Overview

1. 3 External 5.25” Bays
2. Power Button
3. HDD Activity LED
4. Front I/O: 1 USB 2.0, 2 USB 3.0, 1 Headphone, 1 Microphone, 1 1394a

Overview

5. Choice of 850W, 88% or 1125W, 90% Efficient Power Supplies
6. 16 DIMM Slots for DDR3 ECC Memory
7. 3 External 5.25” Bays
8. 4 Internal 3.5” Bays
9. 2 Intel Xeon Processors E5-2600 family
10. Rear I/O: Rear Power Button & LED, PS/2 Ports, 1 1394a, 4 USB 2.0, 2 USB 3.0, 2 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out, 1 Microphone, 1 Serial Port
11. 3 PCIe x16 Gen3 Slots (3rd Slot available ONLY when 2nd CPU is installed)
12. 1 PCIe x16 (x8) Gen3 (Available ONLY when 2nd CPU is installed), 1 PCIe x8(x4) Gen3, 1 PCIe x8(x4) Gen2, 1 PCI Slot
13. 6 Internal USB 2.0 Ports
14. 6 SATA, 8 SAS Ports

Form Factor	Rackable Minitower
Operating Systems	Preinstalled: • Windows 7 Professional 32-bit* • Windows 7 Professional 64-bit*

Overview

- Windows 7 Ultimate 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
- 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 (Preinstall NOT available; 1 year paper license only)

Supported:

- Genuine Windows® 7 Enterprise 32/64
- SUSE Linux Enterprise Desktop 11
- 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

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

Available Processors

Name	Cores	Clock Speed (GHz)	Intel® Turbo Boost Technology[1]	Cache (MB)	Memory Speed (MHz)	QPI Speed (GT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	TDP (W)
Intel® Xeon® E5-2687W processor	8	3.1	3, 7	20	1600	8.0	Y	Y	150
Intel® Xeon® E5-2690 processor	8	2.9	4, 9	20	1600	8.0	Y	Y	135
Intel Xeon E5-2680 processor	8	2.7	4, 8	20	1600	8.0	Y	Y	130
Intel Xeon E5-2670 processor	8	2.6	4, 7	20	1600	8.0	Y	Y	115
Intel Xeon E5-2667 processor	6	2.9	3, 6	15	1600	8.0	Y	Y	130
Intel Xeon E5-2665 processor	8	2.4	4, 7	20	1600	8.0	Y	Y	115
Intel Xeon E5-2660 processor	8	2.2	5, 8	20	1600	8.0	Y	Y	95
Intel Xeon E5-2650 processor	8	2.0	4, 8	20	1600	8.0	Y	Y	95
Intel Xeon E5-2643 processor	4	3.3	1, 2	10	1600	8.0	Y	Y	130
Intel Xeon E5-2640 processor	6	2.5	3, 5	15	1333	7.2	Y	Y	95
Intel Xeon E5-2630 processor	6	2.3	3, 5	15	1333	7.2	Y	Y	95
Intel Xeon E5-2620 processor	6	2.0	3, 5	15	1333	7.2	Y	Y	95

Overview

Intel Xeon E5-2609 processor	**4**	**2.4**	**N/A**	**10**	**1066**	**6.4**	**N**	**Y**	**80**
Intel Xeon E5-2603 processor	**4**	**1.8**	**N/A**	**10**	**1066**	**6.4**	**N**	**Y**	**80**
Intel Xeon E5-2697 v2 processor	**12**	**2.7**	**3, 8**	**30**	**1866**	**8.0**	**Y**	**Y**	**130**
Intel Xeon E5-2695 v2 processor	**12**	**2.4**	**4, 8**	**30**	**1866**	**8.0**	**Y**	**Y**	**115**
Intel Xeon E5-2690 v2 processor	**10**	**3.0**	**3, 6**	**25**	**1866**	**8.0**	**Y**	**Y**	**130**
Intel Xeon E5-2687W v2 processor	**8**	**3.4**	**2, 6**	**20**	**1866**	**8.0**	**Y**	**Y**	**150**
Intel Xeon E5-2680 v2 processor	**10**	**2.8**	**3, 8**	**25**	**1866**	**8.0**	**Y**	**Y**	**115**
Intel Xeon E5-2670 v2 processor	**10**	**2.5**	**4, 8**	**25**	**1866**	**8.0**	**Y**	**Y**	**115**
Intel Xeon E5-2667 v2 processor	**8**	**3.3**	**3, 7**	**25**	**1866**	**8.0**	**Y**	**Y**	**130**
Intel Xeon E5-2660 v2 processor	**10**	**2.2**	**4, 8**	**25**	**1866**	**8.0**	**Y**	**Y**	**95**
Intel Xeon E5-2650 v2 processor	**8**	**2.6**	**4, 8**	**20**	**1866**	**8.0**	**Y**	**Y**	**95**
Intel Xeon E5-2643 v2 processor	**6**	**3.5**	**1, 3**	**25**	**1866**	**8.0**	**Y**	**Y**	**130**
Intel Xeon E5-2640 v2 processor	**8**	**2.0**	**3, 5**	**20**	**1600**	**7.2**	**Y**	**Y**	**95**
Intel Xeon E5-2637 v2 processor	**4**	**3.5**	**1, 3**	**15**	**1866**	**8.0**	**Y**	**Y**	**130**
Intel Xeon E5-2630 v2 processor	**6**	**2.6**	**3, 5**	**15**	**1600**	**7.2**	**Y**	**Y**	**80**
Intel Xeon E5-2620 v2 processor	**6**	**2.1**	**3, 5**	**15**	**1600**	**7.2**	**Y**	**Y**	**80**
Intel Xeon E5-2609 v2 processor	**4**	**2.5**	**N/A**	**10**	**1333**	**6.4**	**N**	**Y**	**80**
Intel Xeon E5-2603 v2 processor	**4**	**1.8**	**N/A**	**10**	**1333**	**6.4**	**N**	**Y**	**80**

	[1]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.
Available Processor Disclaimers	When ordering two processors, the second processor must be the same as the first. Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details. Quad-Core, Six-Core, Eight-Core , Ten-Core and Twelve-Core technologies are designed to improve

Overview

	performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies. 64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information. Intel® Xeon® processor E5-2687W is ONLY available with Liquid Cooling AND with the 1125W Power Supply. Intel® Xeon® processors E5-2643, E5-2665, E5-2667, E5-2670, E5-2680, E5-2687W,E5-2690, E5-2637 v2,E5-2643 v2, E5-2667 v2, E5-2687W v2, E5-2690 v2 and E5-2697 v2 REQUIRE the 1125W Power Supply Option.
Form Factor	Rackable Minitower
Color	Black/Silver
I/O Slots (see system board section for more details)	• 2 PCI Express Gen3 x16 slots • 1 PCI Express Gen3 x16 slot - Available ONLY when 2nd CPU is installed. • 1 PCI Express Gen3 x8 slot - with x16 connector. - Available ONLY when 2nd CPU is installed. • 1 PCI Express Gen3 x4 slot - with x8 connector • 1 PCI Express Gen2 x4 slot - with x8 connector • 1 PCI 32bit/33MHz slot • 1 Mechanical-only slot, supporting cards which mount only to the I/O bulkhead and not the motherboard (half-length, full-height) • The PCIe x8 connectors are open ended, allowing a PCIe x16 card to be seated in the slot.
Bays (see storage section for more details)	Total Bays = 7
Internal Bays	4 internal 3.5" bays (4 with acoustic dampening rail assemblies)
External Bays	3 external 5.25" bays Top bay device depth limit: 175mm Middle bay device depth limit: 206mm Bottom bay device depth limit: 206mm
Front I/O	2 USB 3.0, 1 USB 2.0, 1 Headphone, 1 Microphone, and 1 IEEE 1394a
Rear I/O	1 IEEE 1394a 2 USB 3.0 4 USB 2.0 1 Serial PS/2 keyboard and mouse 2 RJ-45 to integrated Gigabit LAN 1 Audio Line-In, 1 Audio Line-Out, 1 Microphone
Internal USB	6 USB 2.0 ports available by three 2x5 headers
Chassis Dimensions (H x W x D)	44.4 x 20.3 x 52.5 cm (17.5 x 8.0 x 20.7 in)
System Weight	Exact weights depend upon configuration Minimum config: 21.1kg (46.7lbs) Typical config: 22.8kg (50.4lbs) Maximum config: 29.2kg (64.3lbs)

Overview

Temperature	Operating:	5° to 35° C (40° to 95° F)
	Non-operating	-40° to 70° C (-40° to 158° F)
Humidity	Operating:	8% to 85%
	Non-operating	8% to 90%
Maximum Altitude (non-pressurized)	Operating:	3,000 m; 10,000 feet
	Non-operating	9,100 m; 30,000 feet
Power Supply	Choice of: • 850W 88% Efficient wide-ranging, active Power Factor Correction • 1125W 90% Efficient wide-ranging, active Power Factor Correction NOTE: The 1125W power supply can also supply 1275W of output power when the input voltage is greater than 105V. If the input voltage is less than 105V, but greater than 90V for any reason, the maximum power that can be drawn is 1125W. An uninterruptible power supply (UPS) is highly recommended if 1275W output power is desired. The 1125W Power Supply can also supply 1450W of output power when the input voltage is greater than 180V under all conditions. The Z820 power supply efficiency reports can be found at these links: 850W - http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_623195-001_ECOS%202620%201_850W_Report%20(2).pdf 1125W - http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_623196-001_ECOS%202921_1125W_Report(1275w).pdf	
Interfaces Supported	• 2-channel SATA 6.0 Gb/s Interface (2 channels e-SATA configurable) 4-channel SATA 3.0 Gb/s Interface • 8-channel 6 Gb SAS interface (8 SAS connectors on the motherboard), SAS ports can be ported externally by using the SAS Bulkhead and/or Back Panel connector Kits • USB 3.0, USB 2.0, IEEE 1394a	
Hard Drive Controllers Supported	SATA and SAS controllers	
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html	

