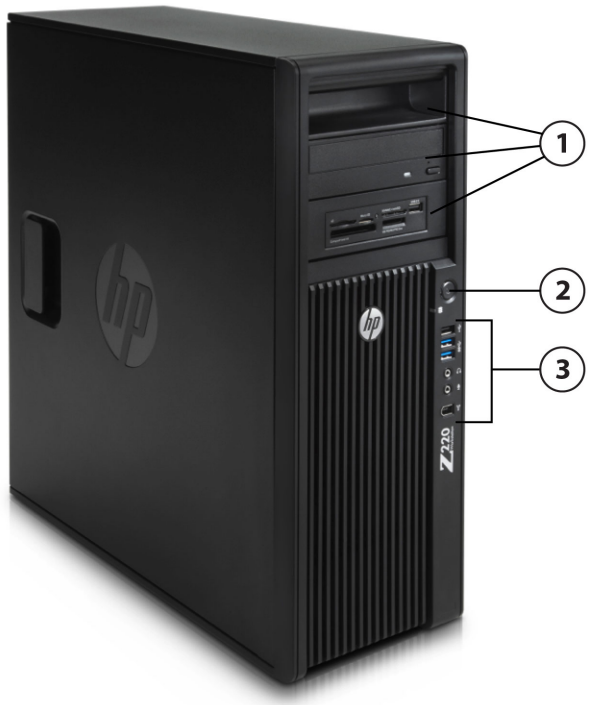
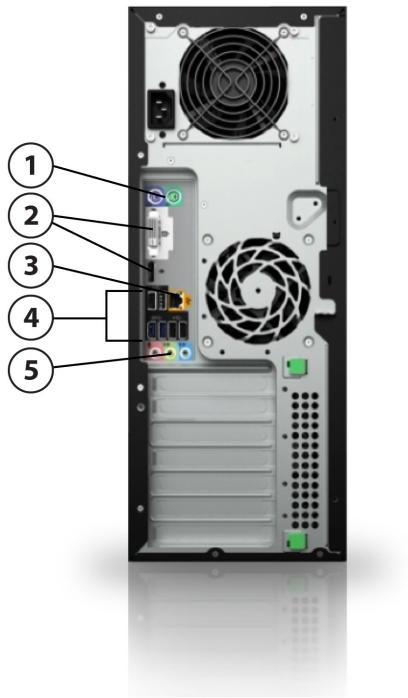
Overview



1. 3 External 5.25” bays; in top to bottom order:
    - HP Z220 CMT handle (optional)
    - DVD-RW optical drive (optional)
    - 22-in-1 Media Card Reader (optional)
2. Power button
3. Front I/O (in top to bottom order): 1 USB 2.0 port, 2 USB 3.0 (blue) ports, Headphone, Microphone, optional IEEE 1394a port.

Overview



1. PS/2 ports (keyboard, mouse)
2. 1 DVI-I single link, 1 DisplayPort (DP 1.1) output from Intel HD graphics (available on selected processors only)
3. RJ-45 to integrated GBE
4. 2 USB 3.0, 4 USB 2.0
5. 1 Audio Line In, 1 Audio Line Out, 1 Microphone

Form Factor	Convertible Minitower
Operating Systems	Preinstalled: • Windows 7 Ultimate 64-Bit • Windows 7 Professional 32/64 • Windows 7 Home Premium 32/64 • Windows 8 Pro 64-bit • Windows 8 Simplified Chinese Edition 64-bit • Windows 8 Pro Downgrade to Windows 7 Professional 32-bit • Windows 8 Pro Downgrade to Windows 7 Professional 64-bit • HP Installer Kit for Linux [includes drivers for 64-bit OS versions of Red Hat Enterprise Linux 6 and SUSE Linux Enterprise Desktop (SLED) 11] • SUSE Linux Enterprise Desktop 11 64-bit • Red Hat Enterprise Linux Workstation (1 year paper license available; Preinstall not available) Supported: • Genuine Windows® 7 Enterprise 32/64

Overview

- Genuine Windows® XP Professional 32/64 (on select configurations)*

* See the "Windows XP Support Matrix for Z Workstations" at: http://www.hp.com/support/workstation_manuals

NOTES: For detailed OS/hardware support information for Linux, see: http://www.hp.com/support/linux_hardware_matrix

Name	Cores	Clock Speed (GHz)	Intel® Turbo Boost Technology[1]	Cache (MB)	Memory Speed (MHz)	Hyper-Threading	Integrated Graphics	Featuring Intel® vPro™ Technology	TDP (W)
Intel® Xeon® processor E3-1290v2	4	3.7	4.1	8	1600	Y	N/A	Y	87W
Intel® Xeon® processor E3-1280v2	4	3.6	4.0	8	1600	Y	N/A	Y	69W
Intel® Xeon® processor E3-1270v2	4	3.5	3.9	8	1600	Y	N/A	Y	69W
Intel® Xeon® processor E3-1245v2	4	3.4	3.8	8	1600	Y	Intel HD Graphics P4000	Y	77W
Intel® Xeon® processor E3-1240v2	4	3.4	3.8	8	1600	Y	N/A	Y	69W
Intel® Xeon® processor E3-1230v2	4	3.3	3.7	8	1600	Y	N/A	Y	69W
Intel® Xeon® processor E3-1225v2	4	3.2	3.6	8	1600	N	Intel HD Graphics P4000	Y	77W
Intel® Core™ i7-3770 processor	4	3.4	3.9	8	1600	Y	Intel HD Graphics 4000	Y	77W
Intel® Core™ i5-3570 processor	4	3.4	3.8	6	1600	N	Intel HD Graphics 2500	Y	77W
Intel® Core™ i5-3470 processor	4	3.2	3.8	6	1600	N	Intel HD Graphics 2500	Y	77W
Intel® Core™ i3-3240 processor	2	3.4	N/A	3	1600	N	Intel HD Graphics 2500	N	55W
Intel® Core™ i3-3220 processor	2	3.3	N/A	3	1600	N	Intel HD Graphics 2500	N	55W
Intel® Core™ i3-2120 processor	2	3.3	N/A	3	1333	N	Intel HD Graphics 2000	N	65W

Overview

Intel® Pentium® G2020 processor	2	2.9	N/A	3	1333	N	Intel HD Graphics	N	55W

[1]The specifications shown in this column represent the maximum turbo frequency with one core active. Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

