and subroutines (up to 256 loops per vertex program) • Dynamic flow control • Conditional execution
	Supported graphics APIs	OpenGL 3.0 Direct X 10.0
	Available graphics drivers	Genuine Windows Vista Business(64-bit and 32-bit), Microsoft Windows XP Professional(64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	High-level Shader Languages	• Optimized compiler for Cg and Microsoft HLSL • OpenGL 2.1 and DirectX 10 support • Open source compiler
	CUDA™ Parallel Processor Cores	16
	Power consumption	33.91 Watts

Technical Specifications - Graphics

ATI FirePro V3700 256MB Graphics Card	Form Factor	4.40 inches (H) × 6.70 inches (L) (11.18 cm (H) × 17.02 cm (L))
	Graphics Controller	ATI FirePro V3700 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	256 MB GDDR3 SDRAM unified graphics memory
	Connectors	2 Dual Link DVI-I Two DVI-I to VGA adapters included
	Maximum Resolution	Two dual-link DVI-I outputs drive two digital displays at resolutions up to 2560 x 1600 @ 60Hz or two analog displays at resolutions up to 2048 x 1536 @ 85Hz
	Shading architecture	Full Shader Model 4.0 • 40 Stream Processing Units • Dynamic load balancing and resource allocation for vertex, geometry, and pixel shaders • Common instruction set and texture unit access supported for all types of shaders • Dedicated branch execution units and texture address processors
	Supported graphics APIs	OpenGL 2.1 DirectX 10.1
	Available graphics drivers	Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Linux drivers may be obtained from: http://ati.amd.com/support/driver.html
	Power consumption	32 Watts
NVIDIA Quadro FX 580 512MB Graphics Card	Form Factor	4.376 inches (H) × 6.60 inches (L)
	Graphics Controller	NVIDIA Quadro FX 580 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	512MB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I. One DisplayPort to DVI and one DVI to VGA adapter included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• Two DisplayPort outputs drive two digital displays up to 2560 x 1600 • One dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz or one analog display at resolutions up to 2048 x 1536 @ 85Hz
	RAMDAC	Single Internal 400 MHz DAC
	Shading architecture	Full Shader Model 4.0 (OpenGL 2.1/DirectX 10 class) • Long fragment programs (unlimited instructions)

		• Long vertex programs (unlimited instructions) • Looping and subroutines (up to 256 loops per vertex program) • Dynamic flow control • Conditional execution
	Supported graphics APIs	OpenGL 3.0 Direct X 10.0
	Available graphics drivers	Genuine Windows Vista Business(64-bit and 32-bit), Microsoft Windows XP Professional(64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	High-level Shader Languages	• Optimized compiler for Cg and Microsoft HLSL • OpenGL 2.1 and DirectX 10 support • Open source compiler
	CUDA™ Parallel Processor Cores	32
	Power consumption	40 Watts
NVIDIA Quadro FX 1800 768MB Graphics Card	Form Factor	4.376 inches (H) x 7.8 inches (L)
	Graphics Controller	NVIDIA Quadro FX 1800 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	768MB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I. One DisplayPort to DVI-D and one DVI to VGA adapter included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• Two DisplayPort outputs drive two digital displays up to 2560 x 1600 • One dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz or one analog display at resolutions up to 2048 x 1536 @ 85Hz
	RAMDAC	Single Internal 400 MHz DAC
	Shading Architecture	Full Shader Model 4.0 (OpenGL 2.1/DirectX 10 class) • Long fragment programs (unlimited instructions) • Long vertex programs (unlimited instructions) • Looping and subroutines (up to 256 loops per vertex program) • Dynamic flow control • Conditional execution
	Supported Graphics APIs	OpenGL 3.0 Direct X 10.0
	Available Graphics Drivers	Genuine Windows Vista Business(64-bit and 32-bit), Microsoft Windows XP Professional(64-bit and 32-bit)

		Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	High-level Shader Languages	• Optimized compiler for Cg and Microsoft HLSL • OpenGL 2.1 and DirectX 10 support • Open source compiler
	CUDA™ Parallel Processor Cores	64.
	Power consumption	59 Watts
ATI FirePro V5700 512MB Graphics Card	Form Factor	4.40 inches (H) × 6.70 inches (L) (11.18 cm (H) × 17.02 cm (L))
	Graphics Controller	ATI FirePro V5700 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	512 MB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I. One DisplayPort to DVI and one DVI to VGA adapter included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• Two DisplayPort outputs drive two digital displays up to 2560 x 1600 • One dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz or one analog display at resolutions up to 2048 x 1536 @ 85Hz
	Shading architecture	Full Shader Model 4.0 • 320 Stream Processing Units • Dynamic load balancing and resource allocation for vertex, geometry, and pixel shaders • Common instruction set and texture unit access supported for all types of shaders • Dedicated branch execution units and texture address processors
	Supported graphics APIs	OpenGL 2.1 DirectX 10.1
	Available graphics drivers	Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Linux drivers may be obtained from: http://ati.amd.com/support/driver.html
	Power consumption	56 Watts

Technical Specifications - Graphics

NVIDIA Quadro FX 3800 1.0GB Graphics Card (NOT AVAILABLE UNTIL JUNE 2009)	Form Factor	4.376 inches (H) x 9.0 inches (L) Single slot card
	Graphics Controller	NVIDIA Quadro FX 3800 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	1GB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I. One DisplayPort to DVI-D and one DVI to VGA adapter included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• Two DisplayPort outputs drive two digital displays up to 2560 x 1600 • One dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz or one analog display at resolutions up to 2048 x 1536 @ 85Hz
	RAMDAC	Single Internal 400 MHz DAC
	Shading architecture	Full Shader Model 4.0 (OpenGL 2.1/DirectX 10 class) • Long fragment programs (unlimited instructions) • Long vertex programs (unlimited instructions) • Looping and subroutines (up to 256 loops per vertex program) • Dynamic flow control • Conditional execution
	Supported graphics APIs	OpenGL 3.0 Direct X 10.0
	Available graphics drivers	Genuine Windows Vista Business(64-bit and 32-bit), Microsoft Windows XP Professional(64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	High-level Shader Languages	• Optimized compiler for Cg and Microsoft HLSL • OpenGL 2.1 and DirectX 10 support • Open source compiler
	CUDA™ Parallel Processor Cores	192
	Power consumption	107.9 Watts

Technical Specifications - Graphics

ATI FirePro V7750 1.0GB Graphics Card	Form Factor	4.40 inches (H) × 13.0 inches (L) (11.18 cm (H) × 33.02 cm (L))
	Graphics Controller	ATI FirePro V7750 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	1024 MB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I. One DisplayPort to DVI and one DVI to VGA adapter included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• Two DisplayPort outputs drive two digital displays up to 2560 x 1600 • One dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz or one analog display at resolutions up to 2048 x 1536 @ 85Hz
	Shading architecture	Full Shader Model 4.0 • 320 Stream Processing Units • Dynamic load balancing and resource allocation for vertex, geometry, and pixel shaders • Common instruction set and texture unit access supported for all types of shaders • Dedicated branch execution units and texture address processors
	Supported graphics APIs	OpenGL 2.1 DirectX 10.1
	Available graphics drivers	Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Linux drivers may be obtained from: http://ati.amd.com/support/driver.html
	Power consumption	76 Watts

Technical Specifications - Graphics

NVIDIA Quadro FX 4800 1.5GB PCIe Graphics Card	Form Factor	4.36" (H) x 10.5" (L) Dual slot card
	Graphics Controller	NVIDIA Quadro FX 4800 graphics board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	1.5 GB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I, 1 3-pin Mini DIN stereo output, Two DisplayPort to DVI-D adapters included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• 2 DisplayPort connectors support ultra-high-resolution panels (up to 2560 x 1600) • Dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz • Internal 400 MHz DACs-One analog display up to 2048 x 1536 @ 85Hz
	Shading Architecture	• Full Shader Model 4.0 (OpenGL 2.1/DirectX 10 class) • Long fragment programs (unlimited instructions) • Long vertex programs (unlimited instructions) • Looping and subroutines (up to 256 loops per vertex program) • Dynamic flow control • Conditional execution
	Supported Graphics APIs	OpenGL 3.0 Direct X 10.0
	Available Graphics Drivers	Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) WS4 & 5 Desktop/Workstation HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	High-Resolution AntiAliasing	• Rotated Grid Full-Scene Antialiasing (RG FSAA) • 32xFSAA dramatically reduces visual aliasing artifacts or "jaggies" at resolution up to 1920 x 1200 • 64x FSAA SLI Mode
	High-level Shader Languages	• Optimized compiler for Cg and Microsoft HLSL • OpenGL 2.1 and DirectX 10 support • Open source compiler
	CUDA™ Parallel Processor Cores	192
	Power consumption	146 Watts

