

### Overview

#### HP Z440 Workstation



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

### Overview



- |     |  |     |   |
|-----|--|-----|---|
| 6.  | 2 External 5.25" Bays  | 12. | Rear I/O: Rear Power Button, 4 USB 3.0, 2 USB 2.0, PS/2 Ports, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out |
| 7.  | 2 Internal 3.5" Bays   | 13. | 8 DIMM Slots for DDR4 ECC Registered Memory   |
| 8.  | Fan and Front Card Guide Kit (optional)                              | 14. | Intel Xeon Processors: E5-1600 v3/v4 family (4C/6C/8C), E5-2600 v3 family (8C)  |
| 9.  | 6 6Gb/s SATA Ports   | 15. | 2 PCIe x16 Gen 3 Slots  |
| 10. | Rear Grip  | 16. | 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot   |
| 11. | 525W, 85% Efficient Power Supply or 700W, 90% Efficient Power Supply |     |   |

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### Form Factor Operating Systems

Minitower

Preinstalled:

- Windows 10 Pro 64
- Windows 10 Pro 64 downgrade to Windows 7 Professional 64
- Windows 10 Home 64 High-end
- Windows 8.1 Pro 64-bit
- HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 6.6, RHEL 7, SUSE Linux Enterprise Desktop 11, Ubuntu 14.04)
- Red Hat® Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS)

Supported:

- Windows 8/8.1 Enterprise 64-bit
- Windows 7 Enterprise 64-bit
- 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	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology <sup>1</sup>	TDP (W)
Intel® Xeon® E5-1680 v4 processor	8	3.4	20	2400	YES	YES	2, 4, 6	140
Intel® Xeon® E5-1660 v4 processor	8	3.2	20	2400	YES	YES	2, 4, 6	140
Intel® Xeon® E5-1650 v4 processor	6	3.6	15	2400	YES	YES	2, 2, 4	140
Intel® Xeon® E5-1630 v4 processor	4	3.7	10	2400	YES	YES	1, 1, 3	140
Intel® Xeon® E5-1620 v4 processor	4	3.5	10	2400	YES	YES	1, 3	140
Intel® Xeon® E5-1607 v4 processor	4	3.1	10	2133	NO	YES	N/A	140
Intel® Xeon® E5-1603 v4 processor	4	2.8	10	2133	NO	YES	N/A	140
Intel Xeon E5-1680 v3 processor	8	3.2	20	2133	YES	YES	3, 6	140
Intel Xeon E5-1660 v3 processor	8	3.0	20	2133	YES	YES	3, 5	140
Intel Xeon E5-2630 v3 processor	8	2.4	20	1866	YES	YES	2, 8	85
Intel Xeon E5-1650 v3 processor	6	3.5	15	2133	YES	YES	1, 3	140
Intel Xeon E5-1630 v3 processor	4	3.7	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1620 v3 processor	4	3.5	10	2133	YES	YES	1, 1	140

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Intel Xeon E5-1607 v3 processor	4	3.1	10	1866	NO	YES	N/A	140
Intel Xeon E5-1603 v3 processor	4	2.8	10	1866	NO	YES	N/A	140
Intel Xeon E5-2637 v4 processor	4	3.5	15	2400	YES	YES	1, 2	135
Intel Xeon E5-2623 v4 processor	4	2.6	10	2133	YES	YES	2, 6	85
<p><sup>1</sup>The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.</p> <p><b>NOTE:</b> Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z440 Workstation does not support dual processor configurations.</p>								

### Available Processors

#### Disclaimers

Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: [http://www.intel.com/products/processor\\_number/](http://www.intel.com/products/processor_number/) for details.

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

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

#### Color

Jack Black

#### Convertibility

No

#### Expansion Slots (see system board section for more details)

**Slot 1 (top):**  
PCI Express Gen2 x1 with open-ended connector\*  
Full-height, Half-length

**Slot 2:**  
PCI Express Gen3 x16  
Full-height, Full-length (with extender)

**Slot 3:**  
PCI Express Gen2 x4 with open-ended connector\*  
Full-height, Full-length (with extender)

**Slot 4:**  
PCI Express Gen3 x8 with open-ended connector\*  
Full-height, Full-length (with extender)

**Slot 5:**  
PCI Express Gen3 x16

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Full-height, Full-length (with extender)

#### Slot 6:

PCI 32bit/33MHz

Full-height, Full-length (with extender)

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

#### Expansion Bays (see storage section for more details)

2 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed)

2 external 5.25" bays

- 3rd and 4th 3.5" HDD each occupy one external bay
- 3rd and 4th 2.5" HDD/SSD occupy a single external bay within a 2:1 carrier)

1 dedicated 9.5mm slim optical disk drive bay

#### Front I/O

4 USB 3.0, 1 Headset, 1 Microphone

#### Internal I/O

2 USB 2.0 ports available with a single 2x5 header. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. The 2x5 header also supports up to one 15-in-1 Media Card Reader.

1 USB 3.0 port available by a 2x10 header.

#### Rear I/O

4 USB 3.0, 2 USB 2.0, 2 PS/2, 1 RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out.

Serial supported with optional connector on PCI bracket cabled to system board connector.

#### Interfaces Supported

15-in-1 Media Card Reader (optional)

6-channel SATA interface (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported).

USB 2.0, USB 3.0

#### On-board RAID Support

RAID 0, 1, 10 (Factory integrated)

RAID 5 (NOT Factory integrated)

Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, and 10)

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

H: 17.0" [431.8mm]

W: 6.65" [168.91mm]

D: 17.5" [444.7mm] (measured to the rear of service panel)

#### Maximum Dimensions:

H: 17.0" [431.8mm]

W: 6.65" [168.91mm]

D: 17.9" [455.7mm] (measured to the rear padlock loop)

#### Rack Dimensions

4U

#### Weight

Exact weights depend upon configuration.

Minimum: 11.0 kg (24.3 lbs.)

Standard: 13.5 kg (29.8 lbs.)

Maximum: 17.5 kg (38.5 lbs.)

### Overview

<b>Temperature</b>	Operating: 5° to 35°C (40° to 95°F) Non-operating: -40° to 60°C (-40° to 140°F)
<b>Humidity</b>	Operating: 8% to 85% relative humidity, non-condensing Non-operating: 8% to 90% relative humidity, non-condensing
<b>Maximum Altitude (non-pressurized)</b>	Operating: 3,048m (10,000ft) Non-operating: 9,144m (30,000ft)
<b>Power Supply</b>	<b>ENTRY</b> 525 watts wide-ranging, active Power Factor Correction, 85% Efficient, with no 6-pin graphics power cable  The Z440 525W power supply efficiency report can be found at this link: <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf</a>  <b>HIGH-END</b> 700 watts wide-ranging, active Power Factor Correction, 90% Efficient, with two graphics power cables 700w PSU will support up to 225w of graphics  The Z440 700W power supply efficiency report can be found at this link: <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf</a>
<b>Workstation ISV Certifications</b>	See the latest list of certifications at <a href="http://www.hp.com/united-states/campaigns/workstations/partnerships.html">http://www.hp.com/united-states/campaigns/workstations/partnerships.html</a>

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### Supported Components

#### Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Intel® Xeon® E5-1600 v4 Series CPU</b>				
Intel® Xeon® E5-1603 v4 2.8 2133 4C CPU	Y	N		
Intel® Xeon® E5-1607 v4 3.1 2133 4C CPU	Y	N		
Intel® Xeon® E5-1620 v4 3.5 2400 4C CPU	Y	N		
Intel® Xeon® E5-1630 v4 3.7 2400 4C CPU	Y	N		
<b>Intel® Xeon® E5-1600 v3 Series CPU</b>				
Intel® Xeon® E5-1680 v3 3.2 2133 8C CPU	Y	N		
Intel® Xeon® E5-1660 v3 3.0 2133 8C CPU	Y	N		
Intel® Xeon® E5-1650 v3 3.5 2133 6C CPU	Y	N		
Intel® Xeon® E5-1630 v3 3.7 2133 4C CPU	Y	N		
Intel® Xeon® E5-1620 v3 3.5 2133 4C CPU	Y	N		
Intel® Xeon® E5-1603 v3 2.8 1866 4C CPU	Y	N		
<b>Intel® Xeon® E5-2600 v3 Series CPU</b>				
Intel® Xeon® E5-2630 v3 2.4 1866 8C CPU	Y	N		

\*Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing system required. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

#### Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Z Display Z30i 30-inch IPS LED Backlit Monitor				
HP Z Display Z27i 27-inch IPS LED Backlit Monitor				
HP Z Display Z24i 24-inch IPS LED Backlit Monitor				
HP Z Display Z23i 23-inch IPS LED Backlit Monitor				
HP Z Display Z22i 21.5-inch IPS LED Backlit Monitor				
HP DreamColor Z27x Professional Display				
HP DreamColor Z24x Professional Display				
Supported by all operating systems available from HP				
Screen size measured diagonally				

#### Storage / Hard Drives

##### SAS Hard Drives

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

### Supported Components

600GB SAS 15K SFF HDD	Y	Y	L5B75AA
300GB SAS 15K SFF HDD	Y	Y	L5B74AA

**NOTES:**

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

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

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

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

Removable Boot Drive option

### SATA Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>SATA (Serial ATA) Hard Drives for HP Workstations</b>				
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	WOR10AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	WOR10AA	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	K4T76AA	
500GB SATA 7.2K SED SFF HDD	Y	N	D8N29AA	
1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	Y	Y	M7S54AA	

**NOTES:**

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

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

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

**NOTE:** 3rd and 4th HDDs require and will be automatically installed in the factory into a single 3.5" to 5.25" external bay adapter, available as AMO (NQ099AA). This hardware is required when installing 3rd/4th HDDs using Aftermarket Option (AMO) drives.

Removable Boot Drive option



### Supported Components

#### SATA Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>HP Solid State Drives (SSDs) for Workstations</b>				
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 256GB SATA* 6Gb/s SED SSD	Y	N		
HP 256GB SATA 6Gb/s SED Opal 2 SSD	Y	Y	G7U67AA	
HP 512GB SATA SED SSD	Y	Y	N8T26AA	
HP Enterprise Class 240GB SATA SSD	Y	Y	T3U07AA	
HP Enterprise Class 480GB SATA SSD	Y	Y	T3U08AA	

#### NOTES:

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

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

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

3rd and 4th SSDs require and will be automatically installed into a single 2:1 5.25" external bay adapter, available as AMO (K4T74AA). This hardware is required when installing 3rd/4th SSDs using Aftermarket Option (AMO) drives.

#### PCIe Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>PCIe SSDs for HP Workstations</b>				
HP Z Turbo Drive 512GB SSD	Y	Y	G3G89AA	
HP Z Turbo Drive 256GB SSD	Y	Y	G3G88AA	
HP Z Turbo Drive G2 512GB SSD	Y	Y	M1F74AA	
HP Z Turbo Drive G2 256GB SSD	Y	Y	M1F73AA	
HP Z Turbo Drive G2 1TB SSD	Y	Y	T9H98AA	
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 G2 1TB TLC SSD	Y	Y	Y1T52AA	
HP Z Turbo Drive G2 256GB SED SSD	Y	Y	Y1T55AA	
HP Z Turbo Drive G2 512GB SED SSD	Y	Y	Y1T58AA	
<b>HP Z Turbo Drive Quad Pro</b>				
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	Note 2
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Y	Y	N2M99AA	Note 2
HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	Y	Y	T9H99AA	Note 2
HP Z Turbo Drive G2 1TB TLC SSD	Y	Y	Y1T52AA	
HP Z Turbo Drive G2 256GB TLC SSD	Y	Y	Y1T46AA	

### Supported Components

HP Z Turbo Drive G2 512GB TLC SSD	Y	Y	Y1T49AA	
HP Z Turbo Drive Quad Pro 256GB SSD module	N	Y	N2N00AA	Note 1
HP Z Turbo Drive Quad Pro 512GB SSD module	N	Y	N2N01AA	Note 1
HP Z Turbo Drive Quad Pro 1TB SSD module	N	Y	T9J00AA	Note 1
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 PCIe SSD</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	

#### NOTES:

Up to (4) PCI Express Solid State Drives: 256, 512 GB, 1 TB; 4.0 TB max (via Quad Pro)

Up to (1) Intel 750 Series PCIe SSD: 400GB, 800GB, 1.2TB

**NOTE:** 525W PSU on Z440 only has power connections for (2) HDDs standard. 3rd/4th HDDs/SSDs require a 4pin-to-dual-SATA cable.

