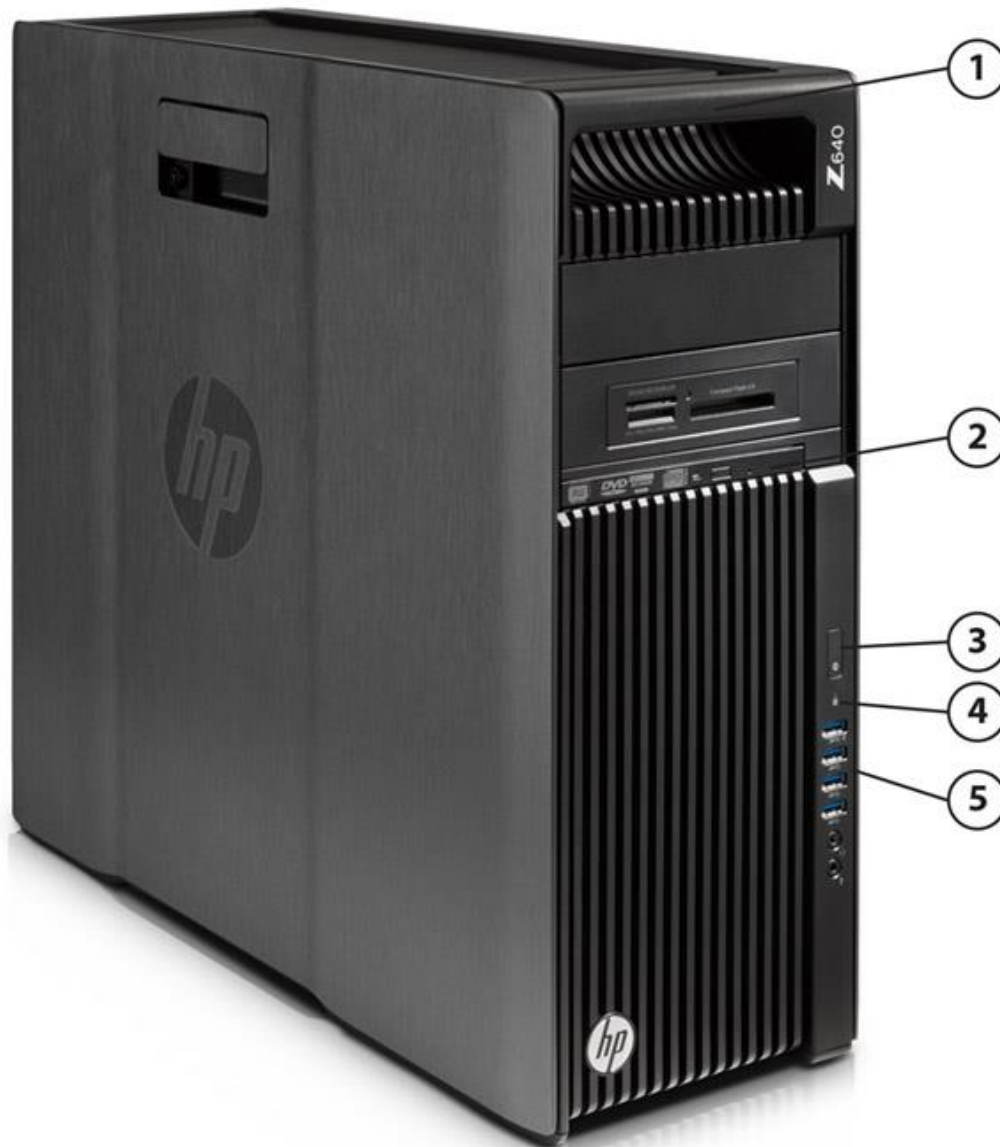


### Overview

### HP Z640 Workstation



1. Integrated Front Handle
2. Dedicated 9.5mm Optical Drive Bay
3. Power Button
4. HDD Activity LED
5. Front I/O: 4 USB 3.0 with Charging Port (topmost port), 1 Microphone, 1 Headset

### Overview



- |   |   |
|---|---|
| 6. 2 External 5.25" Bays  | 12. Intel Xeon Processors: E5-1600 v3 family or E5-2600 v3 family |
| 7. 2 Internal 3.5" Bays   | 13. 4 DIMM Slots for DDR4 ECC Registered Memory                   |
| 8. 6 6Gb/s SATA Ports   | 14. 2 <sup>nd</sup> CPU and Memory Riser Module with 4 DIMM slots |
| 9. Rear Flip-Up Handle  | 15. 2 PCIe x16 Gen 3 Slots  |
| 10. 925W, 90% Efficient Power Supply  | 16. 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot |
| 11. Rear I/O: Rear Power Button, 4 USB 3.0, 2 USB 2.0,<br>PS/2 Ports, 1 RJ-45 to Integrated GbE, 1 Audio Line In,<br>1 Audio Line Out |   |

### Overview

## Overview

<b>Form Factor</b>	Rackable Minitower
<b>Operating Systems</b>	<p>Preinstalled:</p> <ul style="list-style-type: none"> <li>Windows 7 Professional 64-bit</li> <li>Windows 8.1 Pro 64-bit</li> <li>Windows 8.1 Pro 64 downgrade to Windows 7 Professional 64-bit</li> <li>Ubuntu 14.04</li> <li>HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 6.6, RHEL 7, SUSE Linux Enterprise Desktop 11, Ubuntu 14.04)</li> <li>Red Hat Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS)</li> </ul> <p>Supported:</p> <ul style="list-style-type: none"> <li>Windows 10 64-bit</li> <li>Windows 7 Enterprise 64-bit</li> <li>Windows 8/8.1 Enterprise 64-bit</li> <li>Red Hat Enterprise Linux Desktop 6, 7</li> <li>SUSE Linux Enterprise Desktop 11 SP3, 12</li> </ul> <p><b>Notes:</b> For detailed OS/hardware support information for Linux, see: <a href="http://www.hp.com/support/linux_hardware_matrix">http://www.hp.com/support/linux_hardware_matrix</a></p>

Available Processors									
Name	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MHz)	QPI (GT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology <sup>1</sup>	TDP (W)
Intel® Xeon® E5-1680 v3 processor	8	3.2	20	2133	–	YES	YES	3, 6	140
Intel Xeon E5-1660 v3 processor	8	3.0	20	2133	–	YES	YES	3, 5	140
Intel Xeon E5-1650 v3 processor	6	3.5	15	2133	–	YES	YES	1, 3	140
Intel Xeon E5-1630 v3 processor	4	3.7	10	2133	–	YES	YES	1, 1	140
Intel Xeon E5-1620 v3 processor	4	3.5	10	2133	–	YES	YES	1, 1	140
Intel Xeon E5-1607 v3 processor	4	3.1	10	1866	–	NO	YES	N/A	140
Intel Xeon E5-1603 v3 processor	4	2.8	10	1866	–	NO	YES	N/A	140
Intel Xeon E5-2699 v3 processor	18	2.3	45	2133	9.6	YES	YES	5, 13	145
Intel Xeon E5-2697 v3 processor	14	2.6	35	2133	9.6	YES	YES	5, 10	145
Intel Xeon E5-2695 v3 processor	14	2.3	35	2133	9.6	YES	YES	5, 10	120
Intel Xeon E5-2683 v3 processor	14	2.0	35	2133	9.6	YES	YES	5, 10	120

### Overview

Intel Xeon E5-2690 v3 processor	12	2.6	30	2133	9.6	YES	YES	5, 9	135
Intel Xeon E5-2680 v3 processor	12	2.5	30	2133	9.6	YES	YES	4, 8	120
Intel Xeon E5-2670 v3 processor	12	2.3	30	2133	9.6	YES	YES	3, 8	120
Intel Xeon E5-2660 v3 processor	10	2.6	25	2133	9.6	YES	YES	3, 7	105
Intel Xeon E5-2650 v3 processor	10	2.3	25	2133	9.6	YES	YES	3, 7	105
Intel Xeon E5-2667 v3 processor	8	3.2	20	2133	9.6	YES	YES	2, 4	135
Intel Xeon E5-2640 v3 processor	8	2.6	20	1866	8.0	YES	YES	2, 8	90
Intel Xeon E5-2630 v3 processor	8	2.4	20	1866	8.0	YES	YES	2, 8	85
Intel Xeon E5-2643 v3 processor	6	3.4	20	2133	9.6	YES	YES	2, 3	135
Intel Xeon E5-2620 v3 processor	6	2.4	15	1866	8.0	YES	YES	2, 8	85
Intel Xeon E5-2609 v3 processor	6	1.9	15	1600	6.4	NO	YES	N/A	85
Intel Xeon E5-2603 v3 processor	6	1.6	15	1600	6.4	NO	YES	N/A	85
Intel Xeon E5-2637 v3 processor	4	3.5	15	2133	9.6	YES	YES	1, 2	135
Intel Xeon E5-2623 v3 processor	4	3.0	10	1866	8.0	YES	YES	3, 5	105

<sup>1</sup>The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

**NOTE:** Z640 systems configured with an E5-1600 series processor may not add a 2nd processor. To support two processors, an E5-2600 series processor must be chosen.

#### 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/](http://www.intel.com/products/processor_number/) for details.

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

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

#### Color

Hematite Brushed Aluminum and HP Black

#### I/O Expansion Slots(see

Slot 1 (top):

### Overview

system board section for more details)	<p>PCI Express Gen2 x1 with open-ended connector* Full-height, Half-length (Not available when 2nd processor/memory module is installed)</p> <p><b>Slot 2:</b> PCI Express Gen3 x16 Full-height, Full-length (with extender)</p> <p><b>Slot 3:</b> PCI Express Gen2 x4 with open-ended connector* Full-height, Full-length (with extender)</p> <p><b>Slot 4:</b> PCI Express Gen3 x8 with open-ended connector* Full-height, Full-length (with extender)</p> <p><b>Slot 5:</b> PCI Express Gen3 x16 Full-height, Full-length (with extender)</p> <p><b>Slot 6:</b> PCI 32bit/33MHz Full-height, Full-length (with extender) * Open-ended connector allows a greater bandwidth (e.g., x16) card to be installed physically into a lower bandwidth connector/slot.</p>
<b>Expansion Bays</b> (see Storage section for more details)	<p>2 internal 3.5" bays (with acoustic dampening rail assemblies preinstalled) 2 external 5.25" bays</p> <ul style="list-style-type: none"> <li>• 3rd and 4th 3.5" HDD each occupy one external bay</li> <li>• 3rd and 4th 2.5" HDD/SSD occupy a single external bay within a 2:1 carrier</li> </ul> <p>1 dedicated 9.5mm slim optical disk drive bay</p>
<b>Front I/O</b>	4 USB 3.0, 1 Headset, 1 Microphone
<b>Rear I/O</b>	4 USB 3.0, 2 USB 2.0, 2 PS/2, 1 RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out. Serial supported with optional connector on PCI bracket cabled to system board connector.
<b>Internal USB</b>	2 USB 2.0 ports available with a single 2x5 header. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. The 2x5 header also supports up to one 15-in-1 Media Card Reader. 1 USB 3.0 port available by a 2x10 header.
<b>Chassis Dimensions</b> (H x W x D)	<p>Footprint Dimensions:</p> <p>H: 17.45" [442.9mm] W: 6.75" [171.45mm] D: 18.3" [464.8mm] (measured to the rear of service panel)</p> <p>Maximum Dimensions:</p> <p>H: 17.45" [442.9mm] W: 6.75" [171.45mm]</p>

### Overview

	D: 18.65" [473.3mm] (measured to rear PCIe retainer clips)
	Rack utilization: 4U
<b>System Weight</b>	Actual weight depends upon configuration Minimum configuration: 15.0 kg (33.1 lbs.) Typical configuration: 17.0 kg (37.5 lbs.) Maximum configuration: 21.8 kg (48.0 lbs.)
<b>Temperature</b>	Operating: 5° to 35°C (40° to 95° F) Non-operating: -40° to 60°C (-40° to 140°F)
<b>Humidity</b>	Operating: 8% to 85% relative humidity, non-condensing Non-operating: 8% to 90% relative humidity, non-condensing
<b>Maximum Altitude</b> (non-pressurized)	Operating: 3,048m (10,000ft) Non-operating: 9,144m (30,000ft)
<b>Power Supply</b>	Tool-free 925W 90% Efficient wide-ranging, active Power Factor Correction, with two graphics power cables  <a href="http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf">The Power Supply Efficiency Report for this product may be found at this link: http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf</a>
<b>Interfaces Supported</b>	15-in-1 Media Card Reader (optional) 6-channel SATA interfaces (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported). USB 2.0, USB 3.0 Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, 5, and 10)
<b>Workstation ISV Certifications</b>	See the latest list of certifications at <a href="http://www.hp.com/united-states/campaigns/workstations/partnerships.html">http://www.hp.com/united-states/campaigns/workstations/partnerships.html</a>

### Supported Components

#### Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Intel Xeon E5-1600 v3 Series CPU</b>				
Intel Xeon E5-1680 v3 3.2 2133 8C CPU	Y	N		
Intel Xeon E5-1660 v3 3.0 2133 8C CPU	Y	N		
Intel Xeon E5-1650 v3 3.5 2133 6C CPU	Y	N		
Intel Xeon E5-1630 v3 3.7 2133 4C CPU	Y	N		
Intel Xeon E5-1620 v3 3.5 2133 4C CPU	Y	N		
Intel Xeon E5-1607 v3 3.1 1866 4C CPU	Y	N		
Intel Xeon E5-1603 v3 2.8 1866 4C CPU	Y	N		

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Z640 Intel Xeon E5-2600 v3 Series CPU</b>				
Xeon E5-2699 v3 2.3 2133 18C CPU	Y	Y	J9P85AA	
Xeon E5-2697 v3 2.6 2133 14C CPU	Y	Y	J9P86AA	
Xeon E5-2695 v3 2.3 2133 14C CPU	Y	Y	J9P87AA	
Xeon E5-2683 v3 2.0 2133 14C CPU	Y	Y	J9P90AA	
Xeon E5-2690 v3 2.6 2133 12C CPU	Y	Y	J9P88AA	
Xeon E5-2680 v3 2.5 2133 12C CPU	Y	Y	J9P91AA	
Xeon E5-2670 v3 2.3 2133 12C CPU	Y	Y	J9P92AA	
Xeon E5-2660 v3 2.6 2133 10C CPU	Y	Y	J9P94AA	
Xeon E5-2650 v3 2.3 2133 10C CPU	Y	Y	J9P95AA	
Xeon E5-2667 v3 3.2 2133 8C CPU	Y	Y	J9P89AA	
Xeon E5-2640 v3 2.6 1866 8C CPU	Y	Y	J9P97AA	
Xeon E5-2630 v3 2.4 1866 8C CPU	Y	Y	J9P98AA	
Xeon E5-2643 v3 3.4 2133 6C CPU	Y	Y	J9P93AA	
Xeon E5-2620 v3 2.4 1866 6C CPU	Y	Y	J9Q00AA	
Xeon E5-2609 v3 1.9 1600 6C CPU	Y	Y	J9Q01AA	
Xeon E5-2603 v3 1.6 1600 6C CPU	Y	Y	J9Q02AA	
Xeon E5-2637 v3 3.5 2133 4C CPU	Y	Y	J9P96AA	
Xeon E5-2623 v3 3.0 1866 4C CPU	Y	Y	J9P99AA	

**Note 1:** 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/](http://www.intel.com/products/processor_number/) for details.