Technical Specifications - Graphics

NVIDIA Quadro CX	Form Factor	4.36" (H) x 10.5" (L) Dual slot card
	Graphics Controller	NVIDIA Quadro CX 1.5GB Graphics Card
	Bus Type	PCI Express x16, Generation 2.0
	Memory	1.5 GB GDDR3 SDRAM unified graphics memory
	Connectors	2 DisplayPort, 1 Dual-Link DVI-I, 1 3-pin Mini DIN stereo output. Two DisplayPort to DVI-D adapters included ('DisplayPort to VGA' and 'DisplayPort to Dual Link DVI' adapters available as an accessory)
	Maximum Resolution	• 2 DisplayPort connectors support ultra-high-resolution panels (up to 2560 x 1600) • Dual-link DVI-I output drives one digital display at resolutions up to 2560 x 1600 @ 60Hz • Internal 400 MHz DACs-One analog display up to 2048 x 1536 @ 85Hz
	RAMDAC	400MHz
	Shading Architecture	• Full Shader Model 4.0 (OpenGL 2.1/DirectX 10 class) • Long fragment programs (unlimited instructions) • Long vertex programs (unlimited instructions) • Looping and subroutines (up to 256 loops per vertex program) • Dynamic flow control • Conditional execution
	Supported Graphics APIs	OpenGL 3.0 Direct X 10.0
	Available Graphics Drivers	Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	High-Resolution AntiAliasing	• Rotated Grid Full-Scene Antialiasing (RG FSAA) • 32xFSAA dramatically reduces visual aliasing artifacts or "jaggies" at resolution up to 1920 x 1200 • 64x FSAA SLI Mode
	High-level Shader Languages	• Optimized compiler for Cg and Microsoft HLSL • OpenGL 2.1 and DirectX 10 support • Open source compiler
	CUDA™ Parallel Processor Cores	192
	Power consumption	146 Watts

Technical Specifications - Multimedia and Audio Devices

Integrated Intel/Realtek HD ALC262 Audio	Type	Integrated
	High Definition Codec	Yes
	FM Synthesis Support	Yes
	OPL3 FM Synthesis Support	Yes
	Sound Blaster Compatibility	Yes
	Meets Premium performance for Windows Logo Program 3.0	Yes
	Audio Jacks	Front panel microphone in and headphone out - fixed usage. Rear panel line in and line out jacks - jacks are retaskable One Line-In* (12-K ohm Input Impedance)* NOTE: External Speakers need to be powered externally.
	Sampling	3 stereo ADCs support 16/20-bit PCM format with 44.1K/48K/96kHz sample rate 2 stereo DAC supports 16/20/24-bit PCM format with 44.1K/48K/96K/192kHz sample rate
	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
	DVD Audio	Yes
	Number of Channels on Line-Out	Stereo (Left & Right channels)
	Internal Audio Speaker Power Rating	1.5 W
	Internal Speaker	Yes
	Hardware Equalizer for Internal Speaker	No
	External Speaker Jack (Line-Out)	Yes

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	Frequency Response (-3dB, 24-bit/96kHz input)	FO to 20kHz
	Dimensions	Speakers: 5.72 x 3.74 x 0.96 in (14.52 x 9.50 x 2.45 cm) per speaker
	On/Off/Volume Controls	Right side of right speaker
	Power LED	Front of right speaker (green)
	Watts	2/3 watt (normal/maximum)
	Net weight	0.68 lbs (0.31kg)
	Environmental (all conditions non-condensing)	Temperature (operating): 14° to 104° F (-10° to 40° C) Relative Humidity (operating): 40% to 90%
	Speaker cable length	Input cord: 5.91 ft (1800mm±35mm) L-channel cord: 3.28 ft (1000mm±35mm) USB cord: 5.91 ft (1800mm±35mm)
	Color	HP Carbonite
	Kit Contents	One pair of HP Thin USB Powered Speakers with attached audio signal and USB power cables for connecting to your PC HP Warranty documentation