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel Xeon E5-2600 Series - CTO				
Intel® Xeon® Processor E5-2687W 8C 3.10GHz	Y	N		
Intel® Xeon® Processor E5-2690 8C 2.90GHz	Y	N		
Intel® Xeon® Processor E5-2680 8C 2.70GHz	Y	N		
Intel® Xeon® Processor E5-2670 8C 2.60GHz	Y	N		
Intel® Xeon® Processor E5-2667 6C 2.90GHz	Y	N		
Intel® Xeon® Processor E5-2665 8C 2.40GHz	Y	N		
Intel® Xeon® Processor E5-2660 8C 2.20GHz	Y	N		
Intel® Xeon® Processor E5-2650 8C 2.00GHz	Y	N		
Intel® Xeon® Processor E5-2643 4C 3.30GHz	Y	N		
Intel® Xeon® Processor E5-2640 6C 2.50GHz	Y	N		
Intel® Xeon® Processor E5-2630 6C 2.30GHz	Y	N		
Intel® Xeon® Processor E5-2620 6C 2.00GHz	Y	N		
Intel® Xeon® Processor E5-2609 4C 2.40GHz	Y	N		
Intel® Xeon® Processor E5-2603 4C 1.80GHz	Y	N		
Intel Xeon E5-2600 Series - Z820 AMO				
Z820 Xeon E5-2690 8C 2.90 20MB 1600 CPU2	N	Y	A6S97AA	
Z820 Xeon E5-2680 8C 2.70 20MB 1600 CPU2	N	Y	A6S96AA	
Z820 Xeon E5-2670 8C 2.60 20MB 1600 CPU2	N	Y	A6S95AA	
Z820 Xeon E5-2667 6C 2.90 15MB 1600 CPU2	N	Y	A6S94AA	
Z820 Xeon E5-2665 8C 2.40 20MB 1600 CPU2	N	Y	A6S93AA	
Z820 Xeon E5-2660 8C 2.20 20MB 1600 CPU2	N	Y	A6S92AA	
Z820 Xeon E5-2650 8C 2.00 20MB 1600 CPU2	N	Y	A6S91AA	
Z820 Xeon E5-2643 4C 3.30 10MB 1600 CPU2	N	Y	A6S90AA	
Z820 Xeon E5-2640 6C 2.50 15MB 1333 CPU2	N	Y	A6S89AA	
Z820 Xeon E5-2630 6C 2.30 15MB 1333 CPU2	N	Y	A6S88AA	
Z820 Xeon E5-2620 6C 2.00 15MB 1333 CPU2	N	Y	A6S87AA	
Z820 Xeon E5-2609 4C 2.40 10MB 1066 CPU2	N	Y	A6S86AA	
Z820 Xeon E5-2603 4C 1.80 10MB 1066 CPU2	N	Y	A6S85AA	
Intel Xeon E5-2600 v2 Series - CTO				
Intel® Xeon® Processor E5-2603 v2 4C 1.80GHz	Y	Y		
Intel® Xeon® Processor E5-2609 v2 4C 2.50GHz	Y	Y		
Intel® Xeon® Processor E5-2620 v2 6C 2.10GHz	Y	Y		
Intel® Xeon® Processor E5-2630 v2 6C 2.60GHz	Y	Y		
Intel® Xeon® Processor E5-2637 v2 4C 3.50GHz	Y	Y		
Intel® Xeon® Processor E5-2640 v2 8C 2.00GHz	Y	Y		
Intel® Xeon® Processor E5-2643 v2 6C 3.50GHz	Y	Y		

Supported Components

Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz	Y	Y	
Intel® Xeon® Processor E5-2660 v2 10C 2.20GHz	Y	Y	
Intel® Xeon® Processor E5-2667 v2 8C 3.30GHz	Y	Y	
Intel® Xeon® Processor E5-2670 v2 10C 2.50GHz	Y	Y	
Intel® Xeon® Processor E5-2680 v2 10C 2.80GHz	Y	Y	
Intel® Xeon® Processor E5-2687W v2 8C 3.40GHz	Y	Y	
Intel® Xeon® Processor E5-2690 v2 10C 3.00GHz	Y	Y	
Intel® Xeon® Processor E5-2695 v2 12C 2.40GHz	Y	Y	
Intel® Xeon® Processor E5-2697 v2 12C 2.70GHz	Y	Y	
Intel Xeon E5-2600 v2 Series - Z820 AMO			
Z820 Xeon E5-2603 v2 4C 1.80 10MB 1333 CPU2	Y	Y	E2Q89AA
Z820 Xeon E5-2609 v2 4C 2.50 10MB 1333 CPU2	Y	Y	E2Q88AA
Z820 Xeon E5-2620 v2 6C 2.10 15MB 1600 CPU2	Y	Y	E2Q86AA
Z820 Xeon E5-2630 v2 6C 2.60 15MB 1600 CPU2	Y	Y	E2Q85AA
Z820 Xeon E5-2637 v2 4C 3.50 15MB 1866 CPU2	Y	Y	E2Q87AA
Z820 Xeon E5-2640 v2 8C 2.00 20MB 1600 CPU2	Y	Y	E2Q83AA
Z820 Xeon E5-2643 v2 6C 3.50 25MB 1866 CPU2	Y	Y	E2Q84AA
Z820 Xeon E5-2650 v2 8C 2.60 20MB 1866 CPU2	Y	Y	E2Q82AA
Z820 Xeon E5-2660 v2 10C 2.20 25MB 1866 CPU2	Y	Y	E2Q79AA
Z820 Xeon E5-2667 v2 8C 3.30 25MB 1866 CPU2	Y	Y	E2Q81AA
Z820 Xeon E5-2670 v2 10C 2.50 25MB 1866 CPU2	Y	Y	E2Q78AA
Z820 Xeon E5-2680 v2 10C 2.80 25MB 1866 CPU2	Y	Y	E2Q77AA
Z820 Xeon E5-2687W v2 8C 3.40 25MB 1866 CPU2	Y	Y	E2Q80AA
Z820 Xeon E5-2690 v2 10C 3.00 25MB 1866 CPU2	Y	Y	E2Q76AA
Z820 Xeon E5-2695 v2 12C 2.40 30MB 1866 CPU2	Y	Y	E2Q75AA
Z820 Xeon E5-2697 v2 12C 2.70 30MB 1866 CPU2	Y	Y	E2Q74AA

Intel® Xeon® processors E5-2643, E5-2665, E5-2667, E5-2670, E5-2680, E5-2687W,E5-2690, E5-2637 v2,E5-2643 v2, E5-2667 v2, E5-2687W v2, E5-2690 v2 and E5-2697 v2 REQUIRE the 1125W Power Supply Option.

SAS Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations				
600GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	VM647AA	
450GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU968AA	
300GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU967AA	
HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA	
HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA	
HP 900GB SAS 10K SFF HDD	Y	Y	E2P03AA	
HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA	

Supported Components

	Sub-Section Description/Notes			
	NOTE: NCQ (Native Command Queuing) not supported in Red Hat Enterprise Linux For hard drives, 1 GB = 1 billion bytes; TB = 1 trillion bytes. Actual formatted capacity is less. Up to 12 GB of hard drive (or system disk) is reserved for the system recovery software (XP and XP Pro). Up to 3 GB of system disk is reserved for system recovery software (Vista).			
SATA Hard Drives	**SATA (Serial ATA) Hard Drives for HP Workstations**			
	3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA
	2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA
	1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA
	500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA
	250GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ034AA
	300GB SATA 10K rpm SFF HDD	Y	Y	FX619AA
	1TB SATA 10K rpm SFF HDD	Y	Y	B8X20AA
	500GB SATA 10K rpm SFF HDD	Y	Y	B8X19AA
	250GB SATA 10K rpm SFF HDD	Y	Y	B8X18AA
	500GB SATA 7.2K SED SFF HDD	Y	Y	(not available today as After Market Option)
	Sub-Section Description/Notes			
	Up to 5 SATA drives, 5 SAS, drives, or 6 SATA 2.5", Small Form Factor (SFF) drives 8 port SAS Controller included on the system board			
SATA Solid State Drives	**HP Solid State Drives (SSDs) for Workstations**			
	HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA
	HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA
	HP 256GB SATA 6Gb/s SED SSD	Y	Y	(not available today as After Market Option)
	HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA
	Seagate 600 Pro 480GB SATA SSD	Y	Y	E9Q52AA
	Seagate 600 Pro 240GB SATA SSD	Y	Y	E9Q51AA
	Sub-Section Description/Notes			
	Up to 5 SATA drives, 5 SAS, drives, or 6 SATA 2.5", Small Form Factor (SFF) drives **NOTE:** 128, 256 GB Solid State Drives only available as HDD1			

Hard Drive Controllers	**Factory Configured**	**Option Kit**	**Option Kit Part Number**	**Support Notes**

Supported Components

Factory integrated RAID on motherboard for SATA drives			
RAID 0 Configuration - Striped Array	Y	N	See note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N	See note 2
RAID 1 Configuration - Mirrored Array	Y	N	See note 3
RAID 10 Configuration - Striped/Mirrored Array	Y	N	
RAID 5 Configuration - Parity Array	Y	N	See note 4
HP SAS Back Panel Connector kit			
HP SAS Back Panel Connector kit	Y	Y	Must have 4 or fewer SAS hard drives to configure this option
HP SAS Back Panel Bulkhead Connector Kit			
HP SAS Back Panel Bulkhead	Y	Y	HP SAS Back Panel Connector kit required. Internal SAS HD drives are not supported
LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card and iBBU07 Battery Backup Unit			
LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card	Y	Y	WE465AA
Integrated SAS Controller			
Integrated LSI SAS 2308 Controller with RAID 0/1/1E/10	Y	N	
Integrated SATA 6.0 Gb/s Controller			
Integrated SATA 6.0 Gb/s Controller	Y	N	
Integrated SATA 3.0 Gb/s Controller			
Integrated SATA 3.0 Gb/s Controller	Y	N	

RAID arrays greater than 2 TB in size are fully supported.

NOTE 1: Minimum of 2 hard drives needed. All hard drives must be identical (size/speed/type/bus/functional capabilities). Must have 2, 3 or 4 HD Drives.
NOTE 2: Minimum of 3 SATA hard drives needed. All hard drives must be identical (size/speed/type/bus/functional capabilities).
At least 3 HD Drives required. May have 4th and 5th HD Drives. Drives must be the same drive (size/speed/type/functional capability).
NOTE 3: 2 SATA or 2 SAS hard drives required. All hard drives must be identical (size/speed/type/bus/functional capabilities).
NOTE 4: Minimum of 3 SATA hard drives needed. All SATA hard drives must be identical (size/speed/type/bus/functional capabilities). Must have 3 or 4 HD Drives. 5 HD Drives not allowed.

Supported Components

NOTE: 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 http://www.hp.com/support/linux_hardware_matrix for RAID capabilities with Linux.

LSI RAID Definitions:
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
NOTE: Specific user-configured hardware SAS RAID configurations are supported on this Linux system. Please visit: http://www.hp.com/support/linux_hardware_matrix for details.