Available Processor Disclaimers	Integrated Intel® HD graphics is not supported on the Intel Xeon processor E3-1230v2, E3-1240v2, E3-1270v2, E3-1280v2 or E3-1290v2. Intel® Xeon E3, Intel Core i3 and Intel Pentium processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory. Intel's numbering is 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.
Color	Jack Black
Convertibility	Yes. 5.25" drives rotate for Minitower or Desktop orientation.
Expansion Slots (see system board section for more details)	1 PCIe Gen3 x16 slot 1 PCIe Gen2 x4 slot /x16 connector 1 PCIe Gen2 x4 slot /x8 connector 2 PCIe Gen 2 x1 slot 2 PCI slots **NOTE:** The PCIe x8 connector is open ended, allowing a PCIe x16 card to be seated in the slot. However, this slot supports only half length cards. In the PCIe Gen3 x16 slot, if it is not being used for a graphics card, only cards certified as After Market Options for this platform are supported.
Expansion Bays (see storage section for more details)	3 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 3.0, 1 USB 2.0, 1 IEEE 1394a (requires optional PCIe card to function), 1 Headphone, and 1 Microphone.
Internal I/O	5 USB 2.0 ports available by two separate 2x5 and one 1x5 header: supports one HP Internal USB Port Kit (one port on each Kit) for 1x5 pin header plus (a) up to two USB Media Card Readers, or (b) one Internal Port kit and one USB Media Card Reader.
Rear I/O	1 DVI-I Single Link and 1 DisplayPort (DP 1.1) output from Intel HD graphics (available on selected processors only), 2 USB 3.0, 4 USB 2.0, 1 optional serial port, 2 PS/2, RJ-45 (NIC), 1 Audio Line-in, 1 Audio Line-out, 1 Microphone; 2 IEEE 1394b ports (optional)
Interfaces Supported	22-in-1 Media Card Reader (optional)
Chassis Dimensions (H x W x D)	Standard minitower orientation: 447 x 178 x 455 mm (17.6 x 7 x 17.9 in); Converted desktop orientation: 178 x 447 x 455 mm (7 x 17.6 x 17.9 in)
Weight	Exact weights depend upon configuration: Minimum: 10.4 :kg (22.9 lbs) Typical*: 11.6 kg (25.5 lbs) Maximum: 14.8 kg (32.6 lbs) Max Supported Weight (desktop orientation) 35 kg (77 lb)

Overview

	* Typical weight when configured with 1 3.5" hard drive, 1 optical drive, 2 DIMMs and 1 NVIDIA NVS 300 graphics card
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: 3,000 m; 10,000 ft Non-operating: 9,100 m; 30,000 ft
Power Supply	400 watts wide-ranging, active Power Factor Correction, 90% Efficient The Power Supply Efficency Report for this Power Supply may be found at the following link: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD_619397-001_ECOS%202277%201_400W_Report.pdf
Backup Devices	For a complete listing of compatible DAT tape drives, LTO tape drives and RDX Removable Disk Backup System offerings, please visit: http://www.hp.com/go/connect
Chipset	Intel® C216 chipset
Memory	4 DIMM slots, supporting up to 32GB ECC/non-ECC, DDR3 1600 MHz
Memory disclaimers	The CPUs determine the speed at which the memory is clocked. If a 1066 MHz capable CPU is used in the system, the maximum speed the memory will run at is 1066 MHz regardless of the specified speed of the memory.
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel® Xeon® processor E3 v2 family (Z220)				
Intel® Xeon® processor E3-1290v2, Quad-Core, 8 MB cache, 3.7 GHz, up to 4.1 GHz with Intel Turbo Boost Technology	Y	N		See Note 2
Intel® Xeon® processor E3-1280v2, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology	Y	N		See Note 2
Intel® Xeon® processor E3-1270v2, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology	Y	N		See Note 2
Intel® Xeon® processor E3-1245v2, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technolo	Y	N		See Note 2
Intel® Xeon® processor E3-1240v2, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology	Y	N		See Note 2
Intel® Xeon® processor E3-1230v2, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology	Y	N		See Note 2
Intel® Xeon® processor E3-1225v2, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology	Y	N		See Note 2
3rd generation Intel® Core™ processor family				
Intel® Core™ i7-3770 processor, Quad-Core, 8 MB cache, 3.4GHz, up to 3.9 GHz with Intel Turbo Boost Technology	Y	N		See Note 3
Intel® Core™ i5-3570 processor, Quad-Core, 6 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology	Y	N		See Note 3
Intel® Core™ i5-3470 processor, Quad-Core, 6 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology	Y	N		See Note 3
Intel® Core™ i3-3240 processor, Dual-Core, 3 MB cache, 3.4 GHz	Y	N		See Note 2
Intel® Core™ i3-3220 processor, Dual-Core, 3 MB cache, 3.3 GHz	Y	N		See Note 2
Dual-Core Intel® Pentium® processors (Z220)				
Intel® Pentium® G2020 processor, Dual-Core, 3 MB cache, 2.9 GHz	Y	N		See Note 2

NOTE 1: Intel HD Graphics P4000 supports workstation-specific graphics drivers for improved compatibility and performance on select professional applications, compared to either Intel HD Graphics 4000 or Intel HD Graphics 2500.

NOTE 2: These processors support either ECC or non-ECC memory

NOTE 3: These processors support only non-ECC memory

Supported Components

Monitors / Displays

		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	HP DreamColor LP2480zx Professional Display				
	HP ZR30w 30-inch S-IPS LCD Monitor				
	HP ZR2740w 27-inch LED Backlit IPS Monitor				
	HP ZR24w 24-inch S-IPS LCD Monitor				
	HP ZR2440w 24-inch LED Backlit IPS Monitor				
	HP ZR2240w 21.5-inch LED Backlit IPS Monitor				
	HP ZR2040w 20-inch LED Backlit IPS Monitor				
	Supported by all Operating Systems available from HP				
	Screen Size Diagonally Measured				

Hard Drives

SATA Hard Drives

		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	SATA (Serial ATA) Hard Drives for HP Workstations				
	250GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ034AA	
	500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
	1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
	2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
	250GB SATA 10K rpm SFF HDD	Y	Y	B8X18AA	
	500GB SATA 10K rpm SFF HDD	Y	Y	B8X19AA	
	1TB SATA 10K rpm SFF HDD	Y	Y	B8X20AA	
	500GB SATA 7.2K SED SFF HDD	Y	N	(not available today as After Market Option)	
SATA Solid State Drives	**HP Solid State Drives (SSDs) for Workstations**				
	HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA	
	HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA	
	HP 256GB SATA 6Gb/s SED SSD	Y	Y	D8N28AA	
	HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA	
	Intelligent Disk Caching				
	24GB SSD Disk Cache Module	Y	N		

Supported Components

Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated SATA Controller (Z220)				
Integrated SATA Controller (CMT), RAID 0,1 supported: 4 ports 3 Gb/s, 2 ports 6 Gb/s	Y	N		
Factory integrated RAID on motherboard for SATA drives				
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	N	N		
RAID 0 Configuration - Striped Array	Y	N		
RAID 1 Configuration - Mirrored Array	Y	N		

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. All drives must be identical in type and capacity
Boot volume/RAID array must be less than 2 TB.
NOTE 1: Requires identical hard drives (speeds, capacity, interface).

