

### Overview

### HP Z840 Workstation



- |                               |                                                                                     |
|-------------------------------|-------------------------------------------------------------------------------------|
| 1. Slimline Optical Drive Bay | 4. HDD Activity LED                                                                 |
| 2. 2 External 5.25" Bays      | 5. Front I/O: 4 USB 3.0 (Top Port has Charging Capability), 1 Headset, 1 Microphone |
| 3. Power Button               |                                                                                     |

### Overview



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| <p>6. Choice of 850W, 88% or 1125W, 90% Efficient Power Supplies</p> <p>7. 16 DIMM Slots for DDR4 ECC Memory</p> <p>8. 2 External 5.25" Bays</p> <p>9. 4 Internal 3.5" Bays</p> <p>10. Rear I/O:<br/>Rear Power Button<br/>4 USB 3.0<br/>2 USB 2.0<br/>1 Serial<br/>PS/2 keyboard and mouse<br/>2 RJ-45 to integrated Gigabit LAN<br/>1 Audio Line-In (can be retasked as microphone)<br/>1 Audio Line-Out</p> | <p>11. 2 Intel Xeon Processors E5-2600 v3/v4 family</p> <p>12. <ul style="list-style-type: none"> <li>• Slot 1: PCIe Gen3 x4</li> <li>• Slot 2: PCIe Gen3 x16</li> <li>• Slot 3: PCIe Gen3 x8 - Available ONLY when 2nd processor is installed</li> <li>• Slot 4: PCIe Gen3 x16 - Available ONLY when 2nd processor is installed</li> <li>• Slot 5: PCIe Gen2 x4 when 1 CPU is installed. Transforms to PCIe Gen3 x8 when 2nd CPU is installed</li> <li>• Slot 6: PCIe Gen3 x16</li> <li>• Slot 7: PCIe Gen2 x1</li> </ul> </p> <p>13. 6 SATA, 8 SAS Ports</p> <p>14. 2 USB 2.0 Ports, 1 USB 3.0 Port</p> |
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### Overview

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#### Form Factor

Rackable Tower

#### Operating Systems

Preinstalled:

- Windows 10 Pro 64-bit for workstations
- Windows 10 Pro 64 to Windows 7 Professional 64-bit
- Windows 10 Home 64 High-end
- Windows 7 Professional 64-bit
- Windows 8.1 Pro 64-bit OS
- HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 6 & 7, SUSE Linux Enterprise Desktop 11 and Ubuntu 14.04)
- Red Hat Enterprise Linux Desktop (RHEL) Workstation (Paper license with 1 year support; no preinstalled OS)

Supported:

- Windows 8/8.1 Enterprise 64-bit
- Windows 7 Enterprise 64-bit
- Ubuntu 14.04
- Red Hat Enterprise Linux Desktop 6, 7
- SUSE Linux Enterprise Desktop 11 SP3, 12

**NOTES:** For detailed OS/hardware support information for Linux, see:  
[http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

#### Available Processors

Name	Clock Speed (GHz)	Cores	Cache (MB)	Memory Speed (MT/s)	QPI Speed (GT/s)	Hyper Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology <sup>1</sup>	TDP (W)
Intel® Xeon® E5-2643 v3 processor	3.4	6	20	2133	9.6	YES	YES	2/3	135
Intel® Xeon® E5-2630 v3 processor	2.4	8	20	1866	8.0	YES	YES	2/8	85
Intel® Xeon® E5-2620 v3 processor	2.4	6	15	1866	8.0	YES	YES	2/8	85
Intel® Xeon® E5-2699 v4 processor	2.2	22	55	2400	9.6	YES	YES	YES	145
Intel® Xeon® E5-2697 v4 processor	2.3	18	45	2400	9.6	YES	YES	YES	145
Intel® Xeon® E5-2695 v4 processor	2.1	18	45	2400	9.6	YES	YES	YES	120
Intel® Xeon® E5-2687W v4 processor	3.0	12	30	2400	9.6	YES	YES	YES	160
Intel® Xeon® E5-2690 v4 processor	2.6	14	35	2400	9.6	YES	YES	YES	135
Intel® Xeon® E5-2667 v4 processor	3.2	8	25	2400	9.6	YES	YES	YES	135
Intel® Xeon® E5-2683 v4 processor	2.1	16	40	2400	9.6	YES	YES	YES	120
Intel® Xeon® E5-2680 v4 processor	2.4	14	35	2400	9.6	YES	YES	YES	120
Intel® Xeon® E5-2643 v4 processor	3.4	6	20	2400	9.6	YES	YES	YES	135
Intel® Xeon® E5-2660 v4 processor	2.0	14	35	2400	9.6	YES	YES	YES	105

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Intel® Xeon® E5-2650 v4 processor	2.2	12	30	2400	9.6	YES	YES	YES	105
Intel® Xeon® E5-2637 v4 processor	3.5	4	15	2400	9.6	YES	YES	YES	135
Intel® Xeon® E5-2640 v4 processor	2.4	10	25	2133	8.0	YES	YES	YES	90
Intel® Xeon® E5-2630 v4 processor	2.2	10	25	2133	8.0	YES	YES	YES	85
Intel® Xeon® E5-2623 v4 processor	2.6	4	10	2133	8.0	YES	YES	YES	85
Intel® Xeon® E5-2620 v4 processor	2.1	8	20	2133	8.0	YES	YES	YES	85
Intel® Xeon® E5-2609 v4 processor	1.7	8	20	1866	6.4	NO	YES	N/A	85
Intel® Xeon® E5-2603 v4 processor	1.7	6	15	1866	6.4	NO	YES	N/A	85

<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. E5-2687Wv3, E5-2690v3, E5-2695v3, E5-2697v3 and E5-2699v3 REQUIRE the 1125W (1450W at 200V Input Voltage) Power Supply Option.

### 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.

Multicore is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding and/or naming is not a measurement of higher performance.

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

Intel® Xeon® processors E5-2643v3 REQUIRES the 1125W (1450W at 200V Input Voltage) Power Supply Option.

Intel® Xeon® processors E5-2637v4, E5-2643v4, E5-2680v4, E5-2683v4, E5-2667v4, E5-2687Wv4, E5-2690v4, E5-2695v4, E5-2697v4 and E5-2699v4 REQUIRE the 1125W (1450W at 200V Input Voltage) Power Supply Option.

### Form Factor

Tower

### Color

Black /Hematite

### I/O Slots (see system board section for more details)

Slot 1: PCIe Gen3 x4  
 Slot 2: PCIe Gen3 x16  
 Slot 3: Gen3 x8 - Available ONLY when 2nd processor is installed  
 Slot 4: Gen3 x16 - Available ONLY when 2nd processor is installed  
 Slot 5: PCIe Gen2 x4 when 1 CPU is installed. Transforms to PCIe Gen3 x8 when 2nd CPU is installed  
 Slot 6: PCIe Gen3 x16  
 Slot 7: PCIe Gen 2x1

The PCIe x8 connectors are open ended, allowing a PCIe x16 card to be seated in the slot.

### Overview

<b>Bays (see storage section for more details)</b>	Total Bays = 7 4 Internal 3.5" storage bays 2 External 5.25" bays 1 External Slim-line Optical bay
<b>Internal Bays</b>	4 internal 3.5" bays (All 4 include acoustic dampening rail assemblies)
<b>External Bays</b>	2 external 5.25" bays <ul style="list-style-type: none"><li>• Top bay device depth limit: 206mm</li><li>• Bottom bay device depth limit: 206mm</li></ul>
<b>Front I/O</b>	<ul style="list-style-type: none"><li>• 4 USB 3.0</li><li>• 1 Combo Headset</li><li>• 1 Microphone</li></ul>
<b>Rear I/O</b>	<ul style="list-style-type: none"><li>• 4 USB 3.0</li><li>• 2 USB 2.0</li><li>• 1 Serial</li><li>• PS/2 keyboard and mouse</li><li>• 2 RJ-45 to integrated Gigabit LAN</li><li>• 1 Audio Line-In (can be retasked as microphone)</li><li>• 1 Audio Line-Out</li></ul>
<b>Internal USB</b>	<ul style="list-style-type: none"><li>• 2 USB 2.0 ports available with a single 2x5 header.</li><li>• 1 USB 3.0 port available with a shrouded 20-pin connector.</li></ul>

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.

### Chassis Dimensions (H x W x D)

Footprint Dimensions:

H: 17.5" [444.5mm]

W: 8.0" [203.2mm]

D: 20.7" [525.8mm] (measured to the rear of service panel)

Maximum Dimensions:

H: 17.5" [444.5mm]

W: 8.0" [203.2mm]

D: 20.9" [530.9mm] (measured to the embossment for the rear chassis fans)

Rack Dimensions: 5U

### System Weight

Exact weights depend upon configuration.

- Minimum config: 21.1kg (46.7lbs.)
- Typical config: 22.8kg (50.4lbs.)
- Maximum config: 29.2kg (64.3lbs.)

### Temperature

Operating: 5° to 35°C (40° to 95°F)

Non-operating: -40° to 70°C (-40° to 158°F)

### Overview

#### Humidity

Operating: 8% to 85%  
Non-operating: 8% to 90%

Operating: 3,000 m; 10,000 feet  
Non-operating: 9,100 m; 30,000 feet

#### Maximum Altitude (non-pressurized)

Operating: 3,048m (10,000feet)  
Non-operating: 9,100m (30,000feet)

#### Power Supply

Choice of:

- 850W 88% Efficient wide-ranging, active Power Factor Correction
  - 1125W 90% Efficient wide-ranging, active Power Factor Correction
- Includes three 6-pin graphics power cables.

**NOTE:** The 1125W (1450W at 200V Input Voltage) power supply can also supply 1275W of output power when the input voltage is greater than 105V. If the input voltage is less than 105V, but greater than 90V for any reason, the maximum power that can be drawn is 1125W. An uninterruptible power supply (UPS) is highly recommended if 1275W output power is desired.

The 1125W Power Supply can also supply 1450W of output power when the input voltage is greater than 200V under all conditions.

The Z840 power supply efficiency reports can be found at these links:

850W - [http://www.plugloadsolutions.com/psu\\_reports/HEWLETT%20PACKARD\\_719798-001\\_850W\\_ECOS%203882\\_Report.pdf](http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719798-001_850W_ECOS%203882_Report.pdf)

1125W - [http://www.plugloadsolutions.com/psu\\_reports/HEWLETT%20PACKARD\\_719799-001\\_1125W\\_ECOS%203883\\_Report.pdf](http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719799-001_1125W_ECOS%203883_Report.pdf)

#### Interfaces Supported

- 6 channel SATA 6.0 Gb/s interface
- 8-channel 6 Gb SAS interface
  - 8 SAS connectors on the motherboard, SAS ports can be ported externally by using the SAS Bulkhead and/or Back Panel connector Kits
- Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, 5\*, and 10)
- USB 3.0, USB 2.0

**\*NOTE:** Controller card required to support SAS RAID 5

#### Hard Drive Controller Supported

SATA and SAS controllers

#### Workstation ISV Certifications

See the latest list of certifications at <http://www.hp.com/united-states/campaigns/workstations/partnerships.html>

### Supported Components

#### Processors\*

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Z840 Intel® Xeon® E5-2600 v3 Series CPU</b>				
Xeon E5-2620 v3 2.4 1866 6C CPU	Y	Y	J9V75AA	
Xeon E5-2630 v3 2.4 1866 8C CPU	Y	Y	J9Q17AA	
Xeon E5-2643 v3 3.4 2133 6C CPU	Y	Y	J9Q12AA	
<b>Z840 Intel® Xeon® E5-2600 v4 Series CPU</b>				
Z840 Xeon E5-2623 v4 2.6 2133 4C 2ndCPU	Y	Y	T9U30AA	
Z840 Xeon E5-2620 v4 2.1 2133 8C 2ndCPU	Y	Y	T9U29AA	
Z840 Xeon E5-2637 v4 3.5 2400 4C 2ndCPU	Y	Y	T9U32AA	
Z840 Xeon E5-2699 v4 2.2 2400 22C 2ndCPU	Y	Y	T9U44AA	
Z840 Xeon E5-2697 v4 2.3 2400 18C 2ndCPU	Y	Y	T9U43AA	
Z840 Xeon E5-2683 v4 2.1 2400 16C 2ndCPU	Y	Y	T9U39AA	
Z840 Xeon E5-2680 v4 2.4 2400 14C 2ndCPU	Y	Y	T9U38AA	
Z840 Xeon E5-2643 v4 3.4 2400 6C 2ndCPU	Y	Y	T9U34AA	
Z840 Xeon E5-2640 v4 2.4 2133 10C 2ndCPU	Y	Y	T9U33AA	
Z840 Xeon E5-2609 v4 1.7 1866 8C 2ndCPU	Y	Y	T9U28AA	
Z840 Xeon E5-2603 v4 1.7 1866 6C 2ndCPU	Y	Y	T9U27AA	
Z840 Xeon E5-2690 v4 2.6 2400 14C 2ndCPU	Y	Y	T9U41AA	
Z840 Xeon E5-2650 v4 2.2 2400 12C 2ndCPU	Y	Y	T9U35AA	
Z840 Xeon E5-2630 v4 2.2 2133 10C 2ndCPU	Y	Y	T9U31AA	
Z840 Xeon E5-2687W v4 3.0 2400 12C 2ndCPU	Y	Y	T9U40AA	
Z840 Xeon E5-2660 v4 2.0 2400 14C 2ndCPU	Y	Y	T9U36AA	
Z840 Xeon E5-2667 v4 3.2 2400 8C 2ndCPU	Y	Y	T9U37AA	
Z840 Xeon E5-2695 v4 2.1 2400 18C 2ndCPU	Y	Y	T9U42AA	

Intel® Xeon® processors E5-2643v3 REQUIRES the 1125W (1450W at 200V Input Voltage) Power Supply Option.

Intel® Xeon® processors E5-2637v4, E5-2643v4, E5-2680v4, E5-2683v4, E5-2667v4, E5-2687Wv4, E5-2690v4, E5-2695v4, E5-2697v4 and E5-2699v4 require the 1125W (1450W at 200V Input Voltage) Power Supply Option.

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.

#### Monitors / Displays

### Supported Components

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z Display Z27n 27-inch IPS LED Backlit Monitor		Y	K7C09A8#ABA	
HP Z Display Z25n 25-inch IPS LED Backlit Monitor		Y	K7C01A8#ABA	
HP Z Display Z24n 24-inch IPS LED Backlit Monitor		Y	K7B99A8#ABA	
HP Z Display Z24nq 23.8-inch IPS Backlit Monitor		Y	L1K59A8#ABA	
HP Z Display Z24nf 23.8-inch IPS Backlit Monitor		Y	K7C00A8#ABA	
HP Z Display Z23n 23-inch IPS LED Backlit Monitor		Y	M2J79A8#ABA	
HP Z Display Z22n 21.5-inch IPS LED Backlit Monitor		Y	M2J71A8#ABA	
HP DreamColor LP2480zx Professional Display		Y	GV546A8	

### Storage / Hard Drives

#### Sub-Section

#### Description/Notes

**NOTES:** NCQ (Native Command Queuing) not supported in Red Hat Enterprise Linux

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

#### SAS Hard Drives

#### SAS Hard Drives for HP Workstations

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
300GB SAS 15K rpm 6Gb/s 3.5" HDD	Y	Y	LU967AA	
HP 300GB SAS 10K SFF HDD	Y	Y	A2Z20AA	
HP 600GB SAS 10K SFF HDD	Y	Y	A2Z21AA	
HP 1.2TB SAS 10K SFF HDD	Y	Y	E2P04AA	

Up to 5 3.5" SATA drives supported

Up to 5 3.5" SAS drives supported

Up to 8 2.5" (SFF) SAS drives with the High Density Storage Option or

Up to 8 2.5" (SFF) SATA 2.5" drives with the High Density Storage Option

8 port SAS Controller included on the system board

### Supported Components

SATA Hard Drives	SATA Hard Drives for HP Workstations	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	4TB SATA 7200 rpm 6Gb/s 3.5" HDD HDD (Enterprise Class)	Y	Y	K4T76AA	
	3.0TB* SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
	2.0TB* SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
	1TB* SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
	1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	W0R10AA	
	500GB* SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
	500GB* SATA 7.2K SED SFF HDD	Y	N	(not available today as After Market Option)	
	1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	Y	Y	M7S54AA	
	Up to 5 3.5" SATA drives supported				
	Up to 5 3.5" SAS drives supported				
	Up to 8 2.5" (SFF) SAS drives with the High Density Storage Option or Up to 8 2.5" (SFF) SATA 2.5" drives with the High Density Storage Option				
	Up to 5 3.5" SATA drives supported				
	Up to 5 3.5" SAS drives supported				
	Up to 8 2.5" (SFF) SAS drives with the High Density Storage Option or Up to 8 2.5" (SFF) SATA 2.5" drives with the High Density Storage Option				

SATA Solid State Drives	SATA SSDs for HP Workstations	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
	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	
	HP 2TB SATA 6Gb/s SSD	Y	Y	Y6P08AA	
	HP Enterprise Class 240GB SATA SSD	Y	Y	T3U07AA	
	HP Enterprise Class 480GB SATA SSD	Y	Y	T3U08AA	
	HP 256GB* SATA 6Gb/s SED Opal 1 SSD	Y	Y	G7U67AA	Note 1
	HP 512GB SATA SED SSD	Y	Y	N8T26AA	
	<b>NOTE 1:</b> The 256GB Self-Encrypting Drive (SED) version has similar performance to the standard 256GB SSD. It is also available in Opal 1.0 and Opal 2.0 versions				
	Up to 8 SATA SSD drives supported with the High Density Storage Option				

### Supported Components

PCIe Solid State Drives	PCIe SSDs for HP Workstations	Factory	Option	Option	Support
		Configured	Kit	Kit Part Number	
	HP Z Turbo Drive G2 512GB SSD	Y	Y	M1F74AA	
	HP Z Turbo Drive G2 256GB SSD	Y	Y	M1F73AA	
	HP Z Turbo Drive G2 1TB SSD	Y	Y	T9H98AA	
	<b>HP Z Turbo Drive</b>				
	HP Z Turbo Drive G2 256GB SED SSD	Y	Y	Y1T55AA	
	HP Z Turbo Drive G2 1TB TLC SSD	Y	Y	Y1T52AA	
	HP Z Turbo Drive G2 256GB TLC SSD	Y	Y	Y1T46AA	
	HP Z Turbo Drive G2 512GB TLC SSD	Y	Y	Y1T49AA	
	HP Z Turbo Drive Quad Pro 256GB SSD module	Y	Y	N2M00AA	
	HP Z Turbo Drive Quad Pro 512GB SSD module	Y	Y	N2M01AA	
	<b>HP Z Turbo Drive Quad Pro</b>				
	HP Z Turbo Drive Quad Pro 256GB SSD module	Y	Y	N2M00AA	
	HP Z Turbo Drive Quad Pro 512GB SSD module	Y	Y	N2M01AA	
	HP Z Turbo Drive Quad Pro 1TB SSD module	Y	Y	T9J00AA	
	HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	
	HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Y	Y	N2M99AA	
	HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	Y	Y	T9H99AA	
	<b>Intel 750 Series AIC</b>				
	Intel 750 Series AIC 400GB PCIe SSD	Y	Y	Y4A61AV	
	Intel 750 Series AIC 800GB PCIe SSD	Y	Y	Y4A62AV	
	Intel 750 Series AIC 1.2TB PCIe SSD	Y	Y	Y4A63AV	

\*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

### Supported Components

#### HP 4-Bay SAS-SATA 2.5in High Density Storage Kit

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 4-Bay SAS-SATA 2.5in High Density Storage Kit		Y	K5J28AA	

This kit converts two of the native 3.5" HDD bays to enable four SFF (2.5") HDDs or SSDs. Once the kit is installed, it enables independent, tool-free access for these SFF drives. Enterprise class SAS HDDs (15mm) are also supported. Up to two modules are supported in the Z840, which enables up to 8 SFF drives to be added to the internal section of the Z840. HDDs and SSDs are supported with up to 6Gb/s bandwidth.