**NOTE:** PCIe SSDs are not available with SAS controller or SAS HDDs. All PCIe SSD configurations require the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

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

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

### Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Integrated SATA 6.0 Gb/s Controller</b>				
Integrated SATA 6.0 Gb/s Controller	Y	N		Six Ports
<b>Factory integrated RAID on motherboard for SATA drives</b>				
RAID 0 Configuration – Striped Array	Y	N		Note 1
RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array	Y	N		Note 1
RAID 1 Configuration – Mirrored Array	Y	N		Note 1
RAID 10 Configuration - Striped/Mirrored Array	Y	N		Note 1
<b>LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card</b>				
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA	Note 2, 4
<b>LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit</b>				
LSI 9270-8i SAS 6Gb/s ROC RAID Card	N	Y	E0X21AA	Note 2, 4
LSI iBBU09 Battery Backup Unit	N	Y	E0X19AA	
<b>Integrated RAID for PCIe SSDs</b>				
RAID 0 Data Configuration	Y	N		Note 3

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.

### Supported Components

All drives must be identical in type and capacity.  
RAID arrays greater than 2 TB are fully supported.

**NOTE 1:** Requires hard drives with identical speed, capacity, and interface. Specific user-configured hardware SAS RAID configurations are supported on this Linux system. For details, please visit [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

**NOTE 2:** Specific user-configured hardware SAS RAID configurations are supported on this Linux system.  
IS: Striping of 2 or more HDDs into a single logical volume  
IM: Mirroring of 2 HDDs into a single logical volume  
IME: Mirroring of 3 or more HDDs into a single logical volume.  
For details, please visit [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

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

**Note 4:** Configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

### Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Mixed?
<b>Professional 2D</b>						
NVIDIA NVS 310 1GB Graphics	Y	Y	M6V51AA	Note 1	3	
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 1	3	
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 2	2	
<b>Graphics Cable Adapters</b>						
HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA		1	
HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		1	
HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	
HP DisplayPort To DVI-D Adapter (6-Pack)	Y	N			1	
HP DisplayPort To VGA Adapter	Y	Y	AS615AA		1	
HP DisplayPort To VGA Adapter 2nd	Y	N			1	
<b>Entry 3D</b>						
NVIDIA® Quadro® K620 2GB Graphics	Y	Y	J3G87AA		2	
NVIDIA® Quadro® K420 2GB Graphics	Y	Y	N1T07AA		2	
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA		2	
<b>Mid-range 3D</b>						
NVIDIA® Quadro® K1200 4GB Graphics	Y	Y	L4D16AA		2	
NVIDIA® Quadro® K2200 4GB Graphics	Y	Y	J3G88AA	Note 5, 6	2	
NVIDIA® Quadro® M2000 4GB Graphics	Y	Y	T7T60AA	Note 5, 6	2	
NVIDIA® Quadro® P2000 5GB Graphics	Y	Y	1ME41AA	Note 5, 6	2	
AMD FirePro W4300 4GB Graphics	Y	Y	T7T58AA	Note 5, 6	2	

### Supported Components

AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA	Note 5, 6	2	
<b>High End 3D</b>						
NVIDIA® Quadro® M4000 8GB Graphics	Y	Y	M6V52AA	Notes 3, 4	2	
NVIDIA® Quadro® M5000 8GB Graphics	Y	Y	M6V53AA	Notes 3, 4	1	
NVIDIA® Quadro® P5000 16GB Graphics	Y	Y	Z0B13AA	Notes 3, 4	1	
AMD FirePro™ W7100 8GB Graphics	Y	Y	J3G93AA	Notes 3, 4	1	
Radeon Pro™ WX7100 8GB Graphics*	Y	Y	Z0B14AA	Notes 3, 4	2	N

**Note 1:** When configuring with a 3rd NVS 310 or 315--the configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

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

**Note 3:** Configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

**Note 4:** Supported on 700W PSU chassis only.

**Note 5:** Dual graphics configuration supported on 700W PSU chassis only.

**Note 6:** Dual graphics configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

### High Performance GPU Computing

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
NVIDIA Tesla K40 Workstation Coprocessor	Y	Y	F4A88AA	Notes 1, 2, 3

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

Tesla K40 configurations require the addition of either NVIDIA® Quadro® K620 1st graphics or NVIDIA® Quadro® K2200 1st graphics.

**NOTE 2:** All Tesla configurations require the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

**NOTE 3:** Supported on 700W PSU chassis only.

### Memory

CTO	Option Kit Part Number	Support Notes
<b>DDR4-2133 ECC Registered DIMMs</b>		
16GB DDR4-2133 ECC Registered RAM	J9P83AA	1,2
8GB DDR4-2133 ECC Registered RAM	J9P82AA	1,2
HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM	T9V41AA	1,2
HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM	T9V40AA	1,2
HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM	T9V39AA	1,2
HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM	T9V38AA	1,2

#### NOTES:

For details on the supported memory configurations on the HP Z440 Workstation, please refer to the System Technical Specifications - System Board section of this document.

### Supported Components

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. If an 2133MT/s capable CPU is used in the system, the maximum speed the memory will run at is 2133MT/s, regardless of the specified speed of the memory.

**NOTE 1:** ONLY registered DDR4 DIMMs are supported.  
DDR3 DIMMs ARE NOT SUPPORTED.

**NOTE 2:** Configurations of greater than 4x memory DIMMs require the HP Z440 Memory Cooling Solution, which is available both CTO (J2R51AV) and AMO (J2R52AA).

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### Multimedia and Audio Devices

### Supported Components

#### Multimedia and Audio Devices

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

#### Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>HP SlimTray Optical Drives</b>				
HP 9.5mm Slim DVD Writer	Y	Y	1HH49AV	
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	Note 1
HP 9.5mm Slim BDXL Blu-Ray Writer	Y	Y	K3R65AA	Note 2
<b>HP 15-in-1 Media Card Reader</b>				
HP 15-in-1 Media Card Reader	Y	Y	G1S79AA	
<b>HP DX115 Removable Drive Enclosure</b>				
HP DX115 Removable HDD Frame/Carrier	N	Y	FZ576AA	Note 3
HP DX115 Removable HDD Carrier	N	Y	NB792AA	

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

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

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

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

**NOTE 3:** Only one DX115 device can be installed into Z440. This device can only be installed into the top optical (5.25") bay.

**NOTE 4:** Carrier requires a Z440 to have the DX115 frame installed. This part number is for the carrier only.

#### Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP IEEE 1394b FireWire® PCIe Card	Y	Y	NK653AA	
HP Thunderbolt™ 2 PCIe 1-port I/O Card	Y	Y	F3F43AA	Note 1

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

#### Networking and Communications

### Supported Components

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel I218LM PCIe GbE Controller	Y	N		
Intel Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
Intel Ethernet I350-T2 2-Port 1Gb NIC	Y	Y	V4A91AA	
Intel 7260 802.11 a/b/g/n PCIe WLAN NIC	N	Y	F2P07AA	
Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC	N	Y	N0S95AA	

**NOTE 1:** "Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/sec. For high speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

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

### Racking and Physical Security

### Supported Components

#### Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Solenoid Hood Lock & Hood Sensor	Y	N		
HP Business PC Security Lock Kit	N	Y	PV606AA	
HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit	N	Y	WH340AA	
HP Keyed Cable Lock 10mm	N	Y	T1A62AA	

#### Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP PS/2 Keyboard	Y	Y	QY774AA	
HP USB Keyboard	Y	Y	QY776AA	
HP USB Smart Card Keyboard	Y	Y	E6D77AA	
HP Wireless Keyboard and Mouse	Y	Y	QY449AA	
HP PS/2 Mouse	Y	Y	QY775AA	
HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	N	Y	ET424AA	
HP USB Hardened Mouse	Y	Y	P1N77AA	
HP SpaceMouse Pro USB 3D Input Device	N	Y	B4A20AA	
HP SpacePilot Pro 3D USB Intelligent Controller	N	Y	WH343AA	
3Dconnexion CADMouse	Y	Y	M5C35AA	
HP PS/2 Business Slim Keyboard	Y	Y	N3R86AA	
HP USB Business Slim Keyboard	Y	Y	N3R87AA	
HP Wireless Business Slim Keyboard	Y	Y	N3R88AA	Note 1

**NOTE 1:** Combo kit includes wireless mouse

#### Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Z440 HP Z Cooler	Y	N		
HP Z440 Memory Cooling Solution	Y	Y	J2R52AA	Note 1
HP Z440 Fan and Front Card Guide Kit	Y	Y	J9P80AA	Note 2
HP Internal USB Port Kit	N	Y	EM165AA	Note 3
HP eSATA PCI Cable Kit	Y	Y	GM110AA	Note 4
HP Serial Port Adapter	Y	Y	PA716A	
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	
HP Power Cord Kit	N	Y	DM293A	
HP Workstation Mouse Pad	Y	N		Japan only
HP ENERGY STAR® Enabled Configuration	Y	N		



### Supported Components

**Note 1:** The HP Z440 Memory Cooling Solution is available to add to any configuration for improved system cooling, but is required for memory configurations using greater than 4x DIMMs.

**Note 2:** Fan and Front Card Guide required for any configuration that includes any of the following components:

- 1 x LSI 9217 SAS Controller
- 1 x NVIDIA® Quadro® P5000
- 1 x AMD Radeon Pro WX 7100
- 2 x AMD FirePro W4300
- 2 x NVIDIA® Quadro® M2000
- 3 x NVIDIA NVS 310/315
- 1 x NVIDIA® Quadro® M4000
- 1 x NVIDIA® Quadro® M5000
- 1 x NVIDIA® Quadro® K4200
- 1 x NVIDIA® Quadro® K5200
- 2 x AMD FirePro W5100
- 1 x AMD FirePro W7100
- 1 x NVIDIA Tesla K40
- 1 x HP Z Turbo Drive 256GB
- 1 x HP Z Turbo Drive 512GB
- 1 x HP Z Turbo Drive G2 256GB
- 1 x HP Z Turbo Drive G2 512GB
- Any HP Z Turbo Quad Pro configuration

**Note 3:** The HP Internal USB Port kit has a single USB 2.0 type A connector.

**Note 4:** No hot plug / hot swap supported

### Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	Y		Note 1
HP Remote Graphics Software (RGS) 7.1	Y	Y		Note 2
MS Office Home & Business 2016	Y	Y		Note 3
Cyberlink 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:** Supported operating systems:

- Windows 7 Professional 32/64
- Windows 8.1 Professional 32/64
- RHEL v6.6, 7
- SLED 11 SP3

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

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

### Supported Components

#### Operating Systems

#### Support Notes

Windows 10 Pro 64

Windows 10 Pro downgrade to Windows 7 Professional 64

Windows 10 Home 64

High end

HP Linux Installer Kit

Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)

Note 1

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

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### System Technical Specifications

#### System Board

<b>System Board Form Factor</b>	Main System Board: 24 x 31 cm 9.6 x 12.2 inches
<b>Processor Socket</b>	Single LGA2011 R3
<b>Chipset</b>	Intel® C612 Chipset
<b>Super I/O Controller</b>	Nuvoton NPCD379H (SIO-12)
<b>Memory Expansion Slots</b>	8 DDR4 memory slots
<b>Memory Type Supported</b>	DDR4, RDIMM (Registered), ECC: 4GB, 8GB, 16GB and 32GB
<b>Memory Modes</b>	Channel Interleaved
<b>Memory Speed Supported</b>	1600MT/s, 1866MT/s, 2133MT/s, and 2400MT/s
<b>Memory Protection</b>	ECC available on data, parity on address and command
<b>Memory Configuration Table</b>	Please refer to the table below for details on how supported memory configurations are installed in your system.