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Professional 2D						
NVIDIA NVS300 512MB Graphics	Y	Y	XP612AA		2	NO
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA		2	NO
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA		2	NO
Entry 3D						
NVIDIA Quadro 410 512MB Graphics	Y	Y	A7U60AA		2	NO
NVIDIA Quadro K600 1GB Graphics	Y	Y	C2J92AA		2	NO
Mid-range 3D						
NVIDIA Quadro K2000 2GB Graphics	Y	Y	C2J93AA		3	NO
High End 3D						
NVIDIA Quadro 6000 6GB Graphics	Y	Y	WS097AA	Contact Factory for support for greater than 2 cards	2	NO
NVIDIA Quadro K5000 4GB Graphics	Y	Y	C2J95AA	Contact Factory for support for greater than 2 cards	3	NO
AMD FirePro W7000 4GB Graphics	Y	Y	C2K00AA	Contact Factory for support for greater than 2 cards	2	NO

Supported Components

NVIDIA Quadro K4000 3GB Graphics	Y	Y	C2J94AA	Contact Factory for support for greater than 2 cards	2	NO

For configurations not listed in this specification, please contact the factory for review

High Performance GPU Computing		Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	NVIDIA Tesla C2075 Compute Processor	Y	Y	QB035AA	See note 1
	NVIDIA Tesla K20c Compute Processor	Y	Y	C2J97AA	See note 2

NOTE 1: Up to two C2075 processors are supported.
Only supported with the Z820 1125W Chassis.
Must have add-in graphics card in addition to the C2075.
Supported Graphics cards are Quadro 600, Quadro 2000, and Quadro 6000.
Not supported in a configuration that has BOTH E5-2687 Processors and Quadro 6000 Graphics.
NOTE 2: Up to two K20 processors are supported. Only supported with the Z820 1125W Chassis. Must have add-in graphics card in addition to the K20. Supported Graphics cards are Quadro K600, Quadro K2000, and Quadro K5000.

Memory	CTO	Option Kit Part Number	Support Notes
	DDR3-1600 ECC Unbuffered DIMMs - CTO		
	4GB DDR3-1600 ECC Unbuffered RAM		
	2GB DDR3-1600 ECC Unbuffered RAM		
	DDR3-1600 ECC Registered DIMMs - CTO		
	32GB DDR3-1333 ECC Load Reduced (LR) RAM		
	16GB DDR3-1600 ECC Registered RAM		
	8GB DDR3-1600 ECC Registered RAM		
	4GB DDR3-1600 ECC Registered RAM		
	DDR3-1866 ECC Unbuffered DIMMs - CTO		
	4GB DDR3-1866 ECC Unbuffered RAM		
	2GB DDR3-1866 ECC Unbuffered RAM		
	DDR3-1866 ECC Registered DIMMs - CTO		
	16GB DDR3-1866 ECC Registered RAM		
	8GB DDR3-1866 ECC Registered RAM		
	4GB DDR3-1866 ECC Registered RAM		

Sub-Section Description/Notes

For details on the supported memory configurations on the HP Z820 Workstation, please refer to the System Technical Specifications - System Board section of this document.
DIMMs should be distributed across all four memory channels for optimal performance.

Supported Components

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.

NOTE: You cannot intermix registered and unbuffered DIMMs. The system will not work.
NOTE: You cannot intermix LR DIMMs with either registered or unbuffered DIMMs. The system will not work.

AMO

DDR3-1600 ECC Unbuffered DIMMs - AMO

HP 2GB (1x2GB) DDR3-1600 ECC RAM	
HP 4GB (1x4GB) DDR3-1600 ECC RAM	

DDR3-1600 ECC Registered DIMMs - AMO

32GB DDR3-1333 ECC Load Reduced (LR) RAM	A2Z53AA
16GB DDR3-1600 ECC Registered RAM	A2Z52AA
8GB DDR3-1600 ECC Registered RAM	A2Z51AA
4GB DDR3-1600 ECC Registered RAM	A2Z49AA

DDR3-1866 ECC Unbuffered DIMMs - AMO

HP 4GB (1x4GB) DDR3-1866 ECC RAM	E2Q91AA
HP 2GB (1x2GB) DDR3-1866 ECC RAM	E2Q90AA

DDR3-1866 ECC Registered DIMMs - AMO

HP 4GB (1x4GB) DDR3-1866 ECC Reg RAM	E2Q92AA
HP 8GB (1x8GB) DDR3-1866 ECC Reg RAM	E2Q94AA
HP 16GB (1x16GB) DDR3-1866 ECC Reg RAM	E2Q95AA

NOTE: You cannot intermix registered and unbuffered DIMMs. The system will not work.
NOTE: You cannot intermix LR DIMMs with either registered or unbuffered DIMMs. The system will not work.

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	

Supported Components

Optical and Removable Storage	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Slot Load DVD+/-RW Drive	Y	N		See note 1
HP 16X DVD+/-RW SuperMulti SATA Drive (non-Lightscribe)	Y	Y	QS208AA	
HP 16X DVD-ROM SATA Drive (non Lightscribe)	Y	Y	AR629AA	See note 2
HP Blu-ray Writer	Y	Y	AR482AA	
HP 22-in-1 Media Card Reader Kit (Workstations)	Y	Y	NK361AA	
HP DX115 Removable Drive Enclosure				
HP DX115 Removable HDD Frame/Carrier	Y	Y	FZ576AA	

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: May only order one.
NOTE 2: Cannot be 2nd 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

* 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.

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	See note 1
Broadcom NetXtreme Gigabit Ethernet Plus NIC (PCIe)	Y	Y	FS215AA	See notes 1 and 2
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
HP 361T PCIe Dual Port Gigabit NIC	Y	Y	C3N37AA	See note 1
Intel Ethernet I210-T1 PCIe	Y	Y	E0X95AA	

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 the Z820.

Racking and Physical Security	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Security Cable with Kensington Lock	N	Y	PC766A	
HP Chassis Intrusion Sensor	Y	N		
HP Z6/Z8 Adjustable Sliding Rail Rack Kit	N	Y	NN124AA	

Input Devices	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Standard Keyboard	Y	Y	DT527A	
HP USB Standard Keyboard	Y	Y	DT528A	
HP PS/2 Optical Scroll Mouse	Y	Y	EY703AA	
HP USB 2-Button Optical Scroll Mouse	Y	Y	DC172B	
HP USB Laser Mouse	Y	Y	GW405AA	
HP USB Optical 3-Button Mouse	Y	Y	DY651A	
HP USB Smart Card Keyboard	Y	Y	ED707AA	
HP 2.4GHz Wireless Keyboard & Mouse	N	Y	NB896AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	
HP SpaceExplorer 3D USB Controller	N	Y	RY429AA	
HP SpacePilot 3D USB Intelligent Controller	N	Y	WH343AA	
HP PS/2 Keyboard	Y	Y	QY774AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Keyboard	Y	Y	QY776AA	

Supported Components

HP USB Optical Mouse	Y	Y	QY777AA
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA

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

Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Internal USB Port Kit	N	Y	EM165AA	
HP SAS Back Panel Connector Kit	N	Y	EM164AA	
HP eSATA PCI Cable Kit	Y	Y	GM110AA	
HP Power Cord Kit	Y	N		
HP Workstation Mouse Pad	Y	N		Japan Only
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP ENERGY STAR Qualified Configuration	Y	N		

Software

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

NOTE 1: Available as a free download here: 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 be selected as a Configure to Order option. Delivered in the form of a "Drop in the Box" CD.

Supported Components

Operating Systems	Support Notes
Genuine Windows® 7 Ultimate 64-bit	See note 1
Genuine Windows® 7 Professional 64-bit	See note 1
Genuine Windows® 7 Professional 32-bit	See note 1
Windows 8 Pro 64-bit	
Windows 8 Simplified Chinese Edition 64-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 32-bit	
Windows 8 Pro Downgrade to Windows 7 Professional 64-bit	
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	See note 2

NOTE 1: See http://www.microsoft.com/windows/windows-7/ for support details.
NOTE 2: This second OS must be ordered with the HP Linux Intaller Kit as the first OS.

System Technical Specifications

System Board	
System Board Form Factor	Custom Form Factor, 13" x 14.25" (330.20mm x 361.95mm)
Processor Socket	Dual LGA2011
CPU Bus Speed	QPI: Up to 8.0GT/sec
Chipset	Intel® C602 Chipset
Super I/O Controller	Nuvoton NPCD379H
Memory Expansion Slots	16 slots (8 slots per CPU)
Memory Type Supported	DDR3, RDIMM (Registered) or UDIMM (Unbuffered), ECC, LR (Load Reduction) DIMMs
Memory Modes	NUMA (Non-Uniform Memory Architecture), Memory Node Interleave
Memory Speed Supported	1066MHz, 1333MHz, & 1600MHz

		Single Processor							
		CPU0 Bottom Slots				CPU0 Top 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
8	UDIMM	2GB		2GB			2GB		2GB
8	UDIMM	4GB							4GB
8	RDIMM	4GB							4GB
16	UDIMM	4GB		4GB			4GB		4GB
16	RDIMM	4GB		4GB			4GB		4GB
24	UDIMM	4GB	2GB	4GB	2GB	2GB	4GB	2GB	4GB
32	UDIMM	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB
32	RDIMM	4GB	4GB	4GB	4GB	4GB	4GB	4GB	4GB
32	RDIMM	8GB		8GB			8GB		8GB
48	RDIMM	8GB	4GB	8GB	4GB	4GB	8GB	4GB	8GB
64	RDIMM	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB
64	RDIMM	16GB		16GB			16GB		16GB
128	RDIMM	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB
128	RDIMM	32GB		32GB			32GB		32GB
256	RDIMM	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB
Slot Load Order		1	5	3	7	8	4	6	2

System Technical Specifications

		Dual Processor															
		CPU0 Bottom Slots				CPU0 Top Slots				CPU1 Bottom Slots				CPU1 Top Slots			
Capacity (GB)	Type	DIMM 1	DIMM 2	DIMM 3	DIMM 4	DIMM 5	DIMM 6	DIMM 7	DIMM 8	DIMM 1	DIMM 2	DIMM 3	DIMM 4	DIMM 5	DIMM 6	DIMM 7	DIMM 8
4	UDIMM	2GB								2GB							
16	UDIMM	2GB		2GB			2GB		2GB	2GB		2GB			2GB		2GB
32	UDIMM	4GB		4GB			4GB		4GB	4GB		4GB			4GB		4GB
32	RDIMM	4GB		4GB			4GB		4GB	4GB		4GB			4GB		4GB
32	RDIMM	8GB							8GB	8GB							8GB
48	UDIMM	4GB	2GB	4GB	2GB	2GB	4GB	2GB	4GB	4GB	2GB	4GB	2GB	2GB	4GB	2GB	4GB
64	RDIMM	8GB		8GB			8GB		8GB	8GB		8GB			8GB		8GB
96	RDIMM	8GB	4GB	8GB	4GB	4GB	8GB	4GB	8GB	8GB	4GB	8GB	4GB	4GB	8GB	4GB	8GB
128	RDIMM	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB	8GB
128	RDIMM	16GB		16GB			16GB		16GB	16GB		16GB			16GB		16GB
256	RDIMM	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB	16GB
256	RDIMM	32GB		32GB			32GB		32GB	32GB		32GB			32GB		32GB
512	RDIMM	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB	32GB
Slot Load Order		1	9	5	13	15	7	11	3	2	10	6	14	16	8	12	4