#### Notes:

For a video installation guide, please see <http://www2.hp.com/index.html>

The installation guide can also be accessed in the Maintenance and Service Guide for your workstation at [http://www.hp.com/support/workstation\\_manuals](http://www.hp.com/support/workstation_manuals)

#### HDD Carrier

#### HP 4-in-1 SFF (2.5 in) HDD Carrier

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP 4-in-1 SFF (2.5 in) HDD Carrier*		Y	B8K60AA	

\* For the Z440, Z640, and Z840, the carrier can be installed in any of the 5.25" ODD bays.

#### Notes:

Additional controllers may be required to support the additional drives located in this carrier.

This kit includes an additional 4 carriers which can be mounted to drives for easy external access and transfer of data between systems.

#### Hard Drive Controllers

Factory integrated RAID on motherboard for SATA drives	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
RAID 0 Configuration - Striped Array	Y	N		Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		Note 2
RAID 1 Configuration - Mirrored Array	Y	N		Note 3
RAID 10 Configuration - Striped/Mirrored Array	Y	N		
RAID 5 Configuration - Parity Array	Y	N		Note 4
HP SAS Back Panel Connector kit	Y	Y		
<i>Must have 4 or fewer SAS hard drives to configure this option</i>				
HP SAS Back Panel Bulkhead Connector Kit	Y	Y		
<i>HP SAS Back Panel Connector kit required. Internal SAS HD drives are not supported</i>				
LSI iBBU09 Battery Backup Unit	Y	Y	E0X19AA	
LSI 9270-8i SAS 6Gb/s ROC RAID Card	Y	Y	E0X21AA	
Integrated LSI SAS 2308 Controller with RAID 0/1/1E/10	Y	N		
Integrated SATA 6.0 Gb/s Controller	Y	N		

### Supported Components

#### Integrated RAID for PCIe SSDs

RAID 0 Data Configuration	Y	N	Not available for Boot RAID Configurations
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**NOTE 1:** Minimum of 2 storage drives needed. All drives must be identical (size/speed/type/bus/functional capabilities). Must have 2, 3 or 4 storage Drives.

**NOTE 2:** Minimum of 3 SATA hard drives needed. All hard drives must be identical (size/speed/type/bus/functional capabilities).

At least 3 HD Drives required. May have 4th and 5th HD Drives. Drives must be the same drive (size/speed/type/functional capability).

**NOTE 3:** 2 storage drives required. All hard drives must be identical (size/speed/type/bus/functional capabilities).

**NOTE 4:** Minimum of 3 storage drives needed. All drives must be identical (size/speed/type/bus/functional capabilities). SAS controller card required to support SAS RAID 5

**NOTE:** SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix) for RAID capabilities with Linux.

LSI RAID Definitions:

IS: Striping of 2 or more HDDs into a single logical volume

IM: Mirroring of 2 HDDs into a single logical volume

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

**NOTE:** Specific user-configured hardware SAS RAID configurations are supported on this Linux system. Please visit: [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix) for details

### Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards
<b>Professional 2D</b>					
NVIDIA NVS 310 1GB Graphics	Y	Y	M6V51AA	Note 1	3
NVIDIA NVS 315 1GB Graphics (for HP Workstations)	Y	Y	E1U66AA	Note 1	4
NVIDIA NVS 510 2GB Graphics	N	Y	C2J98AA	Note 2	2
<b>Entry 3D</b>					
NVIDIA® Quadro® K420 2GB Graphics	Y	Y	N1T07AA		2
NVIDIA® Quadro® K620 2GB Graphics	Y	Y	J3G87AA		2
NVIDIA® Quadro® P600 2GB Graphics	Y	Y	1ME42AA		2
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA		2
<b>Mid-range 3D</b>					
NVIDIA® Quadro® K1200 4GB Graphics	Y	Y	L4D16AA		3
NVIDIA® Quadro® K2200 4GB Graphics	Y	Y	J3G88AA		2
NVIDIA® Quadro® M2000 4GB Graphics	Y	Y	T7T60AA		2
NVIDIA® Quadro® P2000 5GB Graphics	Y	Y	1ME41AA		2

### Supported Components

AMD FirePro W4300 4GB Graphics	Y	Y	T7T58AA	2
AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA	2
Radeon Pro™ WX4100 4GB 1st GFX Graphics	Y	Y	Z0B15AA	1
<b>High End 3D</b>				
NVIDIA® Quadro® M4000 8GB Graphics	Y	Y	M6V52AA	3
NVIDIA® Quadro® M5000 8GB Graphics	Y	Y	M6V53AA	3
NVIDIA® Quadro® M6000 12 GB Graphics	Y	Y	L2K02AA	2
NVIDIA® Quadro® M6000 24GB Graphics	Y	Y	T7T61AA	2
NVIDIA® Quadro® P4000 8GB Graphics	Y	Y	1ME40AA	2
NVIDIA® Quadro® P5000 16GB Graphics	Y	Y	Z0B13AA	3
AMD FirePro W7100 8GB Graphics	Y	Y	J3G93AA	2
Radeon Pro™ WX7100 8GB Graphics*	Y	Y	Z0B14AA	3
<b>Ultra 3D</b>				
NVIDIA® Quadro® GP100 16GB Graphics	Y	Y	1ZE81AA	2
NVIDIA® Quadro® P6000 24GB Graphics	Y	Y	Z0B12AA	2
NVIDIA® Quadro® Sync II	Y	Y	1WT20AA	

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

**NOTE 1:** 3rd and 4th graphics possible by using Option Kits.

**NOTE 2:** NVIDIA NVS 510 graphics available by using Option Kits only.

### Memory

	DDR4-2133 ECC Registered DIMMs	Option Kit Part Number	Support Notes
<b>CTO</b>	16GB DDR4-2133 ECC Registered RAM	J9P83AA	
	8GB DDR4-2133 ECC Registered RAM	J9P82AA	
	<b>DDR4-2400 ECC Registered DIMMs</b>		
	HP 64GB (1x64GB) DDR4-2400 ECC LR RAM	T9V42AA	
	HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM	T9V41AA	
	HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM	T9V39AA	
	HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM	T9V40AA	
	HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM	T9V38AA	

#### NOTES:

For details on the supported memory configurations on the HP Z840 Workstation, please refer to the System Technical Specifications - System Board section of this document.

DIMMs should be equally distributed across all four memory channels for optimal performance.

Each processor supports up to 4 channels of DDR4 memory. To realize full performance at least 1 DIMM must be inserted into each channel.

The CPUs determine the speed at which the memory is clocked. For example, if a 1600MT/s capable CPU is used in the system, the maximum speed the memory will run at is 1600MT/s regardless of the specified speed of the memory.

MT/s = Million Transfers per second

You cannot intermix LR DIMMs with Registered DIMMs. The system will not work.

### Supported Components

The Z840 is designed to work ONLY with DDR4 memory. The system will not work with DDR3 memory. **NOTE:** Factory-configured CTO (xxxxxAV) and aftermarket AMO (xxxxxAA, xxxxxAT) HP memory part numbers designated as "2133"? or "2400"? will be transitioned to using 2666MHz speed memory components. This does not affect HP part number availability nor does it affect system performance or operation. All hardware configurations currently supporting HP memory part numbers designated as "2133"? or "2400"? have been tested to work with 2666MHz memory and are fully-supported by HP under standard support terms.

### Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Thin USB Powered Speakers	N	Y	KK912AA	
Integrated IDT 92HD94 Audio	Y	N	NA	

### Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>HP DX115 Removable Drive Enclosure</b>				
HP DX115 Removable HDD Frame/Carrier	N	Y	FZ576AA	Note 1
HP DX115 Removable HDD Carrier	Y	Y	NB792AA	Note 2
<b>HP 15-in-1 Media Card Reader</b>				
HP 15-in-1 Media Card Reader	Y	Y	F4N90AA	
<b>HP SlimTray Optical Drives</b>				
HP 9.5mm Slim DVD Writer	Y	Y	K3R64AA	
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	Note 3
HP 9.5mm Slim BDXL Blu-Ray Writer	Y	Y	K3R65AA	Note 4

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 DVD drives and players.

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.

**NOTE1:** Z840 support is for two DX115, in both of the 5.25"? ODD bays.

**NOTE 2:** Carrier requires the workstation to have the DX115 frame installed. This part number is for the carrier only.

**NOTE 3:** Not supported as a 2nd Optical Drive

**NOTE 4:** Cannot be ordered in combination with another Blu-ray Writer drive.

### Controller Cards

### Supported Components

	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	

### Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
Intel® Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
Intel® 7260 802.11 a/b/g/n PCIe WLAN NIC	N	Y		
Integrated Intel I210AT PCIe GbE Controller	Y	N		Note 1
Integrated Intel I218LM PCIe GbE Controller	Y	N		Note 1
HP 361T PCIe Dual Port Gigabit NIC	Y	Y	C3N37AA	Note 1
Intel® Ethernet I350-T4 4-port 1Gb NIC	N	Y	W8X25AA	Note 1

**NOTE 1:** "Gigabit" or "GbE" 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
Security Cable with Kensington Lock	N	Y	PC766A	
HP Chassis Intrusion Sensor	Y	N		Standard on all systems
HP Z6/8 Adjustable Rail Rack Kit, Flush Mount	N	Y	B8S55AA	
HP Keyed Cable Lock 10mm	N	Y	T1A62AA	

### Supported Components

#### Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP USB Smart Card Keyboard	Y	Y	ED707AA	
HP 2.4GHz Wireless Keyboard & Mouse	N	Y	NB896AA	
HP SpaceExplorer 3D USB Controller	N	Y	RY429AA	
HP SpacePilot 3D USB Intelligent Controller	N	Y	WH343AA	
HP PS/2 Keyboard	Y	Y	QY774AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
3Dconnexion CAD Mouse	Y	Y	M5C35AA	
HP PS/2 Business Slim Keyboard	Y	Y	N3R86AA	
HP USB Business Slim Keyboard	Y	Y	N3R87AA	
HP Wireless Business Slim Keyboard	Y	Y		
HP USB Hardened Mouse	Y	Y	P1N77AA	

#### Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Internal USB Port Kit	N	Y	EM165AA	Note 1
HP SAS Back Panel Connector Kit	N	Y	EM164AA	
HP eSATA PCI Cable Kit	Y	Y	GM110AA	Note 2
HP Power Cord Kit	Y	N		
HP Workstation Mouse Pad	Y	N		Japan Only
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP ENERGY STAR® Qualified Configuration	Y	N		
HP 4-Bay SAS-SATA 2.5in High Density Storage Kit	Y	Y	K5J28AA	Note 3
Z840 HP Z Cooler	Y	Y	N3R54AA	

**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 with eSATA

**NOTE 3:** The CTO option (J8J30AV) installs two of these kits to create room for 8 2.5" bays.

### Supported Components

#### Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 6.0	Y	Y		Note 2
MS Office Home & Business 2013	Y	N		Note 3
Cyberlink PowerDVD and Power2Go	Y	N		
Foxit PhantomPDF Express	Y	N		

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

**NOTE 2:** Supports Windows 7, Windows 8.1, SLED 11, and RHEL v6.5

**NOTE 3:** Must be selected as a Configure to Order option. Delivered in the form of a "Drop in the Box" CD.

#### Operating Systems

	Support Notes
Windows 10 Pro 64	
Windows 10 Pro downgrade to Windows 7 Professional 64	
Windows 10 Home 64	Note 1
Windows 8.1 Pro 64-bit	
Genuine Windows® 7 Professional 64-bit	
HP Linux Installer Kit	
Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)	Note 2

**NOTE 1:** Windows 10 Home High-End, not supported with dual-processor configurations

**NOTE 2:** 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>	Custom Form Factor, 13" x 14.25" (330.20mm x 361.95mm)
<b>Processor Socket</b>	Dual LGA2011-3
<b>CPU Bus Speed</b>	QPI: Up to 9.6GT/sec, dual link implementation
<b>Chipset</b>	Intel® C612 Chipset
<b>Super I/O Controller</b>	Nuvoton NPCD379H
<b>Memory Expansion Slots</b>	16 slots (8 slots per CPU)
<b>Memory Type Supported</b>	DDR4 R-DIMM (Registered), ECC: 4GB, 8GB, and 16GB DDR4 LR-DIMM (Load Reduced), ECC: 32GB (6 release)
<b>Memory Modes</b>	NUMA (Non-Uniform Memory Architecture), Memory Node Interleave
<b>Memory Speed Supported</b>	1600MT/s, 1866MT/s, and 2133MT/s

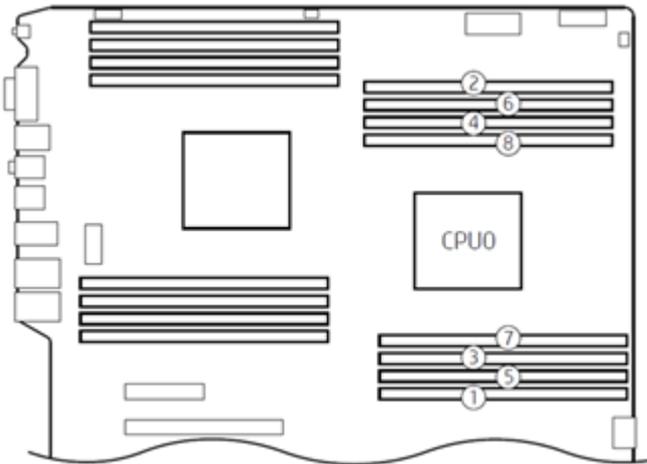
		Single Processor CPU 0								
		Bottom Slots				Top Slots				
Capacity	Notes	DIMM1	DIMM2	DIMM3	DIMM4	DIMM5	DIMM6	DIMM7	DIMM8	Rating
4 GB	*	4 GB								Fair
8 GB		4 GB 8 GB							4 GB	Good Fair
12 GB	~	4 GB		4 GB					4 GB	Better
16 GB		4 GB 8 GB		4 GB			4 GB		4 GB 8 GB	Best Good
32 GB		4 GB 8 GB 16 GB	4GB	4 GB 8 GB	4 GB	4 GB	4 GB 8 GB	4 GB	4 GB 8 GB 16 GB	Best Best Good
48 GB	~	8 GB	4 GB	8 GB	4 GB	4 GB	8 GB	4 GB	8 GB	Best
64 GB		8 GB 16 GB	8 GB	8 GB 16 GB	8 GB	8 GB	8 GB 16 GB	8 GB	8 GB 16 GB	Best Best
96 GB	~	16 GB	8 GB	16 GB	8 GB	8 GB	16 GB	8 GB	16 GB	Best
128 GB		16 GB 32 GB	16 GB	16 GB 32 GB	16 GB	16 GB	16 GB 32 GB	16 GB	16 GB 32 GB	Best Best
256 GB	~	32 GB 64 GB	32 GB	32 GB 64 GB	32 GB	32 GB	32 GB 64 GB	32 GB	32 GB 64 GB	Best Best
512 GB	~ ~	64 GB 128 GB	64 GB	64 GB 128 GB	64 GB	64 GB	64 GB 128 GB	64 GB	64 GB 128 GB	Best Best
1 TB	~	128 GB	128 GB	128 GB	128 GB	128 GB	128 GB	128 GB	128 GB	Best
<b>Slot Load Order</b>		1	5	3	7	8	4	6	2	

### System Technical Specifications

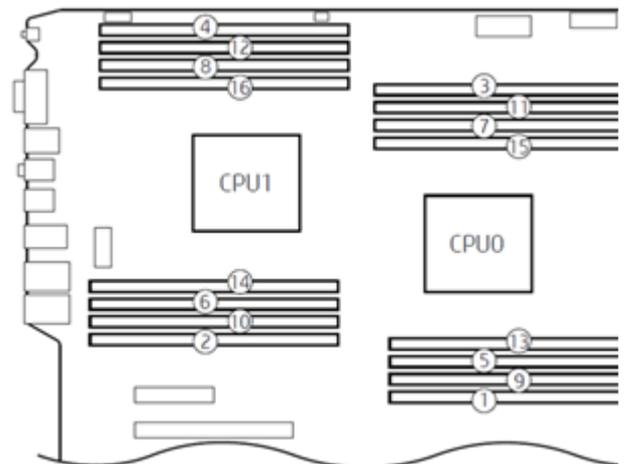
		Dual Processor														
		CPU 0							CPU 1							
		Bottom Slots				Top Slots			Bottom Slots				Top Slots			
Capacity	Notes	DIMM1	DIMM2	DIMM3	DIMM4	DIMM5	DIMM6	DIMM7	DIMM8	DIMM1	DIMM2	DIMM3	DIMM4	DIMM5	DIMM6	DIMM7
8 GB		4 GB								4 GB						
16 GB		4 GB 8 GB							4 GB	4 GB 8 GB						
32 GB		4 GB 8 GB 16 GB		4 GB			4 GB		4 GB 8 GB	4 GB 8 GB 16 GB		4 GB			4 GB	
64 GB		4 GB 8 GB	4 GB	4 GB 8 GB	4 GB	4 GB	4 GB 8 GB	4 GB	4 GB 8 GB	4 GB 8 GB	4 GB	4 GB 8 GB	4 GB	4 GB	4 GB 8 GB	4 GB
96 GB	~	8 GB	4 GB	8 GB	4 GB	4 GB	8 GB	4 GB	8 GB	8 GB	4 GB	8 GB	4 GB	4 GB	8 GB	4 GB
128 GB	~	8 GB 16 GB 32 GB	8 GB	8 GB 16 GB	8 GB	8 GB	8 GB 16 GB	8 GB	8 GB 16 GB 32 GB	8 GB 16 GB 32 GB	8 GB	8 GB 16 GB	8 GB	8 GB	8 GB 16 GB	8 GB
192 GB	~	16 GB 16 GB	8 GB 16 GB	16 GB 16 GB	8 GB	8 GB	16 GB 16 GB	8 GB 16 GB	16 GB 16 GB	16 GB 16 GB	8 GB 16 GB	16 GB 16 GB	8 GB	8 GB	16 GB 16 GB	8 GB 16 GB
256 GB		16 GB 32 GB	16 GB	16 GB 32 GB	16 GB	16 GB	16 GB 32 GB	16 GB	16 GB 32 GB	16 GB 32 GB	16 GB	16 GB 32 GB	16 GB	16 GB	16 GB 32 GB	16 GB
512 GB	~	32 GB 64 GB	32 GB	32 GB 64 GB	32 GB	32 GB	32 GB 64 GB	32 GB	32 GB 64 GB	32 GB 64 GB	32 GB	32 GB 64 GB	32 GB	32 GB	32 GB 64 GB	32 GB
1 TB	~	64 GB 128 GB GB	64 GB	64 GB 128 GB GB	64 GB	64 GB	64 GB 128 GB GB	64 GB	64 GB 128 GB GB	64 GB 128 GB GB	64 GB	64 GB 128 GB GB	64 GB	64 GB	64 GB 128 GB GB	64 GB
<b>Slot Load Order</b>		1	9	5	13	15	7	11	3	2	10	6	14	16	8	12

