

### Overview



1. Handle in Top Optical Bay (optional)
2. 3 External 5.25" Bays
3. 22-in-1 Media Card Reader (optional)
4. Power Button
5. HDD Activity LED
6. Front I/O: 1 USB 2.0, 2 USB 3.0, 1 Headphone, 1 Microphone, 1 1394a
7. Easy-open Side Panel

Overview



8. 3 External 5.25" Bays
9. 3 Internal 3.5" Bays
10. 8 DIMM Slots for DDR3 ECC Memory
11. 600W, 90% Efficient Power Supply
12. Rear I/O: Rear Power Button & LED, PS/2 Ports, 1 1394a, 4 USB 2.0, 2 USB 3.0, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out, 1 Microphone
13. Intel Xeon Processors: E5-1600 family (4C/6C), E5-2600 family (8C), E5-1600v2 family (4C/6C/8C), E5-2600v2 (8C)
14. 2 PCIe x16 Gen3 Slots
15. 1 PCIe x8 Gen3, 1 PCIe x8(x4) Gen2, 1 PCIe x4(x1) Gen2, 1 PCI Slot
16. 6 Internal USB 2.0 Ports
17. 6 SATA Ports

Form Factor	Convertible Minitower
Operating Systems	Preinstalled: <ul style="list-style-type: none"><li>Windows 7 Ultimate 64-Bit</li><li></li><li></li></ul>
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- Windows 7 Professional 32-Bit
- Windows 7 Professional 64-Bit
- 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
- Windows 8.1 Pro 64-bit
- Windows 8.1 Simplified Chinese Edition 64-bit
- Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit
- Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit
- SUSE Linux Enterprise Desktop 11 (90 day support)
- HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 5 & 6 and SUSE Linux Enterprise Desktop 11)
- Red Hat Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS)

#### Supported:

- Genuine Windows® 7 Enterprise 32/64
- Windows® XP Professional 32/64 (on select configurations)\*

Notes: \*See the "Windows XP Support Matrix for Z Workstations" at:  
[http://www.hp.com/support/workstation\\_manuals](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](http://www.hp.com/support/linux_hardware_matrix)

### Available Processors

Name	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MHz)	QPI Speed (GT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology <sup>1</sup>	TDP (W)
Intel® Xeon® E5-1680 v2 processor	8	3.0	25	1866	-	Y	Y	4, 9	130
Intel Xeon E5-2650 v2 processor	8	2.6	20	1866	8.0	Y	Y	4, 8	95
Intel Xeon E5-1660 v2 processor	6	3.7	15	1866	-	Y	Y	2, 3	130
Intel Xeon E5-1650 v2 processor	6	3.5	12	12	-	Y	Y	1, 4	130
Intel Xeon E5-1620 v2 processor	4	3.7	10	1866	-	Y	Y	0, 2	130
Intel Xeon E5-1607 v2 processor	4	3.0	10	1600	-	N	Y	N/A	130
Intel Xeon E5-1620 processor	4	3.6	10	1600	-	Y	Y	2, 3	130
Intel Xeon E5-1603 processor	4	2.8	10	1066	-	N	Y	N/A	130

### Overview

	<p><sup>1</sup>The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.</p> <p><b>NOTE:</b> Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z420 Workstation does not support dual processor configurations.</p>
<b>Available Processor Disclaimers</b>	<p>Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: <a href="http://www.intel.com/products/processor_number/">http://www.intel.com/products/processor_number/</a> for details.</p> <p>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: <a href="http://www.intel.com/info/em64t">http://www.intel.com/info/em64t</a> for more information.</p> <p>Quad-Core, Six-Core, and Eight-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.</p>
<b>Color</b>	Jack Black
<b>Convertibility</b>	Yes. 5.25" drives rotate for Minitower or Desktop orientation.
<b>Expansion Slots</b> (see system board section for more details)	<p>Slot 1 (top): PCI Express Gen2 x4(1)* Full-height, Full-length</p> <p>Slot 2: PCI Express Gen3 x 16 Full-height, Full-length (with extender)</p> <p>Slot 3: PCI Express Gen2 x 8(4)* with open-ended connector** Full-height, Full-length (with extender)</p> <p>Slot 4: PCI Express Gen3 x8 with open-ended connector** Full-height, Full-length (with extender)</p> <p>Slot 5: PCI Express Gen3 x16 Full-height, Full-length (with extender)</p> <p>Slot 6: PCI 32bit/33MHz Full-height, Full-length (with extender)</p> <p>* x&lt;number&gt; = number of lanes or size of the physical/mechanical connector. (number) = number of lanes supported electrically. Typically communicated as x# mechanical, x(#)electrical.</p> <p>** open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.</p>
<b>Expansion Bays</b> (see storage section for more details)	<p>3 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed) 3 external 5.25" bays (4th HDD occupies one external bay)</p> <p>Top and Middle 5.25" bay device depth limit: 206mm (8.11 inches) Bottom 5.25" bay device depth limit: 173mm (6.81 inches)</p>

### Overview

<b>Front I/O</b>	2 USB 3.0, 1 USB 2.0, 1 IEEE 1394a standard, 1 Headphone, 1 Microphone	
<b>Internal I/O</b>	6 USB 2.0 ports available by three separate 2x5 headers. Each 2x5 header supports either one HP Internal USB Port Kit (EM165AA) or one 22-in-1 Media Card Reader.	
<b>Rear I/O</b>	2 USB 3.0, 4 USB 2.0, 1 IEEE 1394a port, 2 PS/2, RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out, 1 Microphone. Serial supported with optional connector on PCI bracket cabled to system board connector	
<b>Interfaces Supported</b>	14-in-1 Media Card Reader (optional) 6-channel SATA interface (2 @ 6.0 Gb/s, 4 @ 3.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit. USB 2.0, USB 3.0, IEEE 1394a interface	
<b>Chassis Dimensions</b> (HxWxD)	Standard minitower orientation: 44.76 x 17.78 x 44.52 cm (17.6 x 7.0 x 17.5 in) Converted desktop orientation: 17.9 x 44.76 x 44.52 cm (7.0 x 17.6 x 17.5 in)	
<b>Weight</b>	Exact weights depend upon configuration. Minimum: 12.5kg (27.5 lbs) Standard: 13.2kg (29.2 lbs) Maximum: 17.7kg (39 lbs)	
<b>Temperature</b>	Operating:	5° to 35°C (40° to 95°F)
	Non-operating	-40° to 60°C (-40° to 140°F)
<b>Humidity</b>	Operating:	8% to 85% relative humidity, non-condensing
	Non-operating	8% to 90% relative humidity, non-condensing
<b>Maximum Altitude</b> (non-pressurized)	Operating:	3,048m (10,000ft)
	Non-operating	9,144m (30,000ft)
<b>Power Supply</b>	600 watts wide-ranging, active Power Factor Correction, 90% Efficient The Z420 600W power supply efficiency report can be found at this link: <a href="http://www.pluginloadsolutions.com/psu_reports/HEWLETT_PACKARD_623193-001_ECOS_2619_1_600W_Report.pdf">http://www.pluginloadsolutions.com/psu_reports/HEWLETT_PACKARD_623193-001_ECOS 2619 1 600W Report.pdf</a>	
<b>Workstation ISV Certifications</b>	See the latest list of certifications at <a href="http://www.hp.com/united-states/campaigns/workstations/partnerships.html">http://www.hp.com/united-states/campaigns/workstations/partnerships.html</a>	

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Intel Xeon E5-1600 Series</b>				
Intel® Xeon® Processor E5-1620 4C 3.60GHz	Y	N		
Intel® Xeon® Processor E5-1603 4C 2.80GHz	Y	N		
<b>Intel Xeon E5-2600 v2 Series - CTO</b>				
Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz	Y	N		
<b>Intel Xeon E5-1600 v2 Series</b>				
Intel® Xeon® Processor E5-1680 v2 8C 3.00GHz	Y	N		
Intel® Xeon® Processor E5-1660 v2 6C 3.70GHz	Y	N		
Intel® Xeon® Processor E5-1650 v2 6C 3.50GHz	Y	N		
Intel® Xeon® Processor E5-1620 v2 4C 3.70GHz	Y	N		
Intel® Xeon® Processor E5-1607 v2 4C 3.00GHz	Y	N		
HP Liquid Cooling option available for all the above processors. Intel's numbering is not a measurement of higher performance.				

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 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 measured diagonally				

Hard Drives

<b>Sub-Section Description/Notes</b>				
Up to (4) 3.5-inch 15K rpm SAS drives: 300, 450, 600 GB; 2.4 TB max				
Up to (4) 2.5-inch 10K rpm SAS drives: 300, 600, 900 GB, 1.2 TB; 4.8 TB max				
<b>NOTE:</b> SAS controller add-in card required				
<b>NOTE:</b> 4th SFF HDDs will be automatically installed into the top optical bay in a Handle/HDD carrier				
Removable Boot Drive option				

SAS Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations</b>				
600GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	VM647AA	
450GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU968AA	



Supported Components

300GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU967AA
HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA
HP 900GB SAS 10K SFF HDD	Y	Y	E2P03AA
HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA
HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA

Sub-Section Description/Notes

Up to (4) 3.5-inch 7200 rpm SATA drives: 250, 500 GB, 1.0, 2.0, 3.0 TB; 12.0 TB max

Up to (4) 2.5-inch 10K rpm SATA drives: 250, 500 GB, 1.0 TB; 4.0 TB max

Up to (1) 2.5-inch SATA Self-Encrypting Drive (SED): 500 GB

Removable Boot Drive option

SATA Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations

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
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA
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	

Sub-Section Description/Notes

Up to (4) 2.5-inch Micron 6Gb/s SATA Solid State Drives: 128, 256, 512 GB; 3.0 TB max

Up to (1) 2.5-inch SATA Self-Encrypting Solid State Drive (SED SSD): Micron 6Gb/s 256 GB

Up to (4) 2.5-inch Seagate 600 Pro 6Gb/s SATA Solid State Drives: 120, 240, 480 GB; 1.9 TB max

Up to (1) 2.5-inch Intel Pro 1500 6Gb/s SATA Solid State Drive: 180 GB

NOTE: 4th SSDs will be automatically installed into the top optical bay in a Handle/HDD carrier

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 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA
HP 256GB SATA 6Gb/s SED SSD	Y	N	
Seagate 600 Pro 120GB SATA SSD	Y	Y	E9Q50AA
Seagate 600 Pro 240GB SATA SSD	Y	Y	E9Q51AA
Seagate 600 Pro 480GB SATA SSD	Y	Y	E9Q52AA
Intel Pro 1500 180GB SATA SSD	Y	Y	F5Z70AA

PCIe SSDs

PCIe SSDs for HP Workstations

Fusion ioFX 410GB PCIe Accelerator	Y	Y	E4W49AA
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For hard drives, 1 GB = 1 billion bytes; TB = 1 trillion bytes. Actual formatted capacity is less.