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Integrated Intel HD Graphics Media Accelerators (Z220)						
Intel HD Graphics P4000	Y	N		Supported on Intel Xeon E3-12x5v2 processors only.	1	NO
Intel HD Graphics 4000	Y	N		Supported on Intel Core i7-3xxx processors only.	1	NO
Intel HD Graphics 2500	Y	N		Supported on Intel Core i5-3xxx and i3-3xxx processors only.	1	NO
Intel HD Graphics	Y	N		Supported on Pentium G6xx processors. Even though	1	NO

			graphics on this part is branded as Intel HD Graphics, it is similar to Intel HD Graphics 2000 but lacks some premium media capabilities.		
Professional 2D					
NVIDIA NVS 300 512MB Graphics	Y	Y	XP612AA	2	NO
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	2	NO
NVIDIA NVS 510 2GB Graphics	Y	Y	Can be mixed with one NVS 310	1	Yes
Entry 3D					
AMD FirePro V3900 1GB Graphics	Y	Y	A6R69AA	1	NO
NVIDIA Quadro K600 1GB Graphics	Y	Y	C2J92AA	1	NO
NVIDIA Quadro 410 512MB Graphics	Y	Y	A7U60AA	1	NO
Mid-range 3D					
NVIDIA Quadro K2000 2GB Graphics	Y	Y	C2J93AA	1	NO
High End 3D					
AMD FirePro W7000 4GB Graphics	N	Y	C2K00AA	1	NO
NVIDIA Quadro K4000 3GB Graphics	N	Y	C2J94AA	1	NO

Intermixing integrated Intel HD graphics and discrete graphics cards in order to drive more than two displays can be enabled using the Computer (F10) Setup Utility. However, HP recommends using only discrete graphics cards when attaching three or more displays.

Supported Components

Graphics Cable Adapters

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Graphics Cable Adapters						
HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N			1	
HP DisplayPort To VGA Adapter 2nd	Y	N			1	
HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter (6-Pack)	Y	N			1	
HP DisplayPort To VGA Adapter	Y	Y	AS615AA		1	
HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		1	
HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA		1	

Memory

Sub-Section Description/Notes

Intel® Xeon E3, Intel Core i3 and Intel Pentium processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.

CTO	Option Kit Part Number	Support Notes
DDR3-1600 nECC Unbuffered DIMMs CTO		
HP 32GB (4x8GB) DDR3-1600 nECC RAM		
HP 16GB (4x4GB) DDR3-1600 nECC RAM		
HP 12GB (2x4GB+2x2GB) DDR3-1600 nECC RAM		
HP 8GB (2x4GB) DDR3-1600 nECC RAM		
HP 8GB (4x2GB) DDR3-1600 nECC RAM		
HP 4GB (2x2GB) DDR3-1600 nECC RAM		
HP 4GB (1x4GB) DDR3-1600 nECC RAM		
HP 2GB (1x2GB) DDR3-1600 nECC RAM		
DDR3-1600 ECC Unbuffered DIMMs - CTO		
HP 32GB (4x8GB) DDR3-1600 ECC RAM		
HP 16GB (4x4GB) DDR3-1600 ECC RAM		
HP 12GB (2x4GB+2x2GB) DDR3-1600 ECC RAM		
HP 8GB (2x4GB) DDR3-1600 ECC RAM		
HP 8GB (4x2GB) DDR3-1600 ECC RAM		
HP 4GB (2x2GB) DDR3-1600 ECC RAM		
HP 2GB (1x2GB) DDR3-1600 ECC RAM		

Sub-Section Description/Notes

Supported Components

Two channels of DDR3 memory are supported. To realize full performance at least one DIMM must be inserted into each channel.
The CPUs determine the speed at which the memory is clocked. If a 1066 MHz capable CPU is used in the system, the maximum speed the memory will run at is 1066 MHz regardless of the specified speed of the memory.

AMO	Option Kit Part Number	Support Notes
DDR3-1600 nECC Unbuffered DIMMs AMO		
HP 8GB (1x8GB) DDR3-1600 non-ECC RAM	B1S54AA	
HP 4GB (1x4GB) DDR3-1600 nECC RAM	B1S53AA	
HP 2GB (1x2GB) DDR3-1600 nECC RAM	B1S52AA	
DDR3-1600 ECC Unbuffered DIMMs - AMO		
HP 8GB (1x8GB) DDR3-1600 ECC RAM	A2Z50AA	
HP 4GB (1x4GB) DDR3-1600 ECC RAM	A2Z48AA	
HP 2GB (1x2GB) DDR3-1600 ECC RAM	A2Z47AA	

NOTE: Only unbuffered DDR3 DIMMs are supported.

Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Thin USB Powered Speakers, BFR-PVC free	Y	Y	KK912AA	
Integrated Realtek HD ALC221 Audio	Y	N		

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 16X DVD-ROM SATA Drive (non Lightscribe)	Y	Y	AR629AA	
HP 16X DVD+/-RW SuperMulti SATA Drive (non-Lightscribe)	Y	Y	QS208AA	
HP Blu-ray Writer	Y	Y	AR482AA	
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.

Supported Components

Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire PCIe Card	Y	Y	NK653AA	See Note 1
HP USB 3.0 2x2 Port SuperSpeed PCIe x1 Card	N	Y	QT587AA	See Note 2

NOTE 1: For the HP Z220 CMT Workstation the 1394b card is only supported on Slots 3, 4, or 5.
NOTE 2: Four USB 3.0 ports are available integrated on the motherboard (2 front, 2 rear). Integrated USB 3.0 ports are supported under Windows 7 operating system only. The USB 3.0 2x2 Port SuperSpeed PCIe card is required if Windows XP operating systems support is required (supported as AMO only).

Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel 82579LM PCIe GbE Controller	Y	N		
Intel Gigabit CT Desktop NIC	Y	Y	FH969AA	
Broadcom NetXtreme Gigabit Ethernet Plus NIC (PCIe)	N	Y	FS215AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	

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.
The Intel Gigabit CT NIC is supported on the following operating systems:
Microsoft Windows XP Pro 32-bit and 64-bit and Microsoft Windows 7 32-bit and 64-bit versions.
Red Hat Enterprise Linux (RHEL),
Novell SLED 11

NOTE 2: The integrated network connection is required to support Intel vPro Technology.

NOTE 3: If AMT is enabled network teaming with the built in LAN port is not possible.

NOTE 4: DASH remote manageability support is not available with the Broadcom NIC when used on the Z220 workstation.

Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	WH340AA	
Security Cable with Kensington Lock	N	Y	PC766A	
HP Solenoid Hood Lock & Hood Sensor	Y	Y	DE618A	
HP Business PC Security Lock Kit	N	Y	PV606AA	

Supported Components

Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SpacePilot 3D USB Intelligent Controller	N	Y	EF390AA	
HP SpaceExplorer 3D USB Controller	N	Y	RY429AA	
HP USB Optical 3-Button Mouse	Y	Y	DY651A	
HP 2.4GHz Wireless Keyboard & Mouse	N	Y	NB896AA	
HP USB CCID SmartCard Keyboard	Y	Y	BV813AA	
HP USB 1000dpi Laser Mouse	Y	Y		
HP PS/2 Keyboard	Y	Y		
HP USB Optical Mouse	Y	Y		
HP PS/2 Mouse	Y	Y		
HP USB Keyboard	Y	Y		
HP PS/2 Optical Scroll Mouse	Y	Y		

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Power Cord Kit	N	Y	DM293A	
HP Workstation Mouse Pad	Y	N		Japan only
HP Serial Port Adapter	Y	Y	PA716A	
HP ENERGY STAR 5.0 Enabled Configuration	Y	N		
Configure minitower in desktop orientation	Y	N		
HP Parallel Port Adapter Kit	N	Y	KD061AA	
HP Internal USB Port Kit	N	Y	EM165AA	
HP eSATA PCI Cable Kit	Y	Y	FH966AA	

Supported Components

Software		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	HP Performance Advisor	Y	N		Supports Windows 7 only. Available as a download from hp.com or pre-installed with every Windows 7 order.
	HP ProtectTools Security	Y	N		Must be selected as a Configure to Order option. Delivered in the form of a "Drop in the Box" CD.
	PDF Complete - Corporate Edition	Y	N		
	Cyberlink PowerDVD / Power2Go	Y	N		Media playback and authoring software
	MS Office Home & Business 2013	Y	N		Must be selected as a Configure to Order option. Delivered in the form of a "Drop in the Box" CD.