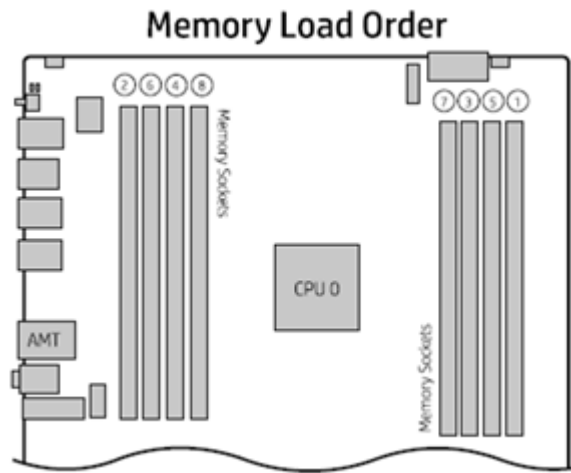
\* For 32 bit operating systems, there is a memory limit of 4GB.

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

		CPU 0								
		Front Slots				Rear 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	4 GB	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	16 GB	16 GB	16 GB	16 GB	16 GB	16 GB	16 GB	Best
128 GB		32 GB		32 GB			32 GB		32 GB	Best
256 GB		32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	Best
<b>Slot Load Order</b>		1	5	3	7	8	4	6	2	

For a detailed diagram, please refer to the label located on the inside of the system side panel.

### System Technical Specifications



**Maximum Memory** Supports up to 256GB

**Memory Configuration (Supported)** Only ECC DIMMs are supported.

**Note on Maximum Memory** Maximum memory capacities assume 64-bit operating systems such as Windows 8.1 64-bit, Windows 7 Ultimate 64-bit, or Windows 7 Professional 64-bit. Windows 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB.

**PCI Express Connectors**

Slot 1 (top):  
PCI Express Gen2 x1  
Full-height, Half-length

Slot 2:  
PCI Express Gen3 x16  
Full-height, Full-length (with extender)

Slot 3:  
PCI Express Gen2 x4 with open-ended connector\*\*  
Full-height, Full-length (with extender)

Slot 4:  
PCI Express Gen3 x8 with open-ended connector\*\*  
Full-height, Full-length (with extender)

Slot 5:  
PCI Express Gen3 x16  
Full-height, Full-length (with extender)

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

**PCI Connectors (5.0V)**

Slot 6:  
PCI 32bit/33MHz  
Full-height, Full-length (with extender)

### System Technical Specifications

<b>Supported Drive Interfaces</b>	<b>SATA</b>	2 SATA @6Gb/s, supports RAID 0,1 and NCQ. 4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	<b>Serial Attached SCSI</b>	Requires Optional PCIe card
	<b>Integrated RAID</b>	SATA: RAID 0, 1 SSATA: RAID 0, 1, 10 <ul style="list-style-type: none"> <li>• RAID 0 configuration - striped array (supported and configure to order)</li> <li>• RAID 1 configuration - mirrored array (supported and configure to order)</li> <li>• RAID 5 parity striping (supported but not configure to order)</li> <li>• RAID 10 striped and mirrored array</li> </ul> *HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead.
	<b>Integrated Graphics</b>	No
	<b>Network Controller</b>	Integrated Intel I-218 Gbit LAN  Supports the following management functionalities: Intel AMT9.1, TXT, DASH 1.1, WOL, VLAN, Teaming and PXE 2.1
	<b>External SATA (eSATA)</b>	Supported on all SATA and sSATA ports configurable with optional eSATA* cable kit * hot plug / hot swap not supported with eSATA
	<b>IDE connector</b>	No
	<b>Floppy connector</b>	No
	<b>Serial</b>	1 internal header
	<b>2nd Serial</b>	No
	<b>Parallel</b>	No
	<b>AUX IN (audio)</b>	No
<b>IEEE 1394 Connector(s)</b>	<b>Front</b>	None
	<b>Rear</b>	2 IEEE 1394b (requires optional PCIe card)
	<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>	2 USB 2.0 port available with a single 2x5 header. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. 1 USB 3.0 port available by a 2x10 header.

### System Technical Specifications

<b>HD Integrated Audio</b>	Realtek ALC221			
<b>Flash ROM</b>	Yes			
<b>CPU Fan Header</b>	Yes			
<b>Chassis Fan Header</b>	1 Rear System Chassis Fan Header			
<b>Front PCI Fan Header</b>	Yes			
<b>Front Control Panel/Speaker Header</b>	Yes			
<b>CMOS Battery Holder - Lithium</b>	Yes			
<b>Integrated Trusted Platform Module</b>	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. CG TPM Certified products list: <a href="http://www.trustedcomputinggroup.org/certification/tpmcertifiedproducts/">http://www.trustedcomputinggroup.org/certification/tpmcertifiedproducts/</a>			
<b>Power Supply Headers</b>	Yes			
<b>Power Switch, Power LED &amp; Hard Drive LED Header</b>	Yes			
<b>Clear Password Jumper</b>	Yes			
<b>Serial Port</b>	1 internal header			
<b>Parallel Port</b>	No			
<b>Keyboard/Mouse</b>	USB or PS/2			
<b>Power Supply</b>	700W 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)		525W 85% Efficient, Custom PSU (Wide-Ranging, Active PFC)	
<b>Operating Voltage Range</b>	90–269 VAC		90–269 VAC	
<b>Rated Voltage Range</b>	100–240 VAC	118 VAC	100–240 VAC	118 VAC
<b>Rated Line Frequency</b>	50–60 Hz	400 Hz	50–60 Hz	400 Hz
<b>Operating Line Frequency Range</b>	47–66 Hz	393–407 Hz	47–66 Hz	393–407 Hz
<b>Rated Input Current</b>	100–240V @ 9.5A	118V @ 9.5A	100–240V @ 7A	118V @ 7A
<b>Heat Dissipation (Configuration and software dependent)</b>	Typical = 1648 btu/hr (415 kg-cal/hr) Max = 2746 btu/hr (692 kg-cal/hr)		Typical = 1311 btu/hr (330 kg-cal/hr) Max = 2185 btu/hr (551 kg-cal/hr)	
<b>Power Supply Fan</b>	92x25 mm variable speed		92x25 mm variable speed	
<b>ENERGY STAR Qualified (Configuration dependent)</b>	Yes		Yes	
	Yes, 90% Efficient		Yes, 85% Efficient	
<b>80 PLUS® Compliant</b>	The Z440 700W power supply efficiency report can be found at this link: <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf</a>		The Z440 525W power supply efficiency report can be found at this link: <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf</a>	
<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	

### System Technical Specifications

<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>	<15w	<15w
<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
<b>Hood Lock Header</b>	Yes	
<b>Hood Sensor Header</b>	Yes	
<b>Memory Fan</b>	1 Memory Fan Header	

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### System Technical Specifications

### System Configuration

<b>Example Configuration #1</b> ENERGY STAR QUALIFIED	Processor	1x Intel Xeon E5-1603 v3 (Quad-Core)					
	Memory	1x 4GB DDR4-2133 Registered RAM					
	Graphics	1x NVIDIA NVS 310					
	Disks / Optical	1x 500GB SATA 7200 / 1x Slim DVD-ROM SATA					
	Power Supply	525W 85% Custom PSU					
	Other	N/A					

Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	51.01 W		51.29 W		53.01 W	
	Windows Busy Typ(S0)	112.95 W		110.62 W		113.96 W	
	Windows Busy Max (S0)	117.16 W		112.45 W		114.67 W	
	Sleep (S3)	2.34 W	2.19 W	2.54 W	2.41 W	2.33 W	2.19 W
	Off (S5)	0.825 W	0.784 W	1.024 W	0.985 W	0.851 W	0.772 W
	Zero Power Mode (ErP)	0.190 W		0.382 W		0.178 W	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	174.06 Btu/hr		175.02 Btu/hr		180.89 Btu/hr	
	Windows Busy Typ(S0)	385.39 Btu/hr		377.4 Btu/hr		388.83 Btu/hr	
	Windows Busy Max (S0)	399.75 Btu/hr		383.68 Btu/hr		391.25 Btu/hr	
	Sleep (S3)	7.98 Btu/hr	7.49 Btu/hr	8.68 Btu/hr	8.21 Btu/hr	7.95 Btu/hr	7.47 Btu/hr
	Off (S5)	2.18 Btu/hr	2.67 Btu/hr	3.49 Btu/hr	3.36 Btu/hr	2.90 Btu/hr	2.63 Btu/hr
	Zero Power Mode (ErP)	0.649 Btu/hr		1.303 Btu/hr		0.607 Btu/hr	

<b>Example Configuration #2</b> ENERGY STAR QUALIFIED	Processor	1x Intel Xeon E5-1630 v3 (Quad-Core)					
	Memory	2x 4GB DDR4-2133 Registered RAM					
	Graphics	1x NVIDIA® Quadro® K620					
	Disks / Optical	1x 500GB SATA 7200 / 1x Slim DVD-ROM SATA					
	Power Supply	700W 90% Custom PSU					
	Other	N/A					

Energy Consumption (Watts)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	62.25 W		61.50 W		62.31 W	
	Windows Busy Typ(S0)	112.48 W		111.39 W		113.48 W	
	Windows Busy Max (S0)	136.87 W		129.05 W		113.64 W	
	Sleep (S3)	2.25 W	2.147 W	2.41 W	2.30 W	2.25 W	2.14 W
	Off (S5)	0.821 W	0.775 W	1.024 W	0.925 W	0.842 W	0.769 W
	Zero Power Mode (ErP)	0.167 W		0.306 W		0.158 W	

Heat Dissipation (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	212.43 Btu/hr		209.85 Btu/hr		212.62 Btu/hr	



### System Technical Specifications

Windows Busy Typ(S0)	383.78 Btu/hr		380.06 Btu/hr		387.19 Btu/hr	
Windows Busy Max (S0)	467.00 Btu/hr		440.32 Btu/hr		387.74 Btu/hr	
Sleep (S3)	7.69 Btu/hr	7.31 Btu/hr	8.21 Btu/hr	7.85 Btu/hr	7.67 Btu/hr	7.31 Btu/hr
Off (S5)	2.80 Btu/hr	2.65 Btu/hr	3.49 Btu/hr	3.16 Btu/hr	2.87 Btu/hr	2.62 Btu/hr
Zero Power Mode (ErP)	0.568 Btu/hr		1.043 Btu/hr		0.538 Btu/hr	

<b>Example Configuration #3</b>	Processor	1x Intel Xeon E5-1620 v3 (Quad-Core)				
	Memory	2x 8GB DDR4-2133 Registered RAM				
	Graphics	1x NVIDIA® Quadro® K2200				
	Disks/Optical	2x 1TB SATA 7200 / 1x Slim DVDRW SATA				
	Power Supply	525W 85% Custom PSU				
	Other	N/A				

<b>Energy Consumption (Watts)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	51.41 W		51.15 W		52.42 W	
	Windows Busy Typ(S0)	179.17 W		175.74 W		176.74 W	
	Windows Busy Max (S0)	201.86 W		198.12 W		196.99 W	
	Sleep (S3)	2.35 W	2.28 W	2.55 W	2.49 W	2.38 W	2.27 W
	Off (S5)	0.827 W	0.785 W	1.028 W	0.986 W	0.853 W	0.770 W
	Zero Power Mode (ErP)	0.167 W		0.382 W		0.177 W	