Maximum Memory	Supports up to 64GB using UDIMMs Supports up to 256GB using RDIMMs Supports up to 512GB using LRDIMMs	
Memory Configuration (Supported)	• Not all memory configurations possible are represented. • Only ECC DIMMs are supported. • UDIMM (Unbuffered), RDIMM (Registered) and LR DIMM(Load Reduction) memory cannot be mixed. All memory installed in the system must be either UDIMM or RDIMM or LR DIMMs. • Do not install memory modules into memory slots if corresponding processor is not installed. • Dual processor configurations with memory modules installed for only one processor is not supported.	
PCI Express Connectors	PCIe3 x16, qty 3 (qty 2 when optional 2nd CPU is not installed) NOTE: 3rd PCIe x16 slot is ONLY available when 2nd CPU is installed. This is Slot #4 on the system board and is designated by a white-colored PCIe connector. PCIe3 x16 (8), qty 1 (qty 0 when optional 2nd CPU is not installed) **NOTE**: This slot is ONLY available when 2nd CPU is installed. This is Slot #3 on the system board and is designated by a white-colored PCIe connector. PCIe3 x8 (4), qty 1 (open-ended connector) PCIe2 x8 (4), qty 1 (open-ended connector)	
PCI Connectors (5.0V)	PCI 32b, 33MHz (supports 64-bit cards), qty 1	
Supported Drive Interfaces		
	SATA	Integrated 2-channel SATA 6.0Gb/sec controller and Integrated 4-channel 3.0Gb/sec controllers with RAID 0, 1, 5, 10 and NCQ. (Factory integrated RAID is Microsoft Windows only)
	Serial Attached SCSI	Integrated 8-channel SAS 6.0Gb/sec controller with HW RAID 0, 1, 10
	Integrated RAID	SATA: RAID 0, 1, 5, 10 SAS: HW RAID 0, 1, 10
Integrated Graphics	None	

System Technical Specifications

Network Controller	Integrated Intel 82579 and 82574 Controllers Memory Integrated 48KB receive buffer and 8KB transmit buffer Data rates supported 10/100/1000 Mb/s Compliance IEEE 802.3, 802.3AB and 802.3u compliant, 802.3x flow control Bus architecture PCIe 1.0a Data path width X1 to each controller Data path speed 2.5 Gb/s per direction transfer rate Data transfer mode Bus-master DMA Power requirement 1.0 watts @ +3.3V AUX supply Boot ROM support Yes Network transfer rate 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 Management capabilities: WOL, PXE 2.1, DASH 1.1, Intel AMT/vPro Technology	
PCI-X Connectors	None	
PCI Card Guide	Yes	
Wake on LAN	Yes	
Integrated Trusted Platform Module	TPM 1.2	
SATA Connectors	6 ports/connectors (Included are 2 eSATA configurable with optional eSATA After-Market Option cable kit)	
IEEE 1394 Connector(s)	**Front**	Yes, 1394a
	Rear	Yes, 1394a
	Internal	None
USB Connector(s)	**Front**	2 USB 3.0 1 USB 2.0
	Rear	2 USB 3.0 4 USB 2.0
	Internal	6 USB 2.0 ports available 3 2x5 headers: supports up to two HP Internal USB Port Kits, AMO-EM165AA, one on each header, or one USB Media Card Reader. Each Internal Port Kit has two USB 2.0 connectors.
HD Integrated Audio	Realtek ALC262	
Flash ROM	Yes, SPI Rom	
CPU Fan Header	One header for the CPU fans and memory fans	
Chassis Fan Header	One Chassis Fan Header	
Front PCI Fan Header	2 Front PCI Fan Headers	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder – Lithium	Yes	
Integrated Trusted Platform Module	Integrated TPM 1.2	

System Technical Specifications

Power Supply Headers	Yes
Power Switch, Power LED & Hard Drive LED Header	Front power switch, front power and hard drive LED. Rear power switch and rear power LED. Drive LED header on system board
Clear Password Jumper	Yes
Serial Port	Yes, on rear panel
Parallel Port	No
Keyboard/Mouse	Yes

Power Supply	850W 88% Efficient, Custom PSU (Wide-Ranging, Active PFC)		1125W/1275W*/1450W* 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)	
Operating Voltage Range	90-269 VAC		90-269 VAC	
Rated Voltage Range	100-127 VAC 200-240 VAC	118 VAC	100 VAC 115-127 VAC 200-240 VAC	118 VAC
Rated Line Frequency	50-60 Hz	400 Hz	50-60 Hz	400 Hz
Operating Line Frequency Range	47-66 Hz	393-407 Hz	47-66 Hz	393-407 Hz
Rated Input Current	11A @ 100-127 VAC 5.5A @ 200-240 VAC	11A @ 118 VAC	12A @ 100 VAC 12A @ 115-127 VAC 10A @ 200-240 VAC	12A @ 118 VAC
Heat Dissipation (Configuration and software dependent)	Typical = 2142 btu/hr (540kg-cal/hr) Max = 3335 btu/hr (840 kg-cal/hr)		Typical = 2773 btu/hr (699 kg-cal/hr) Max-1 = 3878 btu/hr (977 kg-cal/hr) Max-2 = 5002 btu/hr (1260 kg-cal/hr) Max-3 = 5624 btu/hr (1417 kg-cal/hr)	
Power Supply Fan	(2) 80x25 mm variable speed		(2) 80x25 mm variable speed	
ENERGY STAR Qualified (Configuration dependent)	Yes		Yes	
80 PLUS® Compliant	Yes, 88% Efficient The Z820 850W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_623195-001_ECOS%202620%201_850W_Report%20(2).pdf		Yes, 90% Efficient The Z820 1125W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_623196-001_ECOS%202921_1125W_Report(1275w).pdf	
FEMP Standby Power Compliant @115V (<2W in S5 - Power Off)	Yes		Yes	
EuP Compliant @ 230V (<0.5 W in S5 - Power Off)	Yes		Yes	
CECP Compliant @ 220V (<4W in S3 - Suspend to RAM)	Yes; Configuration dependent		Yes; Configuration dependent	

System Technical Specifications

Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC)	<15W	<35W
Built-in Self Test LED	Yes	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes	Yes
		*Input voltage restriction

	NOTE: The 1125W power supply can also supply 1275W of output power when the input voltage is greater than 105V. If the input voltage is less than 105V, but greater than 90V for any reason, the maximum power that can be drawn is 1125W. An uninterruptible power supply (UPS) is highly recommended if 1275W output power is desired. The 1125W Power Supply can also supply 1450W of output power when the input voltage is greater than 180V under all conditions.
AUX IN (audio)	No
Clear CMOS Button	Yes
Multibay Header	No
Integrated Gigabit Ethernet	Yes, dual port.
Access Panel Solenoid Lock Header	No
Access Panel Intrusion Sensor Header	Yes, as part of Front UI (Control Panel) cable header
Memory Fan Connector	Yes, blind-mate

System Configuration

Example Configuration #1	Processor Info	1x Intel Xeon E5-2609 (Four-Core)					
	Memory Info	4x 2GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA Quadro 2000					
	Disks/Optical/Floppy	1x 500GB SATA 7200/1x16X DVD-ROM SATA					
	Power Supply	850W 88% Custom PSU					
	Other	-					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	75.5 W		73.9 W		75.5 W	
	Windows Busy Typ (S0)	156 W		149 W		155 W	
	Windows Busy Max (S0)	176 W		174 W		177 W	
	Sleep (S3)	4.35 W	3.87 W	4.51 W	4.06 W	4.37 W	3.87 W
	Off (S5)	1.68 W	1.28 W	1.85 W	1.45 W	1.67 W	1.27 W
	Zero Power Mode (ErP)	0.23 W		0.39 W		0.22 W	
Heat Dissipation ** **(Btu/hr)**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	258 btu/hr		252 btu/hr		258 btu/hr	
	Windows Busy Typ (S0)	532 btu/hr		508 btu/hr		529 btu/hr	
	Windows Busy Max (S0)	601 btu/hr		594 btu/hr		604 btu/hr	
	Sleep (S3)	14.8 btu/hr	13.2 btu/hr	15.4 btu/hr	13.9 btu/hr	14.9 btu/hr	13.2 btu/hr

	Off (S5)	5.73 btu/hr	4.37 btu/hr	6.31 btu/hr	4.95 btu/hr	5.70 btu/hr	4.33 btu/hr
	Zero Power Mode (ErP)	0.78 btu/hr		1.33 btu/hr		0.75 btu/hr	

Example Configuration #2 (ENERGY STAR QUALIFIED)	Processor Info	2x Intel Xeon E5-2640 (Six-Core)					
	Memory Info	8x 2GB DDR3 1600 (UDIMM)					
	Graphics Info	1x NVIDIA Quadro 4000					
	Disks/Optical/Floppy	3x 500GB SATA 7200/1x16X DVD-ROM SATA					
	Power Supply	850W 88% Custom PSU					
	Other	-					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	128 W		126 W		129 W	
	Windows Busy Typ (S0)	374 W		371 W		380 W	
	Windows Busy Max (S0)	432 W		425 W		434 W	
	Sleep (S3)	5.78 W	5.35 W	5.91 W	5.48 W	5.81 W	5.37 W
	Off (S5)	2.57 W	1.14 W	2.74 W	1.31 W	2.56 W	1.13 W
	Zero Power Mode (ErP)	0.23 W		0.39 W		0.22 W	
Heat Dissipation (Btu/hr)**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	437 btu/hr		430 btu/hr		440 btu/hr	
	Windows Busy Typ (S0)	1276 btu/hr		1266 btu/hr		1297 btu/hr	
	Windows Busy Max (S0)	1474 btu/hr		1450 btu/hr		1481 btu/hr	
	Sleep (S3)	19.7 btu/hr	18.3 btu/hr	20.2 btu/hr	18.7 btu/hr	19.8 btu/hr	18.3 btu/hr
	Off (S5)	8.77 btu/hr	3.89 btu/hr	9.35 btu/hr	4.47 btu/hr	8.74 btu/hr	3.86 btu/hr
	Zero Power Mode (ErP)	0.78 btu/hr		1.33 btu/hr		0.75 btu/hr	

Example Configuration #3	Processor Info	2x Intel Xeon E5-2680 (Eight-Core)					
	Memory Info	8x 4GB DDR3 1600 (RDIMM)					
	Graphics Info	1x NVIDIA Quadro 6000					
	Disks/Optical/Floppy	2x 300GB SAS 15K/1x16X DVD+-RW SuperMulti SATA					
	Power Supply	1125W 90% Custom PSU					
	Other	-					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	152 W		150 W		153 W	
	Windows Busy Typ (S0)	507 W		498 W		509 W	
	Windows Busy Max (S0)	614 W		603 W		617 W	
	Sleep (S3)	7.62 W	7.14 W	7.66 W	7.23 W	7.61 W	7.17 W
	Off (S5)	1.81 W	1.40 W	1.97 W	1.58 W	1.79 W	1.39 W
	Zero Power Mode (ErP)	0.23 W		0.39 W		0.22 W	
Heat Dissipation (Btu/hr)**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	519 btu/hr		512 btu/hr		522 btu/hr	
	Windows Busy Typ (S0)	1730 btu/hr		1699 btu/hr		1737 btu/hr	
	Windows Busy Max (S0)	2095 btu/hr		2058 btu/hr		2105 btu/hr	