Supported Components

Hard Drive Controllers	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Integrated SATA 6.0 Gb/s Controller</b>				
Integrated SATA 6.0 Gb/s Controller	Y	N		Two ports
<b>Integrated SATA 3.0 Gb/s Controller</b>				
Integrated SATA 3.0 Gb/s Controller	Y	N		Four ports
<b>Factory integrated RAID on motherboard for SATA drives</b>				
RAID 0 Configuration - Striped Array	Y	N		Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		Note 1
RAID 1 Configuration - Mirrored Array	Y	N		Note 1
RAID 10 Configuration - Striped/Mirrored Array	Y	N		Note 1
RAID 5 Configuration - Parity Array	Y	N		Note 1
<b>LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card</b>				
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA	Note 2
<b>LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card and iBBU08 Battery Backup Unit</b>				
LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card	N	Y	WE465AA	Note 2
Optional: LSI iBBU08 Battery Backup Unit for LSI 9260-8i	N	Y	LA783AA	
<b>LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU09 Battery Backup Unit</b>				
LSI 9270-8i SAS 6Gb/s ROC RAID Card	Y	Y	E0X21AA	Note 2
LSI iBBU09 Battery Backup Unit	N	Y	E0X19AA	
SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit <a href="http://www.hp.com/support/linux_hardware_matrix">http://www.hp.com/support/linux_hardware_matrix</a> for RAID capabilities with Linux.				
All drives must be identical in type and capacity. RAID arrays greater than 2 TB are fully supported.				
<b>NOTE 1:</b> Requires hard drives with identical speed, capacity, and interface. Specific user-configured hardware SAS RAID configurations are supported on this Linux system. For details, please visit <a href="http://www.hp.com/support/linux_hardware_matrix">http://www.hp.com/support/linux_hardware_matrix</a>				
<b>NOTE 2:</b> Specific user-configured hardware SAS RAID configurations are supported on this Linux system. IS: Striping of 2 or more HDDs into a single logical volume IM: Mirroring of 2 HDDs into a single logical volume IME: Mirroring of 3 or more HDDs into a single logical volume. For details, please visit <a href="http://www.hp.com/support/linux_hardware_matrix">http://www.hp.com/support/linux_hardware_matrix</a>				



Supported Components

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Mixed?
<b>Professional 2D</b>						
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	Note 1	3	YES
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 1	3	NO
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 2	2	YES
<b>Entry 3D</b>						
NVIDIA Quadro 410 512MB Graphics	Y	Y	A7U60AA		2	NO
NVIDIA Quadro K600 1GB Graphics	Y	Y	C2J92AA		2	NO
AMD FirePro V3900 1GB Graphics	Y	Y	A6R69AA		2	NO
<b>Mid-range 3D</b>						
NVIDIA Quadro K2000 2GB Graphics	Y	Y	C2J93AA		2	NO
<b>High End 3D</b>						
AMD FirePro W7000 4GB Graphics	Y	Y	C2K00AA	Note 3	1	NO
NVIDIA Quadro K4000 3GB Graphics	Y	Y	C2J94AA		1	NO
NVIDIA Quadro K5000 4GB Graphics	Y	Y	C2J95AA	Note 3	1	NO
NVIDIA Quadro 6000 6GB Graphics	N	Y	WS097AA	Note 3	1	NO

**NOTE 1:** When configuring with a 3rd NVS 300, 310, or 315--the configuration requires the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

**NOTE 2:** If 1st graphics card is NVS 510 then 2nd graphics card must be NVS 510 or NVS 310.

**NOTE 3:** Configuration requires the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

High Performance GPU Computing

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
NVIDIA Tesla K20c Compute Processor	Y	Y	C2J97AA	Notes 1, 2

**NOTE 1:** This device does not have an operational graphics output.

Tesla C2075 configurations require the addition of either NVIDIA Quadro 600 1st graphics or NVIDIA Quadro 2000 1st graphics.

Tesla K20c configurations require the addition of either NVIDIA Quadro K600 1st graphics or NVIDIA Quadro K2000 1st graphics.

**NOTE 2:** All Tesla configurations require the Z4 Fan and Front Card Guide Kit, which is available both CTO (QE150AV) and AMO (A2Z46AA).

Supported Components

Memory	CTO	Option Kit Part Number	Support Notes
	<b>DDR3-1600 ECC Unbuffered DIMMs - CTO</b>		
	8GB DDR3-1600 ECC Unbuffered RAM		
	4GB DDR3-1600 ECC Unbuffered RAM		
	2GB DDR3-1600 ECC Unbuffered RAM		
	<b>DDR3-1866 ECC Unbuffered DIMMs - CTO</b>		
	8GB DDR3-1866 ECC Unbuffered RAM		
	4GB DDR3-1866 ECC Unbuffered RAM		
	2GB DDR3-1866 ECC Unbuffered RAM		
	<b>Sub-Section Description/Notes</b>		
	For details on the supported memory configurations on the HP Z420 Workstation, please refer to the System Technical Specifications - System Board section of this document.		
	Each processor supports up to 4 channels of DDR3 memory. To realize full performance at least 1 DIMM must be inserted into each channel.		
	The CPUs determine the speed at which the memory is clocked. If a 1066MHz capable CPU is used in the system, the maximum speed the memory will run at is 1066MHz regardless of the specified speed of the memory.		
	<b>AMO</b>		
	<b>DDR3-1600 ECC Unbuffered DIMMs - AMO</b>		
	HP 8GB (1x8GB) DDR3-1600 ECC RAM	A2Z50AA	
	HP 4GB (1x4GB) DDR3-1600 ECC RAM	A2Z48AA	
	HP 2GB (1x2GB) DDR3-1600 ECC RAM	A2Z47AA	
	<b>DDR3-1866 ECC Unbuffered DIMMs - AMO</b>		
	HP 8GB (1x8GB) DDR3-1866 ECC RAM	E2Q93AA	
	HP 4GB (1x4GB) DDR3-1866 ECC RAM	E2Q91AA	
	HP 2GB (1x2GB) DDR3-1866 ECC RAM	E2Q90AA	
	<b>NOTE:</b> Only unbuffered DDR3 DIMMs are supported.		

Multimedia and Audio Devices	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel/Realtek HD ALC262 Audio	Y	N		
HP Thin USB Powered Speakers	Y	Y	KK912AA	
Creative Recon3D PCIe Audio Card	Y	Y	B0U68AA	

### Supported Components

#### 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	Note 1
HP 16X DVD+/-RW SuperMulti SATA Drive (non-Lightscribe)	Y	Y	QS208AA	
HP Blu-ray Writer	Y	Y	AR482AA	Note 2
HP 14-in-1 Media Card Reader	Y	Y	E5G19AA	
HP CMT Handle in Top Optical Bay	Y	Y	A9A48AA	Note 3

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

As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

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

**NOTE 2:** Cannot be ordered in combination with another Blu-ray Writer.

**NOTE 3:** The HP CMT Handle in Top Optical Bay kit, which contains two SFF internal drive bays, is installed automatically when customers order a 4th SFF hard drive.

#### Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire PCIe Card	Y	Y	NK653AA	
HP Thunderbolt-2 PCIe 1-port I/O Card*	Y	Y	F3F43AA	Available early 2014

\* Connect in a flash with 4X USB 3.0 bandwidth on an optional high-performance Thunderbolt™ 2.0 port.

Thunderbolt is new technology. Thunderbolt cable and Thunderbolt device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see <https://thunderbolttechnology.net/products>. Thunderbolt™ 2.0 is planned to be available via an optional add-in card in early 2014.

### Supported Components

#### 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	Note 1
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
Broadcom NetXtreme Gigabit Ethernet Plus NIC (PCIe)	Y	Y	FS215AA	Notes 1 & 2
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
HP Wireless NIC 802.11b/g/n PCIe Card	N	Y	FH971AA	
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.

**NOTE 2:** This is a PCI Express card based on the Broadcom 5761 chip. This card does not support DASH 1.1 manageability on this platform.

#### Racking and Physical Security

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

#### Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Keyboard	Y	Y	QY774AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Smart Card Keyboard	Y	Y	E6D77AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	
HP Wireless Keyboard and Mouse	N	Y	QY449AA	
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA	
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA	

Product numbers QY774AA-QY778AA represent the new 2012 products with the updated product design. The previous models will be phased out over time

### Supported Components

#### Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z420 Front Memory Duct	Y	Y	C4J29AA	Note 1
HP Z4 Fan and Front Card Guide Kit	Y	Y	A2Z46AA	
HP Serial Port Adapter	Y	Y	PA716A	
HP eSATA PCI Cable Kit	Y	Y	GM110AA	
HP Internal USB Port Kit	N	Y	EM165AA	Note 2
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP Power Cord Kit	N	Y	DM293A	
Configure minitower in desktop orientation	Y	N		
HP Workstation Mouse Pad	Y	N		Japan only
HP Energy Star Enabled Configuration	Y	N		

**Note 1:** The HP Z420 Front Memory Duct is available to add to any configuration for improved system cooling, but is required for 4 x 8GB and 8 x 8GB memory configurations and for configurations including the HP Liquid Cooling Solution thermal kit.

**Note 2:** The HP Internal USB Port kit has a single USB 2.0 type A connector.

#### Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 6.0	Y	N		Note 2
HP ProtectTools Security	Y	N		Note 3
MS Office Home & Business 2013	Y	N		Note 4
HP Power Assistant	Y	N		
PDF Complete - Corporate Edition	Y	N		
Cyberlink Media Suite & PowerDVD	Y	N		Media playback/authoring software

**NOTE 1:** Available as a free download here: [www.hp.com/go/performanceadvisor](http://www.hp.com/go/performanceadvisor)

**NOTE 2:** Supports both 32 and 64 bit versions of Windows 7 Professional and Enterprise, Windows XP Professional and Enterprise, and RHEL V6

**NOTE 3:** Must select as a Configure to Order option. Delivered as a "Drop in the Box" CD

**NOTE 4:** Must select as a Configure to Order option

Supported Components

Operating Systems	Support Notes
Windows 8.1 Pro 64-bit	
Windows 8.1 Simplified Chinese Edition 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit (National Academic)	
Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit (National Academic)	
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	
Genuine Windows® 7 Ultimate 64-bit	Note 1
Genuine Windows® 7 Professional 32-bit	Note 1
Genuine Windows® 7 Professional 64-bit	Note 1
SUSE Linux Enterprise Desktop 11	
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	Note 2
<b>NOTE 1:</b> See <a href="http://www.microsoft.com/windows/windows-7/">http://www.microsoft.com/windows/windows-7/</a> for support details.	
<b>NOTE 2:</b> This second OS must be ordered with the HP Linux Installer Kit as the first OS.	