Operating Systems	Support Notes
Genuine Windows® 7 Ultimate 64-bit	
Genuine Windows® 7 Professional 32-bit	See http://www.microsoft.com/windows/windows-7/ for support details.
Genuine Windows® 7 Professional 64-bit	See http://www.microsoft.com/windows/windows-7/ for support details.
Genuine Windows® 7 Home Premium 32-bit	See http://www.microsoft.com/windows/windows-7/ for support details.
Genuine Windows® 7 Home Premium 64-bit	See http://www.microsoft.com/windows/windows-7/ for support details.
Windows 8 Pro 64-bit	
Windows 8 Simplified Chinese Edition 64-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 64-bit	
HP Linux Installer Kit	See http://h20331.www2.hp.com/hpsub/cache/537200-0-0-225-121.html
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	See http://www.redhat.com/rhel/desktop/
SUSE Linux Enterprise Desktop 11	See http://www.suse.com/products/desktop/

Windows XP 32-bit/64-bit OS supported; drivers available on HP support web site.

System Technical Specifications

System Board		
System Board Form Factor	ATX 244 x 305 mm (9.6 x 12 inches)	
Processor Socket	Single LGA-1155	
CPU Bus Speed	DMI	
Chipset	Intel® PCH C216	
Memory Expansion Slots	4 DDR3 memory slots	
Memory Type Supported	DDR3, UDIMM (Unbuffered), ECC& non-ECC	
Memory Modes	Non-Interleaved for single channel. Interleaved when both channels are populated.	
Memory Speed Supported	1600MHz DDR3	
Memory Protection	ECC available on data	
Maximum Memory	32GB	
Memory Configuration (Supported)	2GB,4GB and 8GB ECC or non-ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed on the same system.	
	NOTE: Maximum memory capacities assume 64-bit operating systems, such as genuine Genuine Windows® 7 Professional 64-Bit or Red Hat Linux 64-bit. 32-bit Windows Operating Systems support up to 4 GB.	
PCI Express Connectors	- 1 PCI Express Gen2 slot x8 mechanical/ x4 electrical (full height, half length) - 1 PCI Express Gen3 slot x16 mechanical/ x16 electrical (full height, full length) - 1 PCI Express Gen2 slot x1 mechanical/ x1 electrical (full height) - 1 PCI Express Gen2 slot x16 mechanical/ x4 electrical (full height, full length) - 1 PCI Express Gen2 slot x1 mechanical/ x1 electrical (full height) **NOTE:** The PCIe x8 connector is open ended, allowing a PCIe x16 card to be seated in the slot. However, this slot supports only half length cards. In the PCIe Gen3 (x16 electrical/x16 mechanical) slot, if it is not being used for a graphics card, only cards certified as After Market Options for this platform are supported.	
PCI Connectors (5.0V)	2 PCI slots, full height, full length	
Supported Drive Interfaces	**SATA**	Integrated (6) Serial ATA interfaces (2x 6Gb/s SATA, 4x 3Gb/s SATA). One port can optionally be used for eSATA). RAID 0 and 1 supported. (Factory integrated RAID is Microsoft Windows only). RAID 5 is supported by Software XOR.
	Serial Attached SCSI	None
	Integrated RAID	**NOTE:** Requires identical hard drives (speeds, capacity, interface)
	Integrated Graphics	Integrated Intel HD Graphics(on Pentium G640 processor); Integrated Intel HD Graphics 4000 (on Core i7-3xxx processors); Integrated Intel HD Graphics P4000 (on Intel Xeon E3-12x5v2 processors). Unified Memory Architecture (UMA)- A region of system memory is reserved and dedicated to the graphics display. Support for Microsoft DirectX 10.1; OpenGL 3.0 on Intel HD Graphics P4000; 1 DVI-I and 1 DP 1.1 graphics ports integrated in motherboard; Supports dual displays across DP & DVI-I outputs.

System Technical Specifications

	Network Controller	Integrated Gbit LAN MAC by Intel PHY Lewisville 82579LM. Management capabilities: WOL, PXE 2.1 and AMT 8
	External SATA (eSATA)	1 port eSATA capable (SATA 5) with optional eSATA After-Market Option cable kit.
	IDE connector	No
	Floppy connector	No
	Serial	1 internal header (requires optional Serial Port Adapter Kit)
	2nd Serial	No
	Parallel	1 internal header (optional Parallel Port Adapter required)
	HD Integrated Audio	Yes
	CD-ROM input (Audio)	No
	AUX input (Audio)	No
IEEE 1394 Connector(s)	**Front**	1 IEEE 1394a (requires optional PCIe 1394b card to function. Front port access functions as 1394a port).
	Rear	2 IEEE 1394b ports (requires optional PCIe 1394b card)
	Internal	No
USB Connector(s)	**Front**	2 USB 3.0, 1 USB 2.0
	Rear	2 USB 3.0, 4 USB 2.0
	Internal	5 USB 2.0 ports available by two separate 2x5 and one 1x5 header: supports one HP Internal USB Port Kits, (one port on each Kit) for 1x5 pin header plus (a) up to two USB Media Card Readers, or (b) one Internal Port kit and one USB Media Card Reader.
HD Integrated Audio	Yes	
Flash ROM	Yes	
CPU Fan Header	Yes	
Chassis Fan Header	1 Rear System Chassis Fan Header, 1 Optional Front Chassis Fan Header	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 1.2. The TPM module disabled where restricted by law, i.e. Russia.	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	Yes	
Keyboard/Mouse	USB or PS/2	
	400W Wide Ranging, Active PFC, 90% Efficient	
Operating Voltage Range	90-269 VAC	
Rated Voltage Range	100-240 VAC	

System Technical Specifications

Rated Line Frequency	50-60 Hz
Operating Line Frequency Range	47-66 Hz
Rated Input Current	5.5A @ 100-240V
Heat Dissipation	Typical: 910 btu/hr (229 kg-cal/hr) Maximum: 1569 btu/hr (395 kg-cal/hr)
Power Supply Fan	92x25 mm variable speed
ENERGY STAR® qualified (Config Dependent)	Yes
80 PLUS Compliant	Yes, 90% Efficient For the PSU Efficiency Report for the power supply, please go to this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD_619397-001_ECOS%202277%201_400W_Report.pdf
CECP Compliant @ 220V (<4W in S3 - Suspend to RAM)	Yes, Configuration dependent
FEMP Standby Power Compliant	Yes, with Wake-on-LAN disabled: <2W in S5- Power Off
Power consumption in sleep mode (as defined by ENERGY STAR) **- Suspend to RAM** (S3)	<4W
Built-in Self Test (BIST) **LED**	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes
Hood Lock Header	Yes
ErP Lot 6- Tier 1 Compliance @ 230V (<1W in S5- Power Off)	Yes
ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5- Power Off)	Yes
Declared Noise Emissions (Entry-level and High-end configurations)	

System Configuration

Example Configuration #1	To be advised later with the Intel Core i3 processor introduction.