	Sleep (S3)	26.0 btu/hr	24.4 btu/hr	26.1 btu/hr	24.7 btu/hr	26.0 btu/hr	24.5 btu/hr
	Off (S5)	6.18 btu/hr	4.78 btu/hr	6.72 btu/hr	5.39 btu/hr	6.11 btu/hr	4.74 btu/hr
	Zero Power Mode (ErP)	0.78 btu/hr		1.33 btu/hr		0.75 btu/hr	

Example Configuration #4	Processor Info	2x Intel Xeon E5-2687 (Eight-Core)					
	Memory Info	16x 4GB DDR3 1600 (RDIMM)					
	Graphics Info	2x NVIDIA Quadro 5000					
	Disks/Optical/Floppy	4x 300GB SAS 15K/1x16X DVD+-RW SuperMulti SATA					
	Power Supply	1125W 90% Custom PSU					
	Other	-					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	232 W		228 W		232 W	
	Windows Busy Typ (S0)	783 W		748 W		777 W	
	Windows Busy Max (S0)	896 W		878 W		902 W	
	Sleep (S3)	10.9 W	10.5 W	10.9 W	10.5 W	11.0 W	10.5 W
	Off (S5)	1.80 W	1.40 W	2.00 W	1.58 W	1.79 W	1.38 W
	Zero Power Mode (ErP)	0.23 W		0.39 W		0.22 W	
Heat Dissipation (Btu/hr)**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	792 btu/hr		778 btu/hr		792 btu/hr	
	Windows Busy Typ (S0)	2672 btu/hr		2552 btu/hr		2651 btu/hr	
	Windows Busy Max (S0)	3057 btu/hr		2996 btu/hr		3078 btu/hr	
	Sleep (S3)	37.2 btu/hr	35.8 btu/hr	37.2 btu/hr	35.8 btu/hr	37.5 btu/hr	35.8 btu/hr
	Off (S5)	6.14 btu/hr	4.78 btu/hr	6.82 btu/hr	5.39 btu/hr	6.11 btu/hr	4.71 btu/hr
	Zero Power Mode (ErP)	0.78 btu/hr		1.33 btu/hr		0.75 btu/hr	

Example Configuration #5 (ENERGY STAR QUALIFIED)	Processor Info	2x Intel Xeon 2687W (Eight-Core)					
	Memory Info	16x 32GB DDR3 1600 (LRDIMM)					
	Graphics Info	1x NVIDIA Quadro 6000					
	Disks/Optical/Floppy	2x 3TB SATA/1x 16X DVD+-RW SuperMulti SATA					
	Power Supply	1125W 90% Custom PSU					
	Other	-					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	On-Idle (ENERGY STAR® Idle (S0))	212 W		210 W		213 W	
	ENERGY STAR® P_{MAX} Windows running Linpack and Viewperf	690 W		678 W		700 W	
	ENERGY STAR® "Sleep" (S3)	31.9 W		31.5 W		32.2 W	
	ENERGY STAR® "Standby" (Off) (S5)	1.35 W		1.50 W		1.35 W	
Heat Dissipation (Btu/hr)**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled

System Technical Specifications

	On-Idle (ENERGY STAR® Idle (S0))	723 btu/hr		717 btu/hr		727 btu/hr	
	ENERGY STAR® PMAX Windows running Linpack and Viewperf	2354 btu/hr		2313 btu/hr		2389 btu/hr	
	ENERGY STAR® "Sleep" (S3)	109 btu/hr		107 btu/hr		110 btu/hr	
	ENERGY STAR® "Standby" (Off) (S5)	4.61 btu/hr		5.12 btu/hr		4.61 btu/hr	

Declared Noise Emissions (Entry-level and High-end configurations)		
System Configuration (Entry level)	**Processor Info**	Dual Intel Xeon E5-2660 2.20 GHz with Standard Heatsinks
	Memory Info	4 - DDR3 2 GB 1600 MHz UDIMM
	Graphics Info	Single NVIDIA Quadro NVS 300
	Disks/Optical/Floppy	Single Blu-ray BD-R Single 1 TB 7200 RPM SATA 3.5" HDD

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	4.0	23
	Hard drive Operating (random reads)	4.1	23
	DVD-ROM Operating (sequential reads)	4.7	34

System Configuration (High-end)	**Processor Info**	Dual Intel Xeon E5-2687W 3.10 GHz with Liquid Cooling
	Memory Info	16 - DDR3 4 GB 1600 MHz RDIMM
	Graphics Info	Dual NVIDIA Quadro 6000
	Disks/Optical/Floppy	Single Blu-ray BD-R Dual 600 GB 15K RPM SAS 3.5" HDD

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	5.2	32
	Hard drive Operating (random reads)	5.1	33
	DVD-ROM Operating (sequential reads)	5.3	36

System Technical Specifications

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 **NOTE:** Values represent individual shock events and do not indicate repetitive shock events. Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025 g^2/Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g^2/Hz **NOTE:** Values do not indicate continuous vibration.
	Cooling	Above 1524 m (5000 ft) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1000 ft) elevation increase

Physical Security and Serviceability	
Access Panel	Tool-less Includes system board and memory information
Optical Drive	Tool-less, no carrier or rails required
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on tool-free internal chassis components
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Tool-less, retained by Front PCI Card Guide
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes
Restore CD/DVD Set	Restores the computer to its original factory shipping image - Can be obtained via HP Support
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	No

System Technical Specifications

Cable Lock Support	Yes, Kensington Cable Lock (optional): Prevents entire system theft only. 3mm x 7mm slot at rear of system
Universal Chassis Clamp Lock Support	No
Solenoid Lock and Hood Sensor	No
Rear Port Control Cover	No
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	No
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	A torx driver (T15) is needed to remove the CPU heatsink(s) before the CPU can be removed. CPU removal is tool-less
Power Supply Diagnostic LED	Yes
Front Power Button	Yes
Front Power LED	Yes, blue (normal), red (fault)
Front Hard Drive Activity LED	Yes, green
Front ODD Activity LED	Yes
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS
Cooling Solutions	Air cooled forced convection, liquid cooling (optional)
Power Supply Fans	2x - 80mm x 25mm
CPU Heatsink Fan	92 x 25mm 5-wire PWM for each CPU
Chassis Fan	Rear: 2x - 92mm x 25mm Front (850W config): 1x - 92mm x 25mm (upper position) Front (1125W config): 2x - 92mm x 25mm
Memory Heatsink Fan	3x - 75 x 90 x 35mm memory blowers 80 x 25 mm 4-wire PW fan
HP Vision Diagnostics Offline Edition	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:

	• Run diagnostics • View the hardware configuration of the system Key features and benefits 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: • Testing and diagnosing apparent hardware failures • Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance • Sending configuration information to another location for more in-depth analysis
Access Panel Key Lock	Yes, prevents removal of the access panel and all internal components including optical and floppy drives
ACPI-Ready Hardware	Advanced Configuration and Power Management Interface (ACPI). • Allows the system to wake from a low power mode. • Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system
Trusted Platform Module Chip with optional ProtectTools Software	Yes
Integrated Chassis Handles	Yes, front and rear
Power Supply	Tool-less, direct-connect (blind-mate)
PCIe Card Retention	Yes, rear (all), middle (full-height cards), front (full-length with extender cards)
Flash ROM	Yes. SPI ROM
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes
HP ProtectTools Security Manager	Yes - not supported on Linux

BIOS	
BIOS 32-bit Services	Standard BIOS 32-Bit Service Directory Proposal v0.4. BIOS supports 32 and 64-bit Operating systems.
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces.
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0.
BBS	BIOS Boot Specification v1.01

System Technical Specifications

WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot.
BIOS Power On	Users can define a specific date and time for the system to power on.
ROM Based Computer Setup Utility (F10)	Review and customize system settings controlled by the BIOS.
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM.
Replicated Setup	Saves BIOS settings to diskette or USB flash drive in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 setup).
SMBIOS	System Management BIOS 2.7, for system management information
Boot Control	Disables the ability to boot from removable media on supported devices.
Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and wake from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 2.0 for full compatibility with 64-Bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read the revision level of the system board Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.

System Technical Specifications

Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	Allows the user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
Adaptive Cooling	Fan control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	Early (pre-video) critical errors are reported via beeps and blinks on the power LED.
Industry Standard Specification Support	
UEFI Specification Revision	2.3.1
Industry Standard	Revision Supported by the BIOS
ACPI	Advanced Configuration and Power Management Interface, Version 2.0c
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	• Enhanced Disk Drive Specification Version 1.1 • BIOS Enhanced Disk Drive Specification Version 3.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	• PCI Local Bus Specification, Revision 2.3 • PCI Power Management Specification, Revision 1.1 • PCI Firmware Specification, Revision 3.0, Draft 0.7
PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	• Universal Serial Bus Revision 1.1 Specification • Universal Serial Bus Revision 2.0 Specification • Universal Serial Bus Revision 3.0 Specification
SMBIOS	System Management BIOS Reference Specification, Version 2.7

Social and Environmental Responsibility

Eco-Label Certifications & Declarations	This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks: • ENERGY STAR® (energy-saving features available on selected configurations-Windows only) • US Federal Energy Management Program (FEMP)

	• China Energy Conservation Program • IT ECO declaration * This product conforms to the examination standards (2003 version) under JEITA's 'PC Green Label System.'
Batteries	The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal The battery in this product does not contain: • Mercury greater than 5ppm by weight • Cadmium greater than 10ppm by weight • Lead greater than 40ppm by weight
Restricted Material Usage	This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.
Low Halogen Statement	This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: 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.
End-of-Life Management and Recycling	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.
Hewlett-Packard Corporate Environmental Information	For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html Eco-label certifications http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html ISO 14001 certificates: http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html
Additional Information	• This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC. • Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. • This product is >90% recycle-able when properly disposed of at end of life. EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24 for registration status in your country.
Packaging	HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html • Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment • Does not contain ozone-depleting substances (ODS) • Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100

	ppm sum total for all heavy metals listed • Maximizes the use of post-consumer recycled content materials in packaging materials • All packaging material is recyclable • All packaging material is designed for ease of disassembly • Reduced size and weight of packages to improve transportation fuel efficiency • Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting
Packaging Materials	
Internal	Cushions and plastic bags made of low density polyethylene (LDPE).
External	Outer carton, accessories carton, and insert made of corrugated paper board.