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

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

### Supported Components

Z640 processor AMO kits include:

- 2nd CPU/Memory Module (riser)
- processor
- heatsink

First processor (CPU0) upgrades are not supported by HP.

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### Monitors / Displays

	<b>Factory Configured</b>	<b>Option Kit</b>	<b>Option Kit Part Number</b>	<b>Support Notes</b>
HP Z Display Z30i 30-inch IPS LED Backlit Monitor				
HP Z Display Z27i 27-inch IPS LED Backlit Monitor				
HP Z Display Z24i 24-inch IPS LED Backlit Monitor				
HP Z Display Z23i 23-inch IPS LED Backlit Monitor				
HP Z Display Z22i 21.5-inch IPS LED Backlit Monitor				
HP DreamColor Z27x Professional Display				
HP DreamColor Z24x Professional Display				

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### Supported Components

### Storage/Hard Drives

#### SAS Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>SAS Hard Drives for HP Workstations</b>				
HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA	
HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA	
HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA	
600GB SAS 15K SFF HDD	Y	Y	L5B75AA	
300GB SAS 15K SFF HDD	Y	Y	L5B74AA	

**NOTES:**

Up to (4) 2.5-inch 15K rpm SAS drives: 300, 600 GB; 2.4 TB max

Up to (4) 2.5-inch 10K rpm SAS drives: 300, 600 GB, 1.2 TB; 4.8 TB max

**NOTE:** SAS controller add-in card required

**NOTE:** 3rd and 4th SFF SAS HDDs require and will be automatically installed into a single 2:1 5.25" external bay adapter. This hardware is required when installing 3rd/4th HDDs using Aftermarket Option (AMO) drives.

Removable Boot Drive option

#### SATA Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>SATA Hard Drives for HP Workstations</b>				
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	K4T76AA	
500GB SATA 7.2K SED SFF HDD	Y	Y	D8N29AA	
1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	Y	Y	M7S54AA	

**NOTES:**

Up to (4) 3.5-inch 7200 rpm SATA drives: 500 GB, 1.0, 2.0, 3.0, 4.0 TB; 16.0 TB max

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

Up to (1) 3.5-inch 7200 RPM SATA Solid State Hybrid Drive (SSHD): 1TB + 8GB NAND

**NOTE:** 3rd and 4th HDDs require and will be automatically installed into a 3.5" to 5.25" external bay adapter. This hardware is required when installing 3rd/4th HDDs using Aftermarket Option (AMO) drives.

Removable Boot Drive option

### Supported Components

#### SATA Solid State Drives (SSDs)

#### HP Solid State Drives (SSDs) for Workstations

HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA
HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA
HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA
HP 1TB SATA 6Gb/s SSD	Y	Y	F3C96AA
Samsung Enterprise 240GB SATA SSD	Y	Y	F0W94AA
Samsung Enterprise 480GB SATA SSD	Y	Y	F0W95AA
HP 256GB SATA 6Gb/s SED Opal 2 SSD			
HP 512GB SATA SED SSD	Y	Y	N8T26AA

#### NOTES:

Up to (4) 2.5-inch 6Gb/s SATA Solid State Drives: 128, 256, 512 GB, 1 TB; 4.0 TB max

Up to (1) 2.5-inch 6Gb/s SATA Self-Encrypting Solid State Drive (SED SSD): 256 GB Opal 2, 512 GB Opal 2

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

3rd and 4th SSDs require and will be automatically installed into a single 2:1 5.25" external bay adapter. This hardware is required when installing 3rd/4th SSDs using Aftermarket Option (AMO) drives.

#### PCIe SSDs

#### PCIe SSDs for HP Workstations

HP Z Turbo Drive 512GB SSD	Y	Y	G3G89AA	
HP Z Turbo Drive 256GB SSD	Y	Y	G3G88AA	
HP Z Turbo Drive G2 512GB SSD	Y	Y	M1F74AA	
HP Z Turbo Drive G2 256GB SSD	Y	Y	M1F73AA	
HP Z Turbo Drive Quad Pro 256GB SSD module	Y	Y	N2N00AA	Note 1
HP Z Turbo Drive Quad Pro 512GB SSD module	Y	Y	N2N01AA	Note 1
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	Note 2
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Y	Y	N2M99AA	Note 2

#### NOTES:

Up to (4) PCI Express Solid State Drives: 256, 512 GB; 4.0 TB max  
PCIe SSDs are not available with SAS controller or SAS HDDs

**NOTE 1:** M.2 SSD module only

**NOTE 2:** Dual M.2 SSD modules plus carrier

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

#### Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Integrated SATA 6.0 Gb/s Controller</b>				

### Supported Components

Integrated SATA 6.0 Gb/s Controller	Y	N	Six ports
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#### Factory integrated RAID on motherboard for SATA drives

RAID 0 Configuration – Striped Array	Y	N	Note 1
RAID 1 Configuration – Mirrored Array	Y	N	Note 1
RAID 10 Configuration – Striped/Mirrored Array	Y	N	Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N	Note 1

#### LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card

LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA
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#### LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit

LSI 9270-8i SAS 6Gb/s ROC RAID Card	Y	Y	E0X21AA
LSI iBBU09 Battery Backup Unit	N	Y	E0X19AA

#### Integrated RAID for PCIe SSDs

RAID 0 Data Configuration	Y	N	Note 3
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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](http://www.hp.com/support/linux_hardware_matrix) for RAID capabilities with Linux.

All drives must be identical in type and capacity.

RAID arrays greater than 2 TB are fully supported.

**NOTE 1:** Requires hard drives with identical speed, capacity, and interface.

**NOTE 2:** Specific user-configured hardware SAS RAID configurations are supported on this Linux system. IS: Striping of 2 or more HDDs into a single logical volume

IM: Mirroring of 2 HDDs into a single logical volume

IME: Mirroring of 3 or more HDDs into a single logical volume.

For details, please visit [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

**NOTE 3:** PCIe SSDs NOT available for Boot RAID Configuration

### Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Mixed?
<b>Professional 2D</b>						
NVIDIA NVS 310 512MB Graphics	Y	Y	A7U59AA	Note 1, 2	4	-
NVIDIA NVS 310 1GB Graphics	Y	Y	M6V51AA	Note 1	3	-
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 2	4	-
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 1	2	-

### Graphics Cable Adapters

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Mixed?
HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	-

### Supported Components

HP DisplayPort To VGA Adapter 2nd	Y	N		1	-
HP DisplayPort To DVI-D Adapter (6-Pack)	Y	N		1	-
HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N		1	-
HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA	1	-
HP DisplayPort To VGA Adapter	Y	Y	AS615AA	1	-
HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA	1	-
<b>Entry 3D</b>					
NVIDIA Quadro K420 1GB Graphics	Y	Y	J3G86AA	2	-
NVIDIA Quadro K620 2GB Graphics	Y	Y	J3G87AA	2	-
NVIDIA Quadro K420 2GB Graphics	Y	Y	N1T07AA	2	
<b>Mid-range 3D</b>					
NVIDIA Quadro K2200 4GB Graphics	Y	Y	J3G88AA	2	-
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA	2	-
AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA	2	
<b>High End 3D</b>					
NVIDIA Quadro M4000 8GB Graphics	Y	Y	M6V52AA	Notes 3, 4	2
NVIDIA Quadro M5000 8GB Graphics	Y	Y	M6V53AA	Notes 3, 4	1
NVIDIA Quadro K4200 4GB Graphics	Y	Y	J3G89AA		2
NVIDIA Quadro K5200 8GB Graphics	Y	Y	J3G90AA		2
NVIDIA Quadro K6000 12GB Graphics	Y	Y	C2J96AA		1
NVIDIA Quadro M6000 12GB Graphics	Y	Y	L2K02AA		1
AMD FirePro W7100 8GB Graphics	Y	Y	J3G93AA		2

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

**NOTE 2:** 4th NVS 310 or NVS 315 supported as AMO-only

### High Performance GPU Computing

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
NVIDIA Tesla K40 Workstation Coprocessor	Y	Y	F4A88AA	Note 1

**NOTE 1:** Tesla K40 is supported with QK5200, QK620 or QK2200.

Not supported with 2 graphics cards.

Not supported with OS WIN7 32-bit.

Not supported with OS WIN8.0.

### Memory

#### CTO

#### DDR4-2133 ECC Registered DIMMs

	Option Kit Part Number	Support Notes
4GB DDR4-2133 ECC Registered RAM	J9P81AA	1,2
8GB DDR4-2133 ECC Registered RAM	J9P82AA	1,2
16GB DDR4-2133 ECC Registered RAM	J9P83AA	1,2
32GB DDR4-2133 ECC Load Reduced (LR) RAM	J9P84AA	1,2

#### NOTES:

For details on the supported memory configurations on the HP Z640 Workstation, please refer to the System Technical Specifications - System Board section of this document.

Each processor supports up to 4 channels of DDR4 memory. To realize full performance at least 1

### Supported Components

DIMM must be inserted into each channel.

With single-processor configurations, 4 DIMM slots are available. 4 additional DIMM slots are available with the 2nd CPU & Memory Module.

The CPUs determine the speed at which the memory is clocked. If an 1866MT/s capable CPU is used in the system, the maximum speed the memory will run at is 1866MT/s, regardless of the specified speed of the memory.

ONLY registered and load reduced DDR4 DIMMs are supported.  
DDR3 DIMMs ARE NOT SUPPORTED.

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### Supported Components

#### Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Realtek HD ALC221 Audio	Y	N		

#### Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>HP SlimTray Optical Drives</b>				
HP 9.5mm Slim SuperMulti DVD Writer	Y	Y	K3R64AA	
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	Note 1
HP 9.5mm Slim BDXL Blu-Ray Writer	Y	Y	K3R65AA	Note 2
<b>HP DX115 Removable Drive Enclosure</b>				
HP DX115 Removable HDD Frame/Carrier	N	Y	FZ576AA	Note 3
HP DX115 Removable HDD Carrier	N	Y	NB792AA	Note 4
<b>HP 15-in-1 Media Card Reader</b>				
HP 15-in-1 Media Card Reader	Y	Y	G1S79AA	

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.

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

**NOTE 1:** Not supported as a 2nd Optical Drive.

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

**NOTE 3:** Only one DX115 device can be installed into Z640. This device can only be installed into the top optical (5.25") bay.

**NOTE 4:** Carrier requires a Z640 to have the DX115 frame installed. This part number is for the carrier only.

#### 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	Note 1

**NOTE 1:** Compatible with NVIDIA Quadro K620, K2200, K4200 only.

#### Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
--	--------------------	------------	------------------------	---------------

### Supported Components

Integrated Intel I218LM PCIe GbE Controller	Y	N		
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
Intel 7260 802.11 a/b/g/n PCIe WLAN NIC*	N	Y	F2P07AA	

**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.

\* Wireless access point and internet service required. Availability of public wireless access points limited.

### Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Solenoid Hood Lock & Hood Sensor	Y	N		
HP Business PC Security Lock Kit	N	Y	PV606AA	
HP Z6/8 Adjustable Rail Rack Kit, Flush Mount	N	Y	B8S55AA	

### Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Keyboard	Y	Y	QY774AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Smart Card Keyboard	Y	Y	E6D77AA	
HP Wireless Keyboard and Mouse	Y	Y	QY449AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	Y	Y	ET424AA	
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA	
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA	
3Dconnexion CADMouse	Y	Y	M5C35AA	

### Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Internal USB Port Kit	N	Y	EM165AA	Note 1
HP eSATA PCI Cable Kit	N	Y	GM110AA	Note 2
HP Serial Port Adapter	Y	Y	PA716A	

### Supported Components

HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	Note 3
HP 2.5in HDD/SSD 2-in-1 ODD Bay Bracket	N	Y	K4T74AA	Note 4
HP Power Cord Kit	N	Y	DM293A	
HP Workstation Mouse Pad	Y	N		Japan only
HP ENERGY STAR® Enabled Configuration	Y	N		

**Note 1:** The HP Internal USB Port kit has a single USB 2.0 type A connector.

**Note 2:** No hot plug / hot swap supported

**Note 3:** NQ099AA used to install 3rd/4th 3.5" HDDs in Z640 in the factory or when purchasing Aftermarket Option (AMO) drives

**Note 4:** K4T74AA used to install 3rd/4th 2.5" HDD/SSDs in Z640 in the factory or when purchasing Aftermarket Option (AMO) drives

### Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 7.1	Y	Y		Note 2
MS Office Home & Business 2016	Y	Y		Note 3
Cyberlink Media Suite & PowerDVD	Y	N		
Foxit PhantomPDF Express	Y	N		

**NOTE 1:** Available as a free download here: <http://www.hp.com/go/performanceadvisor>

**NOTE 2:** Supported operating systems:

- Windows 7 Professional 32/64
- Windows 8.1 Professional 32/64
- RHEL v6.3, 7
- SLED 11 SP3

For more information, go to: <http://www.hp.com/go/rgs>

**NOTE 3:** Must select as a Configure to Order option.

### Operating Systems

	Support Notes
Windows 10 Pro 64	
Windows 10 Pro downgrade to Windows 7 Professional 64	
Windows 8.1 Pro 64-bit	
Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit	
Windows® 7 Professional 64-bit	
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	Note 1
Ubuntu 14.04	

**NOTE 1:** This second OS must be ordered with the HP Linux Installer Kit as the first OS



### System Technical Specifications

#### System Board

<b>System Board Form Factor</b>	Main System Board: 24 x 31 cm 9.6 x 12.2 inches  2nd CPU/Memory Board (optional): 14.9 x 29.2 cm 5.85 x 11.50 inches
<b>Processor Socket</b>	LGA2011R3 1st CPU on system board 2nd CPU on optional 2nd CPU/Memory Module
<b>CPU Bus Speed</b>	QPI: Up to 9.6GT/second, depending on processor
<b>Chipset</b>	Intel C612 Chipset
<b>Super I/O Controller</b>	Nuvoton NPCD379H (SIO-12)
<b>Memory Expansion Slots</b>	4 on system board(CPU0) + 4 on optional 2nd CPU/Memory Module(CPU1)
<b>Memory Type Supported</b>	DDR4, RDIMM (Registered), ECC: 4GB, 8GB and 16GB DDR4, LRDIMM (Load Reduced), ECC: 32GB
<b>Memory Modes</b>	NUMA (Non-Uniform Memory Architecture), Memory Node Interleave
<b>Memory Speed Supported</b>	1600MT/s, 1866MHz and 2133MT/s