<b>Heat Dissipation (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	178.82 Btu/hr		174.56 Btu/hr		178.88 Btu/hr	
	Windows Busy Typ(S0)	611.33 Btu/hr		599.62 Btu/hr		603.04 Btu/hr	
	Windows Busy Max (S0)	688.75 Btu/hr		675.99 Btu/hr		672.13 Btu/hr	
	Sleep (S3)	8.02 Btu/hr	7.79 Btu/hr	8.71 Btu/hr	8.48 Btu/hr	8.13 Btu/hr	7.76 Btu/hr
	Off (S5)	2.82 Btu/hr	2.67 Btu/hr	3.51 Btu/hr	3.36 Btu/hr	2.91 Btu/hr	2.62 Btu/hr
	Zero Power Mode (ErP)	0.571 Btu/hr		1.305 Btu/hr		0.604 Btu/hr	

<b>Example Configuration #4</b>	Processor	1x Intel Xeon E5-1680 v3 (Eight-Core)				
	Memory	4x 16GB DDR4-2133 Registered RAM				
	Graphics	1x NVIDIA® Quadro® K5200				
	Disks / Optical	4x 2TB SATA 7200 / 1x Slim DVDRW SATA				
	Power Supply	700W 90% Custom PSU				
	Other	N/A				

<b>Energy Consumption (Watts)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	61.88 W		61.39 W		62.35 W	
	Windows Busy Typ(S0)	296.64 W		290.88 W		303.03 W	
	Windows Busy Max (S0)	338.63 W		334.85 W		333.11 W	
	Sleep (S3)	3.99 W	3.91 W	4.02 W	4.04 W	3.99 W	3.91 W

### System Technical Specifications

	Off (S5)	0.86 W	0.764 W	1.02 W	0.91 W	0.86 W	0.76 W
	Zero Power Mode (ErP)	0.166 W		0.305 W		0.165 W	
<b>Heat Dissipation</b> (Btu/hr)		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Enabled	LAN Disabled	LAN Enabled
	Windows Idle (S0)	211.16 Btu/hr		209.47 Btu/hr		212.75 Btu/hr	
	Windows Busy Typ(S0)	1012.14 Btu/hr		992.48 Btu/hr		1033.94 Btu/hr	
	Windows Busy Max (S0)	1155.41 Btu/hr		1142.51 Btu/hr		1136.57 Btu/hr	
	Sleep (S3)	13.6 Btu/hr	13.4 Btu/hr	13.7 Btu/hr	13.8 Btu/hr	13.6 Btu/hr	13.4 Btu/hr
	Off (S5)	2.94 Btu/hr	2.60 Btu/hr	3.49 Btu/hr	3.11 Btu/hr	2.91 Btu/hr	2.58 Btu/hr
	Zero Power Mode (ErP)	0.565 Btu/hr		1.042 Btu/hr		0.563 Btu/hr	

**NOTE:** Power consumption measurements do not take advantage of the Intel Turbo Boost Technology. As a result, power consumption measurements may be higher.

### DECLARED NOISE EMISSIONS

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

<b>Declared Noise Emissions</b> (in accordance with ISO 7779 and ISO 9296)		<b>Sound Power</b> (LWAd, bels)	<b>Deskside Sound Pressure</b> (LpAm, decibels)
	<b>Idle</b>		3.2
<b>Hard drive Operating</b> (random reads)		3.3	15
<b>DVD-ROM Operating</b> (sequential reads)		4.3	30

### 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>	<b>Shock</b> Operating: ½-sine: 40g, 2-3ms (~62 cm/sec)

### System Technical Specifications

Non-operating:

½-sine: 160 cm/s, 2-3ms (~105g)

square: 422 cm/s, 20g

**NOTE:** Values represent individual shock events and do not indicate repetitive shock events.

#### Vibration

Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g<sup>2</sup>/Hz

Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g<sup>2</sup>/Hz

**NOTE:** Values do not indicate continuous vibration.

#### Cooling

Above 1524 m (5,000 ft.) altitude, maximum operating temperature is derated by 1° C (1.8° F) per 305 m (1,000 ft.) elevation increase

### Physical Security and Serviceability

<b>Access Panel</b>	Tool-less Includes system board and memory information.
<b>Optical Drive</b>	Tool-less
<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 primary serviceable components.
<b>Color-coordinated Cables and Connectors</b>	Yes
<b>Memory</b>	Tool-less
<b>System Board</b>	Screw-In
<b>Dual Color Power and HD LED on Front of Computer</b>	Yes
<b>Configuration Record SW</b>	Yes
<b>Over-Temp Warning on Screen</b>	Yes, at POST screen on reboot
<b>Restore CD/DVD Set</b>	Restores the computer to its original factory shipping image; can be obtained via HP Support.
<b>Dual Function Front Power Switch</b>	Yes, causes a fail-safe power off when held for 4 seconds
<b>Padlock Support</b>	Yes (optional): Locks side cover and secures chassis from theft 7.0 mm (0.2756 in) diameter padlock loop at rear of system
<b>Cable Lock Support</b>	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
<b>Universal Chassis Clamp Lock Support</b>	Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system
<b>Solenoid Lock and Hood Sensor</b>	Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed
<b>Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control</b>	Yes, enables or disables serial, USB, audio, and network ports

### System Technical Specifications

<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 Yes, prevents an unauthorized person from changing the workstation configuration
<b>3.3V Aux Power LED on System PCA</b>	Yes
<b>NIC LEDs (integrated) (Green &amp; Amber)</b>	Yes
<b>CPUs and Heatsinks</b>	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
<b>Power Supply Diagnostic LED</b>	Yes
<b>Front Power Button</b>	Yes, ACPI multi-function
<b>Rear Power Button</b>	Yes
<b>Front Power LED</b>	Yes, white (normal), red (fault)
<b>Front Hard Drive Activity LED</b>	Yes, white
<b>Front ODD Activity LED</b>	Yes, on device
<b>Internal Speaker</b>	Yes
<b>System/Emergency ROM Flash Recovery</b>	Recovers corrupted system BIOS.
<b>Cooling Solutions</b>	Air cooled forced convection heatsinks
<b>Power Supply Fans</b>	92 mm x 92 mm x 25 mm (non-serviceable)
<b>CPU Heatsink Fan</b>	92 mm x 25 mm, 6-wire, PWM
<b>Chassis Fan</b>	Front: (Optional) 92 mm x 92mm x 25 mm, 4-wire, PWM  Rear: 92 mm x 92mm x 25 mm, 4-wire, PWM
<b>Memory Heatsink Fan</b>	Dual 60 mm x 60 mm x 25 mm, 6-wire, PWM, Blindmate
<b>HP PC Hardware Diagnostics UEFI</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.</p> <p>Typical uses of the Vision Diagnostics are:</p> <ul style="list-style-type: none"> <li>• Testing and diagnosing apparent hardware failures</li> </ul>

### System Technical Specifications

- Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance
- Sending configuration information to another location for more in-depth analysis
- Entered using F2

**Access Panel Key Lock** No

**ACPI-Ready Hardware** Advanced Configuration and Power Management Interface (ACPI).

- Allows the system to wake from a low-power mode.
- Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system

**Trusted Platform Module Chip** Infineon TPM 1.2 Certified

**Integrated Chassis Handles** Yes, Front handle and dedicated rear recess

**Power Supply** Requires T15 Torx or flat blade screwdriver

**PCIe Card Retention** Yes, rear (all), middle (all), front (full-length cards with extender, using HP Z4 Fan and Front Card Guide Kit)

**Flash ROM** Yes

**Diagnostic Power Switch LED on board** Yes

**Clear Password Jumper** Yes

**Clear CMOS Button** Yes

**CMOS Battery Holder** Yes

**DIMM Connectors** Yes

### BIOS

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

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

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

**BBS** BIOS Boot Specification v1.01.

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

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

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

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

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

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

**SMBIOS** System Management BIOS 2.7, for system management information.

**Boot Control** Disables the ability to boot from removable media on supported devices.

**Memory Change Alert** Alerts management console if memory is removed or changed.

**Thermal Alert** Monitors the temperature state within the chassis. Three modes:

### System Technical Specifications

- **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 resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 4.0 for full compatibility with 64-bit operating systems.
<b>Ownership Tag</b>	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
<b>Remote Wakeup/Remote Shutdown</b>	System administrators can power on, restart, and power off a client computer from a remote location.
<b>Instantly Available PC (Suspend to RAM - ACPI sleep state S3)</b>	Allows for very low power consumption with quick resume time.
<b>Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)</b>	Allows a new or existing system to boot over the network and download software, including the operating system.
<b>ROM revision levels</b>	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
<b>System board revision level</b>	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
<b>Start-up Diagnostics (Power-on Self-Test)</b>	Assesses system health at boot time with selectable levels of testing.
<b>Auto Setup when new hardware installed</b>	System automatically detects 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>	The user or MIS to set a unique tag string in non-volatile memory.
<b>Per-slot Control</b>	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
<b>Adaptive Cooling</b>	Control parameters are set according to detected hardware configuration for optimal acoustics.
<b>Pre-boot Diagnostics</b>	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
<b>Industry Standard Specification Support</b>	
<b>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

### System Technical Specifications

<b>PMM</b>	PCI Express Base Specification, Revision 3.0
<b>SATA</b>	POST Memory Manager Specification, Version 1.01 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 Computing Group TPM Specification Version 1.2

**UHCI** Universal Host Controller Interface Design Guide, Revision 1.1

**USB** Universal Serial Bus Revision 1.1 Specification

Universal Serial Bus Revision 2.0 Specification

**SMBIOS** Universal Serial Bus Revision 3.0 Specification  
System Management BIOS Reference Specification, Version 2.7

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

### Social and Environmental Responsibility

**Eco-Label Certifications & Declarations** This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

- ENERGY STAR® (energy-saving features available on selected configurations-Windows only)
- US Federal Energy Management Program (FEMP)
- China Energy Conservation Program
- The ECO declaration (TED)

**Batteries** The battery in this product complies with EU Directive 2006/66/EC  
Battery size: CR2032 (coin cell)  
Battery type: Lithium Metal

The battery in this product does not contain:

- Mercury greater than 5ppm by weight
- Cadmium greater than 10ppm by weight
- Lead greater than 40ppm by weight

**Restricted Material Usage** This product meets the material restrictions specified in HP's General Specification for the Environment.  
<http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf>

**Low Halogen Statement** 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.

This product is low-halogen except for power cords, external cables and peripherals. The following customer-configurable internal components may not be low-halogen: 3 ½" SAS HDDs and LSI 9217-4i4e SAS ROC RAID Card. 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.

### System Technical Specifications

#### 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>

#### Additional Information

ISO 14001 certificates:

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

- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.

<http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disasassemblyworkstatio.html>

- Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See <http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24> for registration status in your country.

#### Packaging

HP Workstation product packaging meets the HP General Specification for the Environment at [http://www.hp.com/hpinfo/globalcitizenship/society/gen\\_specifications.html](http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html)

- Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment
- Does not contain ozone-depleting substances (ODS)
- Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed
- Maximizes the use of post-consumer recycled content materials in packaging materials
- All packaging material is recyclable
- All packaging material is designed for ease of disassembly
- Reduced size and weight of packages to improve transportation fuel efficiency
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting

#### Packaging Materials

##### Internal

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

##### External

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

#### Manageability

##### Industry Standard Specifications

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

- DASH 1.1 (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



### System Technical Specifications

- Serial Over LAN (SOL)
- IDE Redirect
- ME Wake-on-LAN (WOL)
- DASH 1.1 compliance
- IPv6 Support
- Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection
- Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance.
- Remote Alerts - automatically alert IT or service provider if issues arise
- Access Monitor - Provides oversight into Intel® AMT actions to support security requirements
- PC Alarm Clock
- Microsoft NAP Support
- Host Base set-up and configuration
- Management Engine (ME) firmware roll back
- Local Time Sync to UTC
- Remote Memory Dump Command – Creates memory dump for debug

**Intel® vPro™ Technology** The HP Z440 Workstation supports Intel® vPro technology when configured as outlined below:

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

**Remote Manageability Software Solutions** The HP Z440 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

### System Software Manager Service, Support, and Warranty

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

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

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

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

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

HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: <http://www.hp.com/go/lookuptool>. Additional HP Care Pack Services information by product is available at: <http://www.hp.com/hps/carepack>. Service levels and response times for HP Care Packs may vary depending on your geographic location.