Manageability	
Industry Standard Specifications	This product meets the following industry standard specifications for manageability functionality: • DASH 1.1 (via Intel LAN on motherboard)
Intel Active Management Technology (AMT)	Intel Active Management Technology (AMT) 7.0 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: • Power Management (on, off, reset) • Hardware Inventory (includes BIOS and firmware revisions) • Hardware Alerting • Agent Presence • System Defense Filters • SOL/IDER • Cisco NAC/SDN Support • ME Wake-on-LAN • DASH 1.1 compliance • IPv6 Support • Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection • Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance. • Remote Alerts - automatically alert IT or service provider if issues arise • Access Monitor - Provides oversight into Intel® AMT actions to support security requirements • PC Alarm Clock • Microsoft NAP Support • Host Base set-up and configuration • Management Engine (ME) firmware roll back
Intel® vPro™ Technology	The HP Z820 Workstation supports Intel vPro technology when configured as outlined below: • Intel Xeon processor E5-2600 product family featuring Intel vPro Technology • Intel C602 chipset • Intel 82579LM GbE LAN
Remote Manageability Software Solutions	The HP Z820 Workstation is supported on the following remote manageability software consoles: • LANDesk Management Suite (HP recommended solution) • Microsoft System Center Configuration Manager • HP Client Automation Enterprise

	For questions or support for manageability needs, please visit http://www.hp.com/go/easydeploy
System Software Manager	For questions or support for SSM, please visit: http://www.hp.com/go/ssm
Service, Support, and Warranty	On-site Warranty and Service (Note 1): Three-years, limited warranty and service offering delivers on-site, next business-day (Note 2) service for parts and labor and includes free telephone support (Note 3) 8am - 5pm. Global coverage (Note 2) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering. **NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply. **NOTE 2:** On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country. **NOTE 3:** Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries. HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at: http://www.hp.com/hps/carepack. Service levels and response times for HP Care Packs may vary depending on your geographic location.
Product Change Notification	• Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile. • PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition. • Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.

Stable & Consistent Offerings

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

Processors	Product #	Offering
	A2A32AV	Intel Xeon E5-2620 2 15M 1333 6C 1 CPU
	A2A35AV	Intel Xeon E5-2643 3.3 10M 1600 4C 1 CPU
	A2A46AV	Intel Xeon E5-2620 2 15M 1333 6C 2 CPU
	A2A49AV	Intel Xeon E5-2643 3.3 10M 1600 4C 2 CPU

Hard Drives	Product #	Offering
	QJ686AV	500GB 7200 RPM SATA 1st HDD
	QJ697AV	500GB 7200 RPM SATA 2nd HDD
	QJ709AV	500GB 7200 RPM SATA 3rd HDD
	QJ721AV	500GB 7200 RPM SATA 4th HDD
	QJ733AV	500GB 7200 RPM SATA 5th HDD
	QJ687AV	1TB 7200 RPM SATA 1st HDD
	QJ698AV	1TB 7200 RPM SATA 2nd HDD
	QJ710AV	1TB 7200 RPM SATA 3rd HDD
	QJ722AV	1TB 7200 RPM SATA 4th HDD
	QJ734AV	1TB 7200 RPM SATA 5th HDD

Graphics	Product #	Offering
	A7U55AV	NVIDIA NVS 310 512MB GFX
	A7U56AV	NVIDIA NVS 310 512MB 2nd GFX

Memory	Product #	Offering
		TBD

Optical and Removable Storage	Product #	Offering
	QG250AV	16X SuperMulti DVDRW SATA 1st ODD

Input Devices	Product #	Offering
	A8Z58AV	HP USB Keyboard
	A8Z60AV	HP USB Optical Mouse

Stable & Consistent Offerings

Operating Systems	Product #	Offering
	QG517AV	Windows 7 Professional 64bit OS

Technical Specifications - Processors

Processors	Intel® Xeon® Processor E5-2603 4C 1.80GHz
	Intel® Xeon® Processor E5-2609 4C 2.40GHz
	Intel® Xeon® Processor E5-2620 6C 2.00GHz
	Intel® Xeon® Processor E5-2630 6C 2.30GHz
	Intel® Xeon® Processor E5-2640 6C 2.50GHz
	Intel® Xeon® Processor E5-2643 4C 3.30GHz
	Intel® Xeon® Processor E5-2650 8C 2.00GHz
	Intel® Xeon® Processor E5-2660 8C 2.20GHz
	Intel® Xeon® Processor E5-2665 8C 2.40GHz
	Intel® Xeon® Processor E5-2667 6C 2.90GHz
	Intel® Xeon® Processor E5-2670 8C 2.60GHz
	Intel® Xeon® Processor E5-2680 8C 2.70GHz
	Intel® Xeon® Processor E5-2687W 8C 3.10GHz
	Intel® Xeon® Processor E5-2690 8C 2.90GHz

Introduction

The Intel® Xeon® processor E5-1600/E5-2600/E5-4600 product families are the next generation of 64-bit, multi-core enterprise processors built on 32-nanometer process technology. Throughout this document, the Intel® Xeon® processor E5-1600/E5-2600/E5-4600 product families may be referred to as simply the processor. Where information differs between the EP and EP 4S SKUs, this document uses specific Intel® Xeon® processor E5-1600 product family, Intel® Xeon® processor E5-2600 product family, and Intel® Xeon® processor E5-4600 product family notation.Based on the low-power/high performance 2nd Generation Intel® Core™ Processor Family microarchitecture, the processor is designed for a two chip platform consisting of a processor and a Platform Controller Hub (PCH) enabling higher performance, easier validation, and improved x-y footprint. The Intel® Xeon® processor E5-1600 product family and the Intel® Xeon® processor E5-2600 product family are designed for Efficient Performance server, workstation and HPC platforms. The Intel® Xeon® processor E5-4600 product family processor supports scalable server and HPC platforms of two or more processors, including "glueless" 4-way platforms. Note: some processor features are not available on all platforms.

These processors feature per socket, two Intel® QuickPath Interconnect point-to-point links capable of up to 8.0 GT/s, up to 40 lanes of PCI Express* 3.0 links capable of 8.0 GT/s, and 4 lanes of DMI2/PCI Express* 2.0 interface with a peak transfer rate of 5.0 GT/s. The processor supports up to 46 bits of physical address space and 48-bit of virtual address space.

Included in this family of processors is an integrated memory controller (IMC) and integrated I/O (IIO) (such as PCI Express* and DMI2) on a single silicon die. This single die solution is known as a monolithic processor.

Performance and Features

- Up to 8 execution cores
- Each core supports two threads (Intel® Hyper-Threading Technology), up to 16 threads per socket
- 46-bit physical addressing and 48-bit virtual addressing
- 1 GB large page support for server applications
- A 32-KB instruction and 32-KB data first-level cache (L1) for each core
- A 256-KB shared instruction/data mid-level (L2) cache for each core
- Up to 20 MB last level cache (LLC): up

Z820 Xeon E5-2603 4C 1.80 10MB 1066 CPU2	A6S85AA

Technical Specifications - Processors

Z820 Xeon E5-2609 4C 2.40 10MB 1066 CPU2	A6S86AA
Z820 Xeon E5-2620 6C 2.00 15MB 1333 CPU2	A6S87AA
Z820 Xeon E5-2630 6C 2.30 15MB 1333 CPU2	A6S88AA
Z820 Xeon E5-2640 6C 2.50 15MB 1333 CPU2	A6S89AA
Z820 Xeon E5-2643 4C 3.30 10MB 1600 CPU2	A6S90AA
Z820 Xeon E5-2650 8C 2.00 20MB 1600 CPU2	A6S91AA
Z820 Xeon E5-2660 8C 2.20 20MB 1600 CPU2	A6S92AA
Z820 Xeon E5-2665 8C 2.40 20MB 1600 CPU2	A6S93AA
Z820 Xeon E5-2667 6C 2.90 15MB 1600 CPU2	A6S94AA
Z820 Xeon E5-2670 8C 2.60 20MB 1600 CPU2	A6S95AA
Z820 Xeon E5-2680 8C 2.70 20MB 1600 CPU2	A6S96AA
Z820 Xeon E5-2690 8C 2.90 20MB 1600 CPU2	A6S97AA

Introduction

The Intel® Xeon® processor E5-1600/E5-2600/E5-4600 product families are the next generation of 64-bit, multi-core enterprise processors built on 32-nanometer process technology. Throughout this document, the Intel® Xeon® processor E5-1600/E5-2600/E5-4600 product families may be referred to as simply the processor. Where information differs between the EP and EP 4S SKUs, this document uses specific Intel® Xeon® processor E5-1600 product family, Intel® Xeon® processor E5-2600 product family, and Intel® Xeon® processor E5-4600 product family notation.Based on the low-power/high performance 2nd Generation Intel® Core™ Processor Family microarchitecture, the processor is designed for a two chip platform consisting of a processor and a Platform Controller Hub (PCH) enabling higher performance, easier validation, and improved x-y footprint. The Intel® Xeon® processor E5-1600 product family and the Intel® Xeon® processor E5-2600 product family are designed for Efficient Performance server, workstation and HPC platforms. The Intel® Xeon® processor E5-4600 product family processor supports scalable server and HPC platforms of two or more processors, including "glueless" 4-way platforms. Note: some processor features are not available on all platforms.
These processors feature per socket, two Intel® QuickPath Interconnect point-to-point links capable of up to 8.0 GT/s, up to 40 lanes of PCI Express* 3.0 links capable of 8.0 GT/s, and 4 lanes of DMI2/PCI Express* 2.0 interface with a peak transfer rate of 5.0 GT/s. The processor supports up to 46 bits of physical address space and 48-bit of virtual address space. Included in this family of processors is an integrated memory controller (IMC) and integrated I/O (IIO) (such as PCI Express* and DMI2)

Performance and Features

- Up to 8 execution cores
- Each core supports two threads (Intel® Hyper-Threading Technology), up to 16 threads per socket
- 46-bit physical addressing and 48-bit virtual addressing
- 1 GB large page support for server applications
- A 32-KB instruction and 32-KB data first-level cache (L1) for each core
- A 256-KB shared instruction/data mid-level (L2) cache for each core
- Up to 20 MB last level cache (LLC): up to 2.5 MB per core instruction/data last level cache (LLC), shared among all cores

Technical Specifications - Processors

Intel® Xeon® Processor E5-2603 v2 4C 1.80GHz
Intel® Xeon® Processor E5-2609 v2 4C 2.50GHz
Intel® Xeon® Processor E5-2620 v2 6C 2.10GHz
Intel® Xeon® Processor E5-2630 v2 6C 2.60GHz
Intel® Xeon® Processor E5-2637 v2 4C 3.50GHz
Intel® Xeon® Processor E5-2640 v2 8C 2.00GHz
Intel® Xeon® Processor E5-2643 v2 6C 3.50GHz
Intel® Xeon® Processor E5-2650 v2 8C 2.60GHz
Intel® Xeon® Processor E5-2660 v2 10C 2.20GHz
Intel® Xeon® Processor E5-2667 v2 8C 3.30GHz
Intel® Xeon® Processor E5-2670 v2 10C 2.50GHz
Intel® Xeon® Processor E5-2680 v2 10C 2.80GHz
Intel® Xeon® Processor E5-2687W v2 8C 3.40GHz
Intel® Xeon® Processor E5-2690 v2 10C 3.00GHz
Intel® Xeon® Processor E5-2695 v2 12C 2.40GHz
Intel® Xeon® Processor E5-2697 v2 12C 2.70GHz