### System Technical Specifications

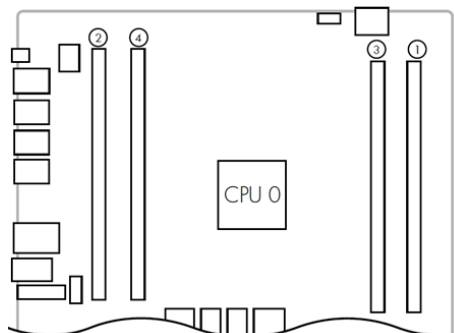
Single Processor						
CPU 0						
		Front Slots		Rear Slots		
Capacity	Notes	DIMM1	DIMM3	DIMM6	DIMM8	Rating
4 GB	*	4 GB				Fair
8 GB		4 GB 8 GB			4 GB	Good Fair
12 GB		4 GB	4 GB		4 GB	Better
16 GB		4 GB 8 GB	4 GB	4 GB	4 GB 8 GB	Best Good
24 GB	~	8 GB	4 GB	4 Gb	8 GB	Better
32 GB		8 GB 16 GB	8 GB	8 GB	8 GB 16 GB	Best Good
48 GB	~	16 GB	8 GB	8 GB	16 GB	Better
64 GB	~	16 GB 32 GB	16 GB	16 GB	16 GB 32 GB	Best Good
128 GB		32 GB	32 GB	32 GB	32 GB	Best
<b>Slot Load Order</b>		1	3	4	2	

Dual Processor										
		CPU 0				CPU 1				
		Front Slots		Rear Slots		Front Slots		Rear Slots		
Capacity	Notes	DIMM1	DIMM3	DIMM6	DIMM8	DIMM1	DIMM2	DIMM3	DIMM4	Rating
8 GB		4 GB				4 GB				Fair
16 GB		4 GB 8 GB			4 GB	4 GB 8 GB			4 GB	Good Fair
32 GB		4 GB 8 GB 16 GB	4 GB	4 GB	4 GB 8 GB	4 GB 8 GB 16 GB	4 GB	4 GB	4 GB 8 GB	Best Good Fair
48 GB	~	8 GB	4 GB	4 GB	8 GB	8 GB	4 GB	4 GB	8 GB	Better
64 GB		8 GB	8 GB	8 GB	8 GB	8 GB	8 GB	8 GB	8 GB	Best
96 GB	~	16 GB	8 GB	8 GB	16 GB	16 GB	8 GB	8 GB	16 GB	Better
128 GB		16 GB 32 GB	16 GB	16 GB	16 GB 32 GB	16 GB 32 GB	16 GB	16 GB	16 GB 32 GB	Best Good
256 GB		32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	Best
<b>Slot Load Order</b>		1	5	7	3	2	6	8	4	

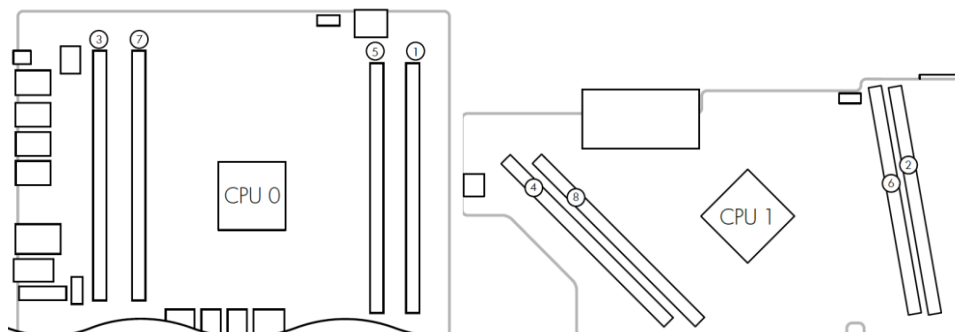
### System Technical Specifications

#### Memory Loading Order:

##### Load Order for Single Processor Configuration



##### Load Order for Dual Processor Configuration



#### Maximum Memory

Supports up to 256GB with two processors. Please refer to the table above for details on how supported memory configurations are installed in your system.

\* For 32 bit operating systems, there is a memory limit of 4GB.

~ Although technically possible, these configurations are not available to order at this time.

#### Memory Configuration (Supported)

- Not all memory configurations possible are represented above.
- Only Registered and LR ECC DIMMs are supported.
- 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.
- RDIMM (Registered) and LRDIMM (Load Reduced) memory cannot be mixed. All memory installed in the system must be either RDIMM or LRDIMM.

#### PCI Express Connectors

##### Slot 1 (top):

PCI Express Gen2 x1 with open-ended connector\*  
Full-height, Half-length  
(not available when 2nd CPU/Memory Module is installed)

##### Slot 2:

PCI Express Gen3 x16  
Full-height, Full-length (with extender)

##### Slot 3:

### System Technical Specifications

PCI Express Gen2 x4 with open-ended connector\*  
Full-height, Full-length (with extender)

**Slot 4:**

PCI Express Gen3 x8 with open-ended connector\*  
Full-height, Full-length (with extender)

**Slot 5:**

PCI Express Gen3 x16  
Full-height, Full-length (with extender)

\* Open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot

**PCI Connectors (5.0V)**

**Slot 6:**

PCI 32bit/33MHz  
Full-height, Full-length (with extender)

**Supported Drive Interfaces**

**SATA**

2 SATA @6Gb/s, supports RAID 0, 1 and NCQ.  
4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ.  
Factory integrated RAID is Microsoft Windows only.

**Serial Attached SCSI**

Requires Optional PCIe card

**Integrated RAID**

SATA: RAID 0, 1  
SSATA: RAID 0, 1, 10  
RAID 0 configuration - striped array (supported and configure to order)  
RAID 1 configuration - mirrored array (supported and configure to order)  
RAID 5 parity striping (supported but not configure to order)  
RAID 10 striped and mirrored array.

\*HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead

**Integrated Graphics**

No

**Network Controller**

Integrated Intel I-218 Gbit LAN  
Memory Integrated 3KB receive buffer and 3KB transmit buffer  
Data rates supported 10/100/1000 Mb/s  
Compliance IEEE 802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3x, 802.3z  
Bus architecture PCIe 1.0 x1 and SMBus  
Power requirement 0.5 watts  
Boot ROM support  
Network transfer rates:  
10BASE-T (half-duplex) 10 Mb/s  
10BASE-T (full-duplex) 20 Mb/s

### System Technical Specifications

100BASE-TX (half-duplex) 100 Mb/s  
 1000BASE-T (full-duplex) 2000 Mb/s  
 100BASE-TX (full-duplex) 200 Mb/s

Management capabilities: WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostics. AMT 9.1 support, vPro compliant

**SATA Connectors** Supported on all SATA and sSATA ports configurable with optional eSATA\* After-Market Option cable kit)  
 \* hot plug / hot swap not supported with eSATA

**IEEE 1394 Connector(s)** **Front** None  
**Rear** 2 IEEE 1394b (requires optional PCIe card)  
**Internal** None

**USB Connector(s)** **Front** 4 - USB 3.0  
**Rear** 4 - USB 3.0  
 2 - USB 2.0  
**Internal** One 2x5 header with two USB 2.0 ports. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header.  
 One 2x10 header with one USB 3.0 port.

**HD Integrated Audio** Realtek ALC221

**Flash ROM** Yes

**CPU Fan Header** One for each CPU socket

**Chassis Fan Header** Rear System Chassis Fan Header  
 Front System Chassis Fan Header

**CMOS Battery Holder – Lithium** Yes

**Power Supply Headers** Yes

**Power Switch, Power LED & Hard Drive LED Header** Yes (includes speaker and intrusion sensor signals)

**Clear Password Jumper** Yes

**Serial Port** One internal header

**Parallel Port** No

**Keyboard/Mouse** PS/2

### System Technical Specifications

<b>Z640 Required Power Supply Info</b>	
<b>Power Supply</b>	925W 90% Efficient, Custom PSU (Wide Ranging, Active PFC)
<b>Operating Voltage Range</b>	90–269 VAC
<b>Rated Voltage Range</b>	100–240 V
<b>Rated Line Frequency</b>	50–60 Hz
<b>Operating Line Frequency Range</b>	47–66 Hz
<b>Rated Input Current</b>	11.3 A @ 100-240 V
<b>Heat Dissipation (Configuration and software dependent)</b>	Typical = 2105 btu/hr (530 kcal/hr) Maximum = 3629 btu/hr (914 kcal/hr)
<b>Power Supply Fan</b>	92x25 mm variable speed
<b>ENERGY STAR Qualified (Configuration dependent)</b>	Yes
<b>80 PLUS® Compliant</b>	Yes, 90% Efficient  The Z640 925W power supply efficiency report can be found at this link: <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf</a>
<b>FEMP Standby Power Compliant @115V (&lt;2W in S5 - Power Off)</b>	Yes
<b>EuP Compliant @ 230V (&lt;0.5 W in S5 - Power Off)</b>	Yes
<b>CECP Compliant @ 220V (&lt;4W in S3 - Suspend to RAM)</b>	Yes; Configuration dependent
<b>Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC)</b>	<20W
<b>Built-in Self-Test LED</b>	Yes
<b>Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)</b>	Yes
<b>Access Panel Solenoid Lock Header</b>	Yes
<b>Access Panel Intrusion</b>	Yes
<b>Sensor Header</b>	Integrated in Front User Interface (Power Switch, Power LED, HDD LED, Speaker) Cable
<b>Multibay Header</b>	No
<b>Integrated Gigabit Ethernet</b>	Integrated Intel I-218 Gbit LAN
<b>Wake on LAN</b>	Yes
<b>ASF 1.0/2.0 (Alert Standard Format)</b>	No
<b>TPM</b>	Infineon TPM 1.2 Certified
<b>Password Clear Header</b>	Yes
<b>AUX IN (audio)</b>	No
<b>Clear CMOS Button</b>	Yes
<b>Memory Fan Header</b>	CPU0 Memory Fan Header; CPU1 Memory Fan Header

### System Technical Specifications

#### SYSTEM CONFIGURATION

<b>Example Z640 Configuration #1</b>  ENERGY STAR QUALIFIED	Processor	1x Intel Xeon E5-1603 v3 (Quad-core)					
	Memory	1x 4GB DDR4-2133 (Registered DIMM)					
	Graphics	1x NVIDIA NVS 310					
	Disks/Optical	1x 500GB SATA 7200 ; 1x Slim DVD-ROM SATA					
	Power Supply	925W 90% Custom PSU					
	Other	N/A					
	<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)		56.68 W		55.98 W		55.96 W	
Windows Busy Typ (S0)		110.76 W		106.57 W		110.89 W	
Windows Busy Max (S0)		114.16 W		112.25 W		114.16 W	
Sleep (S3)		2.26 W	2.16 W	2.49 W	2.39 W	2.25 W	2.15 W
Off (S5)		0.924 W	0.805 W	1.02 W	0.992 W	0.815 W	0.792 W
Zero Power Mode (ErP)		0.203 W		0.388 W		0.201 W	
<b>Heat Dissipation**</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	193.39 btu/hr		191.00 btu/hr		190.94 btu/hr	
	Windows Busy Typ (S0)	377.91 btu/hr		363.61 btu/hr		378.36 btu/hr	
	Windows Busy Max (S0)	389.51 btu/hr		383.00 btu/hr		389.51 btu/hr	
	Sleep (S3)	7.72 btu/hr	7.37 btu/hr	8.51 btu/hr	8.17 btu/hr	7.69 btu/hr	7.33 btu/hr
	Off (S5)	3.15 btu/hr	2.75 btu/hr	3.48 btu/hr	3.38 btu/hr	2.78 btu/hr	2.70 btu/hr
	Zero Power Mode (ErP)	0.695 btu/hr		1.325 btu/hr		0.668 btu/hr	

<b>Example Z640 Configuration #2</b>	Processor	2x Intel Xeon E5-2643 v3 (Dual Six-core)					
	Memory	8x 8GB DDR4-2133 (Registered DIMM)					
	Graphics	1x NVIDIA Quadro K5200					
	Disks/Optical	4x 2TB SATA 7200 ; 1x Slim SuperMulti DVDRW SATA					
	Power Supply	925W 90% Custom PSU					
	Other	N/A					
	<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
Windows Idle (S0)		82.62 W		82.36 W		83.10 W	
Windows Busy Typ (S0)		399.09 W		397.52 W		399.46 W	
Windows Busy Max (S0)		497.57 W		495.56 W		492.48 W	
Sleep (S3)		4.718 W	4.612 W	4.864 W	4.759 W	4.699 W	4.581 W
Off (S5)		0.992 W	0.813 W	1.042 W	0.988 W	0.823 W	0.793 W
Zero Power Mode (ErP)		0.204 W		0.384 W		0.202 W	
<b>Heat Dissipation**</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	281.90 btu/hr		281.01 btu/hr		283.54 btu/hr	
	Windows Busy Typ (S0)	1361.70 btu/hr		1356.34 btu/hr		1362.95 btu/hr	
	Sleep (S3)	16.09	15.74	16.60	16.24	16.03	15.63

### System Technical Specifications

		btu/hr	btu/hr	btu/hr	btu/hr	btu/hr	btu/hr
	Off (S5)	3.15 btu/hr	2.77 btu/hr	3.56 btu/hr	3.37 btu/hr	2.81 btu/hr	2.71 btu/hr
	Zero Power Mode (ErP)	0.694 btu/hr		1.311 btu/hr		0.689 btu/hr	

### DECLARED NOISE EMISSIONS

<b>System Configuration (Entry level)</b>	<b>Processor Info</b>	1x Intel Xeon E5-2650 v3 2.30 GHz
	<b>Memory Info</b>	2x 8 GB DDR4-2133 MT/s RDIMM
	<b>Graphics Info</b>	1x NVIDIA NVS 310
	<b>Disks/Optical/Floppy</b>	1x 1 TB SATA 7200 RPM 1x Blu-ray DVD-RW

<b>Declared Noise Emissions</b> (in accordance with ISO 7779 and ISO 9296)		<b>Sound Power (LWAd, bels)</b>	<b>Deskside Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	3.3	16
	<b>Hard drive Operating</b> (random reads)	3.5	17
	<b>DVD-ROM Operating</b> (sequential reads)	4.5	31