### Product Change Notification

- Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile.

### System Technical Specifications

- 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.
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### Stable & Consistent Offerings

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

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

#### Processors

Product #	Offering
J6S66AV	Intel Xeon E5-1603 v3 2.8GHz 4-core 10MB 1866
J6S68AV	Intel Xeon E5-1620 v3 3.5GHz 4-core 10MB 2133
J6S69AV	Intel Xeon E5-1630 v3 3.7GHz 4-core 10MB 2133
J6S71AV	Intel Xeon E5-2630 v3 2.4GHz 8-core 20MB 1866

#### Hard Drives

Product #	Offering
J3H77AV	500GB 7200 RPM SATA 1st Hard Disk Drive
J3H98AV	500GB 7200 RPM SATA 2nd Hard Disk Drive
J3J19AV	500GB 7200 RPM SATA 3rd Hard Disk Drive
J3J39AV	500GB 7200 RPM SATA 4th Hard Disk Drive
J3H78AV	1TB 7200 RPM SATA 1st Hard Disk Drive
J3H99AV	1TB 7200 RPM SATA 2nd Hard Disk Drive
J3J20AV	1TB 7200 RPM SATA 3rd Hard Disk Drive
J3J40AV	1TB 7200 RPM SATA 4th Hard Disk Drive

#### Graphics

Product #	Offering
J1P69AV	NVIDIA NVS 510 2GB 1st Graphics
J1P81AV	NVIDIA NVS 510 2GB 2nd Graphics
J1P71AV	NVIDIA® Quadro® K620 2GB 1st Graphics
J1P83AV	NVIDIA® Quadro® K620 2GB 2nd Graphics
J1P72AV	NVIDIA® Quadro® K2200 4GB 1st Graphics
J1P84AV	NVIDIA® Quadro® K2200 4GB 2nd Graphics
J1P76AV	AMD FirePro W2100 2GB 1st Graphics
J1P85AV	AMD FirePro W2100 2GB 2nd Graphics

#### Memory

Product #	Offering
G8U28AV	8GB DDR4-2133 (1x8GB) Registered RAM
G8U32AV	16GB DDR4-2133 (2x8GB) Registered RAM
G8U34AV	32GB DDR4-2133 (4x8GB) Registered RAM
G8U36AV	64GB DDR4-2133 (8x8GB) Registered RAM

### Stable & Consistent Offerings

G8U35AV	32GB DDR4-2133 (2x16GB) Registered RAM
G8U37AV	64GB DDR4-2133 (4x16GB) Registered RAM
G8U38AV	128GB DDR4-2133 (8x16GB) Registered RAM

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### Optical and Removable Storage

Product #	Offering
F5W18AV	Slim DVDRW SATA 1st Optical Disk Drive
G8U22AV	Slim DVDRW SATA 2nd Optical Disk Drive

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### Technical Specifications - Processors

Intel Xeon E5-1680 v3 3.2 2133 8C CPU

Intel Xeon E5-1660 v3 3.0 2133 8C CPU

Intel Xeon E5-1650 v3 3.5 2133 6C CPU

Intel Xeon E5-1630 v3 3.7 2133 4C CPU

Intel Xeon E5-1620 v3 3.5 2133 4C CPU

Intel Xeon E5-1607 v3 3.1 1866 4C CPU

Intel Xeon E5-1603 v3 2.8 1866 4C CPU

Intel Xeon E5-2630 v3 2.4 1866 8C CPU

Intel Xeon E5-2637 v4 3.5 2400 4C CPU

Intel Xeon E5-2623 v4 2.6 2133 4C CPU

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### Technical Specifications - Hard Drives

#### STORAGE/HARD DRIVES

**HP SAS (Serial Attached SCSI) Hard Drives for HP Workstations**

**HP 600GB SAS 10K SFF HDD**

<b>Capacity</b>	600GB
<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</b> (typical reads, includes controller overhead, including settling)	<b>Average</b> 2.0ms
<b>Rotational Speed</b>	15K rpm
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

**HP 300GB SAS 10K SFF HDD**

<b>Capacity</b>	300GB
<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</b> (typical reads, includes controller overhead, including settling)	<b>Average</b> 2.0ms
<b>Rotational Speed</b>	15K rpm
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

**HP 300GB SAS 10K SFF HDD**

<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)

### Technical Specifications - Hard Drives

<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 (typical reads, includes controller overhead, including settling)</b>		<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)	
	<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)	

### Technical Specifications - Hard Drives

**SATA (Serial ATA) Hard Drives for HP Workstations**

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

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

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

<b>Capacity</b>	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 (6.0Gb/s), NCQ enabled
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600 MB/s
<b>Buffer</b>	64MB
<b>Cache</b>	Adaptive
<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 2 ms
	<b>Average</b> 11 ms
	<b>Full Stroke</b> 21 ms
<b>Rotational Speed</b>	7,200 rpm
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

**2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD**

<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 (Maximum)</b>	Up to 600 MB/s
<b>Buffer</b>	64MB
<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 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)



### Technical Specifications - Hard Drives

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

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

#### 1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)

<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</b> (based on Rated POH)	<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

### Technical Specifications - Hard Drives

#### 4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)

<b>Capacity</b>	4TB
<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), 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>	32° to 140° F (0° to 60° C)

#### 500GB SATA 7.2K SED SFF HDD

<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</b> (typical reads, includes controller overhead, including settling)	<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)

#### 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)

<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)

### Technical Specifications - Hard Drives

<b>SATA SSDs for HP Workstations</b>	<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)								
		<b>Performance</b>	<table border="0"> <tr> <td><b>Sequential Read</b></td> <td>560 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>400 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>90K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>88K IOPS</td> </tr> </table>	<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>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>	<table border="0"> <tr> <td><b>Sequential Read</b></td> <td>560MB/s (max)</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>510MB/s (max)</td> </tr> <tr> <td><b>Random Read</b></td> <td>100K IOPS (max)</td> </tr> <tr> <td><b>Random Write</b></td> <td>88K IOPS (max)</td> </tr> </table>	<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>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 2 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								

### Technical Specifications - Hard Drives

	<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>	<table border="0"> <tr> <td><b>Sequential Read</b></td> <td>560MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>510 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>100K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>88K IOPS</td> </tr> </table>	<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>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 2								
<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>	<table border="0"> <tr> <td><b>Sequential Read</b></td> <td>560 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>510 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>100K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>88K IOPS</td> </tr> </table>	<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>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>	<table border="0"> <tr> <td><b>Sequential Read</b></td> <td>560 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>510 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>100K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>88K IOPS</td> </tr> </table>	<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>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 - 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	
<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	

### Technical Specifications - Hard Drives

<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	

#### HP Enterprise Class 480GB SATA SSD

<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	

#### PCIe SSDs for HP Workstations

#### HP Z Turbo Drive 256GB SSD

<b>Capacity</b>	256GB	
<b>Protocol</b>	PCIe	
<b>Form Factor</b>	Half-height, half-length	
<b>Controller</b>	AHCI	
<b>NAND Type</b>	MLC	
<b>Endurance</b>	146TB	
<b>Interface</b>	PCI Express 2.0 x4 electrical x4 physical	
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Performance</b>	<b>Sequential Read</b>	1080 MB/s
	<b>Sequential Write</b>	800 MB/s
	<b>Random Read</b>	120K IOPS
	<b>Random Write</b>	60K IOPS
<b>Capacity</b>	512GB	

### Technical Specifications - Hard Drives

<b>HP Z Turbo Drive 512GB SSD</b>	<b>Protocol</b>	PCIe
	<b>Form Factor</b>	Half-height, half-length
	<b>Controller</b>	AHCI
	<b>NAND Type</b>	MLC
	<b>Endurance</b>	292TB
	<b>Interface</b>	PCI Express 2.0 x4 electrical x4 physical
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>Performance</b>	<b>Sequential Read</b> 1170 MB/s
		<b>Sequential Write</b> 950 MB/s
		<b>Random Read</b> 122K IOPS
		<b>Random Write</b> 72K IOPS
<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

### Technical Specifications - Hard Drives

<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 - Hard Drives

<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 (MTBF)</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

<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 (MTBF)</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>	1550 MB/s
		<b>Random Read</b>	300K IOPS
		<b>Random Write</b>	100K IOPS

<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 (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>	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		

### Technical Specifications - Hard Drives

#### HP Z Turbo Drive G2 512GB SED SSD

<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>	<table> <tr> <td><b>Sequential Read</b></td> <td>3200 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>1700 MB/s</td> </tr> <tr> <td><b>Random Read</b></td> <td>330K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>300K IOPS</td> </tr> </table>	<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>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								

#### HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD

<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 (MTBF)</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>1260 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>	1260 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>	1260 MB/s								
<b>Random Read</b>	300K IOPS								
<b>Random Write</b>	100K IOPS								

#### HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD

<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 (MTBF)</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								

#### HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD

<b>Capacity</b>	2TB
<b>Protocol</b>	PCIe

### Technical Specifications - Hard Drives

	<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 border="0"> <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 border="0"> <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									
<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>	<table border="0"> <tr> <td><b>Sequential Read</b></td> <td>2800 MB/s</td> </tr> <tr> <td><b>Sequential Write</b></td> <td>660 MB/s (1600 MB/s max/Turbo)</td> </tr> <tr> <td><b>Random Read</b></td> <td>260K IOPS</td> </tr> <tr> <td><b>Random Write</b></td> <td>260K IOPS</td> </tr> </table>	<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>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)								

### Technical Specifications - Hard Drives

	<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
<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
<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)

### Technical Specifications - Hard Drives

		<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 G2 256GB SED 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 MLC
		<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> 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>	M.2 in Half-height, half-length card
		<b>Controller</b>	NVMe
		<b>NAND Type</b>	3D 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
<b>HP Z Turbo Drive Quad Pro</b>	<b>HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD</b>	<b>Capacity</b>	2x256GB (two M.2 PCIe NVMe modules)
		<b>Interface</b>	PCI Express Gen3 x16
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
	<b>HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD</b>	<b>Capacity</b>	2x512GB (two M.2 PCIe NVMe modules)
		<b>Interface</b>	PCI Express Gen3 x16
		<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)

### Technical Specifications - Hard Drives

<b>HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD</b>	<b>Capacity</b>	2x1TB (two M.2 PCIe NVMe modules)
	<b>Interface</b>	PCI Express Gen3 x16
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
<b>HP Z Turbo Drive Quad Pro 256GB SSD module</b>	<b>Capacity</b>	256GB (one M.2 PCIe NVMe module)
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
<b>HP Z Turbo Drive Quad Pro 512GB SSD module</b>	<b>Capacity</b>	512GB (one M.2 PCIe NVMe module)
	<b>Interface</b>	PCI Express 3.0 x4 electrical x4 physical
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)
<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

<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)

### Technical Specifications - Hard Drives

<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

### Technical Specifications - Hard Drive Controllers

#### HARD DRIVE CONTROLLERS

<b>LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card</b>	<b>PCI Bus</b>	8 lanes, PCI Express 3.0
	<b>RAID Levels</b>	Offers Integrated RAID (0, 1, 1E and 10)
	<b>PCI Data Burst Transfer Rate</b>	Half Duplex x8, PCIe, 8000 MB/s
	<b>SAS Bandwidth</b>	<b>Half Duplex</b> 600 MB/s per lane
	<b>PCI Card Type</b>	3.3V Add-in Card
	<b>PCI Voltage</b>	12 V ± 10%
	<b>PCI Power</b>	9.8W typical, Airflow min 200 LFM
	<b>Bracket</b>	Full height and low profile
	<b>Certification Level</b>	PCI Express 3.0 compliant
	<b>SAS Processor</b>	LSI SAS2308/ Fusion MPT 2.0
	<b>Internal Connectors</b>	One x4 internal mini-SAS (SFF8087)
	<b>External Connectors</b>	One x4 external mini-SAS (SFF8088)
	<b>Maximum Number of SCSI Devices</b>	256 Non-RAID SAS/SATA devices
	<b>LED Indicators</b>	N/A
<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
	<b>PCI Data Burst Transfer Rate</b>	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>Bracket</b>	PCI-Express 3.0
	<b>Certification Level</b>	Eight 6Gb/s and 3Gb/s compatible SAS/SATA ports
	<b>SAS Processor</b>	LSISAS2208 Dual-Core RAID on Chip (ROC)
	<b>Internal Connectors</b>	Two SAS SFF8087 x4 (Mini-SAS)
	<b>External Connectors</b>	None
	<b>Maximum Number of SCSI Devices</b>	Up to 128 SAS and/or SATA hard drives and SSDs
	<b>LED Indicators</b>	<b>Heartbeat LED on card</b>