#### Memory Loading Order:

#### Load Order for Single Processor Configuration



#### Load Order for Dual Processor Configuration



### System Technical Specifications

<b>Maximum Memory</b>	Supports up to 256GB using RDIMMs Supports up to 1024GB using LRDIMMs
<b>Memory Configuration (Supported)</b>	<ul style="list-style-type: none"> <li>• Not all memory configurations possible are represented. Not all memory configurations are supported. Please check Ordering Guide for supported configurations.</li> <li>• Only ECC DIMMs are supported.</li> <li>• RDIMM (Registered) and LR DIMM (Load Reduction) memory cannot be mixed. All memory must be either RDIMM or LR DIMM.</li> <li>• Do not install memory modules into memory slots if corresponding processor is not installed.</li> <li>• Dual processor configurations with memory modules installed for only one processor are not supported.</li> </ul>
<b>Notes</b>	<p>Please refer to the table above for details on how supported memory configurations are installed.</p> <p>* For 32 bit operating systems, there is a memory limit of 4GB.</p> <p>*For systems installed with Microsoft Windows 7 (Ultimate, Enterprise or Pro), the maximum supported memory is 192GB</p> <p>*For systems installed with Microsoft Windows 8.x (Enterprise or Pro), the maximum supported memory is 256GB. Although technically possible, these configurations are not available to order at this time.</p> <p>The Z840 will support up to 512GB at initial release.</p> <p>The Z840 will support up to 1024GB when 64GB DIMM support is added following initial Z840 release.</p> <p>The Z840 will support up to 2048GB when 128GB DIMM support is added following initial Z840 release.</p>
<b>PCI Express Connectors</b>	<p>Two PCIe Gen3 x16 with latch</p> <p>One PCIe Gen3 x16 with latch.</p> <ul style="list-style-type: none"> <li>• Enabled only with optional 2nd CPU is installed.</li> </ul> <p>One PCIe Gen3 x8 open-ended connector.</p> <ul style="list-style-type: none"> <li>• Enabled only with optional 2nd CPU is installed.</li> </ul> <p>One PCIe x8 open-ended connector.</p> <ul style="list-style-type: none"> <li>• Enabled for One PCIe Gen2 x4 slot with 1 CPU</li> <li>• Enabled for One PCIe Gen3 x8 with optional 2nd CPU installed</li> </ul> <p>One PCIe Gen3 x4 open-ended connector.</p> <p>One PCIe Gen2 x1 open-ended connector</p>
<b>Supported Drive Interfaces</b>	<p><b>SATA</b></p> <p>2 SATA @6Gb/s, supports RAID 0,1 and NCQ. 4 sSATA @6Gb/s, Supports RAID 0,1,5,10 and NCQ. Factory integrated RAID is Microsoft Windows 7/8/10</p> <p>External SATA (eSATA)* Supported on all SATA and sSATA ports configured with optional Market Option cable kit * hot plug / hot swap not supported with eSATA</p> <p><b>Serial Attached SCSI</b></p> <p>Integrated 8-channel SAS 6.0Gb/sec controller with 2 SAS ports</p> <p><b>Integrated RAID</b></p> <p>SATA: RAID 0, 1 (Supports one RAID) SATA: RAID 0, 1, 5, 10 (Supports up to 2 RAID5s) SAS: HW RAID 0, 1, 10 (Supports up to 2 RAID5s)</p>

### System Technical Specifications

<b>Integrated Graphics</b>	None
<b>Network Controller</b>	Integrated Intel I218LM  Memory Integrated 3KB receive buffer and 3KB I Data rates supported: 10/100/1000 Mb/s Compliance IEEE 802.1as, 802.1p, 802.1Q, 802.3 802.3x, 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 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s Management capabilities: WOL, auto MDI crossc Advanced cable diagnostics  AMT 9.1 support, vPro compliant
	Integrated I210AT  Adjustable FIFO packet buffer memory up to 24k Data rates supported 10/100/1000 Mb/s Compliance IEEE 802.1as, 802.1q, 802.1Q, 802.3 802.3u, 802.3x, 802.3z  Bus architecture PCIe 1.0 x1 and SMBus Boot ROM support Network transfer rates: 10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s Management capabilities: WOL, auto MDI crossc Advanced cable diagnostics
<b>PCI-X Connectors</b>	None
<b>PCI Card Guide</b>	Yes
<b>Wake on LAN</b>	Yes, both ports
<b>Integrated Trusted Platform Module</b>	Trusted Platform Module (TPM) 1.2 (Infineon SL Certified. Upgradable to TPM 2.0 through Firmw SLB9665). Convertible to FIPS 140-2 Certified m Win 7 32-bit.). When the SLB 9660 is converted mode then it is renamed as SLB 9665. Once con EAL4+ certified.  CG TPM Certified products list: <a href="http://www.trustedcomputinggroup.org/certif">http://www.trustedcomputinggroup.org/certif</a>

### System Technical Specifications

<b>IEEE 1394 Connector(s)</b>	<b>Front</b>	None	
	<b>Rear</b>	None	
	<b>Internal</b>	None	
<b>USB Connector(s)</b>	<b>Front</b>	4 USB 3.0	
	<b>Rear</b>	4 USB 3.0 2 USB 2.0	
	<b>Internal</b>	1 USB 3.0 available with a single 20-pin shrouded USB Media Card reader.	
			2 USB 2.0 port available with one 2x5 header. If USB Port Kit (EM165AA) to provide a single USB uses one half of the 2x5 header. Third party adapters are also available.
<b>HD Integrated Audio</b>		Realtek ALC221	
<b>Flash ROM</b>		Yes	
<b>CPU Fan Header</b>		One header (blind mate) for CPU fans and memory fans	
<b>Chassis Fan Header</b>		One Chassis Fan Header	
<b>Front PCI Fan Header</b>		2 Front PCI Fan Headers	
<b>Front Control Panel/Speaker Header</b>		Yes	
<b>CMOS Battery Holder - Lithium</b>		Yes	
<b>Integrated Trusted Platform Module</b>		Trusted Platform Module (TPM) 1.2 (Infineon SLB 9660). Common Criteria EAL4+ Certified. U Firmware v5.51 upgrade (Infineon SLB9665). Convertible to FIPS 140-2 Certified mode. (TPM bit.). When the SLB 9660 is converted (via Firmware v5.51) to TPM 2.0 mode then it is renamed TPM2.0 the SLB9665 is CC EAL4+ certified.	
		TCG TPM Certified products list: <a href="http://www.trustedcomputinggroup.org/certification/tpm-certified-products/">http://www.trustedcomputinggroup.org/certification/tpm-certified-products/</a>	
<b>Power Supply Headers</b>		Yes	
<b>Power Switch, Power LED &amp; Hard Drive LED Header</b>		Front power switch, front power and hard drive LED. Rear power switch and rear power LED	
<b>Clear Password Jumper</b>		Yes	
<b>Serial Port</b>		Yes, on rear panel	
<b>Parallel Port</b>		No	
<b>Keyboard/Mouse</b>		Yes	
<b>Power Supply</b>		850W 88% Efficient, Custom PSU (Wide-Ranging, Active PFC)	1125W/1275W*/1 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)
<b>Operating Voltage Range</b>		90-269 VAC	90-269 VAC
<b>Rated Voltage Range</b>	100-127 VAC 200-240 VAC	118 VAC	<b>Rated Voltage Range</b>
<b>Rated Line Frequency</b>	50-60 Hz	400 Hz	<b>Rated Line Frequency</b>
<b>Operating Line Frequency Range</b>	47-66 Hz	393-407 Hz	<b>Operating Line Frequency Range</b>
<b>Rated Input Current</b>	11A @ 100-127 VAC 5.5A @ 200-240 VAC	11A @ 118 VAC	<b>Rated Input Current</b>

### System Technical Specifications

<b>Heat Dissipation (Configuration and software dependent)</b>	Typical = 2142 btu/hr (540kg-cal/hr) Max = 3335 btu/hr (840 kg-cal/hr)	Typical = 2773 btu/hr (640kg-cal/hr) Max-1 = 3878 btu/hr (900 kg-cal/hr) Max-2 = 5002 btu/hr (1190 kg-cal/hr) Max-3 = 5624 btu/hr (1300 kg-cal/hr)
<b>Power Supply Fan</b>	(2) 80x25 mm variable speed	(2) 80x25 mm variable speed
<b>ENERGY STAR Qualified</b> (Configuration dependent)	Yes	Yes
<b>Power Supply Efficiency</b>	88% Efficient	90% Efficient

The Z840 850W power supply efficiency report can be found at this link: [plugloadsolutions.com/psu\\_reports/HEWLETT%20PACKARD\\_719798-001\\_850W\\_ECOS%203882\\_Report.pdf](http://plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719798-001_850W_ECOS%203882_Report.pdf)

The Z840 1125W (1450W at 200V Input Voltage) power supply efficiency report can be found at this link: [plugloadsolutions.com/psu\\_reports/HEWLETT%20PACKARD\\_719799-001\\_1125W\\_ECOS%203882\\_Report.pdf](http://plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719799-001_1125W_ECOS%203882_Report.pdf)

<b>FEMP Standby Power Compliant @115V (&lt;2W in S5 - Power Off)</b>	Yes	Yes
<b>EuP Compliant @ 230V (&lt;0.5 W in S5 - Power Off)</b>	Yes	Yes
<b>CECP Compliant @ 220V (&lt;4W in S3 - Suspend to RAM)</b>	Yes; Configuration dependent	Yes; Configuration dependent
<b>Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC)</b>	<23W	<30W
<b>Built-in Self-Test LED</b>	Yes	Yes
<b>Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)</b>	Yes	Yes

\*Input voltage restriction

**NOTE:** The 1125W (1450W at 200V Input Voltage) power supply can also supply 1275W of output power greater than 105V. If the input voltage is less than 105V, but greater than 90V for any reason, the 1125W. An uninterruptible power supply (UPS) is highly recommended if 1275W output power is required.

The 1125W Power Supply can also supply 1450W of output power when the input voltage is greater than 105V.

<b>AUX IN (audio)</b>	No
<b>Clear CMOS Button</b>	Yes
<b>Multibay Header</b>	No
<b>Integrated Gigabit Ethernet</b>	Yes, dual port.
<b>Access Panel Solenoid Lock Header</b>	No
<b>Access Panel Intrusion Sensor Header</b>	Yes, as part of Front UI (Control Panel) cable header
<b>Memory Fan Connector</b>	Yes, blind-mate

### SYSTEM CONFIGURATION

### System Technical Specifications

<b>Example Configuration #1</b>	Processor Info	1x Intel Xeon E5-2609v3 (Six-Core) 85W					
	Memory Info	16GB DDR4-2133 (2x8GB) 1CPU RegRAM					
	Graphics Info	1x NVIDIA® Quadro® K620					
	Disks/Optical/Floppy	1x 500GB SATA 7200 rpm HDD/1x DVD-ROM SATA					
	Power Supply	850W 88% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	103.41 W		102.23 W		103.92 W	
	Windows Busy Typ (S0)	183.75 W		181.88 W		189.37 W	
	Windows Busy Max (S0)	204.93 W		201.28 W		206.74 W	
	Sleep (S3)	3.711 W	3.587 W	3.785 W	3.711 W	3.587 W	3.785 W
	Off (S5)	1.053 W	0.992 W	1.159 W	1.053 W	0.992 W	1.159 W
	Zero Power Mode (ErP)	0.182 W		0.298 W		0.172 W	
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	352.83 btu/hr		348.81 btu/hr		354.58 btu/hr	
	Windows Busy Typ (S0)	626.96 btu/hr		620.57 btu/hr		646.13 btu/hr	
	Windows Busy Max (S0)	699.22 btu/hr		686.77 btu/hr		705.40 btu/hr	
	Sleep (S3)	12.66 btu/hr	12.24 btu/hr	12.91 btu/hr	12.66 btu/hr	12.24 btu/hr	12.91 btu/hr
	Off (S5)	3.59 btu/hr	3.38 btu/hr	3.95 btu/hr	3.59 btu/hr	3.38 btu/hr	3.95 btu/hr
	Zero Power Mode (ErP)	0.621 btu/hr		1.018 btu/hr		0.586 btu/hr	

<b>Example Configuration #2 (ENERGY STAR QUALIFIED)</b>	Processor Info	2x Intel Xeon E5-2640v3 (Eight-Core) 90W					
	Memory Info	32GB DDR4-2133 (8x4GB) 2CPU RegRAM					
	Graphics Info	1x NVIDIA® Quadro® K2200					
	Disks/Optical/Floppy	3x 500GB SATA 7200/1x DVD-ROM SATA					
	Power Supply	1125W (1450W at 200V Input Voltage) 90% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	142.17 W		141.01 W		142.47 W	
	Windows Busy Typ (S0)	324.18 W		320.33 W		323.91 W	
	Windows Busy Max (S0)	398.27 W		396.25 W		398.75 W	
	Sleep (S3)	6.08 W	6.03 W	6.13 W	6.08 W	6.03 W	6.13 W
	Off (S5)	1.04 W	0.99 W	1.10 W	1.04 W	0.99 W	1.10 W
	Zero Power Mode (ErP)	0.181 W		0.308 W		0.172 W	
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	485.08 btu/hr		481.13 btu/hr		486.11 btu/hr	
	Windows Busy Typ (S0)	1106.10 btu/hr		1092.97 btu/hr		1105.18 btu/hr	
	Windows Busy Max (S0)	1358.90 btu/hr		1352.01 btu/hr		1360.54 btu/hr	
	Sleep (S3)	20.75 btu/hr	20.57 btu/hr	20.91 btu/hr	20.75 btu/hr	20.57 btu/hr	20.91 btu/hr
	Off (S5)	3.55 btu/hr	3.38 btu/hr	3.76 btu/hr	3.55 btu/hr	3.38 btu/hr	3.76 btu/hr
	Zero Power Mode (ErP)	0.619 btu/hr		1.051 btu/hr		0.587 btu/hr	

### System Technical Specifications

<b>Example Z840 Configuration #3</b>	Processor Info	2x Intel Xeon E5-2680v3 (12-Core) 120W					
	Memory Info	64GB DDR4-2133 (8x8GB) 2CPU RegRAM					
	Graphics Info	1x NVIDIA® Quadro® K4200					
	Disks/Optical/Floppy	2x 300GB SAS 15K/1x DVDRW SATA					
	Power Supply	1125W (1450W at 200V Input Voltage) 90% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	123.26 W		121.40 W		124.07 W	
	Windows Busy Typ (S0)	413.33 W		393.34 W		412.26 W	
	Windows Busy Max (S0)	496.46 W		483.26 W		498.07 W	
	Sleep (S3)	7.114 W	7.086 W	7.148 W	7.114 W	7.086 W	7.148 W
	Off (S5)	1.054 W	0.993 W	1.161 W	1.054 W	0.993 W	1.161 W
	Zero Power Mode (ErP)	0.181 W		0.307 W		0.177 W	
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	420.56 btu/hr		414.22 btu/hr		423.33 btu/hr	
	Windows Busy Typ (S0)	1410.28 btu/hr		1342.08 btu/hr		1406.63 btu/hr	
	Windows Busy Max (S0)	1693.95 btu/hr		1648.88 btu/hr		1700.10 btu/hr	
	Sleep (S3)	24.27 btu/hr	24.17 btu/hr	24.39 btu/hr	24.27 btu/hr	24.17 btu/hr	24.39 btu/hr
	Off (S5)	3.597 btu/hr	3.388 btu/hr	3.962 btu/hr	3.597 btu/hr	3.388 btu/hr	3.962 btu/hr
	Zero Power Mode (ErP)	0.619 btu/hr		1.049 btu/hr		0.607 btu/hr btu/hr	

<b>Example Z840 Configuration #4</b>	Processor Info	2x Intel Xeon E5-2697v3 (14-Core) 145W					
	Memory Info	64GB DDR4-2133 (16x4GB) 2CPU RegRAM					
	Graphics Info	2x NVIDIA® Quadro® K5200					
	Disks/Optical/Floppy	4x 300GB SAS 15K/1x DVDRW SATA					
	Power Supply	1125W (1450W at 200V Input Voltage) 90% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	141.75 W		140.45 W		141.63 W	
	Windows Busy Typ (S0)	510.66 W		498.90 W		510.82 W	
	Windows Busy Max (S0)	569.34 W		559.38 W		568.48 W	
	Sleep (S3)	6.454 W	3.669 W	6.497 W	6.454 W	3.669 W	6.497 W
	Off (S5)	1.105 W	0.987 W	1.165 W	1.105 W	0.987 W	1.165 W
	Zero Power Mode (ErP)	0.180 W		0.306 W		0.178 W	
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	483.65 btu/hr		497.22 btu/hr		483.24 btu/hr	
	Windows Busy Typ (S0)	1742.37 btu/hr		1702.25 btu/hr		1742.91 btu/hr	
	Windows Busy Max (S0)	1942.29 btu/hr		1908.60 btu/hr		1939.65 btu/hr	
	Sleep (S3)	22.02 btu/hr	21.63 btu/hr	22.16 btu/hr	22.02 btu/hr	21.63 btu/hr	22.16 btu/hr
	Off (S5)	3.77 btu/hr	3.37 btu/hr	3.97 btu/hr	3.77 btu/hr	3.37 btu/hr	3.97 btu/hr
	Zero Power Mode (ErP)	0.616 btu/hr		1.046 btu/hr		0.608 btu/hr	

### System Technical Specifications

<b>Example Configuration #5</b> <b>(ENERGY STAR QUALIFIED)</b>	Processor Info	2x Intel Xeon 2687Wv3 (10-Core) 160W					
	Memory Info	512GB DDR4-2133 (16x32GB) 2CPU LR RAM					
	Graphics Info	2x NVIDIA® Quadro® K6000					
	Disks/Optical/Floppy	6x 300GB 10K SAS SFF/1x DVDRW SATA					
	Power Supply	1125W (1450W at 200V Input Voltage) 90% Custom PSU					
	Other	-					
<b>Energy Consumption</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	On-Idle (ENERGY STAR® Idle (S0))	174.56 W		173.77 W		175.26 W	
	ENERGY STAR® P <sub>MAX</sub> Windows running Linpack and Viewperf	561.98 W		559.23 W		567.75 W	
	ENERGY STAR® "Sleep" (S3)	16.426 W	16.279 W	16.099 W	16.426 W	16.279 W	16.099 W
	ENERGY STAR® "Standby" (Off) (S5)	1.047 W	0.997 W	1.144 W	1.047 W	0.997 W	1.144 W
<b>Heat Dissipation**</b> <b>(Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	On-Idle (ENERGY STAR® Idle (S0))	595.60 btu/hr		592.90 btu/hr		597.99 btu/hr	
	ENERGY STAR® P <sub>MAX</sub> Windows running Linpack and Viewperf	1917.48 btu/hr		1908.09 btu/hr		1937.16 btu/hr	
	ENERGY STAR® "Sleep" (S3)	56.046 btu/hr	55.545 btu/hr	54.935 btu/hr	56.046 btu/hr	55.545 btu/hr	54.935 btu/hr