System Technical Specifications

System Board									
System Board Form Factor		ATX 243.84 x 304.8 mm (9.6 x 12 inches)							
Processor Socket		Single LGA2011							
CPU Bus Speed		QPI: Up to 8.0GT/sec							
Chipset		Intel® C602 Chipset							
Super I/O Controller		Nuvoton NPCD379H (SIO-12)							
Memory Expansion Slots		8 DDR3 memory slots							
Memory Type Supported		DDR3, UDIMM (Unbuffered), ECC							
Memory Modes		Channel Interleaved							
Memory Speed Supported		1066MHz, 1333MHz, 1600MHz, and 1866MHz							
Memory Protection		ECC available on data, parity on address and command							
Memory									
Memory Configuration Table		Please refer to the table below for details on how supported memory configurations are installed in your system.							
		Front Slots				Rear Slots			
Capacity (GB)	Type	DIMM 1	DIMM 2	DIMM 3	DIMM 4	DIMM 5	DIMM 6	DIMM 7	DIMM 8
2	UDIMM	2GB							
4	UDIMM	2GB							2GB
6	UDIMM	2GB		2GB					2GB
8	UDIMM	2GB		2GB			2GB		2GB
16	UDIMM	2GB	2GB	2GB	2GB	2GB	2GB	2GB	2GB
4	UDIMM	4GB							
8	UDIMM	4GB							4GB
12	UDIMM	4GB		4GB					4GB
16	UDIMM	4GB		4GB			4GB	4GB	4GB
32	UDIMM	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB
8	UDIMM	8GB							
16	UDIMM	8GB							8GB
24	UDIMM	8GB		8GB					8GB
32	UDIMM	8GB		8GB			8GB		8GB
64	UDIMM	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB
Slot Load Order		1	5	3	7	8	4	6	2
For a detailed diagram, please refer to the label located on the inside of the system side panel.									
Maximum Memory		Supports up to 64GB							
Memory Configuration (Supported)		Only ECC DIMMs are supported.							
Note on Maximum Memory		*Maximum memory capacities assume 64-bit operating systems such as Genuine Windows® 7 Ultimate 64-bit or Genuine Windows® 7 Professional 64-bit. Genuine Windows® 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB.							
PCI Express Connectors		2 x16 PCIe Gen3 1 x8 PCIe Gen3 1 x8 PCIe (x4) Gen2 1 x4 PCIe (x1) Gen2							





### System Technical Specifications

<b>PCI Connectors (5.0V)</b>	1 PCI	
<b>Supported Drive Interfaces</b>	<b>SATA</b>	Integrated 6-channel SATA interface (2@6Gb/s, 4@3Gb/s). Supports RAID 0, 1, 5, 10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	<b>Integrated RAID</b>	<b>NOTE:</b> Requires identical hard drives (speeds, capacity, interface)
<b>Integrated Graphics</b>	No	
<b>Network Controller</b>	Integrated Intel 82579 Gbit LAN  Supports the following management functionalities: Intel AMT7.0, TXT, DASH 1.1, WOL, and PXE 2.1	
<b>External SATA (eSATA)</b>	6 ports are eSATA configurable with optional eSATA After-Market Option cable kit.	
<b>IDE connector</b>	No	
<b>Floppy connector</b>	No	
<b>Serial</b>	1 internal header	
<b>2nd Serial</b>	No	
<b>Parallel</b>	No	
<b>AUX IN (audio)</b>	No	
<b>IEEE 1394 Connector(s)</b>	<b>Front</b>	1 IEEE 1394a standard
	<b>Rear</b>	1 IEEE 1394a standard; 2 IEEE 1394b (requires optional PCIe card)
	<b>Internal</b>	No
<b>USB Connector(s)</b>	<b>Front</b>	2 USB 3.0 1 USB 2.0
	<b>Rear</b>	2 USB 3.0 4 USB 2.0
	<b>Internal</b>	6 USB 2.0 ports available by three separate 2x5 headers: each header supports either one HP Internal USB Port Kit or one USB Media Card Reader. Each Internal Port Kit has one USB 2.0 connector.
<b>HD Integrated Audio</b>	Realtek ALC262	
<b>Flash ROM</b>	Yes	
<b>CPU Fan Header</b>	Yes	
<b>Chassis Fan Header</b>	1 Rear System Chassis Fan Header	
<b>Front PCI Fan Header</b>	Yes	
<b>Front Control Panel/Speaker Header</b>	Yes	
<b>CMOS Battery Holder - Lithium</b>	Yes	
<b>Integrated Trusted Platform Module</b>	Integrated TPM 1.2	
<b>Power Supply Headers</b>	Yes	
<b>Power Switch, Power LED &amp; Hard Drive LED Header</b>	Yes	
<b>Clear Password Jumper</b>	Yes	
<b>Serial Port</b>	1 internal header	
<b>Parallel Port</b>	No	
<b>Keyboard/Mouse</b>	USB or PS/2	

System Technical Specifications

Power Supply

Power Supply	600W 90% Efficient, Custom PSU (Wide Ranging, Active PFC)	
Operating Voltage Range	90–269 VAC	
Rated Voltage Range	100–240 V	118 V
Rated Line Frequency	50–60 Hz	400 Hz
Operating Line Frequency Range	47–66 Hz	393-407 Hz
Rated Input Current	100–240 V @ 8.0 A	118 V @ 8.0 A
Heat Dissipation	Typical: 1365btu/hr (344 kg-cal/hr) Maximum: 2354btu/hr (593 kg-cal/hr)	
Power Supply Fan	92x25 mm variable speed	
ENERGY STAR Qualified (Configuration dependent)	Yes	
80 PLUS® Compliant	90% Efficient  The Z420 600W power supply efficiency report can be found at this link: <a href="http://www.pluginloadsolutions.com/psu_reports/HEWLETT_PACKARD_623193-001_ECOS_2619_1_600W_Report.pdf">http://www.pluginloadsolutions.com/psu_reports/HEWLETT PACKARD_623193-001_ECOS_2619_1_600W_Report.pdf</a>	
FEMP Standby Power Compliant @115V (Wake-on LAN disabled) (<2W in S5 - Power Off)	Yes	
EuP Compliant @ 230V (<1 W in S5 - Power Off)	Yes	
CECP Compliant @ 220V (<4W in S3 - Suspend to RAM)	Yes; Configuration dependent	
Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC) measured at 115V.	<10W	
Built-in Self Test LED	Yes	
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes	

Hood Lock Header	Yes
Hood Sensor Header	Yes
Memory Fan	1 Memory Fan Header

### System Technical Specifications

System Configurations							
<b>Example Configuration #1</b> (ENERGY STAR QUALIFIED)	Processor Info	1x Intel Xeon E5-1603 (Quad-Core)					
	Memory Info	1x 2GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA NVS 300					
	Disks/Optical/Floppy	1x 250GB SATA 7200/1x 16X DVD-ROM SATA					
	PSU	600W 90% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	50.0 W		48.9 W		49.5 W	
	Windows Busy Typ (S0)	118 W		115 W		118 W	
	Windows Busy Max (S0)	130 W		127 W		129 W	
	Sleep (S3)	3.56 W	3.42 W	3.782 W	3.66 W	3.53 W	3.41 W
	Off (S5)	1.34 W	1.20 W	1.58 W	1.45 W	1.31 W	1.18 W
	Zero Power Mode (ErP)	0.20 W		0.43 W		0.17 W	
		115 VAC		230 VAC		100 VAC	
<b>Heat Dissipation**</b>		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	171 btu/hr		167 btu/hr		169 btu/hr	
	Windows Busy Typ (S0)	403 btu/hr		392 btu/hr		403 btu/hr	
	Windows Busy Max (S0)	444 btu/hr		433 btu/hr		440 btu/hr	
	Sleep (S3)	12.2 btu/hr	11.7 btu/hr	12.9 btu/hr	12.5 btu/hr	12.0 btu/hr	11.6 btu/hr
	Off (S5)	4.57 btu/hr	4.09 btu/hr	5.39 btu/hr	4.95 btu/hr	4.47 btu/hr	4.03 btu/hr
	Zero Power Mode (ErP)	0.68 btu/hr		1.47 btu/hr		0.58 btu/hr	

<b>Example Configuration #2</b> (ENERGY STAR QUALIFIED)	Processor Info	1x Intel Xeon E5-1650 (Six-Core)					
	Memory Info	2x 4GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA Quadro 2000					
	Disks/Optical/Floppy	2x 500GB SATA 7200/1x 16X DVD+-RW SuperMulti SATA					
	Power Supply	600W 90% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	73.9 W		72.9 W		73.8 W	
	Windows Busy Typ (S0)	272 W		270 W		277 W	
	Windows Busy Max (S0)	298 W		294 W		300 W	
	Sleep (S3)	4.31 W	4.18 W	4.53 W	4.41 W	4.27 W	4.17 W
	Off (S5)	1.35 W	1.20 W	1.59 W	1.44 W	1.32 W	1.17 W
	Zero Power Mode (ErP)	0.21 W		0.43 W		0.17 W	
		115 VAC		230 VAC		100 VAC	
<b>Heat Dissipation**</b>		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	252 btu/hr		249 btu/hr		252 btu/hr	
	Windows Busy Typ (S0)	928 btu/hr		921 btu/hr		945 btu/hr	
	Windows Busy Max (S0)	1017 btu/hr		1003 btu/hr		1024 btu/hr	
	Sleep (S3)	14.7 btu/hr	14.3 btu/hr	15.5 btu/hr	15.1 btu/hr	14.6 btu/hr	14.2 btu/hr
	Off (S5)	4.61 btu/hr	4.09 btu/hr	5.43 btu/hr	4.91 btu/hr	4.50 btu/hr	3.99 btu/hr
	Zero Power Mode (ErP)	0.72 btu/hr		1.47 btu/hr		0.58 btu/hr	

### System Technical Specifications

<b>Example Configuration #3</b>	Processor Info	1x Intel Xeon E5-2665 (Eight-Core)					
	Memory Info	8x 4GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA Quadro 5000					
	Disks/Optical/Floppy	4x 600GB SAS 15K/1x 16X DVD+-RW SuperMulti SATA					
	Power Supply	600W 90% Custom PSU					
	Other	LSI 9212 SAS Card					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	152 W		151 W		154 W	
	Windows Busy Typ (S0)	347 W		346 W		354 W	
	Windows Busy Max (S0)	421 W		430 W		432 W	
	Sleep (S3)	6.77 W	6.68 W	6.96 W	6.82 W	6.79 W	6.63 W
	Off (S5)	1.33 W	1.20 W	1.55 W	1.42 W	1.30 W	1.18 W
	Zero Power Mode (ErP)	0.19 W		0.41 W		0.16 W	
		115 VAC		230 VAC		100 VAC	
<b>Heat Dissipation**</b>		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	519 btu/hr		515 btu/hr		525 btu/hr	
	Windows Busy Typ (S0)	1184 btu/hr		1181 btu/hr		1208 btu/hr	
	Windows Busy Max (S0)	1437 btu/hr		1467 btu/hr		1474 btu/hr	
	Sleep (S3)	23.1 btu/hr	23.8 btu/hr	23.8 btu/hr	23.3 btu/hr	23.2 btu/hr	22.6 btu/hr
	Off (S5)	4.54 btu/hr	4.09 btu/hr	5.29 btu/hr	4.85 btu/hr	4.44 btu/hr	4.03 btu/hr
	Zero Power Mode (ErP)	0.65 btu/hr		1.40 btu/hr		0.55 btu/hr	
		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled

### Declared Noise Emissions (Entry-level and High-end configurations)

<b>System Configuration (Entry level)</b>	<b>Processor Info</b>	Intel Xeon E5-2665 2.40 GHz
	<b>Memory Info</b>	4 - DDR3 2 GB 1600 MHz UDIMM
	<b>Graphics Info</b>	NVIDIA Q400
	<b>Disks/Optical/Floppy</b>	Single 500 GB 7200 RPM SATA DVD-RW