### Technical Specifications - Graphics

#### GRAPHICS

##### NVIDIA NVS 310 1GB Graphics

<b>Form Factor</b>	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
<b>Graphics Controller</b>	NVIDIA NVS 310 GPU: GF119-825
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	Size: 1GBB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/
<b>Connectors</b>	2x DisplayPort 1.2
<b>Maximum Resolution</b>	Up to 2560 x 1600 (digital display) per display.
<b>Image Quality Features</b>	<p>The following video formats are supported:</p> <ul style="list-style-type: none"><li>- MPEG2</li><li>- MPEG4 Part 2 Advanced Simple Profile</li><li>- H.264 SVC codec support</li><li>- Support for 3D Blu Ray</li><li>- VC1</li><li>- DivX version 3.11 and later</li><li>- MVC</li></ul> <p>A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.</p>
<b>Display Output</b>	<p>Up to 2 displays in the following configurations:</p> <p>DisplayPort output:</p> <ul style="list-style-type: none"><li>• Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card</li><li>• Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.</li></ul> <p>DVI-D output:</p> <ul style="list-style-type: none"><li>• Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors</li><li>• Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors</li></ul> <p>HDMI output:</p>

### Technical Specifications - Graphics

- NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors

#### VGA display output:

- Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors

<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.1
<b>Available Graphics Drivers</b>	Windows 8.1 Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

#### Notes

- The thermal solution used on this card is an active fan heatsink.
- Factory configured NVS 310 graphics card have no cable adaptors included. Adapters must be ordered separately.
- Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
- Configurations of three NVS 310 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

<b>NVIDIA NVS 315 1 GB 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

### Technical Specifications - Graphics

#### Maximum Resolution Support:

- DMS-59 to VGA: 2048 x 1536 @ 85Hz
- DMS-59 to DVI: 1980 x 1200 @ 60Hz
- DMS-59 to DP: 2560 x 1600 @ 60Hz

**Image Quality Features** See Display Output section.

#### The following video formats are supported:

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

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

#### Display Output

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

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

#### DisplayPort output:

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

#### DVI-D output:

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

#### VGA display output:

- Drives two analog 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:

### Technical Specifications - Graphics

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

#### Notes

1. The thermal solution used on this card is an active fan heatsink.
2. Factory configured NVS 310 graphics card have no cable adapters included. Adapters must be ordered separately.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

#### NVIDIA NVS 510 2GB Graphics

#### Form Factor Graphics Controller

Low Profile, 2.713 inches × 6.3 inches, single slot

#### Bus Type

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

#### Memory

PCI Express x16, Generation 2.0

#### Connectors

2GB DDR3

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

#### Maximum Resolution

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

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

#### Image Quality Features

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

#### Display Output

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

#### Digital Display Support

##### DisplayPort Output

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

##### DVI-D Output

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

### Technical Specifications - Graphics

#### HDMI Output

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

#### Analog Display Support

#### VGA display output

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

**Supported Graphics APIs** Full Microsoft DirectX 11, Shader Model 5.0 support  
Full OpenGL 4.3 support

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

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

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

**Notes** [Heatsink cooler design is active.](#)

#### NVIDIA® Quadro® K620 2GB Graphics

<b>Form Factor</b>	2.713" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included Weight: 133 grams
<b>Graphics Controller</b>	NVIDIA® Quadro® K620 Graphics Card GM107 GPU 384 CUDA cores Max Power: 45 Watts
<b>Bus Type</b>	PCI Express 2.0 x16
<b>Memory</b>	2 GB GDDR3, 900 MHz 128-bit memory I/O path 29 GB/s memory bandwidth
<b>Connectors</b>	1 DL-DVI(I) output, 1 DisplayPort output Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card
<b>Maximum Resolution</b>	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)  Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz  Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz

### Technical Specifications - Graphics

<b>Image Quality Features</b>	10-bit internal display processing pipeline 10-bit scan-out support
<b>Display Output</b>	1 Dual-link DVI-I connector 1 Display Port connector
<b>Shading Architecture</b>	Full Microsoft DirectX 11.1 Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux
	HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>
<b>Notes</b>	<ol style="list-style-type: none"> <li>1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately.</li> <li>2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.</li> </ol>

### NVIDIA® Quadro® K420 2GB Graphics

<b>Form Factor</b>	Low Profile: 2.713 inches × 6.3 inches Cooling: Active
<b>Graphics Controller</b>	NVIDIA® Quadro® K420 GPU: GK107 with 192 CUDA cores Power: 41W
<b>Bus Type</b>	PCI Express x16, 2.0 compliant
<b>Memory</b>	Size: 2GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit
<b>Connectors</b>	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.
<b>Maximum Resolution</b>	VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz
	Dual-link DVI - 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)
	Single-link DVI - 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

### Technical Specifications - Graphics

DisplayPort 1.2  
- 3840 × 2160 × 30 bpp at 60 Hz

**Image Quality Features** 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

**Display Output** Maximum number of displays:  
- 2 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  
- 2 2560x1600  
- 1 3840x2160  
  
Maximum number of monitors across all available Quadro K420 outputs is 4.

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** DX11, OpenGL 4.4  
Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran

**Available Graphics Drivers** Microsoft Windows 8.1  
Microsoft Windows 8  
Microsoft Windows 7  
Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

**Notes**

1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.
2. Option kit Quadro K420 includes one DP to DVI-D adapter.
3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.

**NVIDIA® Quadro® K1200 4GB Graphics** **Form Factor** Dimensions: 2.71" H x 6.875" L  
Single Slot, Low Profile  
**NVIDIA® Quadro® K1200 4GB Graphics** Cooling: Active  
Weight: ~175 grams

**Graphics Controller** NVIDIA® Quadro® K1200 Graphics Card  
GPU: GM107 with 512 CUDA cores  
Power: 46 Watts

**Bus Type** PCI Express 2.0 x16

**Memory** Size: 4GB GDDR5

### Technical Specifications - Graphics

	<p>Memory Bandwidth: 80 GB/s Memory Width: 128-bit</p>
<b>Connectors</b>	<p>4 mini-DisplayPort 1.2a</p> <p>Factory Configured Option: 4 mini-DP-to-DP adapters included with card Option Kit: 4 mini-DP-to-DP adapters included with card</p> <p>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories</p>
<b>Maximum Resolution</b>	<p>DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)</p> <p>DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz</p> <p>Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz</p> <p>VGA (via adapter cable): - 2048 x 1536 x 32 bpp at 85 Hz</p>
<b>Image Quality Features</b>	<p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p>
<b>Display Output</b>	<p>Maximum number of displays - 4 direct attached monitors</p> <p>Maximum number of DisplayPort displays possible: - 4 1920x1200 - 4 2560x1600 - 4 4096x2160</p> <p>Maximum number of monitors across all available Quadro K1200 outputs is 4.</p>
<b>Shading Architecture</b>	<p>Shader Model 5.0</p>
<b>Supported Graphics APIs</b>	<p>OpenGL 4.4 DirectX 11.1</p> <p>API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
<b>Available Graphics Drivers</b>	<p>Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site:</p>



### Technical Specifications - Graphics

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

#### Notes

1. Quadro K1200 offered as Factory Configured Option includes 4 miniDP to DP video cable adapters. Other video cable adapters must be ordered separately.
2. Quadro K1200 offered as an Option Kit includes 4 mini-DP to DP adapters. 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).

<b>NVIDIA® Quadro® K2200 4 GB Graphics</b>	<b>Form Factor</b>	4.38" H x 7.97" L Single Slot, Full Height
	<b>Weight:</b>	240 grams
	<b>Graphics Controller</b>	NVIDIA® Quadro® K2200 Graphics Card GM107 GPU 640 CUDA cores Max Power: 67.7 Watts
	<b>Bus Type</b>	PCI Express 2.0 x16
	<b>Memory</b>	4 GB GDDR5, 2500 Mhz 128-bit memory I/O path 80 GB/s memory bandwidth
	<b>Connectors</b>	1 DL-DVI(I) output, 2 DisplayPort outputs Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card
	<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)
	<b>Image Quality Features</b>	DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz  10-bit internal display processing pipeline 10-bit scan-out support
	<b>Display Output</b>	VGA: <ul style="list-style-type: none"> <li>• requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters</li> <li>• 400 MHz integrated RAMDAC</li> <li>• Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz</li> </ul> DL-DVI(I): <ul style="list-style-type: none"> <li>• Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</li> </ul> SL-DVI(I): <ul style="list-style-type: none"> <li>• Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</li> </ul> DisplayPort: <ul style="list-style-type: none"> <li>• Supports HBR2 and MST</li> </ul>

### Technical Specifications - Graphics

- Max resolution: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution)
- Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200

Maximum number of monitors across all available Quadro K2200 outputs is 4.

<b>Shading Architecture</b>	Full Microsoft DirectX 11.1 Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
<b>Available Graphics Drivers</b>	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux

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

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

<b>Notes</b>	<ol style="list-style-type: none"> <li>1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.</li> <li>2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. 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 or a DisplayPort 1.2 hub device.</li> <li>4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output.</li> </ol>
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#### 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

### Technical Specifications - Graphics

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.

#### Image Quality Features

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

#### Display Output

Maximum number of displays  
- 4 direct attached monitors

Maximum number of monitors across all available Quadro M2000 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, and OpenCL software

#### Available Graphics Drivers

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:

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

#### Notes

1. Quadro M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

**NVIDIA Quadro P2000  
5GB Graphics**

#### Form Factor

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

### Technical Specifications - Graphics

<b>Graphics Controller</b>	NVIDIA Quadro P2000 Graphics Card Power: 75 Watts
<b>Bus Type</b>	PCI Express 3.0 x16
<b>Memory</b>	Size: 5GB GDDR5 Memory Bandwidth: 140 GB/s Memory Width: 160-bit
<b>Connectors</b>	4x DisplayPort 1.4  Factory Configured Option: No adapter included with card After Market Option: No video cable adapter included  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: - up to 5120 x 2880 x 24 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DP 1.3 & 1.4 ready.  DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60 Hz  Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz  HDMI 2.0 (requires DP to HDMI adapter): 5120 x 2880 x 24 bpp @ 60Hz
<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, NVIDIA® Mosaic and nView.
<b>Display Output</b>	Maximum number of displays - 4 direct attached monitors  Maximum number of monitors across all available Quadro P2000 outputs is 4.
<b>Shading Architecture</b>	Shader Model 5.1
<b>Supported Graphics APIs</b>	OpenGL® 4.5 DirectX® 12  API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran software

### Technical Specifications - Graphics

#### Available Graphics Drivers

Microsoft Windows 10  
 Microsoft Windows 7 Professional 64bit  
 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. 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 W2100 2GB Graphics

#### Form Factor

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

#### Graphics Controller

AMD FirePro™ W2100 professional graphics

Power: <50W

Cooling: Active

#### Bus Type

PCI Express® x8, Generation 3.0

#### Memory

2GB DDR3 memory

Memory Bandwidth: 14.4 GB/s

#### 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

#### Display Output

2 x DisplayPort® 1.2

### Technical Specifications - Graphics

<b>Shading Architecture</b>	Shader Model 5.0
<b>Supported Graphics APIs</b>	OpenCL™ 1.2, DirectX® 11 and OpenGL 4.4
<b>Available Graphics Drivers</b>	Windows 8.1 (64-bit and 32-bit) Windows 7 (64-bit and 32-bit) Red Hat Enterprise Linux (RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) Ubuntu HP qualified drivers may be preloaded or available from the HP support Web site: <a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>

**Notes** Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See [www.amd.com/firepro](http://www.amd.com/firepro) for details

<b>AMD FirePro 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)

### Technical Specifications - Graphics

<b>Display Output</b>	<p>Max number of monitors supported using DisplayPort 1.2a:</p> <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> <p>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):</p> <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
<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. 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>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).</li> </ol>

<b>AMD FirePro W5100 4GB Graphics</b>	<b>Form Factor</b>	Full height, single slot (6.75" X 4.376")
	<b>Graphics Controller</b>	AMD FirePro W5100 graphics GPU Frequency: 930Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <75 Watts Cooling: Active
	<b>Bus Type</b>	PCI Express® x16, Generation 3.0
	<b>Memory</b>	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	<b>Connectors</b>	4x Display Port 1.2 connectors with HBR2 and MST support.