SoundBlaster (Creative Labs) X-Fi Titanium PCIe Audio Card	24-bit Analog-to-Digital conversion of analog inputs	96kHz sample rate
	24-bit Digital-to-Analog conversion of digital sources	96kHz to analog 7:1 speaker output
	24-bit Digital-to-Analog conversion of stereo digital sources	8, 11.025, 16, 22.05, 24, 32, 44.1, 48 and 96kHz
	16-bit to 24-bit recording sampling rates	16-bit/44.1kHz, 16-bit/48kHz, 24-bit/44.1kHz, 24-bit/48kHz and 24-bit/96kHz with direct monitoring
	Enhanced SoundFont support	Up to 24-bit resolution
	Signal-to-Noise Ratio (2okHz Low-pass filter, A-Weighted)	109dB
	Total Harmonic Distortion + Noise at 1kHz (20kHz Low-pass filter)	.004%
	Frequency Response (-3dB, 24-bit/96kHz input)	10Hz to 46kHz
	Frequency Response (-3dB, 24-bit/192kHz input)	10Hz to 46kHz
	Speaker and Headphone connections	Stereo to 7.1 (Line Out via three 3.5mm mini jacks)
	Flexijack	Line In/ Microphone In/Optical Out via shared 3.5mm mini jack
	Front Panel Header	Intel HD Audio Compatible (2x5 pin)

Operating System	Microsoft Windows Vista Business 64 Microsoft Windows Vista Business 32 Microsoft® Windows® XP Professional SP2 Microsoft Windows XP Professional x64 Edition	
Minimum System Requirements	System RAM	512MB
	Operating System	Windows Vista 32-bit and 64-bit version or Windows XP 32-bit or 64-bit version

NOTE 1: Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players.

HP DVD-ROM Drive	Description		5.25-inch, half-height, tray-load
	Mounting Orientation		Either horizontal or vertical
	Interface Type		SATA/ATAPI
	Dimensions (WxHxD)		5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm)
	Disc Capacity	DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	DVD-ROM Single Layer	< 140 ms (typical)
		CD-ROM Mode 1	< 125 ms (typical)
		Full Stroke DVD	< 250 ms (seek)
		Full Stroke CD	< 210 ms (seek)
	Power	Source	SATA DC power receptacle
		DC Power Requirements	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
	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)
		Operating Systems Supported	Windows Vista Business 64* Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS3, WS4, 5 Desktop/Workstation Novell SLES 9 & SLE 10 No driver is required for this device. Native support is provided by the operating system.

* Certain Windows Vista product features require advanced or additional hardware. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: http://www.windowsvista.com/upgradeadvisor. For Windows Vista system requirements, visit: http://www.windowsvista.com/systemrequirements.

HP DVD+/-RW Drive	Description	5.25-inch, half-height, tray-load		
	Mounting Orientation	Either horizontal or vertical		
	Interface Type	SATA/ATAPI		
	Dimensions (WxHxD)	5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm)		
	Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW		
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard	
		Full Stroke DVD	< 250 ms (seek)	
		Full Stroke CD	< 210 ms (seek)	
	Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 40X CD-RW Up to 32X	
		DVD ROM Read	DVD-RAM	Up to 12X
			DVD+RW	Up to 8X
			DVD-RW	Up to 8X
			DVD+R DL	Up to 8X
			DVD-R DL	Up to 8X
			DVD-ROM	Up to 16X
			DVD-ROM DL	Up to 8X
			DVD+R	Up to 16X
			DVD-R	Up to 16X
	Power	Source	SATA DC power receptacle	
		DC Power Requirements	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	
	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)	
		Operating Systems Supported	Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS3, WS4, 5 Desktop/Workstation Novell SLES 9 & SLE 10 No driver is required for this device. Native	

		support is provided by the operating system. * Certain Windows Vista product features require advanced or additional hardware. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: http://www.windowsvista.com/upgradeadvisor. For Windows Vista system requirements, visit: http://www.windowsvista.com/systemrequirements. * LightScribe functionality is not natively supported by Linux distributions. Customers may download LightScribe Linux drivers from: http://www.lightscribe.com/downloadSection/linux/index.aspx
	Kit Contents	HP SATA SuperMulti LightScribe DVD Writer drive, LightScribe software, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.