<b>Declared Noise Emissions</b> (in accordance with ISO 7779 and ISO 9296)		<b>Sound Power (LWAd, bels)</b>	<b>Deskside Sound Pressure (LpAm, decibels)</b>
	Idle	3.5	18
	SATA Hard drive Operating (random reads)	3.6	19
	DVD-ROM Operating (sequential reads)	5.2	37

<b>System Configuration (High-end)</b>	<b>Processor Info</b>	Intel Xeon E5-1660 3.30 GHz
	<b>Memory Info</b>	8 - 4 GB DDR3 1600 MHz UDIMM
	<b>Graphics Info</b>	NVIDIA Q4000
	<b>Disks/Optical/Floppy</b>	2 - 600 GB 15K RPM SAS 3.5" DVD-RW

### System Technical Specifications

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
	Idle	4.9	32
	SATA Hard drive Operating (random reads)	5.0	34
	DVD-ROM Operating (sequential reads)	5.3	41

Environmental Requirements	Temperature	Operating: 5° to 35° C (40° to 95° F) Non-operating: -40° to 60° C (-40° to 140° F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 3,000 m (10,000 feet) Non-operating: 9,100 m (30,000 feet)
	Dynamic (new)	Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g <b>NOTE:</b> Values represent individual shock events and do not indicate repetitive shock events.  Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz <b>NOTE:</b> Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5,000 ft) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1,000 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
Green User Touch Points	Yes, on primary serviceable components.
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, at POST screen on reboot

### System Technical Specifications

<b>Restore CD/DVD Set</b>	Restores the computer to its original factory shipping image; can be obtained via HP Support.
<b>Dual Function Front Power Switch</b>	Yes, causes a fail-safe power off when held for 4 seconds
<b>Padlock Support</b>	Yes (optional): Locks side cover and secures chassis from theft 5.56 mm (0.2188 in) diameter padlock loop at rear of system
<b>Cable Lock Support</b>	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
<b>Universal Chassis Clamp Lock Support</b>	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
<b>Solenoid Lock and Hood Sensor</b>	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
<b>Rear Port Control Cover</b>	Yes (optional); locks rear IO cables to prevent cable theft
<b>Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control</b>	Yes, enables or disables serial, USB, audio, and network ports
<b>Removable Media Write/Boot Control</b>	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
<b>Power-On Password</b>	Yes, prevents an unauthorized person from booting up the workstation
<b>Setup Password</b>	Yes, prevents an unauthorized person from changing the workstation configuration
<b>3.3V Aux Power LED on System PCA</b>	Yes
<b>NIC LEDs (integrated) (Green &amp; Amber)</b>	Yes
<b>CPUs and Heatsinks</b>	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
<b>Power Supply Diagnostic LED</b>	Yes
<b>Front Power Button</b>	Yes, ACPI multi-function
<b>Rear Power Button</b>	Yes
<b>Front Power LED</b>	Yes, blue (normal), red (fault)
<b>Front Hard Drive Activity LED</b>	Yes, green
<b>Front ODD Activity LED</b>	Yes
<b>Internal Speaker</b>	Yes
<b>System/Emergency ROM Flash Recovery</b>	Recovers corrupted system BIOS.
<b>Cooling Solutions</b>	Air cooled forced convection, liquid cooling (optional)
<b>Power Supply Fans</b>	92 mm x 92 mm x 25 mm 4-wire (non-serviceable)
<b>CPU Heatsink Fan</b>	92 x 25 mm 5-wire PWM
<b>Chassis Fan</b>	92 mm x 92mm x 25 mm 4-wire PWM
<b>Memory Heatsink Fan</b>	Yes, rear memory
<b>HP Advanced System Diagnostics Offline Edition</b>	HP Vision Diagnostics Offline Edition The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to:



### System Technical Specifications

	<ul style="list-style-type: none"> <li>• Run diagnostics</li> <li>• View the hardware configuration of the system</li> </ul> <p>Key features and benefits</p> <p>HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision Diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are:</p> <ul style="list-style-type: none"> <li>• Testing and diagnosing apparent hardware failures</li> <li>• Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance</li> <li>• Sending configuration information to another location for more in-depth analysis</li> </ul>
<b>Access Panel Key Lock</b>	No
<b>ACPI-Ready Hardware</b>	Advanced Configuration and Power Management Interface (ACPI). <ul style="list-style-type: none"> <li>• Allows the system to wake from a low power mode.</li> <li>• 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</li> </ul>
<b>Trusted Platform Module Chip with optional ProtectTools Software</b>	Yes, Infineon SLB9635TT1.2
<b>Integrated Chassis Handles</b>	No Optional Handle in Top Optical Bay kit
<b>Power Supply</b>	Requires T15 Torx or flat blade screwdriver
<b>PCI Card Retention</b>	Yes, rear (all), middle (optional), front (full-length cards with extender, used in with the front card guide and fan holder)
<b>Flash ROM</b>	Yes
<b>Diagnostic Power Switch LED on board</b>	Yes
<b>Clear Password Jumper</b>	Yes
<b>Clear CMOS Button</b>	Yes
<b>CMOS Battery Holder</b>	Yes
<b>DIMM Connectors</b>	Yes
<b>HP ProtectTools Security Manager</b>	Yes - Not supported on Linux

<b>BIOS</b>	
<b>BIOS 32-bit Services</b>	Standard BIOS 32-bit Service Directory Proposal v0.4
<b>PCI 3.0 Support</b>	Full BIOS support for PCI Express through industry standard interfaces.
<b>ATAPI</b>	ATAPI Removable Media Device BIOS Specification Version 1.0.
<b>BBS</b>	BIOS Boot Specification v1.01.




### System Technical Specifications

<b>WMI Support</b>	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
<b>BIOS Boot Spec 1.01+</b>	Provides more control over how and from what devices the workstation will boot.
<b>BIOS Power On</b>	Users can define a specific date and time for the system to power on.
<b>ROM Based Computer Setup Utility (F10)</b>	Review and customize system configuration settings controlled by the BIOS.
<b>System/Emergency ROM Flash Recovery with Video</b>	Recovers system BIOS in corrupted Flash ROM
<b>Replicated Setup</b>	Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
<b>SMBIOS</b>	System Management BIOS 2.7, for system management information.
<b>Boot Control</b>	Disables the ability to boot from removable media on supported devices.
<b>Memory Change Alert</b>	Alerts management console if memory is removed or changed.
<b>Thermal Alert</b>	Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"> <li>• NORMAL - normal temperature ranges.</li> <li>• ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.</li> <li>• SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.</li> </ul>
<b>Remote ROM Flash</b>	Provides secure, fail-safe ROM image management from a central network console.
<b>ACPI (Advanced Configuration and Power Management Interface)</b>	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.
<b>Ownership Tag</b>	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
<b>Remote Wakeup/ Remote Shutdown</b>	System administrators can power on, restart, and power off a client computer from a remote location.
<b>Instantly Available PC (Suspend to RAM - ACPI sleep state S3)</b>	Allows for very low power consumption with quick resume time.
<b>Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)</b>	Allows a new or existing system to boot over the network and download software, including the operating system.
<b>ROM revision levels</b>	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.
<b>System board revision level</b>	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
<b>Start-up Diagnostics (Power-on Self-Test)</b>	Assesses system health at boot time with selectable levels of testing
<b>Auto Setup when new hardware installed</b>	System automatically detects addition of new hardware.
<b>Keyboard-less Operation</b>	The system can be booted without a keyboard.

### System Technical Specifications


<b>Localized ROM Setup</b>	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
<b>Asset Tag</b>	The user or MIS to set a unique tag string in non-volatile memory.
<b>Per-slot Control</b>	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
<b>Adaptive Cooling</b>	Control parameters are set according to detected hardware configuration for optimal acoustics.
<b>Pre-boot Diagnostics</b>	(Pre-video) critical errors are reported via beeps and blinks on the power LED
<b>Industry Standard Specification Support</b>	
<b>UEFI Specification Revision</b>	2.3.1
<b>Industry Standard</b>	Revision Supported by the BIOS
<b>ACPI</b>	Advanced Configuration and Power Management Interface, Version 2.0c
<b>ATA (IDE)</b>	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
<b>CD Boot</b>	"El Torito" Bootable CD-ROM Format Specification Version 1.0
<b>EDD</b>	<ul style="list-style-type: none"> <li>Enhanced Disk Drive Specification Version 1.1</li> <li>BIOS Enhanced Disk Drive Specification Version 3.0</li> </ul>
<b>EHCI</b>	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
<b>PCI</b>	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7
<b>PCI Express</b>	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
<b>PMM</b>	POST Memory Manager Specification, Version 1.01
<b>SATA</b>	<ul style="list-style-type: none"> <li>Serial ATA Specification, Revision 1.0a</li> <li>Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5</li> <li>Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0</li> </ul>
<b>SPD</b>	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
<b>TPM</b>	Trusted Computing Group TPM Specification Version 1.2
<b>UHCI</b>	Universal Host Controller Interface Design Guide, Revision 1.1
<b>USB</b>	Universal Serial Bus Revision 1.1 Specification  Universal Serial Bus Revision 2.0 Specification  Universal Serial Bus Revision 3.0 Specification
<b>SMBIOS</b>	System Management BIOS Reference Specification, Version 2.7

### Social and Environmental Responsibility

<b>Eco-Label Certifications &amp; Declarations</b>	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: <ul style="list-style-type: none"> <li>ENERGY STAR® (energy-saving features available on selected configurations-Windows only)</li> <li>US Federal Energy Management Program (FEMP)</li> <li>China Energy Conservation Program</li> <li>IT ECO declaration</li> </ul>
<b>Batteries</b>	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: <ul style="list-style-type: none"> <li></li> </ul>
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### System Technical Specifications

	<ul style="list-style-type: none"> <li>Mercury greater than 5ppm by weight</li> <li>Cadmium greater than 10ppm by weight</li> <li>Lead greater than 40ppm by weight</li> </ul>
<b>Restricted Material Usage</b>	<p>This product meets the material restrictions specified in HP's General Specification for the Environment. <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf</a></p> <p>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.</p>
<b>Low Halogen Statement</b>	<p>This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: 3 ½" SAS HDDs, LSI 9260-8i SAS 6Gb/s ROC RAID Card, Creative Recon3D PCIe Audio Card, Liquid Cooling Solution, and Broadcom 5761 Gigabit PCIe NIC are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.</p>
<b>End-of-Life Management and Recycling</b>	<p>Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <a href="http://www.hp.com/recycle">http://www.hp.com/recycle</a> 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.</p>
<b>Hewlett-Packard Corporate Environmental Information</b>	<p>For more information about HP's commitment to the environment: Global Citizenship Report <a href="http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html">http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</a></p>
<b>Additional Information</b>	<p>This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.</p> <ul style="list-style-type: none"> <li>Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.</li> <li>This product is &gt;90% recycle-able when properly disposed of at end of life.</li> </ul> <p>EPEAT Gold registered in the U.S. EPEAT registration varies by country. See <a href="http://www.epeat.net">www.epeat.net</a> for registration status by country</p>
<b>Packaging</b>	<p>HP Workstation product packaging meets the HP General Specification for the Environment at <a href="http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html">http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html</a></p> <ul style="list-style-type: none"> <li>Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment</li> <li>Does not contain ozone-depleting substances (ODS)</li> <li>Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed</li> <li>Maximizes the use of post-consumer recycled content materials in packaging materials</li> <li>All packaging material is recyclable</li> <li>All packaging material is designed for ease of disassembly</li> <li>Reduced size and weight of packages to improve transportation fuel efficiency</li> <li>Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting</li> </ul>
<b>Packaging Materials</b>	
<b>Internal</b>	Cushions and plastic bags made of low density polyethylene (LDPE).
<b>External</b>	Outer carton, accessories carton, and insert made of corrugated paper board.