### Technical Specifications - Graphics

	<p>Factory Configured: No video cable adapter included After market option kit: No video cable adapter included</p>
<b>Maximum Resolution</b>	<p>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.</p> <p>DisplayPort: - 4096x2160 @24bpp 60Hz</p> <p>Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter)</p> <p>Single Link DVI: - 1920x1200 (requires DP to DVI adapter)</p>
<b>Image Quality Features</b>	<p>VGA: - 1920x1200 (requires DP to VGA adapter)</p> <p>Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling</p>
<b>Display Output</b>	<p>Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors</p>
<b>Shading Architecture</b>	<p>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</p> <p>Shader Model 5.0</p>
<b>Supported Graphics APIs</b>	<p>OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle</p>
<b>Available Graphics Drivers</b>	<p>Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux</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>
<b>Notes</b>	<p>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 <a href="http://www.amd.com/eyefinityfaq">www.amd.com/eyefinityfaq</a> for full details.</p>
<b>Form Factor</b>	<p>Full height, single slot (6.75" X 4.376")</p>



### Technical Specifications - Graphics

<b>NVIDIA® Quadro® M4000 8GB Graphics</b>	<b>Form Factor</b>	Dimensions: 4.4" H x 9.5" L Single Slot, Full Height Cooling: Active Weight: 475 grams (without extender)
	<b>Graphics Controller</b>	NVIDIA® Quadro® M4000 GPU: GM204 with 1664 CUDA cores Power: 120 Watts
	<b>Bus Type</b>	PCI Express 3.0 x16
	<b>Memory</b>	Size: 8GB GDDR5 Memory Bandwidth: 192 GB/s Memory Width: 256-bit
	<b>Connectors</b>	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
	<b>Maximum Resolution</b>	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
	<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 - 4 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors

### Technical Specifications - Graphics

Maximum number of DisplayPort displays possible:  
 - 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).

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**NVIDIA® Quadro® M5000 8GB Graphics Form Factor**

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

**Graphics Controller** NVIDIA® Quadro® M5000  
 GPU: GM204 with 2048 CUDA cores  
 Power: 150 Watts

**Bus Type** PCI Express 3.0 x16

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

**Connectors** 1 Dual Link DVI-I  
 4 DisplayPort 1.2a

### Technical Specifications - Graphics

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

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

#### Maximum Resolution

DisplayPort:

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

DL-DVI(I) output:

- up to 2560 x 1600 x 32 bpp @ 60Hz

Single Link-DVI(I) output:

- up to 1920 x 1200 x 32 bpp @ 60Hz

VGA (via adapter cable):

- 2048 x 1536 x 32 bpp at 85 Hz

#### Image Quality Features

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

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

Full OpenGL quad buffered stereo support.

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

#### Display Output

Maximum number of displays

- 4 direct attached monitors
- 4 using DP 1.2a with MST and HBR2 enabled monitors

Maximum number of DisplayPort displays possible (may require MST and/or HBR2):

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

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

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

OpenGL 4.5  
DirectX 12

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

### 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).

#### NVIDIA® Quadro® P5000 16GB Graphics

#### Form Factor

Full-Height Dual Slot (4.4" Height x 10.5" Length)  
 Weight: 815 grams / 1.80 lbs

#### Graphics Controller

Quadro™ P5000 graphics  
 GPU: 2560 NVIDIA CUDA® Parallel Processing Cores  
 Power: 180 Watts  
 Cooling: Active

#### Memory

16GB GDDR5X memory  
 Memory Bandwidth: Up to 288 GB/s  
 Memory Width: 256 bit  
 ECC Memory (disabled by default)

#### Connectors

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 Dual-Link DVI adapters available as accessories.

#### Maximum Resolution

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

### Technical Specifications - Graphics

<b>Image Quality Features</b>	Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. 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 up to 8K at 30Hz) 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1200 @ 120 Hz)
<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 5.0, OpenCL, Java, Python, and 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 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- Supports up to a total of 4 displays</li> <li>2- For HP Z440 Workstations, the 700W power supply option must be used.</li> <li>3- For HP Z840 Workstation configurations, the 1125W power supply option must be used for multiple P5000 configurations.</li> </ol>

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<b>NVIDIA® Quadro® K4200 4GB Graphics</b>	<b>Form Factor</b>	Dimensions: 4.376" H x 9.5" L Single Slot, Full Height Cooling: Active
	<b>Weight:</b>	461 grams (without extender)
	<b>Graphics Controller</b>	NVIDIA® Quadro® K4200 GPU: GK104-850 GPU with 1344 CUDA cores Power: 108 Watts
	<b>Bus Type</b>	PCI Express 2.0 x16
	<b>Memory</b>	Size: 4GB GDDR5 Memory Bandwidth: 173 GB/s Memory Width: 256-bit
	<b>Connectors</b>	1 DL-DVI(I) 2 DisplayPort 1.2a

### Technical Specifications - Graphics

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

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

#### Maximum Resolution

DisplayPort:  
- up to 3840 x 2160 x 30 bpp @ 60Hz  
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

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

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

10-bit internal display processing (hardware support for 10-bit scanout for both windowed desktop and full screen, only available on Windows with Aero disabled and Linux)

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  
- 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 3840x2160

Maximum number of monitors across all available Quadro K4200 outputs is 4.

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

OpenGL 4.4  
DirectX 11.1

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

### Technical Specifications - Graphics

#### Available Graphics Drivers

Microsoft Windows 8.1  
 Microsoft Windows 8  
 Microsoft Windows 7  
 Linux - 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. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K4200 offered as After Market Kits 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).
4. Configurations of a single Quadro K4200 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® K5200 8GB Graphics

#### Form Factor

4.376" H x 10.5" L  
 Dual Slot

#### Weight:

~880 grams

#### Graphics Controller

NVIDIA® Quadro® K5200  
 GK 110 GPU  
 2304 CUDA cores  
 Max Power: 150 Watts

#### Bus Type

PCI Express 3.0 x16

#### Memory

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

#### Connectors

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

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

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

#### Image Quality Features

- DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support
- NVIDIA 3D Vision™ technology

#### Display Output

400 MHz integrated RAMDAC

### Technical Specifications - Graphics

- Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz

#### Dual-link internal TMDS (DVI 1.0)

- Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

#### Single-link internal TMDS (DVI 1.0)

- Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

#### DisplayPort with MST and HBR2.

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

#### HDMI

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

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.4  
DirectX 11  
API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

**Available Graphics Drivers** Windows 8  
Windows 7 Professional (64-bit and 32-bit)  
Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation (64-bit)  
SUSE Linux Enterprise Desktop 11 SP3 (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>

**Notes**

1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA® Quadro® K5200 to enable direct mapping of GPU to Virtual Machine.
2. No display output adapter included.

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**AMD FirePro W7100 8GB Graphics** **Form Factor** Full height, single slot (9.5" X 4.376")

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

**Graphics Controller** PCI Express® x16, Generation 3.0



### Technical Specifications - Graphics

<b>Bus Type</b>	8GB GDDR5 memory Memory Bandwidth: up to 176 GB/s Memory Width: 256 bit
<b>Memory</b>	4x Display Port 1.2a connectors with HBR2 and MST support.  Factory Configured: No video cable adapter included After market option kit: No video cable adapter included  Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
<b>Connectors</b>	DisplayPort: - 4096x2160 @24bpp 60Hz  Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter)  Single Link DVI: - 1920x1200 (requires DP to DVI adapter)  VGA: - 1920x1200 (requires DP to VGA adapter)
<b>Image Quality Features</b>	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling
<b>Display Output</b>	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors  Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - 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:

### Technical Specifications - Graphics

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

#### Notes

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

#### Radeon™ Pro WX 7100 8GB Graphics

#### Form Factor Graphics Controller

Full-Height Single Slot (9.5" Length )

Radeon™ Pro WX 7100 graphics  
GPU: 2304 Stream Processors organized into 36 Compute Units  
Power: 130 Watts  
Cooling: Active

#### Memory

8GB GDDR5 memory  
Memory Bandwidth: 7 Gbps / 224 GB/s  
Memory Width: 256 bit

#### Connectors

4x Display Port 1.4 – HDR ready connectors with HBR3 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

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

#### 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

4 full physical DP1.3 HBR3 / DP1.4 HDR outputs  
FreeSync support

#### GPU Architecture

GCN 4th Generation

#### Supported Graphics APIs

DirectX®12  
OpenGL® 4.5  
OpenCL™ 2.0  
Vulkan™ 1.0

### Technical Specifications - Graphics

#### Available Graphics Drivers

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

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

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

#### Notes

1. HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support.
2. Radeon VR Ready Creator Products are select Radeon Pro and AMD FirePro™ GPUs that meet or exceed the Oculus Rift or HTC Vive recommended specifications for video cards/GPUs. Other hardware (including CPU) and system requirements recommended by Oculus Rift or HTC Vive should also be met in order to operate the applicable HMDs as intended. As VR technology, HMDs and other VR hardware and software evolve and/or become available, these criteria may change without notice.
3. AMD PowerTune and AMD ZeroCore Power are technologies offered by certain FirePro™ and Radeon™ Pro products, which are designed to intelligently manage GPU power consumption in response to certain GPU load conditions.
4. As of September 2016, certified for DisplayPort™ 1.4 HBR3 and ready for DisplayPort™ 1.4 HDR based on independent verification by DisplayPort™ testing authority. HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support.

### Technical Specifications - Graphics

#### HIGH PERFORMANCE GPU COMPUTING

##### NVIDIA Tesla K40 Workstation Compute Processor

##### Form Factor

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

##### Weight:

~826 grams

##### System Interface

PCI Express Gen3 ×16

##### Video Outputs

None.

##### Memory

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

##### Peak Memory Bandwidth

288 GB/s

##### Supported APIs

CUDA, OpenACC, OpenCL 1.2 API support includes:  
C, C++, Java, Python, and Fortran

##### Supported Operating Systems

Windows 8 (64-bit)  
Genuine Windows 7 Professional (64-bit)  
Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit)  
SUSE Linux Enterprise Desktop 11 (64-bit)

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

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

Novell SUSE Linux Enterprise drivers may also be obtained from:  
<ftp://download.nvidia.com/novell> or <http://www.nvidia.com>

##### Processor Cores

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

##### Power Consumption

~235 Watts

**Note:** A 700W PSU is required for any K40 configuration on the Z440.

#### OPTICAL AND REMOVABLE STORAGE

### Technical Specifications – Optical and Removable Storage

#### OPTICAL AND REMOVABLE STORAGE

##### HP 9.5mm Slim DVD Writer

<b>Description</b>	9.5mm height, tray-load	
<b>Mounting Orientation</b>	Either horizontal or vertical	
<b>Interface Type</b>	SATA/ATAPI	
<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm	
<b>Supported Media Types</b>	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
<b>Disc Capacity</b>	DVD-ROM	8.5 GB DL or 4.7 GB standard
	Full Stroke DVD	< 200 ms (seek)
	Full Stroke CD	< 200 ms (seek)
<b>Maximum Data Transfer Rates</b>	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
	DVD ROM Read	DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
<b>Power</b>	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
<b>Operating Environmental (all conditions non-condensing)</b>	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)
<b>Operating Systems Supported</b>	Windows 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	
	<a href="#">* No driver is required for this device. Native support is provided by the operating system.</a>	
<b>Kit Contents</b>	HP SATA DVD Writer drive, installation guide.	