<b>System Configuration (High-end)</b>	<b>Processor Info</b>	2x Intel Xeon E5-2697 v3 2.60 GHz
	<b>Memory Info</b>	8x 16 GB DDR4-2133 MT/s ACPI RDIMM
	<b>Graphics Info</b>	1x NVIDIA Quadro K4200
	<b>Disks/Optical/Floppy</b>	2x 600 GB SAS 15K RPM 3.5" HDD 1x Blu-ray DVD-RW

<b>Declared Noise Emissions</b> (in accordance with ISO 7779 and ISO 9296)		<b>Sound Power (LWAd, bels)</b>	<b>Deskside Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	4.4	27
	<b>Hard drive Operating</b> (random reads)	4.8	29
	<b>DVD-ROM Operating</b> (sequential reads)	4.7	31

### ENVIRONMENTAL DATA

<b>Environmental Requirements</b>	<b>Temperature</b>	Operating: 5°C to 35°C (40°F to 95°F) Non-operating: -40°C to 60°C (-40°F to 140°F)
	<b>Humidity</b>	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	<b>Maximum Altitude</b>	Operating: 3,048 m (10,000 ft) Non-operating: 9,144 m (30,000 ft)
	<b>Dynamic (new)</b>	Shock Operating: ½-sine: 40 g, 2-3ms (~62 cm/sec)



### System Technical Specifications

	<p>Non-operating:            ½-sine: 160 cm/s, 2-3ms (~105 g)            square: 20 g, 422 cm/s</p> <p><b>NOTE:</b> Values represent individual shock events and do not indicate repetitive shock events.</p> <p>Vibration            Operating random: 0.5 g (rms), 5-300 Hz, up to 0.0025 g<sup>2</sup>/Hz            Non-operating random: 2.0 g (rms), 5-500 Hz, up to 0.0150 g<sup>2</sup>/Hz</p> <p><b>NOTE:</b> Values do not indicate continuous vibration.</p>
<b>Cooling</b>	Above 1524m (5,000 ft.) altitude, maximum operating temperature is de-rated by 1°C (1.8°F) per 305m (1,000 ft.) elevation increase

### Physical Security and Serviceability

<b>Access Panel</b>	Tool-less Includes system board and memory information
<b>Optical Drive</b>	Tool-less, no carrier or rails required
<b>Hard Drives</b>	Tool-less  Integrated blind-mate drive carriers  Optional 5.25" external bay carriers
<b>Expansion Cards</b>	Tool-less
<b>Processor Socket</b>	1st socket on main system board. 2nd socket on optional 2nd CPU/Memory Module.
<b>Green User Touch Points</b>	Yes, on primary serviceable components
<b>Color-coordinated Cables and Connectors</b>	Yes
<b>Memory</b>	Tool-less
<b>System Board</b>	Tool-less 2nd CPU/Memory Module: Tool-less
<b>Dual Color Power and HD LED on Front of Computer</b>	Yes
<b>Configuration Record SW</b>	Yes
<b>Over-Temp Warning on Screen</b>	Yes, at POST screen on reboot.
<b>Restore CD/DVD Set</b>	Yes, restores the computer to its original factory shipping image - Can be obtained via HP Support.
<b>Dual Function Front Power Switch</b>	Yes, also acts as a reset switch when held for 4 seconds.

### System Technical Specifications

<b>Padlock Support</b>	No
<b>Cable Lock Support</b>	Yes, Kensington Cable Lock (optional): Prevents entire system theft only. 3mm x 7mm slot at rear of system
<b>Universal Chassis Clamp Lock Support</b>	No
<b>Solenoid Lock and Hood Sensor</b>	Access Panel Solenoid Lock: Yes (optional). Activated remotely to prevent system entry. Access Panel Intrusion Sensor: Yes (optional).
<b>Rear Port Control Cover</b>	No
<b>Removable Media Write/Boot Control</b>	Yes, user can prevent the workstation from writing to or booting from removable media.
<b>Power-On Password</b>	Yes, prevents an unauthorized person from booting up the computer.
<b>Setup Password</b>	Yes, prevents an unauthorized person from changing the system configuration.
<b>3.3V Aux Power LED on System PCA</b>	Yes
<b>NIC LEDs (integrated) (Green &amp; Amber)</b>	Yes
<b>CPUs and Heatsinks</b>	CPU heatsink removal requires a T-15 Torx or flat blade screwdriver. CPU removal is tool-less.
<b>Power Supply Diagnostic LED</b>	Yes
<b>Front Power Button</b>	Yes
<b>Rear Power Button</b>	Yes
<b>Front Power LED</b>	Yes, white (normal), red (fault)
<b>Front Hard Drive Activity LED</b>	Yes, green
<b>Front ODD Activity LED</b>	Yes
<b>Internal Speaker</b>	Yes
<b>System/Emergency ROM</b>	Recovers corrupted system BIOS
<b>Flash Recovery</b>	
<b>Cooling Solutions</b>	Air cooled forced convection
<b>Power Supply Fans</b>	1 - 92mm

### System Technical Specifications

<b>CPU Heatsink Fan</b>	1st CPU: 1 - 92mm Optional 2nd CPU: 1 - 92mm
<b>Memory Heatsink Fan</b>	Optional 2nd CPU/Memory Module: rear bank: 1 - 80mm.
<b>HP Vision Diagnostics Offline Edition</b>	<p>HP Vision Diagnostics Offline Edition</p> <p>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:</p> <ul style="list-style-type: none"><li>• Run diagnostics</li><li>• View the hardware configuration of the system</li></ul> <p>Key features and benefits</p> <p>HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are:</p> <ul style="list-style-type: none"><li>• Testing and diagnosing apparent hardware failures</li><li>• Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance</li><li>• Sending configuration information to another location for more in-depth analysis</li></ul> <p>Entered using F2</p>
<b>Access Panel Key Lock</b>	Yes, prevents removal of the access panel and all internal components including devices installed in the external 5.25" bays.
<b>ACPI-Ready Hardware</b>	Advanced Configuration and Power Management Interface (ACPI). <ul style="list-style-type: none"><li>• Allows the system to wake from a low power mode</li><li>• Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system</li></ul>
<b>Trusted Platform Module Chip</b>	Yes, Infineon TPM 1.2 Certified
<b>Integrated Chassis Handles</b>	Yes
<b>Power Supply</b>	Tool-less. Includes integrated handle.
<b>PCI Card Retention</b>	Yes, tool-less Rear (all) Middle (full-height cards)

### System Technical Specifications

Front (full-length cards with extender)

**Flash ROM** SPI ROM

**Diagnostic Power Switch LED on board** Yes

**Clear Password Jumper** Yes

**Clear CMOS Button** Yes

**CMOS Battery Holder** Yes

**DIMM Connectors** Yes

### BIOS

**BIOS 32-bit Services** Standard BIOS 32-Bit Service Directory Proposal v0.4

**PCI 3.0 Support** Full BIOS support for PCI Express through industry standard interfaces

**ATAPI** ATAPI Removable Media Device BIOS Specification Version 1.0

**BBS** BIOS Boot Specification v1.01

**WMI Support** WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.

**BIOS Boot Spec 1.01+** Provides more control over how and from what devices the workstation will boot

**BIOS Power On** Users can define a specific date and time for the system to power on

**ROM Based Computer Setup Utility (F10)** Review and customize system configuration settings controlled by the BIOS

**System/Emergency ROM Flash Recovery with Video** Recovers system BIOS in corrupted Flash ROM

**Replicated Setup** Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).

**SMBIOS** System Management BIOS 2.7 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

### System Technical Specifications

<b>Thermal Alert</b>	Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"><li>• NORMAL - normal temperature ranges.</li><li>• ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.</li><li>• SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.</li></ul>
<b>Remote ROM Flash</b>	Provides secure, fail-safe ROM image management from a central network console
<b>ACPI (Advanced Configuration and Power Management Interface)</b>	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 4.0 for full compatibility with 64-bit operating systems.
<b>Ownership Tag</b>	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen
<b>Remote Wakeup/Remote Shutdown</b>	System administrators can power on, restart, and power off a client computer from a remote location
<b>Instantly Available PC (Suspend to RAM - ACPI sleep state S3)</b>	Allows for very low power consumption with quick resume time
<b>Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)</b>	Allows a new or existing system to boot over the network and download software, including the operating system
<b>ROM revision levels</b>	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
<b>System board revision level</b>	Allows management SW to read revision level of the system board Revision level is digitally encoded into the HW and cannot be modified
<b>Start-up Diagnostics (Power-on Self-Test)</b>	Assesses system health at boot time with selectable levels of testing
<b>Auto Setup when new hardware installed</b>	System automatically detects the addition of new hardware
<b>Keyboard-less Operation</b>	The system can be booted without a keyboard
<b>Localized ROM Setup</b>	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings
<b>Asset Tag</b>	Allows the user or MIS to set a unique tag string in non-volatile memory

### System Technical Specifications

<b>Per-slot Control</b>	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually
<b>Adaptive Cooling</b>	Fan control parameters are set according to detected hardware configuration for optimal acoustics
<b>Pre-boot Diagnostics</b>	Early (pre-video) critical errors are reported via beeps and blinks on the power LED

#### Industry Standard Specification Support

<b>UEFI Specification Revision</b>	2.3.1
<b>Industry Standard</b>	Revision Supported by the BIOS
<b>ACPI</b>	Advanced Configuration and Power Management Interface, Version 4.0
<b>ATA (IDE)</b>	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
<b>CD Boot</b>	"El Torito" Bootable CD-ROM Format Specification Version 1.0
<b>EDD</b>	<ul style="list-style-type: none"><li>Enhanced Disk Drive Specification Version 1.1</li><li>BIOS Enhanced Disk Drive Specification Version 3.0</li></ul>
<b>EHCI</b>	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
<b>PCI</b>	<ul style="list-style-type: none"><li>PCI Local Bus Specification, Revision 2.3</li><li>PCI Power Management Specification, Revision 1.1</li><li>PCI Firmware Specification, Revision 3.0, Draft 0.7</li></ul>
<b>PCI Express</b>	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
<b>PMM</b>	POST Memory Manager Specification, Version 1.01
<b>SATA</b>	<ul style="list-style-type: none"><li>Serial ATA Specification, Revision 1.0a</li><li>Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5</li><li>Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0</li></ul>
<b>SPD</b>	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
<b>TPM</b>	Trusted Computing Group TPM Specification Version 1.2
<b>UHCI</b>	Universal Host Controller Interface Design Guide, Revision 1.1
<b>USB</b>	Universal Serial Bus Revision 1.1 Specification

### System Technical Specifications

Universal Serial Bus Revision 2.0 Specification

Universal Serial Bus Revision 3.0 Specification

#### SMBIOS

System Management BIOS Reference Specification, Version 2.7

External BIOS Simulator found at: <http://h20464.www2.hp.com/index.html>

### 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
- The ECO Declaration (TED)

#### 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, external cables and peripherals. The following customer-configurable internal components may not be low-halogen: 3 ½" SAS HDDs, LSI 9270-8i SAS ROC RAID Card, and LSI 9217-4i4e SAS ROC RAID Card. 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>

### System Technical Specifications

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.
- <http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstation.html>
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- 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](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 required functionalities via Intel LAN on motherboard

##### Intel Active Management Technology (AMT)

Intel® Active Management Technology (AMT) 9.1

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 9.1 includes the following advanced management functions:

- Power Management (on, off, reset, graceful shutdown, sleep and hibernate)
- Support in Max Power Savings (Shutdown and Hibernate Modes)
- Hardware Inventory (includes BIOS and firmware revisions)



### System Technical Specifications

- Hardware Alerting
- Agent Presence
- System Defense Filters
- Serial Over LAN (SOL)
- IDE Redirect
- ME Wake-on-LAN (WOL)
- 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
- Local Time Sync to UTC
- Remote Memory Dump Command – Creates memory dump for debug

**Intel® vPro™ Technology** The HP Z640 Workstation supports Intel® vPro™ technology when configured as outlined below:

- Intel® Xeon® processor E5-1600 v3 product family or E5-2600 v3 product family featuring Intel® vPro™ Technology
- Intel® C612 chipset
- Intel® I218LM GbE LAN

**Remote Manageability Software Solutions** The HP Z640 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

### System Technical Specifications

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 components designed and tested to work with 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
	J6F22AV	Intel Xeon E5-1603 v3 2.8GHz 4-core 10MB 1866
	J6F20AV	Intel Xeon E5-1620 v3 3.5GHz 4-core 10MB 2133
	J6F19AV	Intel Xeon E5-1630 v3 3.7GHz 4-core 10MB 2133
	J6F31AV	Intel Xeon E5-2643 v3 3.4GHz 6-core 20MB 2133 1st
	J6F49AV	Intel Xeon E5-2643 v3 3.4GHz 6-core 20MB 2133 2nd
	J6F38AV	Intel Xeon E5-2620 v3 2.4GHz 6-core 15MB 1866 1st
	J6F56AV	Intel Xeon E5-2620 v3 2.4GHz 6-core 15MB 1866 2nd
	J6F36AV	Intel Xeon E5-2630 v3 2.4GHz 8-core 20MB 1866 1st
	J6F54AV	Intel Xeon E5-2630 v3 2.4GHz 8-core 20MB 1866 2nd
Hard Drives	Product #	Offering
	J3J74AV	500GB 7200 RPM SATA 1st Hard Disk Drive
	J3J95AV	500GB 7200 RPM SATA 2nd Hard Disk Drive
	J3K16AV	500GB 7200 RPM SATA 3rd Hard Disk Drive
	J3K36AV	500GB 7200 RPM SATA 4th Hard Disk Drive
	J3J75AV	1TB 7200 RPM SATA 1st Hard Disk Drive
	J3J96AV	1TB 7200 RPM SATA 2nd Hard Disk Drive
	J3K17AV	1TB 7200 RPM SATA 3rd Hard Disk Drive
	J3K37AV	1TB 7200 RPM SATA 4th Hard Disk Drive
Graphics	Product #	Offering
	J1P91AV	NVIDIA NVS 510 2GB 1st Graphics
	J1Q03AV	NVIDIA NVS 510 2GB 2nd Graphics
	J1P93AV	NVIDIA Quadro K620 2GB 1st Graphics
	J1Q05AV	NVIDIA Quadro K620 2GB 2nd Graphics
	J1P94AV	NVIDIA Quadro K2200 4GB 1st Graphics
	J1Q06AV	NVIDIA Quadro K2200 4GB 2nd Graphics
	J1P98AV	AMD FirePro W2100 2GB 1st Graphics
	J1Q09AV	AMD FirePro W2100 2GB 2nd Graphics
Memory	Product #	Offering
	G8X26AV	8GB DDR4-2133 (1x8GB) Registered RAM 1CPU
	G8X30AV	16GB DDR4-2133 (2x8GB) Registered RAM 1CPU
	G8X37AV	16GB DDR4-2133 (2x8GB) Registered RAM 2CPU