<b>Manageability</b>	
<b>Industry Standard Specifications</b>	<p>This product meets the following industry standard specifications for manageability functionality:</p> <ul style="list-style-type: none"> <li>DASH 1.1 required functionalities via Intel LAN on motherboard</li> </ul>
<b>Intel Active Management</b>	Intel Active Management Technology (AMT) 7.0
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### System Technical Specifications

<b>Technology (AMT)</b>	<p>An advanced set of remote management features and functionality providing IT 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 7.0 includes the following advanced management functions:</p> <ul style="list-style-type: none"> <li>• Power Management (on, off, reset)</li> <li>• Hardware Inventory (includes BIOS and firmware revisions)</li> <li>• Hardware Alerting</li> <li>• Agent Presence</li> <li>• System Defense Filters</li> <li>• SOL/IDER</li> <li>• Cisco NAC/SDN Support</li> <li>• ME Wake-on-LAN</li> <li>• DASH 1.1 compliance</li> <li>• IPv6 Support</li> <li>• 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</li> <li>• Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance.</li> <li>• Remote Alerts - automatically alert IT or service provider if issues arise</li> <li>• Access Monitor - Provides oversight into Intel® AMT actions to support security requirements</li> <li>• PC Alarm Clock</li> <li>• Microsoft NAP Support</li> <li>• Host Base set-up and configuration</li> <li>• Management Engine (ME) firmware roll back</li> </ul>
<b>Intel® vPro™ Technology</b>	<p>The HP Z420 Workstation supports Intel vPro technology when configured as outlined below:</p> <ul style="list-style-type: none"> <li>• Intel Xeon processor E5-1600 product family or E5-2600 product family featuring Intel vPro Technology</li> <li>• Intel C602 chipset</li> <li>• Intel 82579LM GbE LAN</li> </ul>
<b>Remote Manageability Software Solutions</b>	<p>The HP Z420 Workstation is supported on the following remote manageability software consoles:</p> <ul style="list-style-type: none"> <li>• LANDesk Management Suite (HP recommended solution)</li> <li>• Microsoft System Center Configuration Manager</li> <li>• HP Client Automation Enterprise</li> </ul> <p>For questions or support for manageability needs, please visit <a href="http://www.hp.com/go/easydeploy">http://www.hp.com/go/easydeploy</a></p>
<b>System Software Manager</b>	<p>For questions or support for SSM, please visit: <a href="http://www.hp.com/go/ssm">http://www.hp.com/go/ssm</a></p>
<b>Service, Support, and Warranty</b>	<p>On-site Warranty and Service (<a href="#">Note 1</a>): Three-years, limited warranty and service offering delivers on-site, next business-day (<a href="#">Note 2</a>) service for parts and labor and includes free telephone support (<a href="#">Note 3</a>) 8am - 5pm. Global coverage (<a href="#">Note 2</a>) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.</p> <p><b>NOTE 1:</b> Terms and conditions may vary by country. Certain restrictions and exclusions apply.  <b>NOTE 2:</b> On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.  <b>NOTE 3:</b> Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.</p> <p>HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at <a href="http://www.hp.com/go/lookuptool">http://www.hp.com/go/lookuptool</a>. Additional HP Care Pack Services information by product is available at <a href="http://www.hp.com/hps/carepack">http://www.hp.com/hps/carepack</a>. Service levels</p>

System Technical Specifications

	<a href="#">and response times for HP Care Packs may vary depending on your geographic location.</a>
<b>Product Change Notification</b>	<ul style="list-style-type: none"><li>• Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile.</li><li>• PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition.</li><li>• Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.</li></ul>

### 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
	A2H76AV	Intel® Xeon® Processor E5-1620 4C 3.60GHz
	E2R01AV	Intel® Xeon® Processor E5-1620v2 4C 3.70GHz
Hard Drives	Product #	Offering
	QE198AV	HP 500 GB SATA 7200 1st HDD
	QE199AV	HP 500 GB SATA 7200 2nd HDD
	QE200AV	HP 500 GB SATA 7200 3rd HDD
	QE201AV	HP 500 GB SATA 7200 4th HDD
	QE190AV	HP 1 TB SATA 7200 1st HDD
	QE191AV	HP 1 TB SATA 7200 2nd HDD
	QE192AV	HP 1 TB SATA 7200 3rd HDD
	QE193AV	HP 1 TB SATA 7200 4th HDD
Graphics	Product #	Offering
	A7U44AV	NVIDIA NVS 310 512MB Graphics
	A7U45AV	NVIDIA NVS 310 512MB Graphics (2nd)
Memory	Product #	Offering
	QE252AV	2GB (1x2GB) DDR3-1600 ECC Unbuffered RAM
	QE254AV	4GB (2x2GB) DDR3-1600 ECC Unbuffered RAM
	B0Q75AV	6GB (3x2GB) DDR3-1600 ECC Unbuffered RAM
	QE256AV	8GB (4x2GB) DDR3-1600 ECC Unbuffered RAM
	QE258AV	16GB (8x2GB) DDR3-1600 ECC Unbuffered RAM
	E4W55AV	8GB (2x4GB) DDR3-1600 ECC Unbuffered RAM
	QE257AV	16GB (4x4GB) DDR3-1600 ECC Unbuffered RAM
	QE260AV	32GB (8x4GB) DDR3-1600 ECC Unbuffered RAM
	E6R36AV	4GB (1x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S39AV	8GB (2x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S41AV	12GB (3x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S43AV	16GB (4x4GB) DDR3-1866 ECC Unbuffered RAM
	E2S45AV	32GB (8x4GB) DDR3-1866 ECC Unbuffered RAM

Stable & Consistent Offerings

Optical and Removable Storage	Product #	Offering
	QE236AV	HP 16X DVD+-RW SuperMulti SATA 1st Drive
	QE237AV	HP 16X DVD+-RW SuperMulti SATA 2nd Drive
<hr/>		
Operating Systems	Product #	Offering
	QD971AV	Genuine Windows® 7 Professional 64-bit



### Technical Specifications - Processors

#### Introduction

Intel® Xeon® Processor E5-1620 4C 3.60GHz

Intel® Xeon® Processor E5-1603 4C 2.80GHz

#### Processor Note

For detailed processor specifications, please refer to the Overview section at the beginning of this document.

Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz

Intel® Xeon® Processor E5-1607 v2 4C 3.00GHz

Intel® Xeon® Processor E5-1620 v2 4C 3.70GHz

Intel® Xeon® Processor E5-1650 v2 6C 3.50GHz

Intel® Xeon® Processor E5-1660 v2 6C 3.70GHz

Intel® Xeon® Processor E5-1680 v2 8C 3.00GHz

Technical Specifications - Hard Drives

HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations	600GB SAS 15K rpm 6Gb/s 3.5" HDD	Capacity	600GB	
		Height	1 in; 2.54 cm	
		Width		Media Diameter
				3.5 in; 8.9 cm
				Physical Size
				4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6.0 Gb/s	
		Buffer	16 MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Logical Blocks	1,172,123,568 - 512 byte blocks	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	450GB SAS 15K rpm 6Gb/s 3.5" HDD	Capacity	450GB	
		Height	1 in; 2.54 cm	
		Width		Media Diameter
				3.5 in; 8.9 cm
				Physical Size
				4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	300GB SAS 15K rpm 6Gb/s 3.5" HDD	Capacity	300GB	
		Height	1 in; 2.54 cm	
		Width		Media Diameter
				3.5 in; 8.9 cm
				Physical Size
				4 in; 10.17 cm
		Interface	SAS	
		Synchronous Transfer Rate (Maximum)	6Gb/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.2 ms
			Average	3.4 ms
			Full Stroke	6.6 ms
		Rotational Speed	15,000 rpm	
		Operating Temperature	50° to 95° F (10° to 35° C)	
	HP 300GB SAS 10K SFF HDD	Capacity	300GB	
		Height	0.6 in; 1.53 cm	

Technical Specifications - Hard Drives

	<b>Width</b>	<b>Media Diameter</b>	2.5 in; 6.36 cm
		<b>Physical Size</b>	2.75 in; 6.99 cm
	<b>Interface</b>	SAS 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	64MB	
	<b>Cache</b>	multi-segmentable cache buffer	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	0.4 ms (max)
		<b>Average</b>	3.6 ms
		<b>Full Stroke</b>	7.3 ms
	<b>Rotational Speed</b>	10,000 rpm	
	<b>Logical Blocks</b>	585,937,500	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
HP 600GB SAS 10K SFF HDD	<b>Capacity</b>	600GB	
	<b>Height</b>	0.6 in; 1.53 cm	
	<b>Width</b>	<b>Media Diameter</b>	2.5 in; 6.36 cm
		<b>Physical Size</b>	2.75 in; 6.99 cm
	<b>Interface</b>	SAS 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	64MB	
	<b>Cache</b>	multi-segmentable cache buffer	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	0.4 ms (max)
		<b>Average</b>	3.6 ms
		<b>Full Stroke</b>	7.3 ms
	<b>Rotational Speed</b>	10,000 rpm	
	<b>Logical Blocks</b>	1,172,123,568	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
HP 900GB SAS 10K SFF HDD	<b>Capacity</b>	900GB	
	<b>Height</b>	0.6 in; 1.53 cm	
	<b>Width</b>	<b>Media Diameter</b>	2.5 in; 6.36 cm
		<b>Physical Size</b>	2.75 in; 6.99 cm
	<b>Interface</b>	SAS 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	64MB	
	<b>Cache</b>	multi-segmentable cache buffer	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	0.2ms (max)
		<b>Average</b>	3.5 ms
		<b>Full Stroke</b>	7.0 ms
	<b>Rotational Speed</b>	10,000 rpm	
	<b>Logical Blocks</b>	1,758,174,767	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

HP 1.2TB SAS 10K SFF HDD	Capacity	1.2TB	
	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	SAS 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	multi-segmentable cache buffer	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.18ms (max)
		Average	3.5ms
		Full Stroke	7.17ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	2,344,225,968	
	Operating Temperature	41° to 131° F (5° to 55° C)	
SATA (Serial ATA) Hard Drives for HP Workstations	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 HDD	Capacity	500GB
		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



Technical Specifications - Hard Drives

**Operating Temperature**41° to 131° F (5° to 55° C)

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

500GB SATA 7200 rpm 6Gb/s 3.5" HDD	<b>Capacity</b>	500GB	
	<b>Height</b>	1 in; 2.5 cm	
	<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
		<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	16 MB	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	2 ms
		<b>Average</b>	11 ms
		<b>Full Stroke</b>	21 ms
	<b>Rotational Speed</b>	7,200 rpm	
	<b>Logical Blocks</b>	976,773,168	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	