System Technical Specifications

Example Configuration #2	**Processor Info**	1x Intel Xeon E3-1280v2 3.6 8MB 4C HT 69W GT0 CPU
	Memory Info	4GB (2x 2GB) 1600 MHz DDR3 ECC
	Graphics Info	1x NVIDIA Quadro 600 1GB Graphics
	Disks/Optical/Floppy	2x SATA 2 TB 7.2k rpm/ 2 Optical
	PSU	400W 90%
	OS /BIOS	Win7 64/v 0.9

Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	48.2 W		49.5 W		48.3 W	
	Windows Busy Typ (S0)	155.7 W		158.8 W		155.6 W	
	Windows Busy Max (S0)	180.5 W		183.8 W		184.7 W	
	Sleep (S3)	2.73 W	2.96W	2.95 W	2.80 W	2.69 W	2.55 W
	Off (S5)	1.15 W	1.00 W	1.27 W	1.10 W	1.15 W	1.00W
	Zero Power Mode (EuP)	0.23W		0.34 W		0.24W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	164.5 btu/hr		168.9 btu/hr		164.8 btu/hr	
	Windows Busy Typ (S0)	531.2 btu/hr		541.8 btu/hr		530.9 btu/hr	
	Windows Busy Max (S0)	615.9 btu/hr		627.1 btu/hr		630.2 btu/hr	
	Sleep (S3)	9.31 btu/hr	10.10 btu/hr	10.07 btu/hr	9.55 btu/hr	9.18 btu/hr	8.70 btu/hr
	Off (S5)	4.47 btu/hr	3.41 btu/hr	4.33 btu/hr	3.75 btu/hr	3.92 btu/hr	3.41 btu/hr
	Zero Power Mode (EuP)	0.78 btu/hr		1.16 btu/hr		0.82 btu/hr	

Example Configuration #3	**Processor Info**	1x Intel Xeon E3-1280v2 3.6 8MB 4C HT 69W GT0 CPU
	Memory Info	32GB (4x 8GB) 1600 MHz DDR3 ECC
	Graphics Info	1x NVIDIA Quadro 600 1GB Graphics
	Disks/Optical/Floppy	3x SATA 2 TB 7.2k rpm/ 2 Optical
	PSU	400W 90%
	OS /BIOS	Win7 64/v 0.9

System Technical Specifications

Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	65.3 W		64.3 W		64.4 W	
	Windows Busy Typ (S0)	185.7 W		194.0 W		181.2 W	
	Windows Busy Max (S0)	260.3 W		258.6 W		263.5 W	
	Sleep (S3)	3.57 W	3.34 W	3.67W	3.52 W	3.49 W	3.33 W
	Off (S5)	1.15 W	0.98 W	1.28 W	1.14 W	1.13 W	0.98 W
	Zero Power Mode (EuP)	0.22 W		0.36 W		0.21W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	222.8 btu/hr		219.4 btu/hr		219.7 btu/hr	
	Windows Busy Typ (S0)	633.6 btu/hr		661.9 btu/hr		618.3 btu/hr	
	Windows Busy Max (S0)	888.1 btu/hr		882.3 btu/hr		899.1 btu/hr	
	Sleep (S3)	12.18 btu/hr	11.39 btu/hr	12.52 btu/hr	12.01 btu/hr	11.91 btu/hr	11.36 btu/hr
	Off (S5)	3.92 btu/hr	3.34btu/hr	4.37 btu/hr	3.89 btu/hr	3.86 btu/hr	3.34 btu/hr
	Zero Power Mode (EuP)	0.75 btu/hr		1.23 btu/hr		0.72 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 Core i7-3770 3.4 GHz
	Memory Info	2 x 2GB DDR3 1600 MHz
	Graphics Info	Integrated Intel HD Graphics 4000
	Disks/Optical	1x 250 GB 7200rpm SATA HDD/ SATA DVD-ROM

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.2	13
	Hard drive Operating (random reads)	3.3	15
	DVD-ROM Operating (sequential reads)	4.99	35

System Technical Specifications

System Configuration (High-end)	**Processor Info**	Intel Xeon E3-1290v2 3.7 GHz
	Memory Info	4 x 4GB DDR3 1600 MHz
	Graphics Info	NVIDIA Quadro 2000
	Disks/Optical	2x 300GB 10K rpm SATA HDDs/ SATA Blu-ray ODD

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.4	20
	Hard drive Operating (random reads)	3.7	23
	DVD-ROM Operating (sequential reads)	4.93	34

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

Physical Security and Serviceability	
Access Panel	Tool-less Includes system board and memory information
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less

System Technical Specifications

Green User Touch Points	Yes, on tool-free internal chassis mechanisms
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-In
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes
Restore CD/DVD Set	Restores the system to the factory shipped operating system. Included with the system and available from 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
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
Front Power Button	Yes, ACPI multi-function

System Technical Specifications

Front Power LED	Yes, blue (normal), red (fault)
Front Hard Drive Activity LED	Yes, green
Front ODD Activity LED	Yes
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
Cooling Solutions	Air cooled forced convection
Power Supply Fans	92 mm x 92 mm x 25 mm 4-wire PWM (non-serviceable)
CPU Heatsink Fan	Mainstream (<=95W): 92 mm x 92 mm x 25 mm 4-wire PWM
Chassis Fan	92 mm x 92mm x 25 mm 4-wire PWM
Memory Heatsink Fan	No
HP Advanced System Diagnostics Offline Edition	HP System Advanced Diagnostics utility can be invoked by pressing F2 at POST, and enables you to perform testing and to view critical computer hardware and system software configuration information. HP Advanced System Diagnostics is provided on systems shipped with Windows and available as a download from HP Support.
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.
Integrated Chassis Handles	No; optional Optical Bay Handle available.
Power Supply	Requires T15 Torx or flat blade screwdriver
PCI Card Retention	Yes, rear (all), middle (optional), 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	Yes
DIMM Connectors	Yes

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.

System Technical 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 USB flash device in human readable file. Repsetup.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.7.1, 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	No.
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 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.