### Stable & Consistent Offerings

G8X31AV	32GB DDR4-2133 (4x8GB) Registered RAM 1CPU
G8X38AV	32GB DDR4-2133 (4x8GB) Registered RAM 2CPU
G8X41AV	64GB DDR4-2133 (8x8GB) Registered RAM 2CPU
G8X32AV	32GB DDR4-2133 (2x16GB) Registered RAM 1CPU
G8X40AV	32GB DDR4-2133 (2x16GB) Registered RAM 2CPU
G8X33AV	64GB DDR4-2133 (4x16GB) Registered RAM 1CPU
G8X42AV	128GB DDR4-2133 (8x16GB) Registered RAM 2CPU

### Optical and Removable Storage

Product #	Offering
F2D70AV	Slim SuperMulti DVDRW SATA 1st Optical Disk Drive
G8U64AV	Slim SuperMulti DVDRW SATA 2nd Optical Disk Drive

### Technical Specifications - Hard Drives

#### STORAGE/HARD DRIVES

<b>SAS Hard Drives for HP Workstations</b>	<b>600GB SAS 15K SFF HDD</b>	<b>Capacity</b>	600GB	
		<b>Height</b>	5.9 in; 15 cm	
		<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm	
		<b>Interface</b>	12Gb/s SAS	
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 1200 MB/s (SAS single port)	
		<b>Buffer</b>	128MB	
		<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Average</b> 2.0ms	
		<b>Rotational Speed</b>	15K rpm	
		<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
			<b>600GB SAS 15K SFF HDD</b>	<b>Capacity</b>
		<b>Height</b>	5.9 in; 15 cm	
		<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm	
		<b>Interface</b>	12Gb/s SAS	
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 1200 MB/s (SAS single port)	
		<b>Buffer</b>	128MB	
		<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Average</b> 2.0ms	
		<b>Rotational Speed</b>	15K rpm	
		<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
	<b>300GB SAS 10K rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>	300GB	
		<b>Height</b>	0.6 in; 1.53 cm	
		<b>Width</b>	<b>Media Diameter</b> 2.5 in; 6.36 cm	
			<b>Physical Size</b> 2.75 in; 6.99 cm	
		<b>Interface</b>	SAS	
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600 MB/s	
		<b>Buffer</b>	64MB	
		<b>Cache</b>	multi-segmentable cache buffer	
		<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 0.4 ms (max)	
			<b>Average</b> 3.6 ms	
			<b>Full Stroke</b> 7.3 ms	
		<b>Rotational Speed</b>	10,000 rpm	
		<b>Logical Blocks</b>	585,937,500	
		<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
	<b>HP 600GB SAS 10K SFF HDD</b>	<b>Capacity</b>	600GB	
		<b>Height</b>	0.6 in; 1.53 cm	
		<b>Width</b>	<b>Media Diameter</b> 2.5 in; 6.36 cm	
			<b>Physical Size</b> 2.75 in; 6.99 cm	
		<b>Interface</b>	SAS 6Gb/s	

### Technical Specifications - Hard Drives

<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s
<b>Buffer</b>	64MB
<b>Cache</b>	multi-segmentable cache buffer
<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 0.4 ms (max) <b>Average</b> 3.6 ms <b>Full Stroke</b> 7.3 ms
<b>Rotational Speed</b>	10,000 rpm
<b>Logical Blocks</b>	1,172,123,568
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

#### HP 1.2TB SAS 10K SFF HDD

<b>Capacity</b>	1.2TB
<b>Height</b>	0.6 in; 1.53 cm
<b>Width</b>	<b>Media Diameter</b> 2.5 in; 6.36 cm <b>Physical Size</b> 2.75 in; 6.99 cm
<b>Interface</b>	SAS 6Gb/s
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s
<b>Buffer</b>	64MB
<b>Cache</b>	multi-segmentable cache buffer
<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 0.18ms (max) <b>Average</b> 3.5ms <b>Full Stroke</b> 7.17ms
<b>Rotational Speed</b>	10,000 rpm
<b>Logical Blocks</b>	2,344,225,968
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

#### SATA Hard Drives for HP Workstations

##### 500GB SATA 7200 rpm 6Gb/s 3.5" HDD

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

##### 1TB SATA 7200 rpm 6Gb/s 3.5" HDD

<b>Capacity</b>	1 Terabyte (1000 GB)
<b>Height</b>	1 in; 2.54 cm
<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm

### Technical Specifications - Hard Drives

	<b>Physical Size</b>	4 in; 10.17 cm
<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600 MB/s	
<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled	
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600 MB/s	
<b>Buffer</b>	64MB	
<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	2 ms
	<b>Average</b>	11 ms
	<b>Full Stroke</b>	21 ms
<b>Rotational Speed</b>	7,200 rpm	
<b>Logical Blocks</b>	1,953,525,168	
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
<b>2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>	2TB
	<b>Height</b>	1 in; 2.54 cm
	<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm
	<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>	Serial ATA (6.0 Gb/s), NCQ Enabled
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s
	<b>Buffer</b>	64MB
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 1.0 ms
		<b>Average</b> 11 ms
		<b>Full Stroke</b> 18 ms
	<b>Rotational Speed</b>	7,200 rpm
	<b>Logical Blocks</b>	3,907,029,168
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)
<b>3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>	3.0TB
	<b>Height</b>	1 in; 2.54 cm
	<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm
	<b>Physical Size</b>	4.0 in; 10.17 cm
	<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 6.0 Gb/s
	<b>Buffer</b>	64MB
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 0.6 ms
		<b>Average</b> 11 ms
		<b>Full Stroke</b> Not specified
	<b>Rotational Speed</b>	7200 rpm
	<b>Operating Temperature</b>	41° to 140° F (5° to 60° C)
<b>4TB SATA 7200 rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>	4TB
	<b>Height</b>	1 in; 2.54 cm
	<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm

### Technical Specifications - Hard Drives

		<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>	Serial ATA (6Gb/s), NCQ enabled	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	128MB	
	<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Single Track</b>	0.7ms
		<b>Average</b>	8.5ms
		<b>Full Stroke</b>	15.7ms
	<b>Rotational Speed</b>	7,200 rpm	
	<b>Operating Temperature</b>	5° to 60° F (-15° to 15.56° C)	
<b>500GB SATA 7.2K SED SFF HDD</b>	<b>Capacity</b>	500GB	
	<b>Height</b>	0.275 in; 0.7 cm	
	<b>Width</b>	<b>Media Diameter</b>	2.5 in; 6.36 cm
		<b>Physical Size</b>	2.75 in; 6.99 cm
	<b>Interface</b>	Serial ATA (6Gb/s)	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	32MB	
	<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Single Track</b>	1ms
		<b>Average</b>	4.2ms
		<b>Full Stroke</b>	25ms (typical)
	<b>Rotational Speed</b>	7,200 rpm	
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C)	
<b>1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)</b>	<b>Capacity</b>	1TB	
	<b>Height</b>	1 in; 2.54 cm	
	<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
		<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>	6Gb/s SATA	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	64MB standard HDD cache buffer	
	<b>Cache</b>	8GB NAND flash	
	<b>Rotational Speed</b>	7200 rpm	
	<b>Operating Temperature</b>	32° to 140° F (0° to 60° C)	

#### SATA SSDs for HP Workstations

<b>HP 128GB SATA 6Gb/s SSD</b>	<b>Capacity</b>	128GB	
	<b>Height</b>	0.28 in; 0.7 cm	
	<b>Width</b>	<b>Physical Size</b>	2.5 in; 6.36 cm
	<b>Interface</b>	SATA 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 500MB/s (Sequential Read)	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>HP 256GB SATA 6Gb/s SSD</b>	<b>Capacity</b>	256GB	
	<b>Height</b>	0.28 in; 0.7 cm	
	<b>Interface</b>	6Gb/s SATA	



### Technical Specifications - Hard Drives

**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 Opal 2 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 550MB/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** SATA 6Gb/s  
**Synchronous Transfer Rate (Maximum)** Up to 500MB/s (Sequential Read)  
**Operating Temperature** 32° to 158° F (0° to 70° C)

**HP 512GB SATA SED SSD**

**Capacity** 512GB  
**Height** 0.28 in; 0.7 cm  
**Width** **Physical Size**  
**Interface** SATA 6Gb/s  
**Synchronous Transfer Rate (Maximum)** Up to 600MB/s  
**Operating Temperature** 32° to 158° F (0° to 70° C)

**HP 1TB SATA 6Gb/s SSD**

**Capacity** 1TB  
**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 550MB/s (Sequential Read)  
**Operating Temperature** 32° to 158° F (0° to 70° C)

**Samsung Enterprise 240GB SATA SSD**

**Capacity** 240GB  
**Width** **Physical Size** 2.5 in; 6.36 cm  
**Interface** SATA 6Gb/s  
**Synchronous Transfer Rate (Maximum)** 600 Mb/s

**Samsung Enterprise 480GB SATA SSD**

**Capacity** 480GB  
**Width** **Physical Size** 2.5 in; 6.36 cm  
**Interface** SATA 6Gb/s  
**Synchronous Transfer Rate (Maximum)** 600 Mb/s

**PCIe SSDs for HP Workstations**

**HP Z Turbo Drive 256GB SSD**

**Capacity** 256GB  
**Interface** PCI Express 2.0 x4 electrical x4 physical  
**Operating Temperature** 32° to 158° F (0° to 70° C)

**HP Z Turbo Drive**

**Capacity** 512GB

### Technical Specifications - Hard Drives

	<b>512GB SSD</b>	<b>Interface</b>	PCI Express 2.0 x4 electrical x4 physical
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>HP Z Turbo Drive G2 256GB SSD</b>	<b>Capacity</b>	256GB
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>HP Z Turbo Drive G2 512GB SSD</b>	<b>Capacity</b>	512GB
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
<b>HP Z Turbo Drive Quad Pro</b>	<b>HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD</b>	<b>Capacity</b>	2x256GB (two M.2 PCIe NVMe modules)
		<b>Interface</b>	PCI Express Gen3 x16
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD</b>	<b>Capacity</b>	2x512GB (two M.2 PCIe NVMe modules)
		<b>Interface</b>	PCI Express Gen3 x16
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>HP Z Turbo Drive Quad Pro 256GB SSD module</b>	<b>Capacity</b>	256GB (one M.2 PCIe NVMe module)
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>HP Z Turbo Drive Quad Pro 512GB SSD module</b>	<b>Capacity</b>	512GB (one M.2 PCIe NVMe module)
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)

### HARD DRIVE CONTROLLERS

<b>LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card</b>	<b>PCI Bus</b>	8 lanes, PCI Express 3.0
	<b>RAID Levels</b>	Offers Integrated RAID (0, 1, 1E and 10)
	<b>PCI Data Burst Transfer Rate</b>	Half Duplex x8, PCIe, 8000 MB/s
	<b>SAS Bandwidth</b>	<b>Half Duplex</b> 600 MB/s per lane
	<b>PCI Card Type</b>	3.3V Add-in Card
	<b>PCI Voltage</b>	12 V ± 10%
	<b>PCI Power</b>	9.8W typical, Airflow min 200 LFM
	<b>Bracket</b>	Full height and low profile
	<b>Certification Level</b>	PCI Express 3.0 compliant

### Technical Specifications - Hard Drive Controllers

<b>SAS Processor</b>	LSI SAS2308/ Fusion MPT 2.0
<b>Internal Connectors</b>	One x4 internal mini-SAS (SFF8087)
<b>External Connectors</b>	One x4 external mini-SAS (SFF8088)
<b>Maximum Number of SCSI Devices</b>	256 Non-RAID SAS/SATA devices
<b>LED Indicators</b>	N/A

### LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit

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

### Technical Specifications - Graphics

#### GRAPHICS

<b>NVIDIA NVS 310 512MB Graphics</b>	<b>Form Factor</b>	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
	<b>Graphics Controller</b>	NVIDIA NVS 310 GPU: GF119-825
	<b>Bus Type</b>	PCI Express x16, 2.0 compliant
	<b>Memory</b>	Size: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	<b>Connectors</b>	2 x DisplayPort
	<b>Maximum Resolution</b>	Up to 2560 x 1600 (digital display) per display.
	<b>Image Quality Features</b>	The following video formats are supported: - 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.
	<b>Display Output</b>	Up to 2 displays in the following configurations:  DisplayPort output: <ul style="list-style-type: none"><li>• Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card</li><li>• Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.</li></ul> DVI-D output: <ul style="list-style-type: none"><li>• Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors</li><li>• Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors</li></ul> HDMI output: <ul style="list-style-type: none"><li>• NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors</li></ul> VGA display output: <ul style="list-style-type: none"><li>• Drives two analog display at resolutions up to 1920 × 1200 at 60</li></ul>

### Technical Specifications - Graphics

Hz using DisplayPort to VGA cable adaptor

<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.1
<b>Available Graphics Drivers</b>	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:  
<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>

<b>Note</b>	<ol style="list-style-type: none"> <li>1. The thermal solution used on this card is an active fan heatsink.</li> <li>2. Factory configured NVS 310 graphics card have no cable adaptors included. Adapters must be ordered separately.</li> <li>3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.</li> </ol>
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#### NVIDIA NVS 310 1GB Graphics

<b>Form Factor</b>	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
<b>Graphics Controller</b>	NVIDIA NVS 310 GPU: GF119-825
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	Size: 1GBB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/
<b>Connectors</b>	2x DisplayPort 1.2
<b>Maximum Resolution</b>	Up to 2560 x 1600 (digital display) per display.
<b>Image Quality Features</b>	The following video formats are supported: <ul style="list-style-type: none"> <li>- MPEG2</li> <li>- MPEG4 Part 2 Advanced Simple Profile</li> <li>- H.264 SVC codec support</li> <li>- Support for 3D Blu Ray</li> <li>- VC1</li> <li>- DivX version 3.11 and later</li> <li>- MVC</li> </ul>

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.