Z820 Xeon E5-2603 v2 4C 1.80 10MB 1333 CPU2	E2Q89AA
Z820 Xeon E5-2609 v2 4C 2.50 10MB 1333 CPU2	E2Q88AA
Z820 Xeon E5-2620 v2 6C 2.10 15MB 1600 CPU2	E2Q86AA
Z820 Xeon E5-2630 v2 6C 2.60 15MB 1600 CPU2	E2Q85AA
Z820 Xeon E5-2637 v2 4C 3.50 15MB 1866 CPU2	E2Q87AA
Z820 Xeon E5-2640 v2 8C 2.00 20MB 1600 CPU2	E2Q83AA
Z820 Xeon E5-2643 v2 6C 3.50 25MB 1866 CPU2	E2Q84AA
Z820 Xeon E5-2650 v2 8C 2.60 20MB 1866 CPU2	E2Q82AA
Z820 Xeon E5-2660 v2 10C 2.20 25MB 1866 CPU2	E2Q79AA
Z820 Xeon E5-2667 v2 8C 3.30 25MB 1866 CPU2	E2Q81AA
Z820 Xeon E5-2670 v2 10C 2.50 25MB 1866 CPU2	E2Q78AA
Z820 Xeon E5-2680 v2 10C 2.80 25MB 1866 CPU2	E2Q77AA
Z820 Xeon E5-2687W v2 8C 3.40 25MB 1866 CPU2	E2Q80AA
Z820 Xeon E5-2690 v2 10C 3.00 25MB 1866 CPU2	E2Q76AA
Z820 Xeon E5-2695 v2 12C 2.40 30MB 1866 CPU2	E2Q75AA
Z820 Xeon E5-2697 v2 12C 2.70 30MB 1866 CPU2	E2Q74AA

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	
	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**	0.4 ms (max)
		Average	3.6 ms
		Full Stroke	7.3 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	585,937,500	
	Operating Temperature	41° to 131° F (5° to 55° C)	
HP 600GB SAS 10K SFF HDD	**Capacity**	600GB	
	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**	0.4 ms (max)
		Average	3.6 ms
		Full Stroke	7.3 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	1,172,123,568	
	Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

	HP 900GB SAS 10K SFF HDD	**Capacity**	900GB	
		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	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.2ms (max)
			Average	3.5ms
			Full Stroke	7.0ms
		Rotational Speed	10,000 rpm	
		Logical Blocks	1,758,174,767	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	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	
		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	
	Operating Temperature	41° to 131° F (5° to 55° C)	
1TB SATA 10K rpm SFF HDD	**Capacity**	1TB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	64MB	
	Cache	Adaptive	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1.2ms (typical)
		Average	3.6ms
		Full Stroke	9.0ms (typical)
	Rotational Speed	10K rpm	
	Operating Temperature	41° to 131° F (5° to 55° C)	
250GB SATA 7200 rpm	**Capacity**	250 GB	

Technical Specifications - Hard Drives

6Gb/s 3.5" HDD	**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 600MB/s	
	Buffer	8 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	488,397,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	500GB	
	Height	1 in; 2.5 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	16 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	1 Terabyte (1000 GB)	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Buffer	32MB	

	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	1,953,525,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
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	

Technical Specifications - Hard Drives

	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)	
300GB SATA 10K rpm SFF HDD	**Capacity**	300,069,052,416 bytes	
	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 (3.0 Gb/s), Native Command Queuing enabled	
	Synchronous Transfer Rate (Maximum)	Up to 300 MB/s	
	Cache	16 MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7 ms (maximum)
		Average	4.4 ms
		Full Stroke	9.5 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	586,072,368	
	Operating Temperature	41° to 131° F (5° to 55° C)	

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	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SED SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 512GB SATA 6Gb/s SSD	**Capacity**	512GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	Seagate 600 Pro 240GB SATA SSD	**Capacity**	240GB	
		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)	

Technical Specifications - Hard Drives

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)	

Technical Specifications - Hard Drive Controllers

LSI MegaRAID® 9260-8i SAS 6Gb/s ROC RAID Card and iBBU07 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 iBBU07 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. **NOTE:** 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 - Graphics

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

Technical Specifications - Graphics

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

Technical Specifications - Graphics

		Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power Consumption	19.5 Watts
	Note	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adpaters included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
NVIDIA NVS 315 1GB Graphics	**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: - 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,

Technical Specifications - Graphics

	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 adapter. 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	Shader Model 5.0
Supported Graphics APIs	DX11, OpenGL 4.3
Available Graphics Drivers	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).

Technical Specifications - Graphics

NVIDIA Quadro 410 512MB Graphics	**Form Factor**	Low Profile: 2.713 inches × 5.7 inches, single slot
	Graphics Controller	NVIDIA Quadro 410 GPU: GK107
	Bus Type	PCI Express x16, 3.0 compliant
	Memory	Size: 512MB DDR3 Clock: 900MHz Memory Bandwidth: 14GB/s
	Connectors	One dual-link DVI-I connector One DisplayPort connector
	Maximum Resolution	VGA (through DVI to VGA cable): • 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI • 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI • 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 • 3840 × 2160 × 36 bpp at 60 Hz
	RAMDAC	400 MHz integrated RAMDAC
	Display Output	Maximum number of displays supported: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.2
	Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Factory configured Quadro 410 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro 410 includes one DP to DVI-D adapter
NVIDIA Quadro K600 1GB Graphics	**Form Factor**	2.731" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed

Technical Specifications - Graphics

	Low Profile bracket included
Graphics Controller	NVIDIA Quadro K600 Graphics Card Kepler GK107 GPU 192 CUDA cores Max Power: 41 Watts
Bus Type	PCI Express 2.0 x16
Memory	1 GB GDDR3, 891 Mhz 128-bit memory I/O path 29 GB/s memory bandwidth
Connectors	1 DL-DVI(I) output, 1 DisplayPort output CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to the Quadro K600 DisplayPort connector at this resolution) - Max number of daisy-chained monitors: 2
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5.0
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit)

Technical Specifications - Graphics

		Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. Quadro K600 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K600 offered as AMO includes one DP-to-DVI video cable adapter. Additonal cables must be ordered separately. 3. Quadro K600 is Windows 8 Compliant. 4. A total maximum of 2 active monitors are supported across all display output types.

NVIDIA Quadro 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
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	• 10-bit internal display processing pipeline • 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz

	SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2000 outputs is 4.
Shading Architecture	Full Microsoft DirectX 11 Shader Model 5
Supported Graphics APIs	OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Notes	1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.

Technical Specifications - Graphics

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	• 30-bit color • Up to 16K x16K texture and render processing • Transparent multisampling and super sampling • 16x angle independent anisotropic filtering • 128-bit floating point performance • 32-bit per-component floating point texture filtering and blending • 64x full scene antialiasing (FSAA) / 128x FSAA in SLI Mode • Support for any combination of two connected displays • DisplayPort 1.1a, HDMI 1.3a, and HDCP support • NVIDIA 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support • Full OpenGL quad buffered stereo support • Underscan/overscan compensation and hardware scaling • NVIDIA nView® multi-display technology
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.0 DirectX 11 CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and 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: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Power Consumption	<250 Watts

Technical Specifications - Graphics

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	• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology
	Display Output	400 MHz integrated RAMDAC • Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz Dual-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link internal TMDS (DVI 1.0) • Maximum resolution over digital port (single GPU and SLI mode):1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort with MST and HBR2. • Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz HDMI • Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz
	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:

		http://welcome.hp.com/country/us/en/support.html
	Power Consumption	122 Watts
	Note	No display output adapter included.
AMD FirePro W7000 4GB Graphics	**Form Factor**	Full height, full length, single slot
	Graphics Controller	AMD FirePro™ W7000 Professional Graphics Max Power: <150 Watts
	Bus Type	PCI Express™ x16, Generation 3.0
	Memory	4GB GDDR5, 153.6 GB/s bandwidth, ECC support
	Connectors	4 x DisplayPort with HBR2 and MST support.
	Maximum Resolution	DisplayPort: 4096x2160 @24bpp 60Hz Dual Link DVI: 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: 1920x1200 (requires DP to DVI adapter) VGA: 1920x1200 (requires DP to VGA adapter)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component
	Display Output	Max number of monitors supported using DisplayPort: 6 Monitor chaining from a single DisplayPort options(subject to a max of 6 total monitors across all outputs, requires use of DisplayPort Monitors supporting MST or the use of DisplayPort hubs): • 1 4096x2169 display • 2 2560x1600 displays • 4 1920x1200 displays
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL® 4.2 with OpenGL Shading Language OpenCL 1.1 Microsoft® DirectX® 11.1
	Available Graphics Drivers	Windows 8 Windows 7 Professional (64-bit and 32-bit) Windows 8 (64bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Note	1. AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See www.amd.com/firepro for details. 2. Factory configured FirePro W7000 graphics card does not include any video

adapter cables. Adapters must be ordered separately.

3. Option Kit FirePro W7000 graphics card does not include any video cable adapters. Adapters must be ordered seperately.