HP Blu-Ray Writer	Description	5.25-inch, half-height, tray-load		
	Mounting Orientation	Either horizontal or vertical		
	Interface Type	SATA		
	Dimensions (WxHxD)	5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm)		
	Disc Formats	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW		
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard	
		Blu-ray	50 GB DL or 25 GB standard	
		Full Stroke DVD	< 250 ms (seek)	
		Full Stroke CD	< 210 ms (seek)	
		Blu-ray	Blu-ray	
		Startup Time (Time to drive ready from tray loading)	BD-ROM (SL/DL)	25S / 28S
			BD-R (SL/DL)	25S / 28S
			BD-RE (SL/DL)	25S / 28S
			DVD-ROM (SL/DL)	18S / 18S

		DVD-R (SL/DL)	25S / 25S
		DVD-RW	25S
		DVD+R (SL/DL)	25S / 25S
		DVD+RW	25S
		DVD-RAM	45S
		CD-ROM	45S
Maximum Data Transfer Rates	CD ROM Read	CD-ROM	Up to 40X
		CD-R	Up to 40X
		CD-RW	Up to 40X
	DVD ROM Read	DVD-RAM	Up to 5X
		DVD+RW	Up to 10X
		DVD-RW	Up to 10X
		DVD+R DL	Up to 8X
		DVD-R DL	Up to 8X
		DVD-ROM	Up to 16X
		DVD-ROM DL	Up to 8X
		DVD+R	Up to 12X
		DVD-R	Up to 12X
	Blu-Ray	BD-ROM	Up to 6X
		BD-ROM DL	Up to 4.8X
		BD-R	Up to 6X
		BD-R DL	Up to 4.8X
		BD-R	Up to 6X
		BD-RE SL/DL	Up to 4.8X
Power	Source	SATA DC power receptacle	
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 10%-100 mV ripple p-p	
	DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum	
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	15% to 80%	
	Maximum Wet Bulb Temperature	86° F (30° C)	
	Operating Systems Supported	Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS3, WS4, 5 Desktop/Workstation Novell SLES 9 & SLE 10 No driver is required for this device. Native support is provided by the operating system.	

	Kit Contents	HP Blue Laser RW Drive, LightScribe software, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide.
	Disclaimer	As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.
HP 22-in-1 Media Card Reader	Description	The Media Card Reader device uses the same physical form factor and mounting as a Floppy Disk Drive. The device connects to a 2x5 two-channel USB header on the motherboard of the system. There is no USB controller card provided. Please see the Disc Formats section below for a list of flash memory card formats that are supported.
	Mounting Orientation	The Media Card Reader can be mounted in a dedicated Floppy Drive bay (if the chassis provides one) or in an appropriate Optical Bay adapter. It will operate in any orientation.
	Interface Type	USB 2.0 (one channel dedicated to the separate USB port; one channel dedicated to the flash memory card slots)
	Dimensions (WxHxD)	4.9 x 4.0 x 1.0 in (124.5 x 101.6 x 25.4 mm)
	Disc Formats	xD-Picture Micro SD Micro SDHC SD SDHC Mini SD Mini SDHC MultiMediaCard (MMC) Reduced Size MultiMediaCard (RS MMC) MultiMedia Card 4.2 (MMC Plus, including MMC Plus HC) Reduced Size MultiMedia Card 4.2 (MMC Mobile, including MMC Mobile HC) CompactFlash Card Type I CompactFlash Card Type II MicroDrive Memory Stick (MS) MagicGate Memory Stick (MG) MagicGate Memory Stick Duo Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo Two additional formats are usable with adapters (not supplied): MMC Micro Memory Stick Micro (M2)