1TB SATA 7200 rpm 6Gb/s 3.5" HDD	<b>Capacity</b>	1 Terabyte (1000 GB)	
	<b>Height</b>	1 in; 2.54 cm	
	<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
		<b>Physical Size</b>	4.0 in; 10.17 cm
	<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600 MB/s	
	<b>Buffer</b>	32MB	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	2 ms
		<b>Average</b>	11 ms
		<b>Full Stroke</b>	21 ms
	<b>Rotational Speed</b>	7,200 rpm	
	<b>Logical Blocks</b>	1,953,525,168	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Capacity	2.0TB	
	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 600 MB/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)	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Capacity	3.0TB	
	Height	1 in; 2.54 cm	
	Width	Media Diameter	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 6.0 Gb/s	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	Single Track	0.6 ms
		Average	11 ms
		Full Stroke	Not Specified
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 140° F (5° to 60° 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	
	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)	

Technical Specifications - Hard Drives

HP Solid State Drives (SSDs) for Workstations	HP 128GB SATA 6Gb/s SSD	Capacity	128GB	
		Height	0.28 in; 0.7 cm	
		Width	<b>Physical Size</b>	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	<b>Physical Size</b>	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	<b>Physical Size</b>	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)	
	Seagate 600 Pro 120GB SATA SSD	Capacity	120GB	
		Height	0.276 in; 0.7 cm	
		Width	<b>Physical Size</b>	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Seagate 600 Pro 240GB SATA SSD	Capacity	240GB	
		Height	0.28 in; 0.7 cm	
		Width	<b>Physical Size</b>	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	





Technical Specifications - Hard Drives

PCIe SSDs for HP Workstations	Seagate 600 Pro 480GB SATA SSD	Capacity	480GB	
		Height	0.28 in; 0.7 cm	
		Width	Physical Size	2.76 in; 7.01 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Intel Pro 1500 180GB SATA SSD	Capacity	180GB	
		Width	Physical Size	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	600 Mb/s	
	Fusion ioFX 410GB PCIe Accelerator	Operating Temperature	32° to 158° F (0° to 70° C)	
		Capacity	410GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 95° F (0° to 35° C)	

Technical Specifications - Hard Drive Controllers

LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	PCI Bus	8 lanes, PCI Express 3.0
	RAID Levels	Offers Integrated RAID (0, 1, 1E and 10)
	PCI Data Burst Transfer Rate	Half Duplex x8, PCIe, 8000 MB/s
	SAS Bandwidth	Half Duplex600 MB/s per lane
	PCI Card Type	3.3V Add-in card
	PCI Voltage	12 V ± 10%
	PCI Power	9.8W typical, Airflow min 200 LFM
	Bracket	Full height and low profile
	Certification Level	PCI Express 3.0 compliant
	IO Bus	1x4 6Gb/s SAS ports
	SAS Processor	LSI SAS2308/ Fusion MPT 2.0
	Internal Connectors	One x4 internal mini-SAS (SFF8087)
	External Connectors	One x4 external mini-SAS (SFF8088)
	Maximum Number of SCSI Devices	256 Non-RAID SAS/SATA devices
	LED Indicators	N/A
LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card and iBBU08 Battery Backup Unit	PCI Bus	PCI-Express (Gen2) V2.0 x8 lanes
	PCI Modes	Bus Master DMA
	RAID Levels	RAID 0, 1, 5, and 6 RAID spans 10, 50 and 60
	PCI Data Burst Transfer Rate	Up to 4GB/s
	PCI Card Type	Low profile, single PCIe slot design with full height bracket.
		The optional iBBU08 Battery Backup unit mounts on the controller card and the assembly remains within a single PCIe slot width.
	PCI Voltage	+3.3V Add-in Card
	PCI Power	12.5 Watts
	Certification Level	PCI-Express 2.0
	IO Bus	Eight 3 Gb/s and 6Gb/s compatible SAS/SATA ports
	Internal Connectors	Two SAS SFF8087 x4
	External Connectors	None
	Maximum Number of SCSI Devices	32.
		<b>NOTE:</b> HP Workstations do not support this many internal drives.
	LED Indicators	Connector LEDs indicate whether the internal connector is active for ports 0-3 and 4-7

Technical Specifications - Hard Drive Controllers

LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit	PCI Bus	x8 lane PCIe 3.0 compliant
	RAID Levels	RAID 0, 1, 5, and 6 RAID spans 10, 50 and 60
	PCI Card Type	Low profile, single PCIe slot design with full height bracket.
	PCI Voltage	+3.3V Add-in Card
	PCI Power	+3.3V, +12V
	Certification Level	PCI-Express 3.0
	IO Bus	Eight 6Gb/s and 3Gb/s compatible SAS/SATA ports
	SAS Processor	LSISAS2208 Dual-Core RAID on Chip (ROC)
	Internal Connectors	Two SAS SFF8087 x4 (Mini-SAS)
	External Connectors	None
	Maximum Number of SCSI Devices	Up to 128 SAS and/or SATA hard drives and SSDs <b>NOTE:</b> <a href="#">HP Workstations do not support this many internal drives.</a>
	LED Indicators	Heartbeat LED on card

Technical Specifications - Graphics

<b>NVIDIA NVS 310 512MB Form Factor Graphics</b>		Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
<b>Graphics Controller</b>		NVIDIA NVS 310 GPU: GF119-825
<b>Bus Type</b>		PCI Express x16, 2.0 compliant
<b>Memory</b>		Size: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
<b>Connectors</b>		2 x DisplayPort
<b>Maximum Resolution</b>		Up to 2560 x 1600 (digital display) per display.
<b>Image Quality Features</b>		The following video formats are supported: <ul style="list-style-type: none"><li>- MPEG2</li><li>- MPEG4 Part 2 Advanced Simple Profile</li><li>- H.264 SVC codec support</li><li>- Support for 3D Blu Ray</li><li>- VC1</li><li>- DivX version 3.11 and later</li><li>- MVC</li></ul> <p>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.</p>
<b>Display Output</b>		<p>Up to 2 displays in the following configurations:</p> <p>DisplayPort output:</p> <ul style="list-style-type: none"><li>• 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</li><li>• Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.</li></ul> <p>DVI-D output:</p> <ul style="list-style-type: none"><li>• 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</li><li>• 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</li></ul> <p>HDMI output:</p> <ul style="list-style-type: none"><li>• 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</li></ul> <p>VGA display output:</p> <ul style="list-style-type: none"><li>• Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors</li></ul>

### Technical Specifications - Graphics

<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.1
<b>Available Graphics Drivers</b>	<p>Windows 8</p> <p>Genuine Windows 7 Professional (64-bit and 32-bit)</p> <p>Microsoft Windows XP Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux(RHEL)</p> <p>SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)</p> <p>HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:  <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a></p> <p>SUSE Linux Enterprise drivers may also be obtained from:  <a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a></p>
<b>Power Consumption</b>	19.5 Watts
<b>Note</b>	<p>1. The thermal solution used on this card is an active fan heatsink.</p> <p>2. Factory configured NVS 310 graphics card have no cable adaptaters included. Adapters must be ordered separately.</p> <p>3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.</p>

#### NVIDIA NVS 510 2GB Graphics

<b>Form Factor</b>	Low Profile, 2.713 inches × 6.3 inches, single slot
<b>Graphics Controller</b>	<p>NVS 510 GPU</p> <p>Core Clock: 797 Mhz</p> <p>Memory Clock: 891 Mhz</p> <p>CUDA Cores: 192</p>
<b>Bus Type</b>	PCI Express x16, Generation 2.0
<b>Memory</b>	2GB DDR3
<b>Connectors</b>	<p>Four mini-DisplayPort.</p> <p>Four mini-DisplayPort to DisplayPort adapters included.</p> <p>(DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)</p>
<b>Maximum Resolution</b>	<p>Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz)</p> <p><b>NOTE:</b> This card supports up to four displays. For Windows XP, only 2 active displays are supported.</p>
<b>Image Quality Features</b>	10-bit internal display processing, including hardware support for 10-bit scan-out
<b>Display Output</b>	<p>DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.</p> <p>Digital Display Support</p> <p>1. DisplayPort Output</p> <ul style="list-style-type: none"> <li>- 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.</li> <li>- 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.</li> </ul>

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)	
Power Consumption Note	HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>	
	33.4 Watts	
	Heatsink cooler design is active.	

NVIDIA NVS 315 1GB Graphics (for HP Workstations)	Form Factor	Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 315 (using GF119-825 GPU) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	Connectors	DMS-59 output Cables included: - For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable
	Maximum Resolution	Maximum number of displays supported: 2  Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
	Image Quality Features	See Display Output section.
	The following video formats are supported:	

Technical Specifications - Graphics

- MPEG2
- MPEG4 Part 2 Advanced Simple Profile
- H.264 SVC codec support
- Support for 3D Blu Ray
- VC1
- DivX version 3.11 or later

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 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 using one of the following DMS-59 cables:  
DMS-59 to DVI  
DMS-59 to VGA  
DMS-59 to DP

DisplayPort output:  
- Drives two DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adaptor.

DVI-D output:  
- Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor

VGA display output:  
- Drives two analog display at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.

Shading Architecture  
Supported Graphics APIs  
Available Graphics Drivers

Shader Model 5.0  
DX11, OpenGL 4.3  
  
Windows 8  
Microsoft 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. The thermal solution used on this card is an active fan heatsink.
2. Factory configured graphics card includes DMS-59 to DVI cable.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

<b>NVIDIA Quadro 410</b> <b>512MB Graphics</b>	<b>Form Factor</b>	Low Profile: 2.713 inches × 5.7 inches, single slot
	<b>Graphics Controller</b>	NVIDIA Quadro 410 GPU: GK107
	<b>Bus Type</b>	PCI Express x16, 3.0 compliant
	<b>Memory</b>	Size: 512MB DDR3 Clock: 900MHz Memory Bandwidth: 14GB/s
	<b>Connectors</b>	One dual-link DVI-I connector One DisplayPort connector
	<b>Maximum Resolution</b>	VGA (through DVI to VGA cable): <ul style="list-style-type: none"><li>● 2048 × 1536 × 32 bpp at 85 Hz</li></ul> Dual-link DVI <ul style="list-style-type: none"><li>● 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)</li></ul> Single-link DVI <ul style="list-style-type: none"><li>● 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li></ul> DisplayPort 1.2 <ul style="list-style-type: none"><li>● 3840 × 2160 × 36 bpp at 60 Hz</li></ul>
	<b>RAMDAC</b>	400 MHz integrated RAMDAC
	<b>Display Output</b>	Maximum number of displays supported: 2
	<b>Shading Architecture</b>	Shader Model 5.0
	<b>Supported Graphics APIs</b>	DX11, OpenGL 4.2
	<b>Available Graphics Drivers</b>	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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>  SUSE Linux Enterprise drivers may also be obtained from: <a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a>
	<b>Notes</b>	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

<b>NVIDIA Quadro K600</b> <b>1GB Graphics</b>	<b>Form Factor</b>	2.731" H x 6.3" L
		Single Slot, Low Profile
		Full Height Profile bracket installed
		Low Profile bracket included
	<b>Graphics Controller</b>	NVIDIA Quadro K600 Graphics Card
		Kepler GK107 GPU
		192 CUDA cores
		Max Power: 41 Watts



Technical Specifications - Graphics

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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>  SUSE Linux Enterprise drivers may also be obtained from: <a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a>
Notes	1. Quadro K600 offered as CTO does not include a video cable



Technical Specifications - Graphics

- adapter. Video cable adapters must be ordered separately.
2. Quadro K600 offered as AMO includes one DP-to-DVI video cable adapter. Additional 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.