NVIDIA Quadro K4000 3GB Graphics	**Form Factor**	4.376" H x 9.5" L Single Slot, Full Height
	Graphics Controller	NVIDIA Quadro K4000 Graphics Card Kepler GK106 GPU 768 CUDA cores Max Power: 80 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	3 GB GDDR5, 2800 Mhz 192-bit memory I/O path 134 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	• 10-bit internal display processing pipeline • 10-bit scan-out support
	Display Output	VGA: - requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters - 400 Mhz integrated RAMDAC - Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 HDMI:

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

Technical Specifications - High Performance GPU Computing

NVIDIA Tesla C2075 Compute Processor	**Form Factor**	4.376 inches by 9.75 inches Dual Slot
	System Interface	PCI Express Gen2 ×16
	Video Outputs	One Dual Link DVI-I (Entry graphics level of performance)
	Memory	6GB GDDR5
	Peak Memory Bandwidth	+170 GB/s
	Supported APIs	CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Supported Operating Systems	Genuine Windows 7 Professional (64-bit) Genuine Windows Vista Business (64-bit) Microsoft Windows XP 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: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Processor Cores	448 CUDA cores
	Power Consumption	~215 Watts **NOTE 1:** A 1110W PSU is required for Tesla C2075 on the Z800 **NOTE 2:** A 600W PSU is required for Tesla C2075 on the Z400 **NOTE 3:** A 1125W PSU is required for Tesla C2075 on the Z820

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: http://welcome.hp.com/country/us/en/support.html

	Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Processor Cores	GK110 GPU, 706 MHz clock 2496 CUDA cores
Power Consumption	~225 Watts

NOTE 1: A 1125W PSU is required for any K20 configuration on the Z820

Technical Specifications - Optical and Removable Storage

HP Slot Load DVD+/-RW Drive	**Description**	Slim-Line, Slot-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA	
	Dimensions (WxHxD)	12.7 x 1.2 x 12.9 cm (5 x 0.5 x 5 in)	
	Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	**DVD-ROM**	5/9/10/18 G DVD-Single / Dual (PTP, OTP) (Read Only) 4.7G DVD±R/RW (Read & Write) DVD±R Dual (Read & Write) 80mm DVD DVD-RAM (Read & Write)
		CD-ROM	650 MB CD-ROM (Read Only) 80mm CD 800/700/650/ CD-Recordable (Read & Write) 700/650MB CD-Rewritable (Read & Write) 700/650MB High Speed CD-Rewritable (Read & Write) 700/650MB Ultra & Ultra+ Speed CD-Rewritable (Read & Write)
		Full Stroke DVD	< 270 ms (seek)
		Full Stroke CD	< 250 ms (seek)
	Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM, CD-R and CD-RW Up to 24X
		DVD ROM Read	DVD-RAM Up to 5X DVD Single layer Up to 8X DVD Dual Layer Up to 8X
	Power	**Source**	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC 40 mA typical, 800 mA maximum
	Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 90%
		Operating Systems Supported	Genuine Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation, SUSE Linux Enterprise Desktop 10 & 11. Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows XP Professional or Windows XP Home 32*. No driver is required for this device. Native support is provided by the operating system.
		Kit Contents	Factory integrated only. Not available as a kit.
HP DVD+/-RW Drive	**Description**	5.25-inch, half-height, tray-load	

Technical Specifications - Optical and Removable Storage

Mounting Orientation	Either horizontal or vertical		
Interface Type	SATA/ATAPI		
Dimensions (WxHxD)	15.0 x 4.4 x 17.5 cm (5.9 x 1.7 x 8.0 in)		
Disc Formats	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW		
Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard	
	Full Stroke DVD	< 240 ms (seek)	
	Full Stroke CD	< 200 ms (seek)	
Maximum Data Transfer Rates	**CD ROM Read**	CD-ROM, CD-R Up to 40X CD-RW Up to 32X	
	DVD ROM Read	DVD-RAM	Up to 12X
		DVD+RW	Up to 8X
		DVD-RW	Up to 8X
		DVD+R DL	Up to 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	

			No driver is required for this device. Native support is provided by the operating system.
		Kit Contents	HP SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media.

HP DVD-ROM Drive	**Description**		5.25-inch, half-height, tray-load
	Mounting Orientation		Either horizontal or vertical
	Interface Type		SATA/ATAPI
	Dimensions (WxHxD)		15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in)
	Disc Capacity	**DVD-ROM**	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	**DVD-ROM Single Layer**	< 140 ms (typical)
		CD-ROM Mode 1	< 125 ms (typical)
		Full Stroke DVD	< 250 ms (seek)
		Full Stroke CD	< 210 ms (seek)
	Power	**Source**	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 5%-200 mV ripple p-p
		DC Current	5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum
	Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 90%
		Maximum Wet Bulb Temperature	86° F (30° C)
		Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.

HP 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

Technical Specifications - Optical and Removable Storage

		BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
Disc Capacity	**DVD-ROM**	8.5 GB DL or 4.7 GB standard	
	Blu-ray	50 GB DL or 25 GB standard	
	Full Stroke DVD	< 250 ms (seek)	
	Full Stroke CD	< 210 ms (seek)	
	Blu-ray	<275 ms (seek)	
	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

Technical Specifications - Optical and Removable Storage

		BD-RE SL/DL Up to 4.8X
Power	**Source**	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p 12 VDC ± 10%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 1200 mA maximum 12 VDC -1000 mA typical, 1600 mA maximum
Operating Environmental (all conditions non-condensing)	**Temperature**	41° to 122° F (5° to 50° C)
	Relative Humidity	15% to 80%
	Maximum Wet Bulb Temperature	86° F (30° C)
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, SUSE Linux Enterprise Desktop 10 & 11 * No driver is required for this device. Native support is provided by the operating system. ** RHEL WS4 not supported on Z200/Z200SFF
	Kit Contents	HP Blue Laser RW Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide.
Disclaimer	As Blu-Ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-Ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.	

Technical Specifications - Optical and Removable Storage

HP 22-in-1 Media Card Reader	**Description**	The Media Card Reader device uses the same physical form factor and mounting as a Floppy Disk Drive. The device connects to a 2x5 two-channel USB header on the motherboard of the system. There is no USB controller card provided. Please see the Disc Formats section below for a list of flash memory card formats that are supported.
	Mounting Orientation	The Media Card Reader can be mounted in a dedicated Floppy Drive bay (if the chassis provides one) or in an appropriate Optical Bay adapter. It will operate in any orientation.
	Interface Type	USB 2.0 (one channel dedicated to the separate USB port; one channel dedicated to the flash memory card slots)
	Dimensions (WxHxD)	124.5 x 101.6 x 25.4 mm (4.9 x 4.0 x 1.0 in)
	Disc Formats	Picture Micro SD Micro SDHC SD SDHC SDXC Mini SD Mini SDHC MultiMediaCard Reduced Size MultiMediaCard (RS MultiMediaCard) MultiMedia Card 4.2 (MultiMediaCard Plus, including MultiMediaCard Plus HC) Reduced Size MultiMedia Card 4.2 (MultiMediaCard Mobile, including MultiMediaCard Mobile HC) CompactFlash Card Type I CompactFlash Card Type II MicroDrive Memory Stick (MS) MagicGate Memory Stick (MG) MagicGate Memory Stick Duo Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo Two additional formats are usable with adapters (not supplied): MultiMediaCard Micro Memory Stick Micro (M2)
HP DX115 Removable Drive Enclosure	**Interface Type**	Compatible with SAS or SATA controllers
	Dimensions (WxHxL)	147.6 x 41.1 x 205 mm (5.81 x 1.62 x 8.08 in)
	Weight	Frame and Carrier: 1.73 kg (3.8 lbs) Carrier: 0.45 kg (1 lbs)

Technical Specifications - Controller Cards

HP IEEE 1394b FireWire PCIe Card	**Data Transfer Rate**	Supports up to 800 Mbps
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b bilingual 9-Pin connectors (Rear)
	Internal Connectors	One 10-Pin Header connector
	System Requirements	Windows 7 Professional 32-bit and 64-bit, Microsoft® Windows® XP Professional, Windows XP Home, Windows Vista, SLED 11 and RHEL 6. Intel Pentium® G series or higher processor, 128-MB RAM, 1-GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	Temperature – Operating	50° to 131° F (10° to 55° C)
	Temperature – Storage	–22° to 140° F (–30° to 60° C)
	Relative Humidity – Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Windows 7 Professional 32-bit and 64-bit, Windows Vista® Business 32-bit and 64-bit, Windows® XP Professional, XP Professional 64-bit, RHEL 6 and SLED 11.
HP Thunderbolt-2 PCIe 1-port I/O Card	**Data Transfer Rate**	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	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.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	Kit Contents	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.
	Warranty	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

Integrated Intel 82579LM PCIe GbE Controller	**Connector**	RJ-45
	Controller	Intel 82579LM GbE platform LAN connect networking controller
	Memory	24 KB FIFO packet buffer memory
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1P, 802.1Q, 802.2, 802.3, 802.3ab, 802.3az, 802.3u
	Bus Architecture	PCI Express and SMBus
	Data Path Width	Single Channel PCI-Express
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V and 1.05V or just 3.3V with integrated regulators
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic. AMT 7.0 support

Intel Gigabit CT Desktop NIC	**Connector**	RJ-45
	Controller	Intel WG82574L Gigabit Ethernet Controller
	Memory	Integrated Dual 48K configurable transmit receive FIFO Buffers
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802,1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control
	Bus Architecture	PCI-E 1.0a
	Data Path Width	X1, 250 MB/s, Bi-directional interface
	Data Transfer Mode	Bus-master DMA
	Hardware Certifications	FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union
	Power Requirement	Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T
	Boot ROM Support	Yes
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	85% at 131° F (55° C)

Technical Specifications - Networking and Communications

	Dimensions	12.1 x 5.7 x 2.0 cm (4.75 x 2.25 x 0.8 in)
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64, Windows Vista Business 32, Windows XP Professional, Windows XP x64. Red Hat Enterprise Linux 4 (RHEL4.8 or newer)*, Red Hat Enterprise Linux 5 (RHEL5.3 or newer), Red Hat Enterprise Linux 6, SUSE Linux Enterprise Desktop (SLED) 11 RHEL 4 and 5, SLED 10, are not supported on the Z220 CMT/SFF
	Management Capabilities	WOL , PXE, DMI, WFM 2.0
	Kit Contents	Intel Gigabit CT Desktop NIC, low profile bracket, CD containing Intel PROset II NIC drivers, quick install guide, product warranty statement
Broadcom (5761) NetXtreme Gigabit Ethernet Plus NIC	**Connector**	RJ-45
	Controller	Broadcom 5761 PCI-Express LAN Controller
	Memory	8 MB NVRAM serial Flash
	Data Rates Supported	10/100/1000 Mbps
	Compliance	IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x
	Bus Architecture	PCI-Express
	Data Path Width	Single Channel PCI-Express
	Data Transfer Mode	Bus Master DMA
	Hardware Certifications	FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682)
	Power Requirement	1.8W @ 3.3V
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex Half-duplex (not available for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	131° F (55° C) with 5% to 95% non-condensing humidity
	Dimensions	7 cm x 10.5 cm (2.75 in x 4.13 in), low profile compatible
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit, Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional, Windows XP x64 Red Hat Enterprise Linux (RHEL) 5, 6; Novell SLED 10 & 11
	Management Capabilities	ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles
	Kit Contents	Broadcom NetXtreme Gigabit Ethernet Plus NIC, Broadcom NetXtreme Gigabit Ethernet Plus NIC USB Cable Assembly, CD, drivers, quick install guide, product warranty statement

Technical Specifications - Networking and Communications

HP X520 10GbE Dual Port Adapter	**Hardware Certifications**	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
HP 10GbE SFP+ SR Transceiver	**Operating Temperature**	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d)inches (1.19 x 1.38 x 5.57 cm)
HP 361T PCIe Dual Port Gigabit NIC	**Connector**	Two RJ-45
	Controller	Intel® Ethernet I350 Controller
	Data Rates Supported	10/100/1000 Mbps, Half- and full-duplex
	Compliance	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)
	Bus Architecture	PCI-E 1.0a
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	Network Transfer Rate	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
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	10% to 95% non-condensing
	Dimensions (H x W x D)	5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets)
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
	Management Capabilities	WOL , PXE 2.1

Kit Contents	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).