<b>Display Output</b>	Up to 2 displays in the following configurations:  DisplayPort output:
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### Technical Specifications - Graphics

- 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

<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.1
<b>Available Graphics Drivers</b>	Windows 8.1 Windows 8 Genuine Windows 7 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 NVS 310 graphics card have no cable adaptors included. Adapters must be ordered separately.
3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
4. Configurations of three NVS 310 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

#### NVIDIA NVS 315 1GB Graphics (for HP Workstations)

<b>Form Factor</b>	Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams
<b>Graphics Controller</b>	NVIDIA NVS 315 (using GF119-825 GPU)

### Technical Specifications - Graphics

	<p>Number of Cores: 48 CUDA cores            Max. Power: 19.3W            Cooling Solution: Active fan heatsink</p>
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	<p>Size: 1GB DDR3            Clock: 875Mhz            Memory Bandwidth: 14GB/s</p>
<b>Connectors</b>	<p>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</p>
<b>Maximum Resolution</b>	<p>Maximum number of displays supported: 2</p> <p>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</p>
<b>Image Quality Features</b>	<p>See Display Output section.</p> <p>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</p> <p>A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.</p>
<b>Display Output</b>	<p>Up to 2 displays using one of the following DMS-59 cables:            DMS-59 to DVI            DMS-59 to VGA            DMS-59 to DP</p> <p>DisplayPort output:            - Drives two DisplayPort enabled digital displays at resolutions up to 2560 x 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter.</p> <p>DVI-D output:            - Drives two digital displays at resolutions up to 1920 x 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor</p> <p>VGA display output:            - Drives two analog displays at resolutions up to 2048 x 1536 at 85 Hz using DMS-59 to VGA cable adaptor.</p>
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.3
<b>Available Graphics Drivers</b>	<p>Windows 8            Microsoft Windows 7 Professional (64-bit and 32-bit)            Microsoft Windows XP Professional (64-bit and 32-bit)</p>

### Technical Specifications - Graphics

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).

#### NVIDIA NVS 510 2GB Graphics

#### Form Factor Graphics Controller

Low Profile, 2.713 inches × 6.3 inches, single slot

#### Bus Type

NVS 510 GPU  
Core Clock: 797 MHz  
Memory Clock: 891 MHz  
CUDA Cores: 192

#### Memory

PCI Express x16, Generation 2.0

#### Connectors

2GB DDR3

Four mini-DisplayPort.  
Four mini-DisplayPort to DisplayPort adapters included.  
(DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)

#### Maximum Resolution

Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz)

**NOTE:** This card supports up to four displays. For Windows XP, only 2 active displays are supported.

#### Image Quality Features

10-bit internal display processing, including hardware support for 10-bit scan-out

#### Display Output

DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.

#### Digital Display Support

##### 1. DisplayPort Output

- Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card.
- DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking.

##### 2. DVI-D Output

- Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors.
- Drives four digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors.



### Technical Specifications - Graphics

#### 3. HDMI Output

- The NVS 510 graphics board is capable of driving four high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors.

#### Analog Display Support

#### 1. VGA display output

- Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.

#### Supported Graphics APIs

Full Microsoft DirectX 11, Shader Model 5.0 support  
Full OpenGL 4.3 support

#### Available Graphics Drivers

Genuine Windows 7 Professional (64-bit and 32-bit)  
Microsoft Windows XP Professional (64-bit and 32-bit)  
Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation  
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

HP qualified drivers may be preloaded or available from the HP support Web site:

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

#### Power Consumption Note

33.4 Watts

Heatsink cooler design is active.

#### Graphics Cable Adapters Note

Graphics Cable Adapter option choice is available starting Feb 1 2013 for the following graphics cards:  
NVS 310, Quadro 410, Quadro K5000, FirePro V3900, FirePro W7000

New Graphics Cards introduced after Feb 1 2013 will be eligible for choosing Graphics Cable Adapters, unless otherwise specified.

No cable choice for NVS 300, NVS 510.

Maximum number of cables allowed is 8.

#### NVIDIA Quadro K420 1GB Graphics Form Factor

Low Profile:  
2.713 inches × 6.3 inches, single slot

#### Graphics Controller

NVIDIA Quadro K420  
GPU: GK107

#### Bus Type

PCI Express x16, 2.0 compliant

#### Memory

Size: 1GB DDR3  
Clock: 891MHz  
Memory Bandwidth: 29GB/s

#### Connectors

One dual-link DVI-I connector

#### Maximum Resolution

One DisplayPort connector

VGA (via adapter cable):

- 2048 × 1536 × 32 bpp at 85 Hz

Dual-link DVI

- 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Single-link DVI

### Technical Specifications - Graphics

- 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

DisplayPort 1.2

- 3840 × 2160 × 30 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 4.4

**Available Graphics Drivers**

Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran

Microsoft Windows 8.1

Microsoft Windows 8

Microsoft Windows 7

Linux

**Notes**

1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.

2. Option kit Quadro K420 includes one DP to DVI-D adapter.

**NVIDIA Quadro K420 2GB Graphics**

**Form Factor**

Low Profile:  
2.713 inches × 6.3 inches  
Cooling: Active

**Graphics Controller**

NVIDIA Quadro K420  
GPU: GK107 with 192 CUDA cores  
Power: 41W

**Bus Type**

PCI Express x16, 2.0 compliant

**Memory**

Size: 2GB DDR3  
Clock: 891MHz  
Memory Bandwidth: 29GB/s  
Memory Width: 128 bit

**Connectors**

One dual-link DVI-I connector  
One DisplayPort connector

Factory Configured: No video cable adapter included  
After market option kit: One DP-to-DVI adapter included with card

Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.

**Maximum Resolution**

VGA (via adapter 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

### Technical Specifications - Graphics

	- 3840 × 2160 × 30 bpp at 60 Hz
<b>Image Quality Features</b>	<ul style="list-style-type: none"> <li>• 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</li> </ul> <p>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo</p>
<b>Display Output</b>	<p>Maximum number of displays:</p> <ul style="list-style-type: none"> <li>- 2 direct attached monitors</li> <li>- 4 using DP 1.2a with MST and HBR2 enabled monitors</li> </ul> <p>Maximum number of DisplayPort displays possible (may require MST and/or HBR2):</p> <ul style="list-style-type: none"> <li>- 4 1920x1200</li> <li>- 2 2560x1600</li> <li>- 1 3840x2160</li> </ul> <p>Maximum number of monitors across all available Quadro K420 outputs is 4.</p>
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.4 Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran
<b>Available Graphics Drivers</b>	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions
<b>Notes</b>	<ol style="list-style-type: none"> <li>1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.</li> <li>2. Option kit Quadro K420 includes one DP to DVI-D adapter.</li> <li>3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.</li> </ol>

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<b>NVIDIA Quadro K620 2GB Graphics</b>	<b>Form Factor</b>	2.713" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included Weight: 133 grams
	<b>Graphics Controller</b>	NVIDIA Quadro K620 Graphics Card GM107 GPU 384 CUDA cores Max Power: 45 Watts
	<b>Bus Type</b>	PCI Express 2.0 x16
	<b>Memory</b>	2 GB GDDR3, 900 MHz 128-bit memory I/O path 29 GB/s memory bandwidth

### Technical Specifications - Graphics

<b>Connectors</b>	1 DL-DVI(I) output, 1 DisplayPort output Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card
<b>Maximum Resolution</b>	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)  Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz  Single Link-DVI(I) output:  - up to 1920 x 1200 x 32 bpp @ 60Hz
<b>Image Quality Features</b>	10-bit internal display processing pipeline 10-bit scan-out support
<b>Display Output</b>	1 Dual-link DVI-I connector  1 Display Port connector
<b>Shading Architecture</b>	Full Microsoft DirectX 11.1 Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 DirectX 11.1 API support includes:
<b>Available Graphics Drivers</b>	CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux  HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>  SUSE Linux Enterprise drivers may also be obtained from: <a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a>
<b>Notes</b>	<ol style="list-style-type: none"> <li>1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately.</li> <li>2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.</li> </ol>

#### NVIDIA Quadro K2200 4GB Graphics

<b>Form Factor</b>	4.38" H x 7.97" L Single Slot, Full Height Weight: 240 grams
<b>Graphics Controller</b>	NVIDIA Quadro K2200 Graphics Card GM107 GPU 640 CUDA cores

### Technical Specifications - Graphics

	Max Power: 67.7 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	4 GB GDDR5, 2500 MHz 128-bit memory I/O path 80 GB/s memory bandwidth
<b>Connectors</b>	1 DL-DVI(I) output, 2 DisplayPort outputs Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card
	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
<b>Maximum Resolution</b>	DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)
<b>Display Output</b>	DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz VGA: <ul style="list-style-type: none"> <li>• Requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters</li> <li>• 400 MHz integrated RAMDAC</li> <li>• Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz</li> </ul> DL-DVI(I): <ul style="list-style-type: none"> <li>• Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</li> </ul> SL-DVI(I): <ul style="list-style-type: none"> <li>• Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</li> </ul> DisplayPort: <ul style="list-style-type: none"> <li>• Supports HBR2 and MST</li> <li>• Max resolution: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution)</li> <li>• Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200</li> </ul> Maximum number of monitors across all available Quadro K2200 outputs is 4.
<b>Shading Architecture</b>	Full Microsoft DirectX 11.1 Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux
	HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
<b>Note</b>	1. Quadro K2200 offered as Factory Configured Option does not

### Technical Specifications - Graphics

include a video cable adapter. Video cable adapters must be ordered separately.

2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device.
4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output.

<b>AMD FirePro W2100 2GB Graphics</b>	<b>Form Factor</b>	Low Profile, half length (full-height bracket included)
	<b>Graphics Controller</b>	AMD FirePro™ W2100 professional graphics Power: <50W Cooling: Active
	<b>Bus Type</b>	PCI Express® x8, Generation 3.0
	<b>Memory</b>	2GB DDR3 memory Memory Bandwidth: 14.4 GB/s
	<b>Connectors</b>	2x Display Port 1.2 connectors
		Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card
		Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	<b>Maximum Resolution</b>	DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz  Dual Link DVI(I) (requires adapter cable): - up to 2560 x 1600 x 32 bpp @ 60Hz  Single Link-DVI(I)(requires adapter): - up to 1920 x 1200 x 32 bpp @ 60Hz  VGA(requires adapter):  - up to 1920 x 1200 x 32 bpp @ 60Hz
	<b>Display Output</b>	2 x DisplayPort® 1.2
	<b>Shading Architecture</b>	Shader Model 5.0
	<b>Supported Graphics APIs</b>	OpenCL™ 1.2, DirectX® 11 and OpenGL 4.4
	<b>Available Graphics Drivers</b>	Windows 8.1 (64-bit and 32-bit) Windows 7 (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) SUSE Linux Enterprise Desktop 11(64-bit and 32-bit) Ubuntu
		HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>

### Technical Specifications - Graphics

**NOTE:** 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](http://www.amd.com/firepro) for details.

<b>AMD FirePro W5100 4GB Graphics</b>	<b>Form Factor</b>	Full height, single slot (6.75" X 4.376")
	<b>Graphics Controller</b>	AMD FirePro W5100 graphics GPU Frequency: 930Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <75 Watts Cooling: Active
	<b>Bus Type</b>	PCI Express® x16, Generation 3.0
	<b>Memory</b>	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	<b>Connectors</b>	4x Display Port 1.2 connectors with HBR2 and MST support.  Factory Configured: No video cable adapter included After market option kit: No video cable adapter included  Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	<b>Maximum Resolution</b>	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)
	<b>Image Quality Features</b>	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling
	<b>Display Output</b>	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors  Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays

### Technical Specifications - Graphics

- four 1920x1200 displays

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.4  
OpenCL 1.2 and 2.0  
DirectX 11.2 / 12  
AMD Mantle

**Available Graphics Drivers** Windows 8.1 / 8 (64-bit and 32-bit)  
Windows® 7 (64-bit and 32-bit)  
Linux

HP qualified drivers may be preloaded or available from the HP support Web site:

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

**Notes** 1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See [www.amd.com/eyefinityfaq](http://www.amd.com/eyefinityfaq) for full details.

**Form Factor** Full height, single slot (6.75" X 4.376")

#### NVIDIA Quadro M4000 8GB Graphics

**Form Factor** Dimensions: 4.4" H x 9.5" L  
Single Slot, Full Height  
Cooling: Active  
Weight: 475 grams (without extender)

**Graphics Controller** NVIDIA Quadro M4000  
GPU: GM204 with 1664 CUDA cores  
Power: 120 Watts

**Bus Type** PCI Express 3.0 x16

**Memory** Size: 8GB GDDR5  
Memory Bandwidth: 192 GB/s  
Memory Width: 256-bit

**Connectors** 4 DisplayPort 1.2a  
Factory configured Option: No video cable adapter included  
After market option kit: No video cable adapter included

Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories



### Technical Specifications - Graphics

<b>Maximum Resolution</b>	<p>DisplayPort:</p> <ul style="list-style-type: none"><li>- single DisplayPort up to 4096 x 2160 x 30 bpp @ 60Hz</li><li>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)</li></ul> <p>DL-DVI(I) output:</p> <ul style="list-style-type: none"><li>- up to 2560 x 1600 x 32 bpp @ 60Hz</li></ul> <p>Single Link-DVI(I) output:</p> <ul style="list-style-type: none"><li>- up to 1920 x 1200 x 32 bpp @ 60Hz</li></ul> <p>VGA (via adapter cable):</p> <ul style="list-style-type: none"><li>- 2048 x 1536 x 32 bpp at 85 Hz</li></ul>
<b>Image Quality Features</b>	<p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p> <p>NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support</p> <p>Full OpenGL quad buffered stereo support</p> <p>Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies</p>
<b>Display Output</b>	<p>Maximum number of displays</p> <ul style="list-style-type: none"><li>- 4 direct attached monitors</li><li>- 4 using DP 1.2a with MST and HBR2 enabled monitors</li></ul> <p>Maximum number of DisplayPort displays possible:</p> <ul style="list-style-type: none"><li>- 4 1920x1200</li><li>- 4 2560x1600</li><li>- 4 4096x2160</li><li>- 2 5120x2880 (requires dual DP input capable 5k displays)</li></ul> <p>Maximum number of monitors across all available Quadro M4000 outputs is 4.</p>
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	<p>OpenGL 4.5 DirectX 12</p> <p>API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
<b>Available Graphics Drivers</b>	<p>Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>HP qualified drivers may be preloaded or available from the HP support</p>

### Technical Specifications - Graphics

Web site:

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

#### Notes

1. Configurations using the Quadro M4000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

#### NVIDIA Quadro M5000 8GB Graphics

#### Form Factor

Dimensions: 4.4" H x 10.5" L  
Dual Slot, Full Height  
Cooling: Active  
Weight: 525 grams (without extender)

#### Graphics Controller

NVIDIA Quadro M5000  
GPU: GM204 with 2048 CUDA cores  
Power: 150 Watts

#### Bus Type

PCI Express 3.0 x16

#### Memory

Size: 8GB GDDR5 ECC capable  
Memory bandwidth: 211GB/s  
Memory Width: 256-bit

#### Connectors

1 Dual Link DVI-I  
4 DisplayPort 1.2a

Factory configured option: No adapter included with card.  
After market option kit: No adaptor included with card.