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
	Connectors	1 DL DVI, 1 DP output One DP to DVI adapter included
	Maximum Resolution	2560x1600 per display (5120x1600 max. horizontal resolution)
	Display Output	1 DisplayPort® 1.2 1 Dual-link DVI
	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)
	Power Consumption	HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
Note		<50W 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 <a href="http://www.amd.com/firepro">www.amd.com/firepro</a> for details.

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	<p>DisplayPort:</p> <ul style="list-style-type: none"><li>- up to 3840 x 2160 x 30 bpp @ 60Hz</li><li>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)</li></ul> <p>DL-DVI(I) output:</p> <ul style="list-style-type: none"><li>- up to 2560 x 1600 x 32 bpp @ 60Hz</li></ul>
Image Quality Features	<ul style="list-style-type: none"><li>• 10-bit internal display processing pipeline</li><li>• 10-bit scan-out support</li></ul>
Display Output	<p>VGA:</p> <ul style="list-style-type: none"><li>- requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters</li><li>- 400 Mhz integrated RAMDAC</li><li>- Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz</li></ul> <p>DL-DVI(I):</p> <ul style="list-style-type: none"><li>- Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</li></ul> <p>SL-DVI(I):</p> <ul style="list-style-type: none"><li>- Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</li></ul> <p>DisplayPort:</p> <ul style="list-style-type: none"><li>- Supports HBR2 and MST</li><li>- 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)</li><li>- 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</li></ul> <p>Maximum number of monitors across all available Quadro K2000 outputs is 4.</p>
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5
Supported Graphics APIs	<p>OpenGL 4.3</p> <p>DirectX 11</p> <p>API support includes:</p> <p>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
Available Graphics Drivers	<p>Windows 8 Pro 64-bit</p> <p>Windows 8 (China) 64-bit</p> <p>Genuine Windows 7 Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit)</p> <p>Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation</p> <p>SUSE Linux Enterprise Desktop 11 (64-bit)</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site:</p> <p><a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a></p> <p>SUSE Linux Enterprise drivers may also be obtained from:</p> <p><a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a></p>
Notes	<ol style="list-style-type: none"><li>1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.</li><li>2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.</li></ol>

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): <ul style="list-style-type: none"><li>• 1 4096x2169 display</li><li>• 2 2560x1600 displays</li><li>• 4 1920x1200 displays</li></ul>
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL® 4.2 with OpenGL Shading Language OpenCL 1.1 Microsoft® DirectX® 11.1
NVIDIA Quadro K4000 3GB Graphics	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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
	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 <a href="http://www.amd.com/firepro">www.amd.com/firepro</a> 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 - Graphics

<b>Graphics Controller</b>	NVIDIA Quadro K4000 Graphics Card Kepler GK106 GPU 768 CUDA cores Max Power: 80 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	3 GB GDDR5, 2800 Mhz 192-bit memory I/O path 134 GB/s memory bandwidth
<b>Connectors</b>	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
<b>Maximum Resolution</b>	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
<b>Image Quality Features</b>	<ul style="list-style-type: none"> <li>• 10-bit internal display processing pipeline</li> <li>• 10-bit scan-out support</li> </ul>
<b>Display Output</b>	<p>VGA:</p> <ul style="list-style-type: none"> <li>- requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters</li> <li>- 400 Mhz integrated RAMDAC</li> <li>- Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz</li> </ul> <p>DL-DVI(I):</p> <ul style="list-style-type: none"> <li>- Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</li> </ul> <p>SL-DVI(I):</p> <ul style="list-style-type: none"> <li>- Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</li> </ul> <p>DisplayPort:</p> <ul style="list-style-type: none"> <li>- Supports HBR2 and MST</li> <li>- 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)</li> <li>- 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</li> </ul> <p>HDMI:</p> <ul style="list-style-type: none"> <li>- Requires use of DP-to-HDMI cable</li> <li>- Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz</li> </ul> <p>Maximum number of monitors across all available Quadro K4000 outputs is 4.</p>
<b>Shading Architecture</b>	Full Microsoft DirectX 11 Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	Windows 8 Pro 64-bit Windows 8 (China) 64-bit

Technical Specifications - Graphics

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.

NVIDIA Quadro K5000 4GB Graphics	Form Factor	4.376" H x 10.5" L Dual Slot
	Graphics Controller	NVIDIA Quadro K5000 Graphics Card based on the GK104 GPU
	Bus Type	PCI Express 2.0 x16
	Memory	4GB GDDR5 173GB/s memory bandwidth
	Connectors	DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector. No adapter included with card.
		DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories
	Image Quality Features	<ul style="list-style-type: none"><li>• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support</li><li>• NVIDIA 3D Vision™ technology</li></ul>
	Display Output	400 MHz integrated RAMDAC
		<ul style="list-style-type: none"><li>• Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz</li></ul>
		Dual-link internal TMDS (DVI 1.0) <ul style="list-style-type: none"><li>• Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)</li></ul>
		Single-link internal TMDS (DVI 1.0) <ul style="list-style-type: none"><li>• Maximum resolution over digital port (single GPU and SLI mode):1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li></ul>
		DisplayPort with MST and HBR2.

Technical Specifications - Graphics

		<ul style="list-style-type: none"><li>Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz</li></ul>
		HDMI
		<ul style="list-style-type: none"><li>Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz</li></ul>
	Supported Graphics APIs	OpenGL 4.2 DirectX 11 Shader model 5.0 Support API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran
	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 (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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
	Power Consumption	122 Watts
	Note	No display output adapter included.

NVIDIA Quadro 6000 6GB Graphics	Form Factor	4.376" H x 9.75" L Dual Slot
	Graphics Controller	NVIDIA Quadro 6000 Graphics Card
	Bus Type	PCI Express 2.0 x16
	Memory	6 GB GDDR5 384-bit ECC Memory
	Connectors	1 DVI-I output, 2 DisplayPort outputs, 1 Stereo(3-pin mini DIN); One DP to DVI adapter included with card
		DVI to VGA, DisplayPort to VGA and DisplayPort to dual link DVI adapters available as accessories
	Maximum Resolution	Dual DisplayPort (up to 2560 x 1600 @ 60Hz and 1920x1200 @ 120Hz) Dual-link DVI-I output (up to 2560 x 1600 @ 60Hz and 1920x1200 @ 120Hz)
	Image Quality Features	<ul style="list-style-type: none"><li>30-bit color</li><li>Up to 16K x16K texture and render processing</li><li>Transparent multisampling and super sampling</li><li>16x angle independent anisotropic filtering</li><li>128-bit floating point performance</li><li>32-bit per-component floating point texture filtering and blending</li><li>64x full scene antialiasing (FSAA) / 128x FSAA in SLI Mode</li><li>Support for any combination of two connected displays</li><li>DisplayPort 1.1a, HDMI 1.3a, and HDCP support</li><li>NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support</li><li>Full OpenGL quad buffered stereo support</li><li>Underscan/overscan compensation and hardware scaling</li><li>NVIDIA nView® multi-display technology</li></ul>
	Shading Architecture	Shader Model 5.0



Technical Specifications - Graphics

<b>Supported Graphics APIs</b>	OpenGL 4.0 DirectX 11 CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	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 (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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>  Novell SUSE Linux Enterprise drivers may also be obtained from: <a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a>
<b>Power Consumption</b>	<250 Watts



Technical Specifications - High Performance GPU Computing

NVIDIA Tesla K20c Compute Processor	Form Factor	4.376 inches by 10.5 inches Dual Slot
	System Interface	PCI Express Gen2 ×16
	Video Outputs	None.
	Memory	5GB GDDR5, 320-bit memory path
	Peak Memory Bandwidth	208 GB/s (with ECC off)
	Supported APIs	CUDA and OpenACC API support includes: CUDA C, CUDA C++, Java, Python, and Fortran
	Supported Operating Systems	Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 (64-bit)
		HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
		Novell SUSE Linux Enterprise drivers may also be obtained from: <a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a>
	Processor Cores	GK110 GPU, 706 MHz clock 2496 CUDA cores
	Power Consumption	~225 Watts
<b>NOTE 1:</b> A 1125W PSU is required for any K20 configuration on the Z820		

Technical Specifications - Multimedia and Audio Devices

HP Thin USB Powered Speakers	<b>Frequency Response</b>	(- FO to 20kHz
		3dB, 24-bit/96kHz input)
	<b>Dimensions</b>	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	<b>Description</b>	5.25-inch, half-height, tray-load
	<b>Mounting Orientation</b>	Either horizontal or vertical
	<b>Interface Type</b>	SATA/ATAPI
	<b>Dimensions (WxHxD)</b>	15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	<b>Disc Capacity</b>	<b>DVD-ROM</b> Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	<b>Access Times</b>	<b>DVD-ROM Single Layer</b> < 140 ms (typical)
		<b>CD-ROM Mode 1</b> < 125 ms (typical)
		<b>Full Stroke DVD</b> < 250 ms (seek)
		<b>Full Stroke CD</b> < 210 ms (seek)
	<b>Power</b>	<b>Source</b> SATA DC power receptacle
		<b>DC Power Requirements</b> 5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
		<b>DC Current</b> 5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum
	<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b> 41° to 122° F (5° to 50° C)
		<b>Relative Humidity</b> 10% to 90%
		<b>Maximum Wet Bulb Temperature</b> 86° F (30° C)
		<b>Operating Systems Supported</b> 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	<b>Description</b>	5.25-inch, half-height, tray-load
	<b>Mounting Orientation</b>	Either horizontal or vertical
	<b>Interface Type</b>	SATA/ATAPI
	<b>Dimensions (WxHxD)</b>	15.0 x 4.4 x 17.5 cm (5.9 x 1.7 x 8.0 in)
	<b>Disc Formats</b>	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW
	<b>Disc Capacity</b>	<b>DVD-ROM</b> 8.5 GB DL or 4.7 GB standard
		<b>Full Stroke DVD</b> < 240 ms (seek)
		<b>Full Stroke CD</b> < 200 ms (seek)

Technical Specifications - Optical and Removable Storage

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 12X
		DVD-R DL	Up to 12X
		DVD-ROM	Up to 16X
		DVD-ROM DL	Up to 12X
		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 -<1200 mA typical, <2000 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 8 32-bit and 64-bit, 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	
	Kit Contents	No driver is required for this device. Native support is provided by the operating system.	
		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
	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	

Technical Specifications - Optical and Removable Storage

Disc Capacity	DVD-RW			
	CD-R			
	CD-RW			
	DVD-ROM	8.5 GB DL or 4.7 GB standard		
	Blu-ray	50 GB DL or 25 GB standard		
	Full Stroke DVD	< 250 ms (seek)		
	Full Stroke CD	< 210 ms (seek)		
	Blu-ray	Blu-ray		
	Startup Time (Time to drive ready from tray loading)	BD-ROM (SL/DL)	25S / 28S	
		BD-R (SL/DL)	25S / 28S	
BD-RE (SL/DL)		25S / 28S		
DVD-ROM (SL/DL)		18S / 18S		
DVD-R (SL/DL)		25S / 25S		
DVD-RW		25S		
DVD+R (SL/DL)		25S / 25S		
DVD+RW		25S		
DVD-RAM		45S		
CD-ROM		45S		
Maximum Data Transfer Rates	CD ROM Read	CD-ROM	Up to 40X	
		CD-R	Up to 40X	
		CD-RW	Up to 40X	
	DVD ROM Read	DVD-RAM	Up to 5X	
		DVD+RW	Up to 10X	
		DVD-RW	Up to 10X	
		DVD+R DL	Up to 8X	
		DVD-R DL	Up to 8X	
		DVD-ROM	Up to 16X	
		DVD-ROM DL	Up to 8X	
		DVD+R	Up to 12X	
		DVD-R	Up to 12X	
		Blu-Ray	BD-ROM	Up to 6X
			BD-ROM DL	Up to 4.8X
			BD-R	Up to 6X
	BD-R DL		Up to 4.8X	
	BD-R		Up to 6X	
	BD-RE SL/DL		Up to 4.8X	
	Power	Source	SATA DC power receptacle	
		DC Power	5 VDC ± 5%-100 mV ripple p-p	
		Requirements	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		

Technical Specifications - Optical and Removable Storage

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.