### Technical Specifications – Optical and Removable Storage

<b>HP 9.5mm Slim DVD-ROM Drive</b>	<b>Description</b>	9.5mm height, tray-load	
	<b>Mounting Orientation</b>	Either horizontal or vertical	
	<b>Interface Type</b>	SATA / ATAPI	
	<b>Dimensions (WxHxD)</b>	128 x 9.5 x 127mm	
	<b>Disc Capacity</b>	DVD-ROM	Single layer: Up to 4.7 GB
			Double layer: Up to 8.5 GB
	<b>Access Times</b>	DVD-ROM Single Layer	< 110 ms (typical)
		CD-ROM Mode 1	< 110 ms (typical)
		Full Stroke DVD	< 230 ms (typical)
		Full Stroke CD	< 220 ms (typical)
	<b>Power</b>	Source	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC – <800mA typical, < 1600 mA maximum
<b>Operating Environmental (all conditions non-condensing)</b>	Temperature	41° to 122° F (5° to 50° C)	
	Relative Humidity	10% to 80%	
	Maximum Wet Bulb Temperature	84° F (29° C)	
<b>Operating Systems Supported</b>	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11		
	No driver is required for this device. Native support is provided by the operating system.		
<b>Kit Contents</b>	9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide		

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

### Technical Specifications – Optical and Removable Storage

<b>Disc Capacity</b>	DVD-ROM	8.5 GB DL or 4.7 GB standard	
	Blu-ray	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-R 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 Supported</b>	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*.	

### Technical Specifications – Optical and Removable Storage

Red Hat Enterprise Linux(RHEL) WS4\*\*, 5, 6 Desktop/Workstation  
SUSE Linux Enterprise Desktop 10 & 11

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

#### Kit Contents

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

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

#### HP DX115 Removable Drive Enclosure

##### Interface Type

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

##### Dimensions (WxHxD)

147.6mm W x 41.1mm H x 205mm D  
(5.81" W x 1.62" H x 8.08" D)

##### Approvals

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

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

##### Description

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

##### Interface Type

USB 3.0 High-speed interface

**Note:** If there is a USB2 connection, USB2 transfer speeds are supported.

##### Dimensions (WxHxD)

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

##### Supported Media Types

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

These additional media types are supported with a card adapter.  
Memory Stick Micro (M2)



### Technical Specifications – Optical and Removable Storage

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

**Test Parameters/Conditions - Power applied, unit operating on system  
 ±5%**

**Operating Systems Supported**

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

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

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

Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See <http://www.microsoft.com/windows/windows-7/> for details.

**Kit Contents**

Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD

**Approvals**

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

**Weight**

0.35 lbs. (0.16 kg)

### Technical Specifications - Controller Cards

#### CONTROLLER CARDS

<b>HP IEEE 1394b FireWire PCIe Card</b>	<b>Data Transfer Rate</b>	Supports up to 800 Mb/s
	<b>Devices Supported</b>	IEEE-1394 compliant devices
	<b>Bus Type</b>	PCIe card full height PCIe slots
	<b>Ports</b>	Two IEEE-1394b 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

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

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

<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)

### Technical Specifications - Networking and Communications

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

<b>Intel Ethernet I350-T2 2-Port 1Gb 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 v2.1 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>	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	

### Technical Specifications - Networking and Communications

<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-T2 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 Installation Guide.
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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.
<b>Notes</b>	<ol style="list-style-type: none"> <li>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.</li> <li>2. Check latest software/driver release for updates on supported security features.</li> <li>3. Maximum output power may vary by country according to local regulations.</li> <li>4. In Power Save Polling mode and on battery power.</li> <li>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).</li> </ol>

#### Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC

<b>Operating Temperature</b>	0 to 80 C
<b>Operating Humidity</b>	Non-operating 50% to 90% RH non-condensing (at temperatures of 25C to 35C)
<b>Kit Contents</b>	WLAN module with PCIe x1 card, Dual band antenna, USB cable for internal Bluetooth connection, installation guide, warranty card

### Summary of Changes

#### SUMMARY OF CHANGES

Date of change:	Version History:		Description of change:
August 21, 2014	V1	Added	Style and technical specifications
October 1, 2014	From v1 to v2	Added	Rack dimensions, note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs
		Changed	Turbo specs for E5-1660v3, Acoustics - only 1 ODD on the high-end config, not 2, Declared Noise Emissions section, Supported Components: Graphics, Optical and Removable Storage, Overview, Stable & Consistent, power supply configurations, Noise Emissions section, Updated Power Supply Configurations and table
		Removed	Cyberlink MediaSuite, TPM 2.0 references, HP Power Assistant and PDF Complete
December 3, 2014	From v2 to v3	Added	HP Z440 Memory Cooling Solution, power cable descriptor in Overview and System Technical Specifications sections
January 1, 2015	From v3 to v4	Added	OS under Overview, and Support Components, Memory support matrix and load order
February 1, 2015	From v4 to v5	Added	AMD W5100, W7100 GPU, DX115 Removable HDD Frame/Carrier, 256GB SATA 6Gb/s SED OPAL 2 SSD from Supported Components
		Changed	Internal I/O USB, OS under overview, and Supported components.
March 1, 2015	From v5 to v6	Added	Operating Systems: Red Hat and SUSE Support, 600 and 300GB SAS SFF HDD, 4TB SATA HD, HD Controller
		Changed	HP Installer Kit for Linux, RAID, SAS and SATA Hard Drives Notes, ACPI support under BIOS section
April 1, 2015	From v6 to v7	Changed	Hard Drives Notes and Memory Notes in Supported Components section. Memory Speed Supported in System Board. Memory Info from System Configuration.
		Added	Chassis Dimensions
May 1, 2015	From v7 to v8	Added	Integrated RAID for PCIe SSDs and note in Hard Drive Controllers section
		Changed	Notes in Hard Drive Controllers sections, High Performance GPU Computing, and Other Hardware
July 1, 2015	From v8 to v9	Added	1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), HP Z Turbo Drive G2 512GB SSD, HP Z Turbo Drive G2 256GB SSD, and notes for Supported Components and Technical Specifications; 3Dconnexion CADMouse to Input Devices.
		Changed	Storage/Hard Drives section Descriptions/Notes
		Removed	600GB SAS 15K rpm 6Gb/s 3.5" HDD, 300GB SAS 15K rpm 6Gb/s 3.5" HDD
August 1, 2015	From v9 to v10	Added	Windows 10 64-bit, SUSE Linux Enterprise Desktop 11 SP3, 12 in OS, Overview; NVIDIA NVS 310 1GB Graphics in Professional 2D; NVIDIA® Quadro® K420 2GB Graphics in Entry 3D Graphics section; Intel Xeon E5-1630 v3 in Stable and consistent offerings in Stable and consistent offerings
		Changed	HP Solenoid Hood Lock & Hood Sensor in Supported Components, Racking and Physical Security section; Intel Xeon E5-1603 v3
		Removed	Windows 8.1 64-bit, Windows 8.1 Emerging Market, SUSE Linux Enterprise Desktop 11 SP3
September 1, 2015	From v10 to v11	Added	HP 512GB SATA SED SSD in Supported Components, Storage and Technical Specifications
		Changed	Notes for SATA SSDs, and PCI Express in Supported Components, HP Solenoid Hood Lock & Hood Sensor in Racking and Physical Security, Notes for Memory Cooling Solution in Other Hardware
		Removed	Intel Pro 1500 180GB SATA SSD

### Summary of Changes

November 1, 2015	From v11 to v12	Added	Storage PCIe notes, HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA® Quadro® M4000 8GB Graphics, NVIDIA® Quadro® M5000 8GB Graphics, Z440 HP Z Cooler and notes from Other Hardware section;
		Changed	Controller Cards section notes; HP Remote Graphics Software (RGS) 7.1, MS Office Home & Business 2016 from Software section; Windows 10 Pro 64 and Windows 10 Pro downgrade to Windows 7 Professional 64 from Operative Systems section.
January 1, 2016	From v12 to v13	Added	Updated Preinstalled OS in Overview section
February 1, 2016	From v13 to v14	Added	HP Enterprise Class 240GB SATA SSD and HP Enterprise Class 480GB SATA SSD, NVIDIA® Quadro® K1200 4GB Graphics, HP PS/2 Business Slim Keyboard, HP USB Business Slim Keyboard, HP Wireless Business Slim Keyboard
		Changed	SATA SSDs notes
		Removed	Samsung Enterprise 240GB SATA SSD, Samsung Enterprise 480GB SATA SSD, NVIDIA® Quadro® K5200 8GB Graphics, NVIDIA® Quadro® K6000 12GB Graphics.
March 1, 2016	From v14 to v15	Added	Windows 10 Home 64 High-end in Overview and Supported Components; AMD FirePro W4300 4GB Graphics in Mid-Ranga Category, Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC in Networking and Communications
		Removed	Ubuntu 14.04, and Windows 8.1 64-bit from Overview OS; NVIDIA NVS 310 512MB Graphics, NVIDIA® Quadro® K420 1GB Graphics in Graphics
March 31, 2015	From v15 to v16	Added	Intel Xeon E5-2600 v3 Series CPUs, HP Z Turbo Drive G2 1TB SSD, Intel Ethernet I350-T2 2-Port 1Gb NIC
		Changed	AMD FirePro W2100 2GB Graphics moved to Entry 3D; PCIe Drives and Memory notes; HP Solenoid Hood Lock & Hood Sensor option.
June 7, 2016	From v16 to v17	Added	Enterprise Class status for 4TB SATA HDD, HP USB Hardened Mouse, Intel Xeon E5-1600 v4 Series CPU, Note 6 for NVIDIA® Quadro® M2000
		Removed	Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit
July 1, 2016	From v17 to v18	Added	HP Keyed Cable Lock 10mm
September 1, 2016	From v18 to v19	Added	Z Turbo SED, and notes for PCIe SSDs, Specs for SATA SSDs
October 1, 2016	From v19 to v20	Added	Intel 750 Series PCIe SSDs, Added Z Turbo TLC SSDs, Added 1TB Enterprise HDD
		Removed	OS options, Xeon v3 processors, 4GB 2133 DIMMs
November 1, 2016	From v20 to v21	Added	1TB SATA 7200 rpm HDD (Enterprise Class), HP Z Turbo and Z Turbo Quad Pro SSD Drives
		Changed	PCIe drives note
		Removed	Intel Xeon v3 processors, 4GB DDR4-2133 RAM, Win 7, and 8.1 Pro 64-bit
January 1, 2017	From v21 to v22	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.
February 1, 2017	From v22 to v23	Changed	HP 9.5mm Slim SuperMulti DVD Writer specs and HP Inc. disclaimers
March 1, 2017	From v23 to v24	Added	NVIDIA Quadro P5000
April 1, 2017	From v24 to v25	Added	Hard Drive Controllers section note 4, Fan and Front Card Guide Components,
		Changed	SATA Hard Drives, HP Solid State Drives (SSDs) notes, Notes 5&6 to Mid-Range Quadro M2000, FirePro 4300Graphics and Radeon Pro WX7100, TPM content
April 14, 2017	From v25 to v26	Removed	The System Configuration (High-end) & Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296) subsections under The DECLARED NOISE EMISSIONS section was removed.
May 1, 2017	From v26 to v27	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.
May 1, 2017	From v27 to v28	Added	In page 12 added notes 1 & 2 to all the memory parts, added

### Summary of Changes

			HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM to Memory section, added new configurations to DIMM slots for capacities of 128GB & 256GB in the System Board section.
		Changed	Changed the Maximum Memory support from 128GB to 256GB, changed the Mixed support configuration in the Graphics section.



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