Additional DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories

#### Maximum Resolution

DisplayPort:  
- up to four 4096 x 2160 x 30 bpp @ 60Hz displays  
- up to two 5120 x 2880 @ 60Hz displays  
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

DL-DVI(I) output:  
- up to 2560 x 1600 x 32 bpp @ 60Hz

Single Link-DVI(I) output:  
- up to 1920 x 1200 x 32 bpp @ 60Hz

VGA (via adapter cable):  
- 2048 x 1536 x 32 bpp at 85 Hz

#### Image Quality Features

12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)

NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support.

### Technical Specifications - Graphics

Full OpenGL quad buffered stereo support.

Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies.

#### Display Output

Maximum number of displays  
 - 4 direct attached monitors  
 - 4 using DP 1.2a with MST and HBR2 enabled monitors

Maximum number of DisplayPort displays possible (may require MST and/or HBR2):  
 - 4 1920x1200  
 - 4 2560x1600  
 - 4 4096x2160  
 - 2 5120x2880 (requires dual DP input 5k displays)

Maximum number of monitors across all available Quadro M5000 outputs is 4.

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

OpenGL 4.5  
 DirectX 12

API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran

#### Available Graphics Drivers

Microsoft Windows 10  
 Microsoft Windows 8.1  
 Microsoft Windows 8  
 Microsoft Windows 7  
 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

HP qualified drivers may be preloaded or available from the HP support Web site:

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

#### Notes

1. Factory configured Quadro M5000 does not include a video cable adapter. Video cable adapters must be ordered separately.
2. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).
3. Configurations of a single Quadro M5000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

**NVIDIA Quadro K4200  
 4GB Graphics**

#### Form Factor

4.376" H x 9.5" L  
 Single Slot, Full Height  
 Weight: ~458 grams (without extender)

### Technical Specifications - Graphics

<b>Graphics Controller</b>	NVIDIA Quadro K4200 Graphics Card Kepler GK104 GPU 1344 CUDA cores Max Power: 108 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	4 GB GDDR5, 2700 MHz 256-bit memory I/O path 173 GB/s memory bandwidth
<b>Connectors</b>	1 DL-DVI(I) output, 2 DisplayPort outputs CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card
<b>Maximum Resolution</b>	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories  DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)  DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
<b>Image Quality Features</b>	<ul style="list-style-type: none"> <li>• 10-bit internal display processing pipeline</li> <li>• 10-bit scan-out support</li> </ul>
<b>Display Output</b>	<p>VGA:</p> <ul style="list-style-type: none"> <li>- requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters</li> <li>- 400 MHz integrated RAMDAC</li> <li>- Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz</li> </ul> <p>DL-DVI(I):</p> <ul style="list-style-type: none"> <li>- Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</li> </ul> <p>SL-DVI(I):</p> <ul style="list-style-type: none"> <li>- Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</li> </ul> <p>DisplayPort:</p> <ul style="list-style-type: none"> <li>- Supports HBR2 and MST</li> <li>- Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4200 DisplayPort connector at this resolution)</li> <li>- Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200</li> </ul> <p>HDMI:</p> <ul style="list-style-type: none"> <li>- Requires use of DP-to-HDMI cable</li> <li>- Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz</li> </ul> <p>Maximum number of monitors across all available Quadro K4200 outputs is 4.</p>
<b>Shading Architecture</b>	Full Microsoft DirectX 11 Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

### Technical Specifications - Graphics

#### Available Graphics Drivers

Microsoft Windows 8.1  
Microsoft Windows 8  
Microsoft Windows 7  
Linux

HP qualified drivers may be preloaded or available from the HP support Web site:

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

#### Notes

1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K4200 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device.
4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4200 DisplayPort output. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4000 DisplayPort output.

#### NVIDIA Quadro K5200 8GB Graphics

#### Form Factor

4.376" H x 10.5" L  
Dual Slot  
Weight: ~880 grams (without extender)

#### Graphics Controller

NVIDIA Quadro K5200  
GK110 GPU  
2304 CUDA cores  
Max Power: 150 Watts

#### Bus Type

PCI Express 3.0 x16

#### Memory

8GB GDDR5  
256-bit memory I/O path  
192GB/s memory bandwidth

#### Connectors

DVI-I (1), DVI-D (1), DP (2)

Factory configured option: No adapter included with card.  
Option Kit: No adaptor 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)

### Technical Specifications - Graphics

- 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: 4096 × 2160 × 30 bpp at 60Hz
- Maximum resolution: 2560 × 1600 × 30 bpp at 120Hz

HDMI

- Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz

<b>Shading Architecture</b>	Shader model 5.0 Support
<b>Supported Graphics APIs</b>	OpenGL 4.4 DirectX 11
<b>Available Graphics Drivers</b>	API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation (64-bit) Red Hat Enterprise Linux (RHEL) 7 Desktop/Workstation SUSE Linux Enterprise Desktop 11 SP3 (64-bit)
<b>Note</b>	HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a> 1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro K5200 to enable direct mapping of GPU to Virtual Machine. 2. No display output adapter included.

#### NVIDIA Quadro K6000 12GB Graphics

<b>Form Factor</b>	4.376" H x 10.5" L Dual Slot Power: 234 Watts Weight: ~880 grams
<b>Graphics Controller</b>	NVIDIA Quadro K6000 Graphics Card based on the GK180 GPU Core Count: 2880 Base Clock: 797 MHz Boost Clock: 902 MHz
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	12GB GDDR5 384-bit memory I/O path 288 GB/s memory bandwidth ECC Memory
<b>Connectors</b>	DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector.  Factory configured option: No adapter included with card.  Option Kit: No adaptor included with card.  DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to

### Technical Specifications - Graphics

<b>Image Quality Features</b>	Dual-Link DVI adapters available as accessories. <ul style="list-style-type: none"><li>• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support</li><li>• NVIDIA 3D Vision™ technology</li><li>• NVIDIA Premium Mosaic and nView</li></ul>
<b>Display Output</b>	400 MHz integrated RAMDAC <ul style="list-style-type: none"><li>• Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz</li></ul> Dual-link internal TMDS (DVI 1.0) <ul style="list-style-type: none"><li>• Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)</li></ul> Single-link internal TMDS (DVI 1.0) <ul style="list-style-type: none"><li>• Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li></ul> DisplayPort with MST and HBR2. <ul style="list-style-type: none"><li>• Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz</li></ul> HDMI <ul style="list-style-type: none"><li>• Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz</li></ul>
<b>Shading Architecture</b>	Shader Model 5.0 Full IEEE 754-2008 32-bit and 64-bit precision
<b>Supported Graphics APIs</b>	Full OpenGL 4.3 Full DirectX 11 CUDA API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	Windows 8 Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)
<b>Note</b>	HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a> <ol style="list-style-type: none"><li>1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro K6000 to enable direct mapping of GPU to Virtual Machine.</li><li>2. No display output adapter included.</li></ol>

### Technical Specifications - Graphics

<b>NVIDIA Quadro M6000 12GB Graphics</b>	<b>Form Factor</b>	<p>4.42" H x 10.5" L Dual Slot Power: 250 Watts Weight: ~1030 grams</p>
	<b>Graphics Controller</b>	<p>NVIDIA Quadro M6000 Graphics Card based on the GM200 GPU Core Count: 3072 Base Clock: 1026 MHz Boost Clock: 1152 MHz Idle Clock: 324 MHz</p>
	<b>Bus Type</b>	<p>PCI Express 3.0 x16</p>
	<b>Memory</b>	<p>12GB GDDR5 384-bit memory I/O path 317 GB/s memory bandwidth ECC Memory (disabled by default)</p>
	<b>Connectors</b>	<p>DP (x4) DL-DVI(I) 3-pin mini-DIN connector SLI connector Quadro Sync connector One 8-pin auxiliary power connector</p> <p>Factory configured option: No adapter included with card. Option Kit: No adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p>
	<b>Image Quality Features</b>	<ul style="list-style-type: none"> <li>• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP 1.3 support</li> <li>• NVIDIA 3D Vision™ technology</li> <li>• NVIDIA Premium Mosaic and nView</li> </ul>
	<b>Display Output</b>	<p>400 MHz integrated RAMDAC</p> <ul style="list-style-type: none"> <li>• Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz</li> </ul> <p>Dual-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> <li>• Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)</li> </ul> <p>Single-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> <li>• Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li> </ul> <p>DisplayPort 1.2 with MST and HBR2.</p> <ul style="list-style-type: none"> <li>• Maximum pixel clock: 592 MPixel/s</li> <li>• Maximum bandwidth: 17.2 Gbps</li> <li>• Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz</li> </ul> <p>HDMI</p>



### Technical Specifications - Graphics

- Maximum resolution: 4096 × 2160 × 8 bpp at 60Hz

<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	Full OpenGL 4.4 Full DirectX 12 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	Windows 8.1 Windows 8 Windows 7 Professional Linux  HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://www8.hp.com/us/en/drivers.html">http://www8.hp.com/us/en/drivers.html</a>

<b>Notes</b>	<ol style="list-style-type: none"> <li>1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro M6000 to enable direct mapping of GPU to Virtual Machine.</li> <li>2. No display output adapter included.</li> <li>3. For HP Z840 Workstation configurations, the 1125W power supply option must be used.</li> </ol>
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### AMD FirePro W7100 8GB Graphics

<b>Form Factor</b>	Full height, single slot (9.5" X 4.376")
<b>Graphics Controller</b>	AMD FirePro W7100 graphics GPU: 1792 Stream Processors organized into 28 Compute Units Power: <75 Watts Cooling: Active
<b>Bus Type</b>	PCI Express® x16, Generation 3.0
<b>Memory</b>	8GB GDDR5 memory Memory Bandwidth: up to 176 GB/s Memory Width: 256 bit
<b>Connectors</b>	4x Display Port 1.2a connectors with HBR2 and MST support.  Factory Configured: No video cable adapter included After market option kit: No video cable adapter included  Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
<b>Maximum Resolution</b>	DisplayPort: - 4096x2160 @24bpp 60Hz  Dual Link DVI:

### Technical Specifications - Graphics

- 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. High bandwidth scaler for high quality up and downscaling

**Display Output** Max number of monitors supported using DisplayPort 1.2a:  
- 4 direct attached monitors  
- 6 using DP 1.2a with MST and HBR2 enabled monitors

Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2):  
- one 4096x2160 display  
- two 2560x1600 displays  
- four 1920x1200 displays

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.4  
OpenCL 1.2 and 2.0  
DirectX 11.2 / 12  
AMD Mantle

**Available Graphics Drivers** Windows 8.1 / 8 (64-bit and 32-bit)  
Windows® 7 (64-bit and 32-bit)  
Linux

HP qualified drivers may be preloaded or available from the HP support Web site:

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

**Notes**

1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. See [www.amd.com/eyefinityfaq](http://www.amd.com/eyefinityfaq) for full details.
2. OpenGL 4.4 support available with driver 14.301.xxx or later.
3. OpenCL 2.0 support planned in driver updates for early 2015.
4. For HP Z440 Workstation configurations, the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA), is required.

### Technical Specifications - High Performance GPU Computing

#### HIGH PERFORMANCE GPU COMPUTING

##### **NVIDIA Tesla K40 Workstation Compute Processor**

##### **Form Factor**

Size: 4.376 inches by 10.5 inches  
Slots: Dual Slot  
Power Connectors: One 6-pin and one 8-pin  
Weight: ~826 grams

##### **System Interface**

PCI Express Gen3 ×16

##### **Video Outputs**

None.

##### **Memory**

12GB GDDR5,  
memory path: 384-bit  
memory clock: 3Ghz

##### **Peak Memory Bandwidth**

288 GB/s

##### **Supported APIs**

CUDA, OpenACC, OpenCL 1.2 API support includes:  
C, 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**

GK110B GPU  
Base Clock: 745 MHz  
Boost Clock: up to 875 MHz  
2888 CUDA cores

##### **Power Consumption**

~235 Watts

**NOTE:** A 1125W PSU is required for any K40 configuration on the Z820

### Technical Specifications - Optical and Removable Storage

#### OPTICAL AND REMOVABLE STORAGE

##### HP 9.5mm Slim SuperMulti DVD Writer

<b>Description</b>	9.5mm height, tray-load
<b>Mounting Orientation</b>	Either horizontal or vertical
<b>Interface Type</b>	SATA/ATAPI
<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm
<b>Supported Media Types</b>	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW
<b>Disc Capacity</b>	DVD-ROM 8.5 GB DL or 4.7 GB standard Full Stroke DVD < 200 ms (seek) Full Stroke CD < 200 ms (seek)
<b>Maximum Data Transfer Rates</b>	CD ROM Read CD-ROM, CD-R Up to 24X CD-RW Up to 24X  DVD ROM Read DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
<b>Power</b>	Source SATA DC power receptacle DC Power Requirements 5 VDC ± 5%-100 mV ripple p-p DC Current 5 VDC -< 800 mA typical, <1600 mA maximum
<b>Operating Environmental (all conditions non-condensing)</b>	Temperature 41° to 122° F (5° to 50° C) Relative Humidity 10% to 80% Maximum Wet Bulb Temperature 84° F (29° C)
<b>Operating Systems Supported</b>	Windows 8.1, 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.

### Technical Specifications - Optical and Removable Storage

<b>Kit Contents</b>	9.5mm Slim SuperMulti DVD Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide
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<b>HP 9.5mm Slim DVD-ROM Drive</b>	<b>Description</b>	9.5mm height, tray-load	
	<b>Mounting Orientation</b>	Either horizontal or vertical	
	<b>Interface Type</b>	SATA / ATAPI	
	<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm	
	<b>Disc Capacity</b>	DVD-ROM Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB	
	<b>Access Times</b>	DVD-ROM Single Layer	< 110 ms (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	<b>Power</b>	Source	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC – <800mA typical, < 1600 mA maximum
	<b>Operating Environmental (all conditions non-condensing)</b>	Temperature	41° to 122° F (5° to 50° C)
Relative Humidity		10% to 80%	
Maximum Wet Bulb Temperature		84° F (29° C)	
<b>Operating Systems Supported</b>	Windows 8.1, 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.		
<b>Kit Contents</b>	9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide		

<b>HP 9.5mm Slim BDXL Blu-Ray Writer</b>	<b>Description</b>	9.5mm height, tray-load
	<b>Mounting Orientation</b>	Either horizontal or vertical
	<b>Interface Type</b>	SATA/ATAPI
	<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm
	<b>Supported Media Types</b>	BD-ROM BD-R BD-RE DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL

### Technical Specifications - Optical and Removable Storage

	DVD-R DVD-RW CD-R CD-RW	
<b>Disc Capacity</b>	DVD-ROM Blu-ray	8.5 GB DL or 4.7 GB standard 25 GB (single-layer) 50 GB (dual-layer) 100/128 GB (BDXL)
	Full Stroke DVD Full Stroke CD Blu-ray Startup Time	< 230 ms (seek) < 220 ms (seek) < 230 ms (seek) (Full Stroke Blu-ray) (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 15S
<b>Maximum Data Transfer Rates</b>	CD ROM Read  DVD ROM Read  Blu-ray	CD-ROM, CD-R Up to 24X CD-RW Up to 24X  DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X  BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-R Up to 6X BD-RE SL/DL Up to 6X
<b>Power</b>	Source DC Power Requirements DC Current	SATA DC power receptacle 5 VDC ± 5%-100 mV ripple p-p 5 VDC -900 mA typical, 2000mA maximum
<b>Operating Environmental (all conditions non-condensing)</b>	Temperature Relative Humidity Maximum Wet Bulb Temperature	41° to 122° F (5° to 50° C) 10% to 80% 84° F (29° C)
<b>Operating Systems</b>	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit	

### Technical Specifications - Optical and Removable Storage

**Supported** 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** 9.5mm Slim BDXL Blu-Ray Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide

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.