System Technical Specifications

Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	Enables the user or IT administrator 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.
Intel® Active Management Technology (AMT)	AMT 8.0; Allows workstation status to be monitored on a remote console
Digitally and Cryptographically Signed BIOS	Helps to prevent the installation of unauthorized versions of a BIOS (a rogue BIOS) from a virus, malware, or other code that could lead to compromised system security, data access, physical service, or even system board replacement.
Master Boot Record Protection	A feature in the HP BIOS that prevents changes and/or infections to the Master Boot Record. Useful in protecting from viruses
Boot Block Emergency Recovery Mode (BIOS Recovery)	The HP BIOS offers a write-protected boot block ROM that provides recovery from a failed flashing of the computer BIOS. This special recovery mode prevents the system from becoming unusable or "bricked" when a BIOS update is interrupted.
Industry Standard Specification Support	
UEFI Specification Revision	UEFI 2.3.1
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; PCI Express Base Specification, Revision 3.0.
PMM	POST Memory Manager Specification, Version 1.01
SATA	- Serial ATA Specification, Revision 1.0a - Serial ATAII: Extensions to Serial ATA 1.0, Revision 1.0a - Serial ATAII Cables and Connectors Volume 2 Gold - SATA-IO SATA Revision 3.0 Specification
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification

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
Batteries	The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal The battery in this product does not contain: • Mercury greater than 5ppm by weight • Cadmium greater than 10ppm by weight • Lead greater than 40ppm by weight
Restricted Material Usage	This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.
Low Halogen Statement	This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: Creative Recon3D PCIe Audio Card and Broadcom 5761 Gigabit PCIe NIC are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.
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. This product is greater than 90% recyclable by weight when properly disposed of at end of life.
Hewlett-Packard Corporate Environmental Information	For more information about HP's commitment to the environment: 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
Additional Information	• 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 is >90% recycle-able when properly disposed of at end of life. EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24 for registration status in your country.
Packaging	HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html • Does not contain restricted substances listed in HP Standard 011-1 General Specification for the

	Environment • Does not contain ozone-depleting substances (ODS) • 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 • All packaging material is designed for ease of disassembly • Reduced size and weight of packages to improve transportation fuel efficiency • Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting
Packaging Materials	
Internal	Cushions and plastic bags made of low density polyethylene (LDPE).
External	Outer carton, accessories carton, and insert made of corrugated paper board.

Manageability

Intel Active Management Technology (AMT)	An advanced set of remote management features and functionality which provides network administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 8.0 includes the following advanced management functions: • Power Management (on, off, reset) • Hardware Inventory (includes BIOS and firmware revisions • Hardware Alerting • Agent Presence • System Defense Filters • SOL/IDER • Cisco NAC/SDN Support • ME Wake-on-LAN • DASH 1.1 compliance • IPv6 Support • Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection • Remote Scheduled Maintenance - pre-schedule when the PC connects to the IT or service provider console for maintenance. Remote PCs can get required patches, be inventoried, etc by connecting to their IT console or Service Provider when it's convenient • Remote Alerts - automatically alert IT or service provider if issues arise • Access Monitor - Provides oversight into Intel® AMT actions to support security requirements • PC Alarm Clock • Microsoft NAP Support • Host Base set-up and configuration • Management Engine (ME) firmware roll back • Wireless AMT functionality on Desktop (WoDT) • Enhanced KVM resolution
Intel® vPro™ Technology	The HP Z220 workstations support Intel vPro technology when purchased with a vPro technology capable CPU: Intel® Xeon® processor E3-1200v2 family or 3rd Generation Intel Core i5/i7 processors with Intel VT and Intel TXT technology
Remote Manageability Software Solutions	Visit: http://www.hp.com/go/easydeploy
System Software Manager	Visit: http://www.hp.com/go/ssm

System Technical Specifications

Service, Support, and Warranty	• 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.

Stable & Consistent Offerings

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section. HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers-no special programs, no additional cost-no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

Processors	Product #	Offering
	A8Y07AV	Intel® Xeon® processor E3-1280v2, 3.6/4.0GHz, 69W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel® vPro Technology
	A8Y04AV	Intel® Xeon® processor E3-1240v2, 3.4/3.8GHz, 69W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel® vPro Technology
	A8Y02AV	Intel® Xeon® processor E3-1225v2, 3.2/3.6GHz, 77W, 8 MB cache, 1600 MHz memory, Quad-Core, no HT, Intel® HD Graphics P4000, featuring Intel® vPro Technology

Hard Drives	Product #	Offering
	A8X40AV	1TB 7200 RPM SATA 6G 1st HDD
	A8X52AV	1TB 7200 RPM SATA 6G 2nd HDD
	A8X61AV	1TB 7200 RPM SATA 6G 3rd HDD
	A8X39AV	500GB 7200 RPM SATA 6G 1st HDD
	A8X51AV	500GB 7200 RPM SATA 6G 2nd HDD
	A8X60AV	500GB 7200 RPM SATA 6G 3rd HDD

Graphics	Product #	Offering
	A7U41AV	NVIDIA NVS 310 512MB Graphics
	A7U42AV	NVIDIA NVS 310 512MB 2nd Graphics

Memory	Product #	Offering
	A8Y23AV	16GB DDR3-1600 ECC (4x4GB) RAM
	B4Y02AV	12GB DDR3-1600 ECC (2x4GB+2x2GB) RAM
	A8Y22AV	8GB DDR3-1600 ECC (2x4GB) RAM
	A8Y21AV	8GB DDR3-1600 ECC (4x2GB) RAM
	A8Y20AV	4GB DDR3-1600 ECC (2x2GB) RAM
	A8Y19AV	2GB DDR3-1600 ECC (1x2GB) RAM

Optical and Removable Storage	Product #	Offering
	A8X92AV	16X SuperMulti DVDRW SATA 1st ODD
	A8X95AV	16x SuperMulti DVDRW SATA 2nd ODD

Stable & Consistent Offerings

Operating Systems	Product #	Offering
	A3J50AV	Genuine Windows® 7 Professional 64-bit

Technical Specifications - Processors

Processors

Intel Xeon processor E3-1290v2, 3.70 GHz/4.1GHz, 87W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel vPro Technology

Intel® Xeon® processor E3-1280v2, 3.6/4.0 GHz, 69W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel® vPro Technology

Intel® Xeon® processor E3-1270v2, 3.5/3.9 GHz, 69W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel® vPro Technology

Intel® Xeon® processor E3-1245v2, 3.4/3.8 GHz, 77W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, Intel® HD Graphics P4000, featuring Intel® vPro Technology

Intel® Xeon® processor E3-1240v2, 3.4/3.8 GHz, 69W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel® vPro Technology

Intel® Xeon® processor E3-1230v2, 3.3/3.7 GHz, 69W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, featuring Intel® vPro Technology

Intel® Xeon® processor E3-1225v2, 3.2/3.6 GHz, 77W, 8 MB cache, 1600 MHz memory, Quad-Core, no HT, Intel® HD Graphics P4000, featuring Intel® vPro Technology

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Intel Core i7-3770 processor, 3.4/3.9 GHz, 77W, 8 MB cache, 1600 MHz memory, Quad-Core, HT, Intel HD Graphics 4000, featuring Intel vPro Technology

Intel® Core™ i5-3570 processor, Quad-Core, 6 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology

Intel® Core™ i5-3470 processor, Quad-Core, 6 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology

Intel® Core™ i3-3240 processor, Dual-Core, 3 MB cache, 3.4 GHz

Intel® Core™ i3-3220 processor, Dual-Core, 3 MB cache, 3.3 GHz

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Intel® Pentium® G2020 processor, Dual-Core, 3 MB cache, 2.9 GHz

Technical Specifications - Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations	**1TB SATA 7200 rpm 6Gb/s 3.5" HDD**	**Capacity**	1 Terabyte (1000 GB)	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
		Buffer	32MB	
		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)	
	500GB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	500GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	16MB	
		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)	
	250GB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	250 GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/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)	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	2TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0 Gb/s), NCQ Enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.0 ms
		Average	11 ms
		Full Stroke	18 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	3,907,029,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
250GB SATA 10K rpm SFF HDD	**Capacity**	250GB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
500GB SATA 10K rpm SFF	**Capacity**	500GB	

Technical Specifications - Hard Drives

HDD	**Height**	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
1TB SATA 10K rpm SFF HDD	**Capacity**	1TB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
500GB SATA 7.2K SED SFF HDD	**Capacity**	500GB	
	Height	0.275 in; 0.7 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	32MB	

Technical Specifications - Hard Drives

		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1ms
			Average	4.2ms
			Full Stroke	25ms (typical)
		Rotational Speed	7,200 rpm	
		Operating Temperature	32° to 140° F (0° to 60° C)	
HP Solid State Drives (SSDs) for Workstations	**HP 128GB SATA 6Gb/s SSD**	**Capacity**	128GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SED SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 512GB SATA 6Gb/s SSD	**Capacity**	512GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	

Technical Specifications - Graphics

NVIDIA NVS 300 512MB Graphics	**Form Factor**	2.7 inches (H) x 5.7 inches (L), Half-Height
	Graphics Controller	NVIDIA NVS 300 Graphics Board
	Bus Type	PCI Express x16, Generation 2.0
	Memory	512 MB GDDR3 SDRAM unified graphics memory
	Connectors	DMS-59 Includes DMS-59 to Dual DVI-I adapter DMS-59 to Dual DisplayPort adapter and DMS-59 to Dual VGA adapter available as an option DMS-59 to Dual DisplayPort adapter required for HP ZR30w Display
	Maximum Resolution	DVI: two digital displays up to 1920 x 1200 DisplayPort: two digital displays up to 2560 x 1600 VGA: two analog displays up to 1920 x 1080
	Image Quality Features	
	Display Output	This card support up to two displays: • Drives DVI enabled digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking • Drives DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking (through optional DMS-59 to DisplayPort adapter) • Drives VGA enabled analog displays at resolutions up to 1920 x 1080 (through optional DMS-59 to VGA adapter)
	Supported Graphics APIs	OGL 3.3 DirectX 10.1
	Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Genuine Windows Vista Business (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) 5 Desktop/Workstation Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (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 Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power Consumption	<18 Watts
NVIDIA NVS 310 512MB Graphics	**Form Factor**	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 310 GPU: GF119-825
	Bus Type	PCI Express x16, 2.0 compliant

Technical Specifications - Graphics

Memory	Size: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
Connectors	2 x DisplayPort
Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
Image Quality Features	The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
Display Output	Up to 2 displays in the following configurations: DisplayPort output: ● Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card ● Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. DVI-D output: ● Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors ● Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors HDMI output: ● NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors VGA display output: ● Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.1
Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit)

		Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power Consumption	19.5 Watts
	Note	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adpaters included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
NVIDIA NVS 510 2GB Graphics	**Form Factor**	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 Mhz Memory Clock: 891 Mhz CUDA Cores: 192
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	Four mini-DisplayPort. Four mini-DisplayPort to DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)
	Maximum Resolution	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz) **NOTE:** This card supports up to four displays. For Windows XP, only 2 active displays are supported.
	Image Quality Features	10-bit internal display processing, including hardware support for 10-bit scan-out
	Display Output	DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support. Digital Display Support 1. DisplayPort Output - Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card. - DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking.

Technical Specifications - Graphics

		2. DVI-D Output - Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors. - Drives four digital displays at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors. 3. HDMI Output - The NVS 510 graphics board is capable of driving four high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors. Analog Display Support 1. VGA display output - Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.
	Supported Graphics APIs	Full Microsoft DirectX 11, Shader Model 5.0 support Full OpenGL 4.3 support
	Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (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
	Power Consumption	33.4 Watts
	Note	Heatsink cooler design is active.
AMD FirePro V3900 1GB Graphics	**Form Factor**	Full height, half length (full-height bracket included)
	Graphics Controller	AMD FirePro™ V3900 professional graphics
	Bus Type	PCI Express® x16, Generation 2.1
	Memory	1GB DDR3 memory
	Maximum Resolution	2560x1600 per display (5120x1600 max. horizontal resolution)
	Display Output	1 DisplayPort® 1.2 1 Dual-link DVI
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenCL™ 1.1, DirectX® 11 and OpenGL 4.2
	Available Graphics Drivers	Genuine Windows® 7 Professional (64-bit and 32-bit) Genuine Windows Vista® Business (64-bit and 32-bit) Microsoft® Windows XP® Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (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
	Power Consumption	<50W

Technical Specifications - Graphics

	Note	AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details.
NVIDIA Quadro K600 1GB Graphics	**Form Factor**	2.731" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included
	Graphics Controller	NVIDIA Quadro K600 Graphics Card Kepler GK107 GPU 192 CUDA cores Max Power: 41 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	1 GB GDDR3, 891 Mhz 128-bit memory I/O path 29 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 1 DisplayPort output CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort:

		- Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to the Quadro K600 DisplayPort connector at this resolution) - Max number of daisy-chained monitors: 2
	Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Quadro K600 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K600 offered as AMO includes one DP-to-DVI video cable adapter. Additonal cables must be ordered separately. 3. Quadro K600 is Windows 8 Compliant. 4. A total maximum of 2 active monitors are supported across all display output types.
NVIDIA Quadro 410 512MB Graphics	**Form Factor**	Low Profile: 2.713 inches × 5.7 inches, single slot
	Graphics Controller	NVIDIA Quadro 410 GPU: GK107
	Bus Type	PCI Express x16, 3.0 compliant
	Memory	Size: 512MB DDR3 Clock: 900MHz Memory Bandwidth: 14GB/s
	Connectors	One dual-link DVI-I connector One DisplayPort connector
	Maximum Resolution	VGA (through DVI to VGA cable): • 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI • 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

		Single-link DVI • 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 • 3840 × 2160 × 36 bpp at 60 Hz
	RAMDAC	400 MHz integrated RAMDAC
	Display Output	Maximum number of displays supported: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.2
	Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Factory configured Quadro 410 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro 410 includes one DP to DVI-D adapter
NVIDIA Quadro K2000 2GB Graphics	**Form Factor**	4.38" H x 7.97" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K2000 Graphics Card Kepler GK107 GPU 384 CUDA cores Max Power: 51.1 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	2 GB GDDR5, 2000 Mhz 128-bit memory I/O path 64 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories

Technical Specifications - Graphics

Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
Image Quality Features	• 10-bit internal display processing pipeline • 10-bit scan-out support
Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2000 outputs is 4.
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com

	Notes	1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
NVIDIA Quadro K4000 3GB Graphics	**Form Factor**	4.376" H x 9.5" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K4000 Graphics Card Kepler GK106 GPU 768 CUDA cores Max Power: 80 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	3 GB GDDR5, 2800 Mhz 192-bit memory I/O path 134 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	• 10-bit internal display processing pipeline • 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 HDMI:

	- Requires use of DP-to-HDMI cable - Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz Maximum number of monitors across all available Quadro K4000 outputs is 4.
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Notes	1. Quadro K4000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K4000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. Quadro K4000 is Windows 8 Compliant. 4. A total maximum of 4 active monitors are supported across all display output types. To get 4 monitors, at least one monitor must be daisy chained on a DisplayPort output. 5. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4000 DisplayPort output.