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

<b>System Configuration</b> <b>(Entry level)</b>	<b>Processor Info</b>	1x Intel Xeon E5-2609v3 2.4GHz CPU
	<b>Memory Info</b>	2x 8GB DDR4-2133 RDIMM
	<b>Graphics Info</b>	1x NVIDIA® Quadro® K620
	<b>Disks/Optical/Floppy</b>	1x Seagate 500GB 6Gb/s 7200 RPM HDD 1x SATA DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (LWAd, bels)	Desl
<b>Idle</b>	4.3	
<b>Hard drive Operating</b> (random reads)	4.3	
<b>DVD-ROM Operating</b> (sequential reads)	4.6	

### System Technical Specifications

<b>System Configuration (High-end)</b>	<b>Processor Info</b>	2x Intel Xeon 2687Wv3 (10-Core) 160W
	<b>Memory Info</b>	16x 32GB DDR4-2133 RDMIM
	<b>Graphics Info</b>	2x NVIDIA® Quadro® K6000 Graphics Cards
	<b>Disks/Optical/Floppy</b>	4x Seagate 300GB 10K SFF HDDs 1x Blue-ray DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)	Sound Power (LWAd, bels)	Deskside Sound Pressure (LpAm, decibels)
<b>Idle</b>	4.3	23
<b>Hard drive Operating</b> (random reads)	4.3	26
<b>DVD-ROM Operating</b> (sequential reads)	4.5	29

### Environmental Data

<b>Environmental Requirements</b>	<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% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	<b>Maximum Altitude</b>	Operating: 3,000 m (10,000 feet) Non-operating: 9,100 m (30,000 feet)
	<b>Dynamic (new)</b>	Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105g) square: 422 cm/s, 20g <b>NOTE:</b> Values represent individual shock events and do not indicate repetitive shock events.
		Vibration Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025 g <sup>2</sup> /Hz Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g <sup>2</sup> /Hz <b>NOTE:</b> Values do not indicate continuous vibration.
	<b>Cooling</b>	Above 1524 m (5000 ft.) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1000 ft.) elevation increase

### Physical Security and Serviceability

<b>Access Panel</b>	Tool-less Includes system board and memory information
<b>Optical Drive</b>	Tool-less, no carrier or rails required

### System Technical Specifications

<b>Hard Drives</b>	Tool-less
<b>Expansion Cards</b>	Tool-less
<b>Processor Socket</b>	Tool-less
<b>Green User Touch Points</b>	Yes, on tool-free internal chassis components
<b>Color-coordinated Cables and Connectors</b>	Yes
<b>Memory</b>	Tool-less
<b>System Board</b>	Tool-less, retained by Front PCI Card Guide
<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
<b>Restore CD/DVD Set</b>	Restores the computer to its original factory shipping image - Can be obtained via HP Support
<b>Dual Function Front Power Switch</b>	Yes, causes a fail-safe power off when held for 4 seconds
<b>Padlock Support</b>	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>	No
<b>Rear Port Control Cover</b>	No
<b>Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control</b>	Yes
<b>Removable Media Write/Boot Control</b>	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
<b>Power-On Password Setup Password</b>	Yes, prevents an unauthorized person from booting up the workstation
<b>3.3V Aux Power LED on System PCA</b>	Yes, prevents an unauthorized person from changing the workstation configuration
<b>NIC LEDs (integrated) (Green &amp; Amber)</b>	No
<b>CPUs and Heatsinks</b>	A torx driver (T15) is needed to remove the CPU heatsink(s) before the CPU can be removed. CPU removal is tool-less
<b>Power Supply Diagnostic LED</b>	Yes
<b>Front Power Button</b>	Yes
<b>Front Power LED</b>	Yes, white (normal), red (fault)
<b>Front Hard Drive Activity LED</b>	Yes, white
<b>Front ODD Activity LED</b>	Yes
<b>Internal Speaker</b>	Yes
<b>System/Emergency ROM Flash Recovery</b>	Recovers corrupted system BIOS

### System Technical Specifications

<b>Cooling Solutions</b>	Air cooled forced convection
<b>Power Supply Fans</b>	2x - 80mm x 25mm
<b>CPU Heatsink Fan</b>	92 x 25mm 5-wire PWM for each CPU
<b>Chassis Fan</b>	Rear: 2x - 92mm x 25mm Front (850W config): 1x - 92mm x 25mm (upper position) Front (1125W (1450W at 200V Input Voltage) config): 2x - 92mm x 25mm
<b>Memory Heatsink Fan</b>	3x - 75 x 90 x 35mm memory blowers 80 x 25 mm 4-wire PW fan
<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>
<b>Access Panel Key Lock</b>	Yes, prevents removal of the access panel and all internal components including optical and floppy drives
<b>ACPI-Ready Hardware</b>	<p>Advanced Configuration and Power Management Interface (ACPI).</p> <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
<b>Integrated Chassis Handles</b>	Yes, front and rear
<b>Power Supply</b>	Tool-less, direct-connect (blind-mate)
<b>PCIe Card Retention</b>	Yes, rear (all), middle (full-height cards), front (full-length with extender cards)
<b>Flash ROM</b>	Yes. SPI ROM
<b>Diagnostic Power Switch LED on board</b>	Yes
<b>Clear Password Jumper</b>	Yes
<b>Clear CMOS Button</b>	Yes
<b>CMOS Battery Holder</b>	Yes
<b>DIMM Connectors</b>	Yes

### System Technical Specifications

#### BIOS

<b>BIOS 32-bit Services</b>	Standard BIOS 32-Bit Service Directory Proposal v0.4. BIOS supports 32 and 64-bit Operating systems.
<b>PCI 3.0 Support</b>	Full BIOS support for PCI Express through industry standard interfaces.
<b>ATAPI</b>	ATAPI Removable Media Device BIOS Specification Version 1.0.
<b>BBS</b>	BIOS Boot Specification v1.01
<b>WMI Support</b>	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
<b>BIOS Boot Spec 1.01+</b>	Provides more control over how and from what devices the workstation will boot.
<b>BIOS Power On</b>	Users can define a specific date and time for the system to power on.
<b>ROM Based Computer Setup Utility (F10)</b>	Review and customize system settings controlled by the BIOS.
<b>System/Emergency ROM Flash Recovery with Video Replicated Setup</b>	Recovers system BIOS in corrupted Flash ROM.  Saves BIOS settings to diskette or USB flash drive in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 setup).
<b>SMBIOS</b>	System Management BIOS 2.7, for system management information
<b>Boot Control</b>	Disables the ability to boot from removable media on supported devices.
<b>Memory Change Alert</b>	Alerts management console if memory is removed or changed.
<b>Thermal Alert</b>	Monitors the temperature state within the chassis. Three modes: - NORMAL - normal temperature ranges. - ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. - SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
<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 wake from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 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.

### System Technical Specifications

<b>System board revision level</b>	Allows management SW to read the revision level of the system board Revision level is digitally encoded into the HW and cannot be modified.
<b>Start-up Diagnostics (Power-on Self-Test)</b>	Assesses system health at boot time with selectable levels of testing.
<b>Auto Setup when new hardware installed</b>	System automatically detects addition of new hardware.
<b>Keyboard-less Operation</b>	The system can be booted without a keyboard.
<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.
<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.
<b>Industry Standard Specification Support</b>	
<b>Industry Standard UEFI Specification Revision</b>	Revision Supported by the BIOS 2.3.1
<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>	- Enhanced Disk Drive Specification Version 1.1 - BIOS Enhanced Disk Drive Specification Version 3.0
<b>EHCI</b>	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
<b>PCI</b>	- PCI Local Bus Specification, Revision 2.3 - PCI Power Management Specification, Revision 1.1 - PCI Firmware Specification, Revision 3.0, Draft .7
<b>PCI Express</b>	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
<b>PMM</b>	POST Memory Manager Specification, Version 1.01
<b>SATA</b>	Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
<b>SPD</b>	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
<b>TPM</b>	Trusted Platform Module (TPM) 1.2 (Infineon SLB 9660). Common Criteria EAL4+ Certified. Upgradable to TPM 2.0 through Firmware v5.51 upgrade (Infineon SLB9665). Convertible to FIPS 140-2 Certified mode. (TPM 2.0 is not available for Win 7 32-bit.). When the SLB 9660 is converted (via Firmware v5.51) to TPM 2.0 mode then it is renamed as SLB 9665. Once converted to TPM2.0 the SLB9665 is CC EAL4+ certified.  TCG TPM Certified products list: <a href="http://www.trustedcomputinggroup.org/certification/tpm-certified-products/">http://www.trustedcomputinggroup.org/certification/tpm-certified-products/</a>
<b>UHCI</b>	Universal Host Controller Interface Design Guide, Revision 1.1
<b>USB</b>	Universal Serial Bus Revision 1.1 Specification  Universal Serial Bus Revision 2.0 Specification  Universal Serial Bus Revision 3.0 Specification
<b>SMBIOS</b>	System Management BIOS Reference Specification, Version 2.7 <a href="http://h20464.www2.hp.com/index.html">External BIOS Simulator found at: http://h20464.www2.hp.com/index.html</a>

### System Technical Specifications

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>

HP Inc. is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.

### Low Halogen Statement

This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: 3 ½" SAS HDDs, LSI 9260-8i SAS 6Gb/s ROC RAID Card, Creative Recon3D PCIe Audio Card, Liquid Cooling Solution and Broadcom 5761 Gigabit PCIe NIC are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.

### End-of-Life Management and Recycling

HP Inc. 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.

### HP Inc. Corporate Environmental Information

For more information about HP's commitment to the environment:  
Global Citizenship Report <http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html>

Eco-label certifications  
<http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html>

ISO 14001 certificates:  
<http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html>

### Additional Information

- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.
- Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- This product is >90% recycle-able when properly disposed of at end of life.
- EPEAT Gold registered in the United States. See <http://www.epeat.net> for registration status in your country. EPEAT® registered where applicable. EPEAT registration varies by country. See <http://www.epeat.net> for registration status by country. Search keyword *generator* on HP's 3<sup>rd</sup> party option store for solar energy accessory at <http://www.hp.com/go/options>

### 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

### System Technical Specifications

#### Environment

- Does not contain ozone-depleting substances (ODS)
- Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed
- Maximizes the use of post-consumer recycled content materials in packaging materials
- All packaging material is recyclable
- All packaging material is designed for ease of disassembly
- Reduced size and weight of packages to improve transportation fuel efficiency
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting

#### Packaging Materials

##### Internal

Cushions and plastic bags made of low density polyethylene (LDPE).

##### External

Outer carton, accessories carton, and insert made of corrugated paper board.

## Manageability

#### Industry Standard Specifications

This product meets the following industry standard specifications for manageability functionality:

- DASH 1.1 (via Intel LAN on motherboard)

#### Intel Active Management Technology (AMT)

Intel® Active Management Technology (AMT) 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)
- 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

### System Technical Specifications

**Intel® vPro™ Technology** The HP Z840 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® C610 chipset
- Intel® I218LM GbE LAN

**Remote Manageability Software Solutions** The HP Z840 Workstation is supported on the following remote manageability software consoles:

- LANDesk Management Suite (HP recommended solution)
- Microsoft System Center Configuration Manager
- HP Client Automation Enterprise

For questions or support for manageability needs, please visit <http://www.hp.com/go/easydeploy>

**System Software Manager** For questions or support for SSM, please visit: <http://www.hp.com/go/ssm>

**Service, Support, and Warranty** On-site Warranty and Service (**Note 1**): Three-years, limited warranty and service offering delivers on-site, next business-day (**Note 2**) service for parts and labor and includes free telephone support (**Note 3**) 8am - 5pm. Global coverage (**Note 2**) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.

**NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply.

**NOTE 2:** On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.

**NOTE 3:** Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.

HP Care Pack Services are extended service contracts that go beyond the standard limited 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. HP services are governed by the applicable HP terms and conditions of service provided or indicated to Customer at the time of purchase. Customer may have additional statutory rights according to applicable local laws, and such rights are not in any way affected by the HP terms and conditions of service or the HP Limited Warranty provided with your HP Product.

**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

#### Global Series SKUs

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section.

HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers-no special programs, no additional cost-no kidding. Simply select your hardware and software components when you customize your HP Workstation and be assured that you'll be able to buy that same configuration throughout the lifecycle of the product.

#### Processors

Product #	Offering
J6F75AV	Intel Xeon E5-2620v3 2.4 1866 6C 1stCPU
J6F73AV	Intel Xeon E5-2630v3 2.4 1866 8C 1stCPU
J6F71AV	Intel Xeon E5-2637v3 3.5 2133 4C 1stCPU
J6F94AV	Intel Xeon E5-2620v3 2.4 1866 6C 2ndCPU
J6F92AV	Intel Xeon E5-2630v3 2.4 1866 8C 2ndCPU
J6F90AV	Intel Xeon E5-2637v3 3.5 2133 4C 2ndCPU

#### Hard Drives

Product #	Offering
J3K71AV	500GB 7200 RPM SATA 1st HDD
J3K72AV	1TB 7200 RPM SATA 1st HDD
J3K92AV	500GB 7200 RPM SATA 2nd HDD
J3K93AV	1TB 7200 RPM SATA 2nd HDD
J3L13AV	500GB 7200 RPM SATA 3rd HDD
J3L14AV	1TB 7200 RPM SATA 3rd HDD
J3L36AV	500GB 7200 RPM SATA 4th HDD
J3L37AV	1TB 7200 RPM SATA 4th HDD
J3L54AV	500GB 7200 RPM SATA 5th HDD
J3L55AV	1TB 7200 RPM SATA 5th HDD

#### Graphics

Product #	Offering
J1Q20AV	NVIDIA® Quadro® K2200 4GB 1st GFX
J1Q24AV	AMD FirePro W2100 2GB 1st GFX
J1Q30AV	NVIDIA® Quadro® K620 2GB 2nd GFX
J1Q31AV	NVIDIA® Quadro® K2200 4GB 2nd GFX
J1Q35AV	AMD FirePro W2100 2GB 2nd GFX
J1Q38AV	NVIDIA® Quadro® K2200 4GB 3rd GFX

#### Memory\*

Product #	Offering
G8X58AV	8GB DDR4-2133 (1x8GB) 1CPU RegRAM

### Stable & Consistent Offerings

G8X61AV	16GB DDR4-2133 (2x8GB) 1CPU RegRAM
G8X63AV	32GB DDR4-2133 (4x8GB) 1CPU RegRAM
G8X64AV	64GB DDR4-2133 (8x8GB) 1CPU RegRAM
G8X74AV	32GB DDR4-2133 (4x8GB) 2CPU RegRAM
G8X77AV	64GB DDR4-2133 (8x8GB) 2CPU RegRAM
G8X78AV	128GB DDR4-2133 (16x8GB) 2CPU RegRAM
G8X65AV	64GB DDR4-2133 (4x16GB) 1CPU RegRAM
G8X66AV	128GB DDR4-2133 (8x16GB) 1CPU RegRAM
G8X79AV	128GB DDR4-2133 (8x16GB) 2CPU RegRAM
G8X80AV	256GB DDR4-2133 (16x16GB) 2CPU RegRAM

### Input Devices

Product #	Offering
G8U76AV	HP USB Keyboard
G8U87AV	HP USB Optical Mouse

\*Factory-configured CTO (xxxxxAV) and aftermarket AMO (xxxxxAA, xxxxxAT) HP memory part numbers designated as "2133"? or "2400"? will be transitioned to using 2666MHz speed memory components. This does not affect HP part number availability nor does it affect system performance or operation. All hardware configurations currently supporting HP memory part numbers designated as "2133"? or "2400"? have been tested to work with 2666MHz memory and are fully-supported by HP under standard support terms.

### Technical Specifications - Processors

## Processors

Xeon E5-2603 v3 1.6 1600 6C CPU	J9V77AA
Xeon E5-2609 v3 1.9 1600 6C CPU	J9V76AA
Xeon E5-2620 v3 2.4 1866 6C CPU	J9V75AA
Xeon E5-2623 v3 3.0 1866 4C CPU	J9Q18AA
Xeon E5-2630 v3 2.4 1866 8C CPU	J9Q17AA
Xeon E5-2640 v3 2.6 1866 8C CPU	J9Q16AA
Xeon E5-2637 v3 3.5 2133 4C CPU	J9Q15AA
Xeon E5-2650 v3 2.3 2133 10C CPU	J9Q14AA
Xeon E5-2660 v3 2.6 2133 10C CPU	J9Q13AA
Xeon E5-2643 v3 3.4 2133 6C CPU	J9Q12AA
Xeon E5-2670 v3 2.3 2133 12C CPU	J9Q11AA
Xeon E5-2680 v3 2.5 2133 12C CPU	J9Q10AA
Xeon E5-2683 v3 2.0 2133 14C CPU	J9Q09AA
Xeon E5-2667 v3 3.2 2133 8C CPU	J9Q08AA
Xeon E5-2690 v3 2.6 2133 12C CPU	J9Q07AA
Xeon E5-2687Wv3 3.1 2133 10C CPU	J9Q06AA
Xeon E5-2695 v3 2.3 2133 14C CPU	J9Q05AA
Xeon E5-2697 v3 2.6 2133 14C CPU	J9Q04AA
Xeon E5-2699 v3 2.3 2133 18C CPU	J9Q03AA

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### Technical Specifications – Storage Hard Drives

#### Hard Drives

<b>HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations</b>	<b>300GB SAS 15K rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>	300GB	
		<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>	SAS	
		<b>Synchronous Transfer Rate (Maximum)</b>	6Gb/s	
		<b>Buffer</b>	16MB	
		<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Single Track</b>	0.2 ms
			<b>Average</b>	3.4 ms
			<b>Full Stroke</b>	6.6 ms
		<b>Rotational Speed</b>	15,000 rpm	
		<b>Operating Temperature</b>	50° to 95° F (10° to 35° 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>			<b>Media Diameter</b>
<b>Interface</b>	12Gb/s SAS			
<b>Synchronous Transfer Rate (Maximum)</b>	up to 1200 MB/s (SAS single port)			
<b>Cache</b>	128MB			
<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<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 15K SFF HDD</b>			<b>Capacity</b>
		<b>Height</b>	5.9 in; 15 cm	
		<b>Width</b>	<b>Media Diameter</b>	2.5 in; 6.36 cm
		<b>Interface</b>	12Gb/s SAS	
		<b>Synchronous Transfer Rate (Maximum)</b>	up to 1200 MB/s (SAS single port)	
		<b>Cache</b>	128MB	
		<b>Seek Time (typical reads, includes controller overhead, including settling)</b>	<b>Average</b>	<b>2.0ms</b>

### Technical Specifications – Storage Hard Drives

	<b>Rotational Speed</b>	15K rpm	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
<b>HP 300GB SAS 10K SFF 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 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	64MB	
	<b>Cache</b>	multi-segmentable cache buffer	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	0.4 ms (max)
		<b>Average</b>	3.6 ms
		<b>Full Stroke</b>	7.3 ms
	<b>Rotational Speed</b>	10,000 rpm	
	<b>Logical Blocks</b>	585,937,500	
	<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)	
<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	
	<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)	

### Technical Specifications – Storage Hard Drives

<b>HP 1.2TB SAS 10K SFF HDD</b>	<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>Seek Time (typical reads, includes controller overhead, including settling)</b>		<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)	