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**HP DX115 Removable Drive Enclosure**

**Interface Type** Compatible with SAS or SATA controllers. Offers 6Gb/s performance when used with 6Gb/s HDDs.

**Dimensions (WxHxD)** 147.6mm W x 41.1mm H x 205mm L (5.81" W x 1.62" H x 8.08" L)

**Approvals** Frame and Carrier: 1.73 kg (3.8 lbs.)  
Carrier: 0.45 kg (1 lbs.)

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**HP 15-in-1 Media Card Reader**

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

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

**Dimensions (WxHxD)** 4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm) Fits conveniently in the 5.25" drive bay.

**Supported Media Types** CompactFlash Type I  
CompactFlash Type II  
Microdrive  
Secure Digital Card (SD)  
Secure Digital High Capacity (SDHC)  
SD Extended Capacity Memory Card (SDXC)  
SD Ultra High Speed II(SD UHSII)  
Memory Stick  
Memory Stick Select  
Memory Stick Duo (MS Duo)  
Memory Stick PRO (MS PRO)  
Memory Stick PRO Duo (MS PRO Duo)  
Memory Stick PRO-HG Duo

### Technical Specifications - Optical and Removable Storage

MagicGate Memory Stick (MG)  
MagicGate Memory Stick Duo

These additional media types are supported with a card adapter.

Memory Stick Micro (M2)  
miniSD  
miniSD High Capacity  
Micro SD Memory Card (MicroSD)  
Micro SD High Capacity Memory Card (MicroSDHC)

#### Operating Systems Supported

Test Parameters/Conditions - Power applied, unit operating on system  $\pm 5\%$

Windows 8 Pro (64-bit)\*  
Windows 8.1 (64-bit)\*  
Windows 8 (64-bit)\*  
Windows 7 Ultimate (32-bit)\*\*  
Windows 7 Ultimate (64-bit)\*\*  
Windows 7 Professional (32-bit)\*\*  
Windows 7 Professional (64-bit)\*\*  
Windows 7 Home Basic\*\*  
Windows 7 Home Premium (32-bit)\*\*  
Windows 7 Home Premium (64-bit)\*\*  
Windows Vista Business 64  
Windows Vista Business 32  
Windows Vista Home Basic 32  
Windows XP Professional  
Windows XP Home 32

No driver is required for this device. Native support is provided by the operating system.

Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com>.

Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality.

See <http://www.microsoft.com/windows/windows-7/> for details.

#### Kit Contents

Windows 8 Pro (64-bit)\*  
Windows 8.1 (64-bit)\*  
Windows 8 (64-bit)\*  
Windows 7 Ultimate (32-bit)\*\*  
Windows 7 Ultimate (64-bit)\*\*  
Windows 7 Professional (32-bit)\*\*  
Windows 7 Professional (64-bit)\*\*  
Windows 7 Home Basic\*\*  
Windows 7 Home Premium (32-bit)\*\*  
Windows 7 Home Premium (64-bit)\*\*  
Windows Vista Business 64  
Windows Vista Business 32  
Windows Vista Home Basic 32  
Windows XP Professional  
Windows XP Home 32

No driver is required for this device. Native support is provided by the operating system.



### Technical Specifications - Optical and Removable Storage

Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See <http://www.microsoft.com>.

Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality.

See <http://www.microsoft.com/windows/windows-7/> for details.

#### **Approvals**

USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0,  
Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT

#### **Weight**

0.35 lbs. (0.16 kg)

### Technical Specifications – Controller Cards

#### CONTROLLER CARDS

<b>HP IEEE 1394b FireWire PCIe Card</b>	<b>Data Transfer Rate</b>	Supports up to 800 Mb/s
	<b>Devices Supported</b>	IEEE-1394 compliant devices
	<b>Bus Type</b>	PCIe card full height PCIe slots
	<b>Ports</b>	Two IEEE-1394b bilingual 9-Pin connectors (Rear)
	<b>Internal Connectors</b>	One 10-Pin Header connector
	<b>System Requirements</b>	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit, SLED 11 and RHEL 6. Intel i5 series or higher processor, min 2GB of RAM, 20GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	<b>Temperature – Operating</b>	50° to 131° F (10° to 55° C)
	<b>Temperature – Storage</b>	-22° to 140° F (-30° to 60° C)
	<b>Relative Humidity – Operating</b>	20% to 80%
	<b>Compliances</b>	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	<b>Operating Systems Supported</b>	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit
	<b>HP Thunderbolt-2 PCIe 1-port I/O Card</b>	<b>Data Transfer Rate</b>
<b>Devices Supported</b>		Thunderbolt™ certified devices
<b>Bus Type</b>		PCIe card, full or half height PCIe slots
<b>Ports</b>		One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear)
<b>Internal Connectors</b>		One 5-Pin header connector
<b>System Requirements</b>		Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot.
<b>Temperature - Operating</b>		50° to 131° F (10° to 55° C)
<b>Temperature - Storage</b>		-22° to 140° F (-30° to 60° C)
<b>Relative Humidity - Operating</b>		20% to 80%
<b>Compliances</b>		FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
<b>Operating Systems Supported</b>		Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit..
<b>Kit Contents</b>		HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables (2), user documentation and warranty card.

### Technical Specifications - Networking and Communications

#### NETWORKING AND COMMUNICATIONS

<b>Integrated Intel I218LM PCIe GbE Controller</b>	<b>Connector</b>	RJ-45 (motherboard integration)
	<b>Controller</b>	Intel I218LM GbE platform LAN connect networking controller
	<b>Memory</b>	3 KB FIFO packet buffer memory (both Tx and Rx)
	<b>Data Rates Supported</b>	10/100/1000 Mbps
	<b>Compliance</b>	802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3x, 802.3z
	<b>Bus Architecture</b>	PCI Express 1.1 (x1) and SMBus
	<b>Data Transfer Mode</b>	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	<b>Power Requirement</b>	Requires 3.3V only (integrated regulators)
	<b>Boot ROM Support</b>	Yes
	<b>Network Transfer Mode</b>	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
<b>Network Transfer Rate</b>	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps	
<b>Management Capabilities</b>	WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostics AMT 9.1 support, vPro compliant	

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

<b>HP 10GbE SFP+ SR Transceiver</b>	<b>Connector</b>	Two RJ-45
	<b>Controller</b>	Intel® Ethernet I350 Controller
	<b>Data Rates Supported</b>	10/100/1000 Mbps, Half- and full-duplex
	<b>Compliance</b>	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a

### Technical Specifications - Networking and Communications

	Microsoft WHQL (Windows Hardware Quality Labs)
<b>Data Path Width</b>	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
<b>Power Requirement</b>	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
<b>Network Transfer Rate</b>	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
<b>Operating Temperature</b>	32° to 131° F (0° to 55° C)
<b>Operating Humidity</b>	10% to 95% non-condensing
<b>Dimensions (H x W x D)</b>	5.3 x 2.5 in (13.50cm x 6.4 cm) (without brackets)
<b>Operating System Driver Support</b>	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
<b>Kit Contents</b>	HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Quick Install Card (QIC).

<b>Intel X540-T2 10GbE Dual Port Adapter</b>	<b>Operating Temperature</b>	32° to 131° F (0° to 55° C)
	<b>Operating Humidity</b>	5% to 95% non-condensing
	<b>Dimensions (H x W x D)</b>	Standard PCIe with full height bracket installed, half height bracket included. 0.7 x 2.7 x 6.0 in
<b>Operating System Driver Support</b>	The HP driver drop is a unified package that includes the X540-T2 driver. It is the same driver as is used for the 561T. Currently, it includes drivers for Win7-32, Win7-x64, Win8-x64, and Win81-x64.	
<b>Kit Contents</b>	Intel X540 10Gb Ethernet Dual port adapter, Installation guide, Warranty card.	
<b>NOTES</b>	<a href="#">Windows Server 2012 R2</a> , <a href="#">Windows Server 2012</a> , <a href="#">Windows 8</a> , <a href="#">Windows Server 2008 R2</a> , <a href="#">Windows 7</a> , <a href="#">Windows Server 2008 SP2</a> , <a href="#">Windows Vista SP2</a> , <a href="#">Windows Server 2003 R2</a> , <a href="#">Windows Server 2003 SP2</a> , <a href="#">Linux Stable Kernel version 3.x, 2.6,x</a> , <a href="#">Red Hat Enterprise Linux 5, 6</a> , <a href="#">SUSE Linux Enterprise Server 10, 11</a> , <a href="#">FreeBSD 9</a> , <a href="#">VMware ESX/ESXi</a> . Note: Not all OS's supported on all HP Z Workstations.	

<b>HP 361T PCIe Dual Port Gigabit NIC</b>	<b>Connector</b>	Two RJ-45
	<b>Controller</b>	Intel® Ethernet I350 Controller
	<b>Data Rates Supported</b>	10/100/1000 Mbps, Half- and full-duplex
	<b>Compliance</b>	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B

### Technical Specifications - Networking and Communications

CE EN 55024, EN55022 Class B  
 VCCI Class II  
 UL 1950  
 CSA 950  
 EN 60950  
 CE  
 ACPI 1.1a  
 Microsoft WHQL (Windows Hardware Quality Labs)

<b>Data Path Width</b>	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
<b>Power Requirement</b>	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
<b>Network Transfer Rate</b>	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
<b>Operating Temperature</b>	32° to 131° F (0° to 55° C)
<b>Operating Humidity</b>	10% to 95% non-condensing
<b>Dimensions (H x W x D)</b>	5.3 x 2.5 in (13.50cm x 6.4 cm) (without brackets)
<b>Operating System Driver Support</b>	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11

**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).

#### Intel 7260 802.11 a/b/g/n PCIe WLAN NIC

<b>Operating Humidity</b>	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
<b>Dimensions (H x W x D)</b>	Native HMC: 26.8 x 30.0 x 2.4 mm Carrier Card Assembly 3.3 x 4.7 in (84 x 119 mm)
<b>Kit Contents</b>	PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty.

#### NOTES:

1. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.
2. Check latest software/driver release for updates on supported security features.
3. Maximum output power may vary by country according to local regulations.
4. In Power Save Polling mode and on battery power.
5. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

### Summary of Changes

<b>Date of change:</b>	<b>Version History:</b>		<b>Description of change:</b>
August 21	V1	Added	Style and technical specifications,
October 1, 2014	From v1 to v2	Added	Cyberlink Power2Go on supported components: software, Foxit PhantomPDF Express to supported components: software, note to supported components: memory, Optical drives, DVD, BD-XL specs
		Changed	Processor table with corrected turbo specs for E5-1660v3, Declared Noise Emissions section, stable & consistent offerings, system technical specifications: system board, supported components: optical and removable storage, supported components: graphics, Zero-ed out Noise Emissions
		Removed	"Cyberlink MediaSuite" from supported components: software
January 1, 2015	From v2 to v3	Added	HP 256 GB SED Opal 2 SSD, AMD FirePro W7100 GPU, Intel X540 and Ubuntu OS
		Changed	OS Overview Section, Chassis Dimensions, Power Suply note and links
February 1, 2015	From v3 to v4	Added	Windows 8.1 EM, AMD FirePro W5100 4GB specs, HP DX115 notes
		Changed	Internal I/O USB from Overview and System Board sections
		Removed	NVIDIA Tesla K20c Compute Processor from High Performance GPU Computing
March 1, 2015	From v4 to v5	Added	OS Support, RAID Interfaces Support, 600 and 300 GB SAS 15K SFF HDD, 4TB SATA HDD
		Changed	Linux Installer Kit, Hard Drives description notes, ACPI support from BIOS section
April 1, 2015	From v5 to v6	Changed	Hard Drive and Memory Notes from Supported Components section. Memory Speed Supported and Memory Info from System Board section
May 1, 2015	From v6 to v7	Added	Integrated RAID for PCIe SSDs and note to Supported Hard Drive Controllers section
		Changed	Note 1 from Hard Drive Controllers
July 1, 2015	From v7 to v8	Added	1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), NVIDIA Quadro M6000 12GB Graphics, 3Dconnexion CADMouse, HP 2.5in HDD/SSD 2-in-1 ODD Bay Bracket, Notes for Other software
		Changed	HP Optical Bay HDD Mounting Bracket, Notes for the Storage section
		Removed	600GB SAS 15K rpm 6Gb/s 3.5" HDD, 300GB SAS 15K rpm 6Gb/s 3.5" HDD,
August 1, 2015	From v9 to v10	Added	Windows 10 64-bit, SUSE Linux Enterprise Desktop 11 SP3, 12 in OS, Overview; NVIDIA NVS 310 1GB Graphics in Professional 2D; NVIDIA Quadro K420 2GB Graphics in Entry 3D Graphics section.
		Changed	Intel Xeon E5-1603 v3, Intel Xeon E5-1630 v3 to Stable & Consistent Offerings.
		Removed	Windows 8.1 64-bit, Windows 8.1 Emerging Market
September 1, 2015	From v10 to v11	Added	HP 512GB SATA SED SSD in storage, LSI iBBU09 Battery Backup Unit in hard drive controllers
		Changed	SATA SSDs notes
		Removed	Intel Pro 1500 180GB SATA SSD in Storage and supported components
November 1, 2015	From v11 to v12	Added	Storage PCIe notes, HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA Quadro M4000 8GB Graphics, NVIDIA Quadro M5000 8GB Graphics, notes from Other Hardware section;

### Summary of Changes

		Changed	Controller Cards section notes; HP Remote Graphics Software (RGS) 7.1, MS Office Home & Business 2016 from Software section; Windows 8.1 Professional, Windows 10 Pro 64 and Windows 10 Pro downgrade to Windows 7 Professional 64, RHEL v6.6, 7 from Operative Systems section.

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