HP FireWire/IEEE 1394a PCI Card	Data Transfer Rate	Burst Data Rate up to 400 Mbps
	Device Interface Protocol	IEEE-1394a
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCI card with brackets for low profile and full height PCI slots.
	Certification Level	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Ports	Two IEEE 1394 6-Pin Connector (Rear)
	Internal Connectors	One 10-Pin (9 Contacts) Custom Connector
	System Requirements	Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. No driver is required for this device. Native support is provided by the operating system. * Certain Windows Vista product features require advanced or additional hardware. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: http://www.windowsvista.com/upgradeadvisor. For Windows Vista system requirements, visit: http://www.windowsvista.com/systemrequirements. Pentium II 266 or above 128-MB RAM 1-GB Hard Drive CD-ROM drive Built-in sound system Available PCI slot
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Operating Systems Supported	Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32* * Certain Windows Vista product features require advanced or additional hardware. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: http://www.windowsvista.com/upgradeadvisor. For Windows Vista system requirements, visit: http://www.windowsvista.com/systemrequirements.

Technical Specifications - Controller Cards

HP IEEE 1394b FireWire PCIe Card	Data Transfer Rate	Supports up to 800 Mbps
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b bilingual 9-Pin Connector (Rear)
	Internal Connectors	One 10-Pin header Custom Connector
	System Requirements	Microsoft Windows XP Professional, Windows XP Home, Windows Vista. Not supported on Linux. Pentium® III or higher processor 128-MB RAM 1-GB Hard Drive CD-ROM drive Built in sound system Available PCI slot
	Temperature – Operating	50° to 131° F (10° to 55° C)
	Temperature – Storage	–22° to 140° F (–30° to 60° C)
	Relative Humidity – Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Microsoft Windows XP and Windows Vista

NOTE 1: "Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

Integrated Broadcom 5764 PCIe LOM Controller	Connector	RJ45
	Data Rates Supported	10/100/1000BT
	Bus Architecture	PCIe X1
	Alerting	ASF 2.0

Broadcom (5761) NetXtreme Gigabit Ethernet Plus NIC	Connector	RJ-45
	Controller	Broadcom 5761 PCI-Express LAN Controller
	Memory	8 MB NVRAM serial Flash
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x
	Bus Architecture	PCI-Express
	Data Path Width	Single Channel PCI-Express
	Data Transfer Mode	Bus Master DMA
	Hardware Certifications	FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682)
	Power Requirement	1.8W @ 3.3V
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex Half-duplex (not available for the 1000BASE-T transceiver)
	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 (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	131° F (55° C) with 5% to 95% non-condensing humidity
	Dimensions	2.75 in x 4.13 in (7 cm x 10.5 cm), low profile compatible
	Operating System Driver Support	Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional, Windows XP x64 .
	Management Capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles
	Kit Contents	Broadcom NetXtreme Gigabit Ethernet Plus NIC, Broadcom NetXtreme Gigabit Ethernet Plus NIC USB Cable Assembly, CD, drivers, quick install guide, product warranty statement

Technical Specifications - Networking and Communications

Intel Gigabit CT Desktop NIC	Connector	RJ-45
	Controller	Intel WG82574L Gigabit Ethernet Controller
	Memory	Integrated Dual 48K configurable transmit receive FIFO Buffers
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802,1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	Bus Architecture	PCI-E 1.0a
	Data Path Width	X1, 250 MB/s, Bi-directional 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	Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T
	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 (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	85% at 131° F (55° C)
	Dimensions	4.75 x 2.25 x 0.8 in (12.1 x 5.7 x 2.0 cm)
	Operating System Driver Support	Windows Vista Business 64, Windows Vista Business 32, Windows XP Professional, Windows XP x64. Red Hat Enterprise Linux 4, Red Hat Enterprise Linux 5.
	Management Capabilities	WOL , PXE, DMI, WFM 2.0
	Kit Contents	Intel Gigabit CT Desktop NIC, low profile bracket, CD containing Intel PROset II NIC drivers, quick install guide, product warranty statement

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