HP 14-in-1 Media Card Reader

Supports hardware ECC (Error Correction Code) function  
Supports hardware CRC (Cyclic Redundancy Check) function  
Supports MS 4-bit parallel transfer mode  
Supports MS-PRO 4-bit parallel transfer mode  
Supports MS PRO-HG Duo 4-bit parallel transfer mode  
Supports SD 4-bit parallel transfer mode  
Supports UHS-104 SD 4-bit card (version 3.0)  
Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode

**Interface Type** USB 3.0 High-speed interface  
Note: If there is a USB2 connection, USB2 transfer speeds are supported.

**Dimensions (WxHxD)** 4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm)

**Supported Media Types** CompactFlash Type I  
CompactFlash Type II  
Microdrive  
Secure Digital Card (SD)  
Secure Digital High Capacity (SDHC)  
SD Extended Capacity Memory Card (SDXC)  
Memory Stick  
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  
MagicGate Memory Stick (MG)  
MagicGate Memory Stick Duo  
Note: These additional media types are supported with a card adapter.  
Memory Stick Micro (M2)  
miniSD  
miniSD High Capacity  
Micro SD Memory Card (MicroSD)  
Micro SD High Capacity Memory Card (MicroSDHC)

**Operating** 10°C 10% R.H. ≥ 24 hours

Technical Specifications - Optical and Removable Storage

Environmental (all conditions non-condensing)	<div>10°C 90% R.H. ≥ 24 hours</div> <div>20°C 90% R.H. ≥ 24 hours</div> <div>30°C 90% R.H. ≥ 24 hours</div> <div>40°C 90% R.H. ≥ 24 hours</div> <div>50°C 90% R.H. ≥ 24 hours</div> <div>50°C 10% R.H. ≥ 24 hours</div> <div>Extremes:</div> <div>140°F (60°C) @ 80% R.H. for 96 hours</div> <div>-22°F (-30°C) @ 20% R.H. for 48 hours</div> <div>No power applied</div> <div>Delta °C &lt; 1.0°C/min</div> <div>Delta % R.H. &lt; 1.5% R.H./min</div> <div>Note: Test Parameters/Conditions - Power applied, unit operating on system ±5%</div>
Operating Systems Supported	<div>Windows 8 Pro (64-bit)*</div> <div>Windows 8 (64-bit)*</div> <div>Windows 7 Ultimate (32-bit)**</div> <div>Windows 7 Ultimate (64-bit)**</div> <div>Windows 7 Professional (32-bit)**</div> <div>Windows 7 Professional (64-bit)**</div> <div>Windows 7 Home Basic**</div> <div>Windows 7 Home Premium (32-bit)**</div> <div>Windows 7 Home Premium (64-bit)**</div> <div>Windows Vista Business 64</div> <div>Windows Vista Business 32</div> <div>Windows Vista Home Basic 32</div> <div>Windows XP Professional</div> <div>Windows XP Home 32</div> <div>No driver is required for this device. Native support is provided by the operating system.</div> <div>Note: Not all features are available in all editions of Windows 8.</div> <div>Systems may require upgraded and/orseparately purchased hardware, drivers and/or software to take full advantage of Windows 8functionality. See <a href="http://www.microsoft.com">http://www.microsoft.com</a>.</div> <div>Note: Not all features are available in all editions of Windows 7. This system may require upgraded and/orseparately purchased hardware to take full advantage of Windows 7 functionality. See <a href="http://www.microsoft.com/windows/windows-7/">http://www.microsoft.com/windows/windows-7/</a> for details.</div>
Kit Contents	Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD
Approvals	USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only

HP CMT Handle in Top Features Optical Bay	<div>• Front panel handle/grip for Z4 and Z2 when loaded in top 5.25" external bay</div> <div>• Two tool-free 2.5" SFF drive carriers (drives not included)</div>
Dimensions (HxWxD)	42.7 x 149.0 x 205.5 mm
Weight	0.6 kg (1.3 lbs)
Operating Temperature	5° to 35°C (40° to 94°F)

### Technical Specifications - Controller Cards

<b>HP IEEE 1394b FireWire PCIe Card</b>	<b>Data Transfer Rate</b>	Supports up to 800 Mbps
	<b>Devices Supported</b>	IEEE-1394 compliant devices
	<b>Bus Type</b>	PCIe card full height PCIe slots
	<b>Ports</b>	Two IEEE-1394b bilingual 9-Pin Connector (Rear)
	<b>Internal Connectors</b>	One 10-Pin header Custom Connector
	<b>System Requirements</b>	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.
	<b>Temperature – Operating</b>	50° to 131° F (10° to 55° C)
	<b>Temperature – Storage</b>	–22° to 140° F (–30° to 60° C)
	<b>Relative Humidity – Operating</b>	20% to 80%
	<b>Compliances</b>	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	<b>Operating Systems Supported</b>	Windows 7 Professional 32-bit and 64-bit, Windows Vista® Business 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit. Not supported on Linux.
<b>HP Thunderbolt-2 PCIe 1-port I/O Card</b>	<b>Data Transfer Rate</b>	Supports up to 20 Gb/s (20,000 Mb/s)
	<b>Devices Supported</b>	Thunderbolt™ certified devices
	<b>Bus Type</b>	PCIe card, full or half height PCIe slots
	<b>Ports</b>	One Thunderbolt™ 2 external 20-Pin output connectors (Rear)
	<b>Internal Connectors</b>	One 5-Pin header connector
	<b>System Requirements</b>	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 128-MB RAM, 1-GB Hard Drive, available PCIe slot.
	<b>Temperature - Operating</b>	50° to 131° F (10° to 55° C)
	<b>Temperature - Storage</b>	–22° to 140° F (–30° to 60° C)
	<b>Relative Humidity - Operating</b>	20% to 80%
	<b>Compliances</b>	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	<b>Operating Systems Supported</b>	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	<b>Kit Contents</b>	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables(2), user documentation and warranty card.
	<b>Warranty</b>	The HP Thunderbolt™ 2 PCIe 1-port I/O Card has a one-year Limited Warranty or the remainder of the warranty of the HP supported 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

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

<b>Intel Gigabit CT Desktop NIC</b>	<b>Connector</b>	RJ-45
	<b>Controller</b>	Intel WG82574L Gigabit Ethernet Controller
	<b>Memory</b>	Integrated Dual 48K configurable transmit receive FIFO Buffers
	<b>Data Rates Supported</b>	10/100/1000 Mbps
	<b>Compliance</b>	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	<b>Bus Architecture</b>	PCI-E 1.0a
	<b>Data Path Width</b>	X1, 250 MB/s, Bi-directional interface
	<b>Data Transfer Mode</b>	Bus-master DMA
	<b>Hardware Certifications</b>	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
	<b>Power Requirement</b>	Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T
	<b>Boot ROM Support</b>	Yes
	<b>Network Transfer Rate</b>	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
	<b>Operating Temperature</b>	32° to 131°F (0° to 55° C)
	<b>Operating Humidity</b>	85% at 131° F (55° C)
	<b>Dimensions</b>	12.1 x 5.7 x 2.0 cm (4.75 x 2.25 x 0.8 in)
	<b>Operating System Driver Support</b>	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

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	<b>Management Capabilities</b>	WOL , PXE, DMI, WFM 2.0
	<b>Kit Contents</b>	Intel Gigabit CT Desktop NIC, low profile bracket, CD containing Intel PROset II NIC drivers, quick install guide, product warranty statement

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<b>Broadcom (5761) NetXtreme Gigabit Ethernet Plus NIC</b>	<b>Connector</b>	RJ-45
	<b>Controller</b>	Broadcom 5761 PCI-Express LAN Controller
	<b>Memory</b>	8 MB NVRAM serial Flash
	<b>Data Rates Supported</b>	10/100/1000 Mbps
	<b>Compliance</b>	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x
	<b>Bus Architecture</b>	PCI-Express
	<b>Data Path Width</b>	Single Channel PCI-Express
	<b>Data Transfer Mode</b>	Bus Master DMA
	<b>Hardware Certifications</b>	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)
	<b>Power Requirement</b>	1.8W @ 3.3V
	<b>Boot ROM Support</b>	Yes
	<b>Network Transfer Mode</b>	Full-duplex Half-duplex (not available for the 1000BASE-T transceiver)
	<b>Network Transfer Rate</b>	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
	<b>Operating Temperature</b>	32° to 131°F (0° to 55° C)
	<b>Operating Humidity</b>	131° F (55° C) with 5% to 95% non-condensing humidity
	<b>Dimensions</b>	7 cm x 10.5 cm (2.75 in x 4.13 in), low profile compatible
	<b>Operating System Driver Support</b>	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
	<b>Management Capabilities</b>	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
	<b>Kit Contents</b>	Broadcom NetXtreme Gigabit Ethernet Plus NIC, Broadcom NetXtreme Gigabit Ethernet Plus NIC USB Cable Assembly, CD, drivers, quick install guide, product warranty statement

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<b>HP 361T PCIe Dual Port Connector Gigabit NIC</b>		Two RJ-45
	<b>Controller</b>	Intel® Ethernet I350 Controller
	<b>Data Rates Supported</b>	10/100/1000 Mbps, Half- and full-duplex
	<b>Compliance</b>	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	<b>Bus Architecture</b>	PCI-E 1.0a
	<b>Data Path Width</b>	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	<b>Power Requirement</b>	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	<b>Network Transfer Rate</b>	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
	<b>Operating Temperature</b>	32° to 131°F (0° to 55° C)
	<b>Operating Humidity</b>	10% to 95% non-condensing
	<b>Dimensions (H x W x D)</b>	5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets)
	<b>Operating System</b>	Windows 7 Professional 32-bit and 64-bit.
	<b>Driver Support</b>	Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
	<b>Management Capabilities</b>	WOL , PXE 2.1
	<b>Kit Contents</b>	HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Quick Install Card (QIC).

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

### Technical Specifications - Networking and Communications

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