Technical Specifications - Graphics

AMD FirePro W7000 4GB Graphics	**Form Factor**	Full height, full length, single slot
	Graphics Controller	AMD FirePro™ W7000 Professional Graphics Max Power: <150 Watts
	Bus Type	PCI Express™ x16, Generation 3.0
	Memory	4GB GDDR5, 153.6 GB/s bandwidth, ECC support
	Connectors	4 x DisplayPort with HBR2 and MST support.
	Maximum Resolution	DisplayPort: 4096x2160 @24bpp 60Hz Dual Link DVI: 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: 1920x1200 (requires DP to DVI adapter) VGA: 1920x1200 (requires DP to VGA adapter)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component
	Display Output	Max number of monitors supported using DisplayPort: 6 Monitor chaining from a single DisplayPort options(subject to a max of 6 total monitors across all outputs, requires use of DisplayPort Monitors supporting MST or the use of DisplayPort hubs): • 1 4096x2169 display • 2 2560x1600 displays • 4 1920x1200 displays
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL® 4.2 with OpenGL Shading Language OpenCL 1.1 Microsoft® DirectX® 11.1
	Available Graphics Drivers	Windows 8 Windows 7 Professional (64-bit and 32-bit) Windows 8 (64bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (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
	Note	1. AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details. 2. Factory configured FirePro W7000 graphics card does not include any video adapter cables. Adapters must be ordered separately. 3. Option Kit FirePro W7000 graphics card does not include any video cable adapters. Adapters must be ordered seperately.

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	**Frequency Response** (-3dB, 24-bit/96kHz input)	FO to 20kHz
	Dimensions (H x W x D)	Speakers: 14.52 x 9.50 x 2.45 cm (5.72 x 3.74 x 0.96 in) per speaker

Technical Specifications - Optical and Removable Storage

HP DVD-ROM Drive	**Description**		5.25-inch, half-height, tray-load
	Mounting Orientation		Either horizontal or vertical
	Interface Type		SATA/ATAPI
	Dimensions (WxHxD)		15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	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 7 Professional 32-bit and 64-bit, 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) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.

HP DVD+/-RW Drive	**Description**	5.25-inch, half-height, tray-load
	Mounting Orientation	Either horizontal or vertical
	Interface Type	SATA/ATAPI
	Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW

Technical Specifications - Optical and Removable Storage

		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 7 Professional 32-bit and 64-bit, 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) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.	
	Kit Contents	HP SATA SuperMulti DVD Writer Drive, 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

Technical Specifications - Optical and Removable Storage

Dimensions (WxHxD)	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)		
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

Technical Specifications - Optical and Removable Storage

		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 7 Professional 32-bit and 64-bit, 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) WS4**, 5, 6 Desktop/Workstation, SUSE Linux Enterprise Desktop 10 & 11 * No driver is required for this device. Native support is provided by the operating system. ** RHEL WS4 not supported on Z200/Z200SFF	
	Kit Contents	HP Blue Laser RW Drive, 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.		

Technical Specifications - Optical and Removable Storage

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)	124.5 x 101.6 x 25.4 mm (4.9 x 4.0 x 1.0 in)
	Disc Formats	xD-Picture Micro SD Micro SDHC SD SDHC SDXC 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)

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	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP Professional, Windows XP Home, Windows Vista, SLED 11 and RHEL 6. Intel Pentium® G series or higher processor, 128-MB RAM, 1-GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe 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	Windows 7 Professional 32-bit and 64-bit, Windows Vista® Business 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit, RHEL 6 and SLED 11.
HP USB 3.0 2x2 Port SuperSpeed PCIe x1 Card	**Dimensions** (HxD)	TBD
	Ports	2 External, 2 internal
	Operating Systems Supported	Microsoft Windows 7, Windows Vista*, Windows XP Professional (32-bit and 64-bit); Red Hat Enterprise Linux 6, SUSE Linux Enterprise Desktop 11 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.
	Kit Contents	I/O and Security Software and Documentation CD with software drivers and documentation, HP SuperSpeed USB 3.0 PCIe x1 card (with full-height expansion bracket attached), SATA to SATA split power extension cable, Low profile expansion bracket to replace the full-height expansion bracket required on some computer models and HP SuperSpeed USB 3.0 PCIe x1 Card Quick Setup.
	Regulatory Approvals and registrations	FCC 15B, CE EN55022+ EN55024, VCCI, CISPR 22 AS/NZS CISPR 22, LCIE CB service(ITE/AV) IEC 60950-1, Korea EMC, UL USB-IF
	Weight	0.21 lb (95.0 g)
	Warranty	The HP USB 3.0 2x2 Port Super Speed PCIe x1 Card has either a one-year limited warranty or the remainder of the warranty of the HP product in which it is installed. Technical support is available seven days a week, 24 hours a day, by phone, as well as online support forums. Certain restrictions and exclusions apply.

Technical Specifications - Networking and Communications

Integrated Intel 82579LM PCIe GbE Controller	**Connector**	RJ-45
	Controller	Intel 82579LM GbE platform LAN connect networking controller
	Memory	24 KB FIFO packet buffer memory
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1P, 802.1Q, 802.2, 802.3, 802.3ab, 802.3az, 802.3u
	Bus Architecture	PCI Express and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V and 1.05V or just 3.3V with integrated regulators
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported 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
	Management Capabilities	WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic. AMT 7.0 support

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	12.1 x 5.7 x 2.0 cm (4.75 x 2.25 x 0.8 in)

Technical Specifications - Networking and Communications

	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64, Windows Vista Business 32, Windows XP Professional, Windows XP x64. Red Hat Enterprise Linux 4 (RHEL4.8 or newer)*, Red Hat Enterprise Linux 5 (RHEL5.3 or newer), Red Hat Enterprise Linux 6, SUSE Linux Enterprise Desktop (SLED) 11 RHEL 4 and 5, SLED 10, are not supported on the Z220 CMT/SFF
	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
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	7 cm x 10.5 cm (2.75 in x 4.13 in), low profile compatible
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional, Windows XP x64 Red Hat Enterprise Linux (RHEL) 5, 6; Novell SLED 10 & 11
	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

HP X520 10GbE Dual Port Adapter	**Hardware Certifications**	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
HP 10GbE SFP+ SR Transceiver	**Operating Temperature**	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d)inches (1.19 x 1.38 x 5.57 cm)