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

	<b>1TB SATA 7200 rpm 6Gb/s 3.5" HDD</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>	Serial ATA (6Gb/s)	
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600 MB/s	
		<b>Buffer</b>	64MB	

### Technical Specifications – Storage Hard Drives

	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	1.2ms (typical)
		<b>Average</b>	11ms
		<b>Full Stroke</b>	21ms (typical)
	<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>		2.0TB
	<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 in; 10.17 cm
	<b>Interface</b>		Serial ATA (6.0 Gb/s), NCQ Enabled
	<b>Synchronous Transfer Rate</b> (Maximum)		Up to 600 MB/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</b> (Maximum)		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>		7,200 rpm
	<b>Operating Temperature</b>		41° to 140° F (5° to 60° C)

### Technical Specifications – Storage Hard Drives

<b>1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)</b>	<b>Capacity</b>	1TB	
	<b>Protocol</b>	SATA	
	<b>Form Factor</b>	3.5"	
	<b>Controller</b>	AHCI	
	<b>Reliability (MTBF)</b>	2.0M hours	
	<b>Rated Power On Hours</b>	8760/yr	
	<b>Annualized Failure Rate (based on Rated POH)</b>	<0.62%	
	<b>Rated for 24/7/365 operation</b>	YES	
	<b>Physical Size (Height)</b>	1 in; 2.54 cm	
	<b>Physical Size (Width)</b>	4 in; 10.17 cm	
	<b>Media Diameter</b>	3.5 in; 8.9 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</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	0.32ms
		<b>Average</b>	7.45ms
		<b>Full Stroke</b>	14.2ms
	<b>Operating Temperature</b>	41° to 140° F (5° to 60° C)	
	<b>Performance</b>	<b>Sequential Read</b>	up to 226MB/s
		<b>Sequential Write</b>	up to 226MB/s
<b>Enterprise Class Features</b>	High Reliability		
<b>4TB SATA 7200 rpm 6Gb/s 3.5" HDD HDD (Enterprise Class)</b>	<b>Capacity</b>	4TB	
	<b>Height</b>	1 in; 2.54 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), NCQ enabled	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Buffer</b>	128MB	
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<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>	41° to 131° F (5° to 55° C)	

### Technical Specifications – Storage Hard Drives

<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>Protocol</b>	SATA	
	<b>Form Factor</b>	2.5"	
	<b>Controller</b>	AHCI	
	<b>NAND Type</b>	MLC	
	<b>Endurance</b>	100TBW (TB Written)	
	<b>Reliability (MTTF)</b>	1.5M hours	
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm	
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm	
	<b>Interface</b>	SATA 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 550MB/s (Sequential Read)	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	

### Technical Specifications – Storage Hard Drives

	<b>Performance</b>		<b>Sequential Read</b>	560 MB/s
			<b>Sequential Write</b>	400 MB/s
			<b>Random Read</b>	90K IOPS
			<b>Random Write</b>	88K IOPS
<b>HP 256GB SATA 6Gb/s SSD</b>	<b>Capacity</b>	256GB		
	<b>Protocol</b>	SATA		
	<b>Form Factor</b>	2.5"		
	<b>Controller</b>	AHCI		
	<b>NAND Type</b>	MLC		
	<b>Endurance</b>	200TBW (TB Written)		
	<b>Reliability (MTTF)</b>	1.5M hours		
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm		
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm		
	<b>Interface</b>	SATA 6Gb/s		
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s		
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)		
	<b>Performance</b>		<b>Sequential Read</b>	560MB/s (max)
			<b>Sequential Write</b>	510MB/s (max)
			<b>Random Read</b>	100K IOPS (max)
			<b>Random Write</b>	88K IOPS (max)
<b>HP 256GB SATA 6Gb/s SED Opal 1 SSD</b>	<b>Capacity</b>	256GB		
	<b>Protocol</b>	SATA		
	<b>Form Factor</b>	2.5"		
	<b>Controller</b>	AHCI		
	<b>NAND Type</b>	MLC		
	<b>Endurance</b>	200TBW (TB Written)		
	<b>Reliability (MTTF)</b>	1.5M hours		
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm		
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm		
	<b>Interface</b>	6Gb/s SATA		
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 550MB/s (Sequential Read)		
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)		
	<b>Performance</b>		<b>Sequential Read</b>	560MB/s
			<b>Sequential Write</b>	510 MB/s
			<b>Random Read</b>	100K IOPS
			<b>Random Write</b>	88K IOPS
	<b>Self-Encrypting Drive Support</b>	OPAL 1		

### Technical Specifications – Storage Hard Drives

<b>HP 512GB SATA 6Gb/s SSD</b>	<b>Capacity</b>	512GB		
	<b>Protocol</b>	SATA		
	<b>Form Factor</b>	2.5"		
	<b>Controller</b>	AHCI		
	<b>NAND Type</b>	MLC		
	<b>Endurance</b>	300TBW (TB Written)		
	<b>Reliability (MTTF)</b>	1.5M hours		
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm		
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm		
	<b>Interface</b>	SATA 6Gb/s		
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 550MB/s (Sequential Read)		
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)		
		<b>Performance</b>	<b>Sequential Read</b>	560 MB/s
			<b>Sequential Write</b>	510 MB/s
			<b>Random Read</b>	100K IOPS
	<b>Random Write</b>	88K IOPS		
<b>HP 512GB SATA SED SSD</b>	<b>Capacity</b>	512GB		
	<b>Protocol</b>	SATA		
	<b>Form Factor</b>	2.5"		
	<b>Controller</b>	AHCI		
	<b>NAND Type</b>	MLC		
	<b>Endurance</b>	300TBW (TB Written)		
	<b>Reliability (MTTF)</b>	1.5M hours		
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm		
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm		
	<b>Interface</b>	SATA 6Gb/s		
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s		
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)		
		<b>Performance</b>	<b>Sequential Read</b>	560 MB/s
			<b>Sequential Write</b>	510 MB/s
			<b>Random Read</b>	100K IOPS
	<b>Random Write</b>	88K IOPS		
<b>Self-Encrypting Drive Support</b>	OPAL 1 and 2			

### Technical Specifications – Storage Hard Drives

<b>HP 1TB SATA 6Gb/s SSD</b>	<b>Capacity</b>	1TB	
	<b>Protocol</b>	SATA	
	<b>Form Factor</b>	2.5"	
	<b>Controller</b>	AHCI	
	<b>NAND Type</b>	MLC	
	<b>Endurance</b>	400TBW (TB Written)	
	<b>Reliability (MTTF)</b>	1.5M hours	
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm	
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm	
	<b>Interface</b>	SATA 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 550MB/s (Sequential Read)	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	560 MB/s
		<b>Sequential Write</b>	510 MB/s
<b>Random Read</b>		100K IOPS	
<b>Random Write</b>		88K IOPS	

<b>HP 2TB SATA 6Gb/s SSD</b>	<b>Capacity</b>	2TB	
	<b>Protocol</b>	SATA	
	<b>Form Factor</b>	2.5"	
	<b>Controller</b>	AHCI	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	400TBW (TB Written)	
	<b>Reliability (MTTF)</b>	1.5M hours	
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm	
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm	
	<b>Interface</b>	SATA 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 550MB/s (Sequential Read)	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	530 MB/s
		<b>Sequential Write</b>	500 MB/s
<b>Random Read</b>		92K IOPS	
<b>Random Write</b>		83K IOPS	

### Technical Specifications – Storage Hard Drives

<b>HP Enterprise Class 240GB SATA SSD</b>	<b>Capacity</b>	240GB	
	<b>Protocol</b>	SATA	
	<b>Form Factor</b>	2.5"	
	<b>Controller</b>	AHCI	
	<b>NAND Type</b>	MLC	
	<b>Endurance</b>	920TBW (TB Written)	
	<b>Reliability (MTTF)</b>	2.0M hours	
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm	
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm	
	<b>Interface</b>	6Gb/s SATA	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	420 MB/s
		<b>Sequential Write</b>	290 MB/s
		<b>Random Read</b>	63K IOPS
		<b>Random Write</b>	18K IOPS
<b>Enterprise Class Features</b>	High Endurance NAND Power Loss Protection End-to-End Data Protection		

<b>HP Enterprise Class 480GB SATA SSD</b>	<b>Capacity</b>	480GB	
	<b>Protocol</b>	SATA	
	<b>Form Factor</b>	2.5"	
	<b>Controller</b>	AHCI	
	<b>NAND Type</b>	MLC	
	<b>Endurance</b>	1850TBW (TB Written)	
	<b>Reliability (MTTF)</b>	2.0M hours	
	<b>Physical Size (Height)</b>	0.28 in; 0.7 cm	
	<b>Physical Size (Width)</b>	2.5 in; 6.36 cm	
	<b>Interface</b>	6Gb/s SATA	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	420 MB/s
		<b>Sequential Write</b>	380 MB/s
		<b>Random Read</b>	63K IOPS
		<b>Random Write</b>	23K IOPS
<b>Enterprise Class Features</b>	High Endurance NAND Power Loss Protection End-to-End Data Protection		

### Technical Specifications – Storage Hard Drives

<b>PCIe SSDs for HP Workstations</b>	<b>HP Z Turbo Drive G2 256GB SSD</b>	<b>Capacity</b>	256GB	
		<b>Protocol</b>	PCIe	
		<b>Form Factor</b>	Half-height, half-length	
		<b>Controller</b>	NVMe	
		<b>NAND Type</b>	MLC	
		<b>Endurance</b>	146TB	
		<b>Reliability (MTBF)</b>	1.5M hours	
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
		<b>Performance</b>		
			<b>Sequential Read</b>	2150 MB/s
			<b>Sequential Write</b>	1260 MB/s
			<b>Random Read</b>	300K IOPS
	<b>Random Write</b>	100K IOPS		
	<b>HP Z Turbo Drive G2 512GB SSD</b>	<b>Capacity</b>	512GB	
		<b>Protocol</b>	PCIe	
		<b>Form Factor</b>	Half-height, half-length	
		<b>Controller</b>	NVMe	
		<b>NAND Type</b>	MLC	
		<b>Endurance</b>	292TB	
		<b>Reliability (MTBF)</b>	1.5M hours	
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
		<b>Performance</b>		
			<b>Sequential Read</b>	2150 MB/s
			<b>Sequential Write</b>	1550 MB/s
			<b>Random Read</b>	300K IOPS
	<b>Random Write</b>	100K IOPS		
	<b>HP Z Turbo Drive G2 1TB SSD</b>	<b>Capacity</b>	1TB	
		<b>Protocol</b>	PCIe	
		<b>Form Factor</b>	Half-height, half-length	
		<b>Controller</b>	NVMe	
		<b>NAND Type</b>	MLC	
		<b>Endurance</b>	600TB	
		<b>Reliability (MTTF)</b>	1.5M hours	
		<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
		<b>Performance</b>		
			<b>Sequential Read</b>	2500 MB/s
			<b>Sequential Write</b>	1550 MB/s
			<b>Random Read</b>	210K IOPS
	<b>Random Write</b>	130K IOPS		

### Technical Specifications – Storage Hard Drives

<b>HP Z Turbo Drive G2 256GB TLC SSD</b>	<b>Capacity</b>	256GB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2 in Half-height, half-length card	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	75TBW (TB Written)	
	<b>Reliability (MTBF)</b>	1.5M hours	
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	2800 MB/s
		<b>Sequential Write</b>	320 MB/s (1100 MB/s max/Turbo)
		<b>Random Read</b>	250K IOPS
		<b>Random Write</b>	180K IOPS
<b>HP Z Turbo Drive G2 512GB TLC SSD</b>	<b>Capacity</b>	512GB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2 in Half-height, half-length card	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	150TBW (TB Written)	
	<b>Reliability (MTBF)</b>	1.5M hours	
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	2800 MB/s
		<b>Sequential Write</b>	660 MB/s (1600 MB/s max/Turbo)
		<b>Random Read</b>	260K IOPS
		<b>Random Write</b>	260K IOPS

### Technical Specifications – Storage Hard Drives

<b>HP Z Turbo Drive G2 1TB SSD</b>	<b>Capacity</b>	1TB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	M.2 in Half-height, half-length card
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	3D TLC
	<b>Endurance</b>	300TBW (TB Written)
	<b>Reliability (MTTF)</b>	1.5M hours
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>Performance</b>	<b>Sequential Read</b> 3000 MB/s
		<b>Sequential Write</b> 1150 MB/s (1700 MB/s max/Turbo)
		<b>Random Read</b> 360K IOPS
	<b>Random Write</b> 330K IOPS	

<b>HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD</b>	<b>Capacity</b>	512GB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	PCIe Card, Full Height PCIe Slot
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	MLC
	<b>Endurance</b>	146TB
	<b>Reliability (MTTF)</b>	1.5M hours
	<b>Interface</b>	PCIe Gen3 x4 architecture
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>Performance</b>	<b>Sequential Read</b> 2150 MB/s
		<b>Sequential Write</b> 1260 MB/s
		<b>Random Read</b> 300K IOPS
	<b>Random Write</b> 100K IOPS	

### Technical Specifications – Storage Hard Drives

<b>HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD</b>	<b>Capacity</b>	1TB								
	<b>Protocol</b>	PCIe								
	<b>Form Factor</b>	PCIe Card, Full Height PCIe Slot								
	<b>Controller</b>	NVMe								
	<b>NAND Type</b>	MLC								
	<b>Endurance</b>	292TB								
	<b>Reliability (MTTF)</b>	1.5M hours								
	<b>Interface</b>	PCIe Gen3 x4 architecture								
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>2150 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>1550 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>300K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>100K IOPS</td> </tr> </table>	<b>Sequential Read</b>	2150 MB/s	<b>Sequential Write</b>	1550 MB/s	<b>Random Read</b>	300K IOPS	<b>Random Write</b>	100K IOPS
	<b>Sequential Read</b>	2150 MB/s								
<b>Sequential Write</b>	1550 MB/s									
<b>Random Read</b>	300K IOPS									
<b>Random Write</b>	100K IOPS									

<b>HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD</b>	<b>Capacity</b>	2TB								
	<b>Protocol</b>	PCIe								
	<b>Form Factor</b>	PCIe Card, Full Height PCIe Slot								
	<b>Controller</b>	NVMe								
	<b>NAND Type</b>	MLC								
	<b>Endurance</b>	600TB								
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical								
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>3200 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>1800 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>430K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>320K IOPS</td> </tr> </table>	<b>Sequential Read</b>	3200 MB/s	<b>Sequential Write</b>	1800 MB/s	<b>Random Read</b>	430K IOPS	<b>Random Write</b>	320K IOPS
	<b>Sequential Read</b>	3200 MB/s								
	<b>Sequential Write</b>	1800 MB/s								
<b>Random Read</b>	430K IOPS									
<b>Random Write</b>	320K IOPS									

<b>HP Z Turbo Drive G2 256GB TLC SSD</b>	<b>Capacity</b>	256GB								
	<b>Protocol</b>	PCIe								
	<b>Form Factor</b>	M.2 in Half-height, half-length card								
	<b>Controller</b>	NVMe								
	<b>NAND Type</b>	3D TLC								
	<b>Endurance</b>	75TBW (TB Written)								
	<b>Reliability (MTBF)</b>	1.5M hours								
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical								
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)								
	<b>Performance</b>	<table> <tr> <td><b>Sequential Read</b></td> <td>2800 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>320 MB/s (1100 MB/s max/Turbo)</td> </tr> <tr> <td><b>Random Read</b></td> <td>250K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>180K IOPS</td> </tr> </table>	<b>Sequential Read</b>	2800 MB/s	<b>Sequential Write</b>	320 MB/s (1100 MB/s max/Turbo)	<b>Random Read</b>	250K IOPS	<b>Random Write</b>	180K IOPS
	<b>Sequential Read</b>	2800 MB/s								
<b>Sequential Write</b>	320 MB/s (1100 MB/s max/Turbo)									
<b>Random Read</b>	250K IOPS									
<b>Random Write</b>	180K IOPS									

### Technical Specifications – Storage Hard Drives

<b>HP Z Turbo Drive G2 512GB TLC SSD</b>	<b>Capacity</b>	512GB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2 in Half-height, half-length card	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	150TBW (TB Written)	
	<b>Reliability (MTBF)</b>	1.5M hours	
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	2800 MB/s
		<b>Sequential Write</b>	660 MB/s (1600 MB/s max/Turbo)
		<b>Random Read</b>	260K IOPS
		<b>Random Write</b>	260K IOPS
<b>HP Z Turbo Drive G2 1TB TLC SSD</b>	<b>Capacity</b>	1TB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	M.2 in Half-height, half-length card	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	3D TLC	
	<b>Endurance</b>	300TBW (TB Written)	
	<b>Reliability (MTBF)</b>	1.5M hours	
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	3000 MB/s
		<b>Sequential Write</b>	1150 MB/s (1700 MB/s max/Turbo)
		<b>Random Read</b>	360K IOPS
		<b>Random Write</b>	330K IOPS

### Technical Specifications – Storage Hard Drives

<b>HP Z Turbo Drive G2 256GB SED SSD</b>	<b>Capacity</b>	256GB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	Half-height, half-length	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	MLC	
	<b>Endurance</b>	150TBW (TB Written)	
	<b>Reliability (MTTF)</b>	1.5M hours	
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	3100 MB/s
		<b>Sequential Write</b>	1400 MB/s
		<b>Random Read</b>	330K IOPS
		<b>Random Write</b>	280K IOPS
	<b>Self-Encrypting Drive Support</b>	OPAL 2	
<b>HP Z Turbo Drive G2 512GB SED SSD</b>	<b>Capacity</b>	512GB	
	<b>Protocol</b>	PCIe	
	<b>Form Factor</b>	Half-height, half-length	
	<b>Controller</b>	NVMe	
	<b>NAND Type</b>	MLC	
	<b>Endurance</b>	300TBW (TB Written)	
	<b>Reliability (MTBF)</b>	1.5M hours	
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
	<b>Performance</b>	<b>Sequential Read</b>	3200 MB/s
		<b>Sequential Write</b>	1700 MB/s
		<b>Random Read</b>	330K IOPS
		<b>Random Write</b>	300K IOPS
	<b>Self-Encrypting Drive Support</b>	OPAL 2	

### Technical Specifications – Storage Hard Drives

<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)

<b>HP Z Turbo Drive Quad Pro 1TB SSD module</b>	<b>Capacity</b>	1TB (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>Intel 750 Series AIC PCIe SSD</b>	<b>Intel 750 Series AIC 400GB PCIe SSD</b>	<b>Capacity</b>	400GB	
		<b>Protocol</b>	PCIe	
		<b>Form Factor</b>	PCIe Card, Half Height	
		<b>Controller</b>	NVMe	
		<b>NAND Type</b>	MLC	
		<b>Endurance</b>	127TBW (TB Written)	
		<b>Reliability (MTBF)</b>	1.2M hours	
		<b>Operating Temperature</b>	32° to 131° F (0° to 55° C)	
		<b>Performance</b>	<b>Sequential Read</b>	2200 MB/s
			<b>Sequential Write</b>	900 MB/s
			<b>Random Read</b>	430K IOPS
			<b>Random Write</b>	230K IOPS

	<b>Intel 750 Series AIC 800GB PCIe SSD</b>	<b>Capacity</b>	800GB	
		<b>Protocol</b>	PCIe	
		<b>Form Factor</b>	PCIe Card, Half Height	
		<b>Controller</b>	NVMe	
		<b>NAND Type</b>	MLC	
		<b>Endurance</b>	127TBW (TB Written)	
		<b>Reliability (MTBF)</b>	1.2M hours	
		<b>Operating Temperature</b>	32° to 131° F (0° to 55° C)	
		<b>Performance</b>	<b>Sequential Read</b>	2100 MB/s
			<b>Sequential Write</b>	800 MB/s
			<b>Random Read</b>	420K IOPS
			<b>Random Write</b>	210K IOPS

### Technical Specifications – Storage Hard Drives

<b>Intel 750 Series AIC 1.2TB PCIe SSD</b>	<b>Capacity</b>	1.2TB
	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	PCIe Card, Half Height
	<b>Controller</b>	NVMe
	<b>NAND Type</b>	MLC
	<b>Endurance</b>	127TBW (TB Written)
	<b>Reliability (MTBF)</b>	1.2M hours
	<b>Operating Temperature</b>	1.2TB
	<b>Performance</b>	<b>Sequential Read</b> 2500 MB/s
		<b>Sequential Write</b> 1200 MB/s
	<b>Random Read</b> 460K IOPS	
	<b>Random Write</b> 290K IOPS	

<b>HDD Carrier</b>	<b>HP 4-in-1 SFF (2.5in) HDD Carrier</b>	<b>Dimensions (L x W x H)</b>	6.70 x 5.75 x 1.63 in
		<b>Kit Contents</b>	Drive Carrier, Drive trays (4), Power adapter
		<b>Weight</b>	1.77 lbs

### Technical Specifications - Hard Drive Controllers

<b>LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit</b>	<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 Note: HP Workstations do not support this many internal drives.
	<b>LED Indicators</b>	Heartbeat LED on card

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## Graphics

<b>NVIDIA NVS 310 1GB 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: 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: - 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
	<b>Display Output</b>	A full range of video resolutions are supported including 1080p, 1 NVS 310 GPU provides hardware acceleration for the computation processing, as well as provides improved video playback speeds v Up to 2 displays in the following configurations:  DisplayPort output: <ul style="list-style-type: none"><li>• Drives two DisplayPort enabled digital display at resolution reduced blanking, when connected natively using the 2 DisplayPort 1.2 multi stream topology technology.</li><li>• Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz using DisplayPort to DVI-D single-link cable adaptors</li></ul> DVI-D output: <ul style="list-style-type: none"><li>• Drives two digital display at resolutions up to 1920 × 1200 using DisplayPort to DVI-D single-link cable adaptors</li><li>• Drives two digital display at resolutions up to 2560× 1600 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) pane 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</li></ul>

### Technical Specifications – Graphics

	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 driver is available on the HP driver 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="http://download.nvidia.com/novell">http://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. The thermal solution used on this card is an active fan heat sink.</li> <li>2. Factory configured NVS 310 graphics card have no cable adaptor ordered separately.</li> <li>3. Option kit NVS 310 includes 2 DP to DVI-D cable adaptors.</li> <li>4. Configurations of three NVS 310 graphics cards in HP Z440 Fan and Front Card Guide Kit, configurable from the factory Aftermarket Option (AMO PN: J9P80AA).</li> </ol>

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<b>NVIDIA NVS 315 512MB Graphics</b>	<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) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink
	<b>Bus Type</b>	PCI Express x16, 2.0 compliant
	<b>Memory</b>	Size: 1GB DDR3 Clock: 875MHz Memory Bandwidth: 14GB/s
	<b>Connectors</b>	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
	<b>Maximum Resolution</b>	Maximum number of displays supported: 2  Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
	<b>Image Quality Features</b>	See Display Output section.  The following video formats are supported: - MPEG2

### Technical Specifications – Graphics

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

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

#### Display Output

Up to 2 displays using one of the following DMS-59 cables:

- DMS-59 to DVI
- DMS-59 to VGA
- DMS-59 to DP

DisplayPort output:

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

DVI-D output:

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

VGA display output:

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

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

DX11, OpenGL 4.3

#### Available Graphics Drivers

Windows 8  
Microsoft Windows 7 Professional (64-bit and 32-bit)  
Microsoft Windows XP Professional (64-bit and 32-bit)  
Red Hat Enterprise Linux(RHEL)  
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

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

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

SUSE Linux Enterprise drivers may also be obtained from:

<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

#### NOTES:

1. The thermal solution used on this card is an active fan heatsink.
2. Factory configured graphics card includes DMS-59 to DVI cable.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

## Technical Specifications – Graphics

<b>NVIDIA NVS 510 2GB Graphics</b>	<b>Form Factor</b>	Low Profile, 2.713 inches × 6.3 inches, single slot
	<b>Graphics Controller</b>	NVS 510 GPU Core Clock: 797 MHz Memory Clock: 891 MHz CUDA Cores: 192
	<b>Bus Type</b>	PCI Express x16, Generation 2.0
	<b>Memory</b>	2GB DDR3
	<b>Connectors</b>	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)
	<b>Maximum Resolution</b>	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz)
		<b>NOTE:</b> This card supports up to four displays. For Windows XP, only 2 active displays are supported.
	<b>Image Quality Features</b>	10-bit internal display processing, including hardware support for 10-bit scan-out
	<b>Display Output</b>	DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.  Digital Display Support  1. DisplayPort Output <ul style="list-style-type: none"><li>• Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card.</li><li>• DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking.</li></ul> 2. DVI-D Output <ul style="list-style-type: none"><li>• 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.</li><li>• 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.</li></ul> HDMI Output <ul style="list-style-type: none"><li>• 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.</li></ul> Analog Display Support  1. VGA display output <ul style="list-style-type: none"><li>• Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.</li></ul>

### Technical Specifications – Graphics

**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>

**NOTE:** Heatsink cooler design is active.

#### Graphics Cable Adapters

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 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)

### Technical Specifications – Graphics

	<p>Single-link DVI</p> <ul style="list-style-type: none"> <li>- 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li> </ul>
	<p>DisplayPort 1.2</p> <ul style="list-style-type: none"> <li>- 3840 × 2160 × 30 bpp at 60 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>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>	<p>DX11, OpenGL 4.4</p> <p>Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran</p>
<b>Available Graphics Drivers</b>	<p>Microsoft Windows 8.1</p> <p>Microsoft Windows 8</p> <p>Microsoft Windows 7</p> <p>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p>
<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>	<p>2.713"? H x 6.3"? L</p> <p>Single Slot, Low Profile</p> <p>Full Height Profile bracket installed</p> <p>Low Profile bracket included</p> <p>Weight: 133 grams</p>
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### Technical Specifications – Graphics

<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
<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
<b>Image Quality Features</b>	Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz 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: 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:  
<http://welcome.hp.com/country/us/en/support.html>

1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.

### Technical Specifications – Graphics

<b>NVIDIA® Quadro® P600 2GB Graphics</b>	<b>Form Factor</b>	Dimensions: 2.713"? H x 5.7"? L Single Slot, Low Profile Cooling: Active Weight: 129 grams
	<b>Graphics Controller</b>	NVIDIA® Quadro® P600 Graphics Card GP107-850 GPU 384 CUDA cores Max Power: 40 Watts
	<b>Bus Type</b>	PCI Express 3.0 x16
	<b>Memory</b>	Size: 2 GB GDDR5, 2000 MHz Memory Interface: 128-bit Memory Bandwidth: 64 GB/s
	<b>Connectors</b>	4mDP Outputs*
	<b>Maximum Resolution</b>	DisplayPort 1.4: - up to 4x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST)
	<b>Image Quality Features</b>	10-bit internal display processing pipeline 10-bit scan-out support
	<b>Display Output</b>	4 mDP Connectors
	<b>Shading Architecture</b>	Full Microsoft DirectX 12 Shader Model 5.1
	<b>Supported Graphics APIs</b>	OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL
	<b>Available Graphics Drivers</b>	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 7 Linux
	<b>Notes</b>	<p>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></p> <p>*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports. <b>Note 1:</b> Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles. <b>Note 2:</b> AMO kits for P400, P600, P1000 and Adapters will ship in July 2017.</p> <ul style="list-style-type: none"> <li>• Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits.</li> <li>• If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> <li>- 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables</li> <li>- 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables</li> </ul> </li> </ul>

### Technical Specifications – Graphics

<b>AMD FirePro W4300 4GB Graphics</b>	<b>Form Factor</b>	Low Profile, single slot (6.6" x 3.118") Full Height, single slot (6.6" x 4.725")
	<b>Graphics Controller</b>	AMD FirePro W4300 graphics GPU Frequency: 930Mhz Memory Clock Speed: 1500Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <50 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 Mini 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, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	<b>Maximum Resolution</b>	DisplayPort: - 4096x2160 @24bpp (3 x 4K @ 60Hz, 4 x 4K @ 30Hz)
	<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 Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows GPU control of display refresh rates for tear-free and jitter-free image quality when rotating models or viewing video content.(Requires FreeSync compliant displays)
	<b>Display Output</b>	Max number of monitors supported using DisplayPort 1.2a: <ul style="list-style-type: none"> <li>• 4 direct attached monitors</li> <li>• 6 using DP 1.2a with MST and HBR2 enabled monitors</li> </ul> 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): <ul style="list-style-type: none"> <li>• one 4096x2160 display</li> <li>• two 2560x1600 displays</li> <li>• four 1920x1200 displays</li> </ul>
	<b>Shading Architecture</b>	Shader Model 5.0
	<b>Supported Graphics APIs</b>	OpenGL 4.4 OpenCL 2.0 DirectX 12.0
	<b>Available Graphics Drivers</b>	Windows 10 (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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>

### Technical Specifications – Graphics

#### 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.
2. Configurations of two FirePro W4300 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).

#### AMD FirePro W2100 2GB Graphics

#### Form Factor

Low Profile, half length (full-height bracket included)

#### Graphics Controller

AMD FirePro™ W2100 professional graphics based on Oland GPU.  
GPU: 320 Stream Processors organized into 5 Compute Units  
GPU Frequency: 630MHz  
Power: 35W  
Cooling: Active

#### Bus Type

PCI Express® x8, Generation 3.0

#### Memory

2GB DDR3 memory  
Memory Bandwidth: 28.8 GB/s  
Memory Width: 128bit

#### Connectors

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.

#### Maximum Resolution

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

#### 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

2 x DisplayPort® 1.2  
Maximum number of displays: 2

#### Shading Architecture

Shader Model 5.0

### Technical Specifications – Graphics

<b>Supported Graphics APIs</b>	OpenCL™ 2.0, DirectX® 11.2/12 and OpenGL 4.4
<b>Available Graphics Drivers</b>	Windows 8.1 (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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>

**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 <http://www.amd.com/firepro> for details

<b>NVIDIA® Quadro® K1200 4GB Graphics</b>	<b>Form Factor</b>	Dimensions: 2.71" H x 6.875" L Single Slot, Low Profile Cooling: Active Weight: ~175 grams
	<b>Graphics Controller</b>	NVIDIA® Quadro® K1200 Graphics Card GPU: GM107 with 512 CUDA cores Power: 46 Watts
	<b>Bus Type</b>	PCI Express 2.0 x16
	<b>Memory</b>	Size: 4GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
	<b>Connectors</b>	4 mini-DisplayPort 1.2a  Factory Configured Option: 4 mini-DP-to-DP adapters included with card Option Kit: 4 mini-DP-to-DP adapters included with card  Additional 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)  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

### Technical Specifications – Graphics

<b>Image Quality Features</b>	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)
<b>Display Output</b>	<p>Maximum number of displays</p> <ul style="list-style-type: none"> <li>- 4 direct attached 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> </ul> <p>Maximum number of monitors across all available Quadro K1200 outputs is 4.</p>
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	<p>OpenGL 4.4</p> <p>DirectX 11.1</p> <p>API support includes:</p> <p>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
<b>Available Graphics Drivers</b>	<p>Microsoft Windows 8.1</p> <p>Microsoft Windows 8</p> <p>Microsoft Windows 7</p> <p>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site:</p> <p><a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a></p>
<b>Notes</b>	<ol style="list-style-type: none"> <li>1. Quadro K1200 offered as Factory Configured Option includes 4 miniDP to DP video cable adapters. Other video cable adapters must be ordered separately.</li> <li>2. Quadro K1200 offered as an Option Kit includes 4 mini-DP to DP adapters. Additional cables must be ordered separately.</li> <li>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 (displays must support MST and HBR2).</li> </ol>

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<b>NVIDIA® Quadro® K2200 4GB Graphics</b>	<b>Form Factor</b>	Dimensions: 4.38" H x 7.97" L Single Slot, Full Height Cooling: Active
	<b>Weight:</b>	240 grams
	<b>Graphics Controller</b>	NVIDIA® Quadro® K2200 Graphics Card GM107 GPU with 640 CUDA cores Power: 68 Watts
	<b>Bus Type</b>	PCI Express 2.0 x16

### Technical Specifications – Graphics

<b>Memory</b>	Size: 4 GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
<b>Connectors</b>	1 DL-DVI(I) 2 DisplayPort 1.2a  Factory Configured Option: 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 accessories  DisplayPort: - up to 4096 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  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
<b>Image Quality Features</b>	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)  Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo
<b>Display Output</b>	Maximum number of displays - 3 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 - 2 4096x2160  Maximum number of monitors across all available Quadro K2200 outputs is 4.
<b>Shading Architecture</b>	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

### Technical Specifications – Graphics

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>

1. Quadro K2200 offered as Factory Configured Option does not 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 (displays must support MST and HBR2).

#### NVIDIA® Quadro® M2000 4GB Graphics

##### Form Factor

Dimensions: 4.376" H x 6.6"? L  
Single Slot, Full Height  
Cooling: Active  
Weight: 239 grams

##### Graphics Controller

NVIDIA® Quadro® M2000 Graphics Card  
GPU: GM206 with 768 CUDA cores  
Power: 75 Watts

##### Bus Type

PCI Express 3.0 x16

##### Memory

Size: 4GB GDDR5  
Memory Bandwidth: 105.7 GB/s  
Memory Width: 128-bit

##### Connectors

4x DisplayPort 1.2a

Factory Configured Option: No video cable adapter included  
After Market Option: No video cable adapter included

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

##### Maximum Resolution

DisplayPort:  
- up to 4096 x 2160 x 30 bpp @ 60Hz  
- up to 2560 x 1600 x 30 bpp @ 120 Hz  
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

Using two DP outputs, the M2000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.

### Technical Specifications – Graphics

<b>Image Quality Features</b>	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)  Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo
<b>Display Output</b>	Maximum number of displays - 4 direct attached monitors  Maximum number of monitors across all available Quadro M2000 outputs is 4.
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.5 DirectX 12  API support includes: CUDA C, CUDA C++, DirectCompute 5.0, and OpenCL software
<b>Available Graphics Drivers</b>	Microsoft Windows 10 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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
<b>Notes</b>	<ol style="list-style-type: none"> <li>1. Quadro M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.</li> <li>2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.</li> </ol>

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#### NVIDIA Quadro P2000 5GB Graphics Form Factor

Dimensions: 4.4"?Hx7.9"?L  
Single Slot  
Cooling: Active  
Weight: 260 grams

#### Graphics Controller

NVIDIA Quadro P2000 Graphics Card  
Power: 75 Watts

#### Bus Type

PCI Express 3.0 x16

#### Memory

Size: 5GB GDDR5  
Memory Bandwidth: 140 GB/s  
Memory Width: 160-bit

### Technical Specifications – Graphics

<b>Connectors</b>	<p>4x DisplayPort 1.4</p> <p>Factory Configured Option: No adapter included with card After Market Option: No video cable adapter included</p> <p>Additional DVI to VGA, DisplayPort™ to VGA, DisplayPort™ to DVI, and DisplayPort™ to Dual-Link DVI adapters available as accessories.</p>
<b>Maximum Resolution</b>	<p>DisplayPort:</p> <ul style="list-style-type: none"><li>- up to 5120 x 2880 x 24 bpp @ 60Hz</li><li>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DP 1.3 &amp; 1.4 ready.</li></ul> <p>DL-DVI(I) output:</p> <ul style="list-style-type: none"><li>- up to 2560 x 1600 x 32 bpp @ 60 Hz</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>HDMI 2.0 (requires DP to HDMI adapter):</p> <ul style="list-style-type: none"><li>5120 x 2880 x 24 bpp @ 60Hz</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>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, NVIDIA® Mosaic and nView.</p>
<b>Display Output</b>	<p>Maximum number of displays</p> <ul style="list-style-type: none"><li>- 4 direct attached monitors</li></ul> <p>Maximum number of monitors across all available Quadro P2000 outputs is 4.</p>
<b>Shading Architecture</b>	<p>Shader Model 5.1</p>
<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 software</p>
<b>Available Graphics Drivers</b>	<p>Microsoft Windows 10 Microsoft Windows 7 Professional 64bit Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>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></p>

### Technical Specifications – Graphics

#### Notes

1. Quadro P2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro P2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

#### AMD FirePro W4300 4GB Graphics

#### Form Factor

Low Profile, single slot (6.6" x 3.118")  
Full Height, single slot (6.6" x 4.725")

#### Graphics Controller

AMD FirePro W4300 graphics  
GPU Frequency: 930Mhz  
Memory Clock Speed: 1500Mhz  
GPU: 768 Stream Processors organized into 12 Compute Units  
Power: <50 Watts  
Cooling: Active

#### Bus Type

PCI Express® x16, Generation 3.0

#### Memory

4GB GDDR5 memory  
Memory Bandwidth: up to 96 GB/s  
Memory Width: 128 bit

#### Connectors

4x Mini 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, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.

#### Maximum Resolution

DisplayPort:  
- 4096x2160 @24bpp (3 x 4K @ 60Hz, 4 x 4K @ 30Hz)

#### 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  
Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows GPU control of display refresh rates for tear-free and jitter-free image quality when rotating models or viewing video content.(Requires FreeSync compliant displays)

#### 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

### Technical Specifications – Graphics

<b>Supported Graphics APIs</b>	OpenGL 4.4 OpenCL 2.0 DirectX 12.0
<b>Available Graphics Drivers</b>	Windows 10 (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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
<b>Notes</b>	<ol style="list-style-type: none"> <li>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 <a href="http://www.amd.com/eyefinityfaq">www.amd.com/eyefinityfaq</a> for full details.</li> <li>Configurations of two FirePro W4300 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).</li> </ol>

<b>AMD FirePro W5100 4GB Graphics</b>	<p><b>Form Factor</b> Full height, single slot (6.75" X 4.376")</p> <p><b>Graphics Controller</b> AMD FirePro W5100 graphics GPU Frequency: 930Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: &lt;75 Watts Cooling: Active</p> <p><b>Bus Type</b> PCI Express® x16, Generation 3.0</p> <p><b>Memory</b> 4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit</p> <p><b>Connectors</b> 4x Display Port 1.2 connectors with HBR2 and MST support.</p> <p>Factory Configured: No video cable adapter included After market option kit: No video cable adapter included</p> <p>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.</p> <p><b>Maximum Resolution</b> DisplayPort: - 4096x2160 @24bpp 60Hz</p> <p>Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter)</p>
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### Technical Specifications – Graphics

	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 - four 1920x1200 displays
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
<b>Available Graphics Drivers</b>	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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>

#### 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 <http://www.amd.com/eyefinityfaq> for full details.
2. Configurations of two FirePro W5100 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).

### Technical Specifications – Graphics

<b>Radeon™ Pro WX 4100 4GB Graphics</b>	<b>Form Factor Graphics Controller</b>	Low-Profile Single Slot (6.6" Length) Polaris 11 Baffin GL XT GPU: 1024 Stream Processors organized into 16 Compute Units Power: 50 Watts Cooling: Active
	<b>Memory</b>	4GB GDDR5 memory Memory Bandwidth: 6 Gbps / 96 GB/s Memory Width: 128 bit
	<b>Connectors</b>	4x Mini DisplayPort 1.4 - HDR ready connectors with HBR3 and MDP  Factory Configured: Four mDP-to-DP cable adapters included After market option kit: Four mDP-to-DP cable adapters included  Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Configuration or Option Kit accessories.
	<b>Maximum Resolution</b>	5K support @ 60Hz  <ul style="list-style-type: none"> <li>• 1x single-cable 5K monitor, or 2x dual-cable 5K or 4x 4K support @ 60Hz</li> </ul>
	<b>Image Quality Features</b>	Advanced support for 8-bit and 10-bit per RGB color component. Supports up and downscaling
	<b>Display Output</b>	4 full physical DP1.3 HBR3 / DP1.4 HDR outputs FreeSync support
	<b>GPU Architecture Supported Graphics APIs</b>	GCN 4th Generation DirectX® 12 OpenGL® 4.5 OpenCL™ 2.0 Vulkan™ 1.0
	<b>Available Graphics Drivers</b>	Windows 10 64-bit Windows® 7 64-bit Linux 64-bit (selected Enterprise distributions)  HP qualified drivers may be preloaded or available from the HP support website at <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
	<b>Notes</b>	<ol style="list-style-type: none"> <li>1. HDR content requires that the system be configured in a ready content chain, including: graphics card, monitor/TV, graphics application. Video content must be graded in HDR and viewed with an HDR capable application. Windowed mode content requires operating system support.</li> <li>2. AMD PowerTune and AMD ZeroCore Power are technologies available on AMD FirePro™ and Radeon™ Pro products, which are designed to reduce GPU power consumption in response to certain GPU workloads.</li> <li>3. As of September 2016, certified for DisplayPort™ 1.4 HDR based on independent verification by UL. HDR content requires that the system be configured in a ready content chain, including: graphics card, monitor/TV, graphics application. Video content must be graded in HDR and viewed with an HDR capable application. Windowed mode content requires operating system support.</li> </ol>

## Technical Specifications – Graphics

**8GB Graphics**

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

**Maximum Resolution**

DisplayPort:  
- single DisplayPort up to 4096 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

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

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:

### Technical Specifications – Graphics

- 4 1920x1200
- 4 2560x1600
- 4 4096x2160
- 2 5120x2880 (requires dual DP input capable 5k displays)

Maximum number of monitors across all available Quadro M4000 outputs is 4.

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.5  
DirectX 12

API support includes:  
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and 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. 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

### Technical Specifications – Graphics

	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
<b>Maximum Resolution</b>	DisplayPort: <ul style="list-style-type: none"><li>- up to four 4096 x 2160 x 30 bpp @ 60Hz displays</li><li>- up to two 5120 x 2880 @ 60Hz displays</li><li>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)</li></ul> DL-DVI(I) output: <ul style="list-style-type: none"><li>- up to 2560 x 1600 x 32 bpp @ 60Hz</li></ul> Single Link-DVI(I) output: <ul style="list-style-type: none"><li>- up to 1920 x 1200 x 32 bpp @ 60Hz</li></ul> VGA (via adapter cable): <ul style="list-style-type: none"><li>- 2048 x 1536 x 32 bpp at 85 Hz</li></ul>
<b>Image Quality Features</b>	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.  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.
<b>Display Output</b>	Maximum number of displays <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> Maximum number of DisplayPort displays possible (may require MST and/or HBR2): <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 5k displays)</li></ul> Maximum number of monitors across all available Quadro M5000 outputs is 4.
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.5 DirectX 12 API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran

### Technical Specifications – Graphics

**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).

#### AMD FirePro W7100 8GB Graphics

**Form Factor** Full height, single slot (9.5" X 4.376")

**Graphics Controller** AMD FirePro W7100 graphics  
 GPU: 1792 Stream Processors organized into 28 Compute Units  
 Power: <75 Watts  
 Cooling: Active

**Bus Type** PCI Express® x16, Generation 3.0

**Memory** 8GB GDDR5 memory  
 Memory Bandwidth: up to 176 GB/s  
 Memory Width: 256 bit

**Connectors** 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.

**Maximum Resolution** DisplayPort:  
 - 4096x2160 @24bpp 60Hz

Dual Link DVI:  
 - 2560x1600 (requires DP to DL-DVI adapter)

Single Link DVI:

### Technical Specifications – Graphics

	- 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 - four 1920x1200 displays
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
<b>Available Graphics Drivers</b>	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: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
<b>Notes</b>	<ol style="list-style-type: none"> <li>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 <a href="http://www.amd.com/eyefinityfaq">www.amd.com/eyefinityfaq</a> for full details.</li> <li>2. OpenGL 4.4 support available with driver 14.301.xxx or later.</li> <li>3. OpenCL 2.0 support planned in driver updates for early 2015.</li> <li>4. Configurations of a single FirePro W7100 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).</li> </ol>

Radeon™ Pro WX 7100 8GB

Form Factor

Full-Height Single Slot (9.5" Length)

### Technical Specifications – Graphics

<b>Graphics</b>	<b>Graphics Controller</b>	Radeon™ Pro WX 7100 graphics GPU: 2304 Stream Processors organized into 36 Compute Units Power: 130 Watts Cooling: Active
	<b>Memory</b>	8GB GDDR5 memory Memory Bandwidth: 7 Gbps / 224 GB/s Memory Width: 256 bit
	<b>Connectors</b>	4x Display Port 1.4 - HDR ready connectors with HBR3 and MST  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 a Configuration or Option Kit accessories.
	<b>Maximum Resolution</b>	5K support @ 60Hz <ul style="list-style-type: none"> <li>• 1x single-cable 5K monitor, or 2x dual-cable 5K monitors</li> </ul>
	<b>Image Quality Features</b>	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color color bandwidth scaler for high quality up and downscaling
	<b>Display Output</b>	4 full physical DP1.3 HBR3 / DP1.4 HDR outputs FreeSync support
	<b>GPU Architecture</b> <b>Supported Graphics APIs</b>	GCN 4th Generation DirectX® 12 OpenGL® 4.5 OpenCL™ 2.0 Vulkan™ 1.0
	<b>Available Graphics Drivers</b>	Windows 10 64-bit Windows® 7 64-bit Linux 64-bit  HP qualified drivers may be preloaded or available from the HP <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
	<b>Notes</b>	<ol style="list-style-type: none"> <li>4. HDR content requires that the system be configured with a complete HDR ready content chain, including: graphics card, monitor/TV, graphics application, and HDR content. HDR content must be graded in HDR and viewed with an HDR capable player. Windowed mode content requires operating system support.</li> <li>5. Radeon VR Ready Creator Products are select Radeon graphics cards that meet or exceed the Oculus Rift or HTC Vive recommended specifications. Other hardware (including CPU) recommended by Oculus Rift or HTC Vive should also be used. As VR technology, hardware, and software evolve and/or become available, these recommendations may change.</li> <li>6. AMD PowerTune and AMD ZeroCore Power are technologies used on AMD FirePro™ and Radeon™ Pro products, which are designed to reduce GPU power consumption in response to certain GPU workloads.</li> <li>7. As of September 2016, certified for DisplayPort™ 1.4. DisplayPort™ 1.4 HDR based on independent verification by UL. HDR content requires that the system be configured with a complete HDR ready content chain, including: graphics card, monitor/TV, graphics application, and HDR content. HDR content must be graded in HDR and viewed with an HDR capable player. Windowed mode content requires operating system support.</li> </ol>

### Technical Specifications – Graphics

<b>NVIDIA® QUADRO® M6000 12GB Graphics</b>	<b>Compatibility</b>	HP Z840, Z640
	<b>Form Factor</b>	4.42"? H x 10.5"? L Dual Slot Power: 250 Watts Weight: 1030 grams
	<b>Graphics Controller</b>	NVIDIA® QUADRO® M6000 Graphics Card based on the GM200 GP Core Count: 3072 Base Clock: 1026 MHz Boost Clock: 1152 MHz Idle Clock: 324 MHz
	<b>Bus Type</b>	PCI Express 3.0 x16
	<b>Memory</b>	12GB GDDR5 384-bit memory I/O path 317 GB/s memory bandwidth ECC Memory (disabled by default)
	<b>Connectors</b>	DP (x4) Dual-Link DVI-I 3-pin mini-DIN connector SLI connector QUADRO® Sync connector One 8-pin auxiliary power 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 HDMI adapters available as accessories.
	<b>Image Quality Features</b>	? DisplayPort™ with Multi-Stream Technology (MST) and High Bit HDCP 1.3 support ? NVIDIA® 3D Vision™ technology ? NVIDIA® Premium Mosaic and nView
	<b>Display Output</b>	400 MHz integrated RAMDAC ? Maximum resolution over VGA (requires DVI to VGA cable or DP to VGA adapter) at 85 Hz  Dual-link internal TMDS (DVI 1.0) ? Maximum resolution over digital port (single GPU and SLI mode) (reduced blanking)  Single-link internal TMDS (DVI 1.0) ? Maximum resolution over digital port (single GPU and SLI mode)

### Technical Specifications – Graphics

	(reduced blanking)
	DisplayPort™ 1.2a with MST and HBR2. Each DisplayPort™ connector capabilities: ? Maximum pixel clock: 592 MPixel/s ? Maximum bandwidth: 17.2 Gbps ? Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz
	HDMI ? Maximum resolution (requires DP to HDMI adapter): 4096 × 2160
<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
<b>Available Graphics Drivers</b>	Windows 10 Windows 8.1 Windows 8 Windows 7 Professional Linux® HP qualified drivers may be preloaded or available from the HP support website at <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® GRID v4.0 and later. 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 is required.</li> </ol>

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<b>NVIDIA® Quadro® M6000 24GB Graphics</b>	<b>Form Factor</b>	4.4" H x 10.5" L Dual Slot Power: 250 Watts Weight: 1023 grams
	<b>Graphics Controller</b>	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
	<b>Bus Type</b>	PCI Express 3.0 x16
	<b>Memory</b>	24GB GDDR5 384-bit memory I/O path 317 GB/s memory bandwidth ECC Memory (disabled by default)

### Technical Specifications – Graphics

<b>Connectors</b>	<p>DP (x4)            Dual-Link DVI-I            Optional Stereo            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>Dual-Link 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            ? Maximum resolution over VGA (requires DVI to VGA cable or DP to VGA adapter): 2048 × 1536 × 32 bpp at 85 Hz</p> <p>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)</p> <p>Single-link internal TMDS (DVI 1.0)            ? Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</p> <p>DisplayPort 1.2a with MST and HBR2. Each DisplayPort connector has the following capabilities:            ? Maximum pixel clock: 592 MPixel/s            ? Maximum bandwidth: 17.2 Gbps            ? Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz</p> <p>HDMI            ? Maximum resolution (requires DP to HDMI adapter): 4096 × 2160 × 8 bpp at 60Hz</p>
<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	<p>Full OpenGL 4.4            Full DirectX 12            API support includes:            CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
<b>Available Graphics Drivers</b>	<p>Windows 10            Windows 8.1            Windows 8            Windows 7 Professional            Linux</p>

### Technical Specifications – Graphics

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

<http://www8.hp.com/us/en/drivers.html>

#### Notes

1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA® Quadro® M6000 to enable direct mapping of GPU to Virtual Machine.
2. No display output adapter included.
3. For HP Z840 Workstation configurations, the 1125W power supply option must be used.

#### NVIDIA® Quadro® P4000 8GB Graphics

##### Form Factor

Dimensions: 4.4"?H x 9.5"?L  
Single-slot, full-height  
Weight: 475 grams (without extender)

##### Graphics Controller

NVIDIA® Quadro® P4000 Graphics Card  
GPU: GP104 with 1792 CUDA cores  
Power: 120 Watts

##### Bus Type

PCI Express 3.0 x16

##### Memory

Size: 8GB GDDR5  
Memory Bandwidth: 243 GB/s  
Memory Width: 256-bit

##### Connectors

4 x DisplayPort 1.4  
3-pin mini-DIN connector via optional bracket  
1 x 6-pin auxiliary power connector  
4-pin header for stereo signal  
SYNC connector for Quadro® Sync II  
2 x SLI connectors

Factory Configured Option: No video cable adapter included  
After Market Option: No video cable adapter included

Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayP as accessories

##### Maximum Resolution

Dual-link internal TMDS (DVI 1.0):  
- up to 2560 x 1600 x 32 bpp @ 60 Hz

Single-link internal TMDS (DVI 1.0):  
- up to 1920 x 1200 x 32 bpp @ 60 Hz

HDMI™ 2.0b (requires DP to HDMI adapter):  
- up to 5120 x 2880 x 24 bpp @ 60Hz

DisplayPort:  
- up to 4096 x 2160 x 30 bpp @ 60Hz  
- up to 2560 x 1600 x 30 bpp @ 120 Hz

### Technical Specifications – Graphics

	<p>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)</p>
<b>Image Quality Features</b>	<p>Using two DP outputs, the P4000 can drive one dual DP input display at 5120 x 2880 x 30 bpp @ 60Hz resolution.</p> <p>Advanced support for 8-bit, 10-bit, and 12-bit per RGB color components HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView</p>
<b>Display Output</b>	<p>Maximum number of displays - 4 direct attached monitors</p>
<b>Shading Architecture</b>	<p>Maximum number of monitors across all available Quadro P4000 Shader Model 5.1</p>
<b>Supported Graphics APIs</b>	<p>OpenGL 4.5 DirectX 12 Vulkan 1.0</p>
<b>Available Graphics Drivers</b>	<p>API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and .NET</p> <p>Microsoft Windows 10 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and AI extensions</p>
<b>Notes</b>	<p>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></p> <ol style="list-style-type: none"><li>1. Quadro P4000 offered as Factory Configured Option does not include cable adapters must be ordered separately.</li><li>2. Quadro P4000 offered as an After Market Option does not include cable adapters must be ordered separately.</li></ol>

### Technical Specifications – Graphics

<b>NVIDIA® Quadro® P5000 16GB Graphics</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4"? Height x 10.5"? Length) Weight: 815 grams / 1.80 lbs
	<b>Graphics Controller</b>	Quadro™ P5000 graphics GPU: 2560 NVIDIA CUDA® Parallel Processing Cores Power: 180 Watts Cooling: Active
	<b>Memory</b>	16GB GDDR5X memory Memory Bandwidth: Up to 288 GB/s Memory Width: 256 bit ECC Memory (disabled by default)
	<b>Connectors</b>	DP (x4) with HDR support DL-DVI(D) 3-pin mini-DIN connector SLI connector Quadro Sync connector (compatible with Quadro II Sync) One 8-pin auxiliary power connector  Factory configured option: No video cable adapter included with card After market option Kit: No video cable adaptor included with card.  DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to HDMI available as accessories.
	<b>Maximum Resolution</b>	5K support @ 60Hz 1x single-cable 5K monitor, or 2x dual-cable 5K monitors
	<b>Image Quality Features</b>	Advanced support for 8-bit, 10-bit, and 12-bit per RGB color components HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView Desktop Management
	<b>Display Outputs<sup>1</sup></b>	4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1080 @ 144Hz refresh))
	<b>GPU Architecture</b>	NVIDIA Pascal™
	<b>Supported Graphics APIs</b>	DirectX® 12, OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0 Developer API support includes: CUDA C, CUDA C++, DirectCompute, Fortran
	<b>Available Graphics Drivers</b>	Windows® 10 64-bit Windows® 7 64-bit Linux 64-bit  HP qualified drivers may be preloaded or available from the HP support page at <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
	<b>Notes</b>	<ol style="list-style-type: none"> <li>1- Supports up to a total of 4 displays</li> <li>2- For HP Z440 Workstations, the 700W power supply option is required for multiple P5000 configurations.</li> <li>3- For HP Z840 Workstation configurations, the 1125W power supply is required for multiple P5000 configurations.</li> </ol>

### Technical Specifications – Graphics

<b>NVIDIA® Quadro® P6000 24GB Graphics</b>	<b>Form Factor</b>	Full-Height Dual Slot (4.4"? Height x 10.5"? Length) Weight: 967 grams / 2.14 lbs
	<b>Graphics Controller</b>	Quadro™ P6000 graphics GPU: 3840 NVIDIA CUDA® Parallel Processing Cores Power: 250 Watts Cooling: Active
	<b>Memory</b>	24GB GDDR5X memory Memory Bandwidth: Up to 432 GB/s Memory Width: 384 bit ECC Memory (disabled by default)
	<b>Connectors</b>	DP (x4) with HDR support DL-DVI(I) 3-pin mini-DIN connector SLI connector Quadro Sync connector (compatible with Quadro II Sync) One 8-pin auxiliary power connector  Factory configured option: No video cable adapter included with card After market option Kit: No video cable adaptor included with card.  DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to DisplayPort available as accessories.
	<b>Maximum Resolution</b>	5K support @ 60Hz 1x single-cable 5K monitor, or 2x dual-cable 5K monitors
	<b>Image Quality Features</b>	Advanced support for 8-bit, 10-bit, and 12-bit per RGB color comp HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView
	<b>Display Outputs<sup>1</sup></b>	4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1080 @ 144Hz refresh))
	<b>GPU Architecture</b>	NVIDIA Pascal™
	<b>Supported Graphics APIs</b>	DirectX® 12 , OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0 Developer API support includes: CUDA C, CUDA C++, DirectCompute, Fortran
	<b>Available Graphics Drivers</b>	Windows® 10 64-bit Windows® 7 64-bit Linux 64-bit  HP qualified drivers may be preloaded or available from the HP support page at <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
	<b>Notes</b>	<ol style="list-style-type: none"> <li>1- Supports up to a total of 4 displays</li> <li>2- For HP Z440 Workstations, the 700W power supply option is required</li> <li>3- For HP Z840 Workstation configurations, the 1125W power supply is required for multiple P5000 configurations.</li> </ol>

## Technical Specifications – Graphics

**NVIDIA® Quadro® GP100 16GB Graphics****Form Factor**

Dual Slot (4.4" Height x 10.5" Length)  
Weight: 989 grams +72 grams extender

**Graphics Controller**

NVIDIA® QUADRO® GP100  
GPU: 3584 NVIDIA CUDA® Parallel Processing Cores  
Power: 235 Watts  
Cooling: Active

**Memory**

16GB HBM2  
Memory Bandwidth: Up to 717 GB/s  
Memory Width: 4096-bit  
ECC Memory (disabled by default)

**Connectors**

DP (x4) with HDR support  
DL-DVI(D)  
3-pin mini-DIN connector via optional bracket  
4-pin header for stereo signal  
Quadro Sync connector SYNC for Quadro® Sync II  
One 8-pin auxiliary power connector  
(2x) NVLink connectors

Factory configured option: 8-pin power adapter included with card  
After market option Kit: 8-pin power adapter included with card.

DVI to VGA, DisplayPort™ to VGA, DisplayPort™ to DVI, and DisplayPort™ to DisplayPort™ available as accessories.

**Maximum Resolution**

5K support @ 60Hz  
1x single-cable 5K monitor, or 2x dual-cable 5K monitors

**Image Quality Features**

HDR support over DisplayPort™ 1.4 (SMPTE 2084/2086, BT. 2020)  
HEVC Decode, 4K @ 60 Hz 10b HEVC Encode)  
HDCP 2.2 support over DisplayPort™, DVI, and HDMI connectors  
NVIDIA 3D Vision™ technology  
NVIDIA Mosaic and nView Desktop Management

**Display Outputs**

4x DP1.4 MST & HDR2 outputs (up to 5120 x 2880 @ 60Hz)  
1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz)  
1x Single-link DVI-D output (up to 1920 x 1200 @ 60 Hz)  
HDMI™ 2.0b (up to 5120 x 2880 @ 60Hz)\*

\*requires DP to HDMI adapter

**GPU Architecture**

NVIDIA GP

**Supported Graphics APIs**

DirectX® 12, OpenGL® 4.5, Vulkan™ 1.0  
Developer API support includes: CUDA C, CUDA C++, DirectCompute  
Fortran

**Available Graphics Drivers**

Windows® 10  
Windows® 7 Professional 64-bit  
Linux®

HP qualified drivers may be preloaded or available from the HP support page at <http://welcome.hp.com/country/us/en/support.html>

### Technical Specifications – Graphics

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<b>NVIDIA® Quadro® Sync II</b>	<b>Part number</b>	1WT20AA
	<b>Dimensions (HxD)</b>	6.0 inches × 4.2 inches
	<b>Devices Supported</b>	NVIDIA® Quadro® P4000 NVIDIA® Quadro® P5000 NVIDIA® Quadro® P6000
	<b>Bus Type</b>	Requires one free mechanical PCIe bus slot. 6-pin PCI or SATA power connector
	<b>PCI Form Factor</b>	Full Height, half length, single slot
	<b>Ports</b>	2 RJ45 connectors for carrying frame lock signals over CAT5 cables. BNC Connector for external house synchronization.
	<b>Internal Connectors</b>	6 NVIDIA SLI® style edge fingers for connection to compatible GPUs <ul style="list-style-type: none"><li>• Included with the board are 4 12-Inch Short Sync Cables to connect to GPU's</li><li>• Included with the board are 2 24-Inch Long Sync Cables to connect to GPU's</li></ul>
	<b>System Requirements</b>	Requires one free mechanical PCIe bus slot. 6-pin PCI or SATA power connector Must be used with NVIDIA Quadro P4000, P5000 or P6000 graphics cards. Requires Quadro driver version R375 or later.
	<b>Temperature - Operating</b>	0° to 55° C
	<b>Temperature - Storage</b>	-40° to 60° C
	<b>Relative Humidity - Operating</b>	10% to 80%
	<b>Power Requirements</b>	Board power dissipation: <15W
	<b>Operating Systems Supported</b>	Windows 10 64-bit Windows 7 64-bit Linux 64-bit
	<b>Kit Contents</b>	Contains: <ul style="list-style-type: none"><li>• Quadro Sync II Card</li><li>• 4 x 12-Inch Short Sync Cables</li><li>• 2 x 24-Inch Long Sync Cables (Two)</li><li>• Quick Start Guide</li></ul>

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### Technical Specifications - Optical and Removable Storage

## Optical and Removable Storage

<b>HP 9.5mm Slim DVD 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>	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+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 10, 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

**Kit Contents** 9.5mm Slim DVD Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide

#### HP 9.5mm Slim DVD-ROM Drive

<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 10, 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
	<i>* No driver is required for this device. Native support is provided by the operating system.</i>
<b>Kit Contents</b>	9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide

#### HP 9.5mm Slim BDXL Blu-Ray 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>	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	< 230 ms (seek)
	Full Stroke CD	< 220 ms (seek)
	Blu-ray	< 230 ms (seek) (Full Stroke Blu-ray)
	Startup Time	(Time to drive ready from tray loading)
		BD-ROM (SL/DL) 25S / 28S
		BD-R (SL/DL) 25S / 28S
		BD-RE (SL/DL) 25S / 28S
		DVD-ROM (SL/DL) 18S / 18S
		DVD-R (SL/DL) 25S / 25S
		DVD-RW 25S
		DVD+R (SL/DL) 25S / 25S
		DVD+RW 25S
		DVD-RAM 45S
		CD-ROM 15S
<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
	Blu-ray	BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-RE SL/DL Up to 6X
<b>Power</b>	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 2000mA 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</b>	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit	

### Technical Specifications - Optical and Removable Storage

<b>Supported</b>	<p>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*.</p> <p>Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 &amp; 11</p> <p>No driver is required for this device. Native support is provided by the operating system.</p>
<b>Kit Contents</b>	<p>9.5mm Slim BDXL Blu-Ray Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide</p> <p>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.</p>

<b>HP DX115 Removable Drive Enclosure</b>	<b>Interface Type</b>	Compatible with SAS or SATA controllers. Offers 6Gb/s performance when used with 6Gb/s HDDs.
	<b>Dimensions (WxHxD)</b>	147.6 x 41.1 x 205 mm (5.81 x 1.62 x 8.08 in)
	<b>Weight</b>	Frame and Carrier: 1.73 kg (3.8 lbs.) Carrier: 0.45 kg (1 lbs.)

<b>HP 15-in-1 Media Card Reader</b>	<b>Description</b>	<p>Supports hardware ECC (Error Correction Code) function</p> <p>Supports hardware CRC (Cyclic Redundancy Check) function</p> <p>Supports MS 4-bit parallel transfer mode</p> <p>Supports MS-PRO 4-bit parallel transfer mode</p> <p>Supports MS PRO-HG Duo 4-bit parallel transfer mode</p> <p>Supports SD 4-bit parallel transfer mode</p> <p>Supports UHS-104 SD 4-bit card (version 3.0)</p> <p>Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode</p>
	<b>Interface Type</b>	<p>USB 3.0 High-speed interface</p> <p><b>NOTE:</b> If there is a USB2 connection, USB2 transfer speeds are supported.</p>
	<b>Dimensions (WxHxD)</b>	4.9 x 4 x 1 in (124.5 x 101.6 x 25.4 mm) Fits conveniently in the 5.25" drive bay.
	<b>Supported Media Types</b>	<p>CompactFlash Type I</p> <p>CompactFlash Type II</p> <p>Microdrive</p> <p>Secure Digital Card (SD)</p> <p>Secure Digital High Capacity (SDHC)</p> <p>SD Extended Capacity Memory Card (SDXC)</p> <p>SD Ultra High Speed II(SD UHSII)</p> <p>Memory Stick</p> <p>Memory Stick Select</p> <p>Memory Stick Duo (MS Duo)</p> <p>Memory Stick PRO (MS PRO)</p>

### Technical Specifications - Optical and Removable Storage

	<p>Memory Stick PRO Duo (MS PRO Duo)          Memory Stick PRO-HG Duo          MagicGate Memory Stick (MG)          MagicGate Memory Stick Duo</p> <p>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)</p>
<b>Operating Systems Supported</b>	<p>Test Parameters/Conditions - Power applied, unit operating on system <math>\pm 5\%</math></p> <p>Windows 8 Pro (64-bit)*          Windows 8.1 (64-bit)*          Windows 8 (64-bit)*          Windows 7 Professional (32-bit)**          Windows 7 Professional (64-bit)**          Windows Vista Business 64          Windows Vista Business 32          Windows Vista Home Basic 32          Windows XP Professional          Windows XP Home 32</p> <p>No driver is required for this device. Native support is provided by the operating system.</p> <p>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 <a href="http://www.microsoft.com">http://www.microsoft.com</a>.</p> <p>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 <a href="http://www.microsoft.com/windows/windows-7/">http://www.microsoft.com/windows/windows-7/</a> for details.</p>
<b>Kit Contents</b>	Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD
<b>Approvals</b>	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
<b>Weight</b>	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 external 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>	Supports up to 20 Gb/s (20,000 Mb/s)
		<b>Devices Supported</b>	Thunderbolt™ certified devices
<b>Bus Type</b>		PCIe card, full or half height PCIe slots	
<b>Ports</b>		One Thunderbolt™ 2 external 20-Pin output connectors (Rear) 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

**HP X520 10GbE Dual Port Adapter**    **Hardware Certifications**    FCC B, UL, CE, VCCI, BSMI, CTICK, KCC

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**HP 10GbE SFP+ SR Transceiver**

<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)

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**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).
  6. 802.11a/g (OFDM modulation).
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## Technical Specifications - Networking and Communications

<b>Integrated Intel I210AT PCIe GbE Controller</b>	<b>Connector</b>	RJ-45 (motherboard integration)
	<b>Controller</b>	Intel I210 GbE platform LAN connect networking controller
	<b>Memory</b>	Programmable FIFO packet buffer memory Tx 24KB default Rx up to 16KB
	<b>Data Rates Supported</b>	10/100/1000 Mbps
	<b>Compliance</b>	802.1as, 802.1q, 802.1Q, 802.3, 802.3ab, 802.3ap, 802.3az, 802.3u, 802.3x, 802.3z
	<b>Bus Architecture</b>	PCI Express 2.1 (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

<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

### Technical Specifications - Networking and Communications

<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 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
	<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).

### Technical Specifications - Networking and Communications

<b>Intel Ethernet I350-T4 4-port 1Gb NIC</b>	<b>Connector</b>	Four 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 v2.1 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	<b>Data Path Width</b>	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	<b>Power Requirement</b>	5.0W (typical)
	<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 32-bit and 64-bit; Windows 10 32-bit and 64-bit; Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11	
<b>Kit Contents</b>	Intel I350-T4 PCIe Quad 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 Installation Guide.	

### Technical Specifications - Networking and Communications

<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.  Windows Server 2012 R2, Windows Server 2012, Windows 8, Windows Server 2008 R2, Windows 7, Windows Server 2008 SP2, Windows Vista SP2, Windows Server 2003 R2, Windows Server 2003 SP2, Linux Stable Kernel version 3.x, 2.6.x, Red Hat Enterprise Linux 5, 6, SUSE Linux Enterprise Server 10, 11, FreeBSD 9, VMware ESX/ESXi. Note: Not all OS's supported on all HP Z Workstations.	

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### Summary of Changes

### Summary of Changes

<b>Date of change:</b>	<b>Version History:</b>		<b>Description of change:</b>
August 21, 2014	v1	Added	Style and technical specifications
October 24, 2014	From v1 to v2	Added	note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs
November 1, 2014	From v2 to v3	Added Changed	Note for Internal USB connector conversion, Overview, Internal USB statement in Overview and System Board sections
December 1, 2014	From v3 to v4	Added	Intel X540-T2 10GbE Dual Port Adapter, HP 4-in-1 SFF (2.5in) HDD Carrier
January 1, 2015	From v4 to v5	Added Changed	RHEL for Preinstalled OS, AMD FirePro W7100, Tesla K40 to GPU and High Performance Computing; Ubuntu 14.04 for Supported Components Memory Load Order, High Performance Computing for K40
February 1, 2015	From v5 to v6	Added Changed Removed	Windows 8.1 Pro 64-bit OS, Red Hat Enterprise Linux (RHEL), HP DX115 Removable HDD Carrier, and notes, 4-Bay SAS-SATA and notes, HP 4-Bay SAS-SATA 2.5in High Density Storage Kit Overview OS, Processors table Power Supply table, Hard Drives Notes, Optical and Removable Storage order, Power Consumption and Chassis Fan Windows 7 Professional 64-bit (National Academic)
March 1, 2015	From v6 to v7	Added Changed	Overview: RAID support. Supported Components, Hard Drives: New SAS SFF 15 HDD line and notes, 4TB SATA HDD SAS, and SATAHDD Description Notes. System Board: Memory section.
April 1, 2015	From v7 to v8	Added Changed	NVIDIA® Quadro® M6000 12GB Graphics, Memory notes Memory from Supported Components, Memory Speed Supported from System Board, ACPI version updated in BIOS section.
May 1, 2015	From v8 to v9	Added Changed	Integrated RAID for PCIe SSDs, Declared Noise Emissions (Entry and high end configs), ISO 7779-9296 Form factor from Minitower to Tower
May 6, 2015	From v9 to v10	Changed	NVIDIA GPU front and back specs reorder.
June 1, 2015	From v10 to v11	Added Changed Removed	1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), 3Dconnexion CADMouse Reordered SAS Hard Drives in Supported and Technical Specifications 600GB SAS 15K rpm
July 1, 2015	From v11 to v12	Added	Z Turbo G2 256 and 512GB drives
August 1, 2015	From v12 to v13	Added Changed Removed	Windows 10 64-bit to Supported OS; NVIDIA NVS 310 1GB Graphics, NVIDIA® Quadro® K420 2GB Graphics Professional 2D and Entry 3D SUSE Linux Enterprise Desktop 11 SP3, 12, LSI iBBU09 Battery Backup Unit changed to AMO; System Board Memory Notes; System Configurations. Windows 8.1 Emerging Market in Overview OS and Supported Components
September 1, 2015	From v12 to v13	Removed	Intel Pro 1500 180GB SATA SSD from Storage SATA SSDs

### Summary of Changes

November 1, 2015	From v14 to v15	Added	HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA® Quadro® M4000 8GB Graphics, NVIDIA® Quadro® M5000 8GB Graphics, Z480 HP Z Cooler
		Removed	300 and 600GB SAS 15K SFF HDD from SAS Hard Drives section.
December 3, 2015	From v15 to v16	Added	64 ECC LR Memory in supported components section and Maximum Memory under Technical Specifications section
December 8	From v16 to v17	Added	HP PS/2 Business Slim Keyboard, HP USB Business Slim Keyboard, HP Wireless Business Slim Keyboard, Windows 10 Home versions to Supported components, Operative systems, Overview
January 1, 2015	From v17 to v18	Added	240/480GB Enterprise Class SSDs, NVIDIA® Quadro® K1200 4GB Graphics
		Removed	NVIDIA® Quadro® K6000 12GB Graphics
February 1, 2015	From v18 to v19	Changed	HP 4-Bay SAS-SATA 2.5in High Density Storage Kit installation guide link
		Removed	Samsung Enterprise 240GB SATA SSD, Samsung Enterprise 480GB SATA SSD
March 1, 2016	From v19 to v20	Added	AMD FirePro W4300 4GB Graphics in Mid-Range 3D Category,
		Removed	Ubuntu 14.04, Supported Components OS; NVIDIA NVS 310 512MB Graphics, NVIDIA® Quadro® K420 1GB Graphics in Graphics
March 31, 2016	From v20 to v21	Added	Intel Xeon E5-2600 v4 Series CPU, Preinstalled Windows 10 Pro 64 bit; HP Z Turbo Drive G2 1TB SSD; DDR4-2400 ECC Registered DIMMs
		Changed	Processor disclaimers and notes; Hard Drives, PCIe notes; Supported components OS notes.
May 1, 2016	From v21 to v22	Added	M2000 and M6000 24GB graphics
		Removed	ZCooler availability note, K4200 and K5200 graphics
May 5, 2016	From v22 to v23	Changed	Pgs. 24, 25, 32: Modified TPM info to: Trusted Platform Module (TPM) 1.2 (Infineon SLB9660). Common Criteria EAL4+ Certified. Upgradable to TPM 2.0. Convertible to FIPS 140-2 Certified mode. (TPM 2.0 is not available for Win 7 32-bit.)
May 12, 2016	From v23 to v24	Changed	Integrated TPM extended specs in pgs 25,26, and 37
June 7, 2016	From v24 to v25	Added	Hardened Mouse HDD, (Enterprise Class) to 4TB SATA HDD
		Removed	EOL Win8.1 Downgrade to Win7
July 1, 2016	From v25 to v26	Added	Number of Aux power connections under the power supply section of the Overview
		Changed	Corrected RAID notes
August 1, 2016	From v26 to v27	Added	HP Keyed Cable Lock 10mm to Racking and Physical Security
September 1, 2016	From v27 to v28	Added	ZTurbo SED 256/512 drives
		Removed	NVIDIA® Quadro® M6000/12GB
November 1, 2016	From v28 to v29	Added	1TB SATA 7200 rpm HDD (Enterprise Class), HP Z Turbo Drive G2 TLC SSDs, HP Z Turbo Drive Quad Pro SSDs module, Intel 750 Series AIC SSDs
		Changed	Intel Xeon E5-2600 Series CPU and notes
		Removed	Intel Xeon E5-2600 v3 Series CPU and notes, 4, 32, and 64GB DDR4-2133 RAM DIMMs
January 1, 2016	From v29 to v30	Added	Radeon Pro WX 7100 8GB graphics, HP Z Turbo Drive G2 256GB TLC, HP Z Turbo Drive G2 512GB TLC, HP Z Turbo Drive G2 1TB TLC, 2TB SATA SSD, 9.5mm Slim DVD-Writer.
		Removed	HP Z Turbo Drive 256GB, HP Z Turbo Drive 512GB, HP USB Optical 3-Button Mouse

### Summary of Changes

February 1, 2016	From v30 to v31	Changed	HP 9.5mm Slim SuperMulti DVD Writer, HP Slim DVD-Writer Drive OS Support
March 1, 2017	From v31 to v32	Added	NVIDIA® Quadro® P5000 16GB Graphics and NVIDIA® Quadro® P6000 24GB Graphics
May 1, 2017	From v32 to v33	Added	The NVIDIA® Quadro® P2000 5GB Graphics to Mid-range 3D Graphics
		Changed	Changed The HP 9.5mm Slim SuperMulti DVD Writer for The HP 9.5mm Slim DVD Writer
June 5, 2017	From v33 to v34	Added	The AMD Radeon Pro WX 4100 4 GB Graphics to Mid-range 3D Graphics, added NVIDIA Quadro P600 to Entry 3D Graphics section, added NVIDIA Quadro Sync II, added NVIDIA Quadro P4000 to High-end 3D section
		Changed	HP 9.5mm Slim DVD Writer Option Kit Part Number under Optical and Removable Storage section
		Removed	DVD-RAM as a supported format under the DVD writer section
July 6, 2017	From v34 to v35	Added	NVIDIA Quadro GP100 16GB Graphics to Ultra 3D Graphics, added Intel Ethernet I350-T4 4-port 1Gb NIC to Networking and Communications section
		Changed	The Note 2 for NVIDIA Quadro P600, changed the Operating Systems supported section for the NVIDIA Quadro Sync II and changed the info for the NVIDIA Quadro P4000 8GB Graphics
		Removed	The Tesla K40 as High Performance GPU Computing and removed Slim DVDRW SATA 1st & 2nd ODD from the Stable & Consistent Offerings section
August 21, 2017	From v35 to v36	Changed	EPEAT statement
August 28, 2017	From v36 to v37	Changed	The supported Operating Systems section
September 6, 2017	From v37 to v38	Added	Memory footnotes
		Changed	Displays section and changed RAID 5 support footnotes and changed the info for the NVIDIA Quadro P4000 8GB Graphics
October 1, 2017	From v38 to v39	Changed	Available Processors table
November 1, 2017	From v39 to v40	Added	"for workstations"? added to Windows 10 Pro 64 on OS section.
		Changed	Multi-core disclaimer updated.
January 29, 2018	From v40 to v41	Changed	Typo in power supply section
August 9, 2018	From v41 to v42	Changed	Memory support

title

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