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
7. 2 Internal 3.5” Bays
8. Fan and Front Card Guide Kit (optional)
9. 6 6Gb/s SATA Ports
10. Rear Grip
11. 525W, 85% Efficient Power Supply or 700W, 90% Efficient Power Supply
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
13. 8 DIMM Slots for DDR4 ECC Registered Memory
14. Intel Xeon Processors: E5-1600 v3/v4 family (4C/6C/8C), E5-2600 v3 family (8C)
15. 2 PCIe x16 Gen 3 Slots
16. 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot

Overview

Form Factor Minitower

Operating Systems Preinstalled:

- Windows 10 Pro 64
- Windows 10 Pro 64 downgrade to Windows 7 Professional 64
- Windows 10 Home 64 High-end
- Microsoft Windows 8.1 Pro 64-bit*
- Microsoft Windows 7 Professional 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

Available Processors

Name	Cores	Clock Speed (GHz)	Cache (MB)	Memory Speed (MT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology[1]	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	8	2.4	20	1866	YES	YES	2, 8	85

Overview

E5-2630 v3 processor								
Intel Xeon E5-1650 v3 processor	6	3.5	15	2133	YES	YES	1, 3	140
Intel Xeon E5-1630 v3 processor	4	3.7	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1620 v3 processor	4	3.5	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1607 v3 processor	4	3.1	10	1866	NO	YES	N/A	140
Intel Xeon E5-1603 v3 processor	4	2.8	10	1866	NO	YES	N/A	140
Intel Xeon E5-2637 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
	[1]The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A. **NOTE:** Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z440 Workstation does not support dual processor configurations.							

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/ 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

Overview

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)

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)

Overview

Chassis Dimensions (H x W x D)	**Footprint Dimensions:** 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.)
Temperature	Operating: 5° to 35°C (40° to 95°F) Non-operating: -40° to 60°C (-40° to 140°F)
Humidity	Operating: 8% to 85% relative humidity, non-condensing Non-operating: 8% to 90% relative humidity, non-condensing
Maximum Altitude (non-pressurized)	Operating: 3,048m (10,000ft) Non-operating: 9,144m (30,000ft)
Power Supply	**ENTRY** 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: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf **HIGH-END** 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: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf
Workstation ISV Certifications	See the latest list of certifications at http://www.hp.com/united-states/campaigns/workstations/partnerships.html

Supported Components

Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Intel® Xeon® E5-1600 v4 Series CPU				
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		
Intel® Xeon® E5-1650 v4 3.6 2400 6C CPU	Y	N		
Intel® Xeon® E5-1660 v4 3.2 2400 8C CPU	Y	N		
Intel® Xeon® E5-1680 v4 3.4 2400 8C CPU	Y	N		
Intel® Xeon® E5-1600 v3 Series CPU				
Intel® Xeon® E5-1680 v3 3.2 2133 8C CPU	Y	N		
Intel® Xeon® E5-1660 v3 3.0 2133 8C CPU	Y	N		
Intel® Xeon® E5-1650 v3 3.5 2133 6C CPU	Y	N		
Intel® Xeon® E5-1630 v3 3.7 2133 4C CPU	Y	N		
Intel® Xeon® E5-1620 v3 3.5 2133 4C CPU	Y	N		
Intel® Xeon® E5-1607 v3 3.1 1866 4C CPU	Y	N		
Intel® Xeon® E5-1603 v3 2.8 1866 4C CPU	Y	N		
Intel® Xeon® E5-2600 v3 Series CPU				
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

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

NOTES:

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

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

NOTE: SAS controller add-in card required

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

Removable Boot Drive option

SATA Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QB576AA	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	QF298AA	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD (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

Supported Components

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. This hardware is required when installing 3rd/4th HDDs using Aftermarket Option (AMO) drives.

Removable Boot Drive option

SATA Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Solid State Drives (SSDs) for Workstations				
HP 128GB* SATA 6Gb/s SSD	Y	Y	A3D25AA	
HP 256GB* SATA 6Gb/s SSD	Y	Y	A3D26AA	
HP 512GB* SATA 6Gb/s SSD	Y	Y	D8F30AA	
HP 1TB SATA* 6Gb/s SSD	Y	Y	F3C96AA	
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. 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
PCIe SSDs for HP Workstations				
HP Z Turbo Drive 512GB SSD	Y	Y	G3G89AA	
HP Z Turbo Drive 256GB SSD	Y	Y	G3G88AA	
HP Z Turbo Drive G2 512GB SSD	Y	Y	M1F74AA	
HP Z Turbo Drive G2 256GB SSD	Y	Y	M1F73AA	
HP Z Turbo Drive G2 1TB SSD	Y	Y	T9H98AA	
HP Z Turbo Drive Quad Pro				
HP Z Turbo Drive Quad Pro 256GB SSD module	Y	Y	N2N00AA	Note 1

Supported Components

HP Z Turbo Drive Quad Pro 512GB SSD module	Y	Y	N2N01AA	Note 1
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	Note 2
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Y	Y	N2M99AA	Note 2

NOTES:

Up to (4) PCI Express Solid State Drives: 256, 512 GB, 1 TB; 2.0 TB max (via Quad Pro)

NOTE: 525W PSU on Z440 only has power connections for (2) HDDs standard. 3rd/4th HDDs/SSDs require a 4pin-to-dual-SATA cable.
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
Integrated SATA 6.0 Gb/s Controller				
Integrated SATA 6.0 Gb/s Controller	Y	N		Six Ports
Factory integrated RAID on motherboard for SATA drives				
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
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card				
LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	Y	Y	E0X20AA	Note 2
LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit				
LSI 9270-8i SAS 6Gb/s ROC RAID Card	N	Y	E0X21AA	Note 2
LSI iBBU09 Battery Backup Unit	N	Y	E0X19AA	
Integrated RAID for PCIe SSDs				
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 for RAID capabilities with Linux.
All drives must be identical in type and capacity.
RAID arrays greater than 2 TB are fully supported.

NOTE 1: Requires hard drives with identical speed, capacity, and interface. Specific user-configured

Supported Components

hardware SAS RAID configurations are supported on this Linux system. For details, please visit 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

NOTE 3: PCIe SSDs NOT available for Boot RAID Configuration

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Professional 2D						
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	
Graphics Cable Adapters						
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	
Entry 3D						
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	Y
Mid-range 3D						
NVIDIA Quadro K1200 4GB Graphics	Y	Y	L4D16AA		2	Y
NVIDIA Quadro K2200 4GB Graphics	Y	Y	J3G88AA	Note 5, 6	2	Y
NVIDIA Quadro M2000 4GB Graphics	Y	Y	T7T60AA	Note 5	2	
AMD FirePro W4300 4GB Graphics	Y	Y	T7T58AA		2	Y
AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA	Note 5, 6	2	Y
High End 3D						

Supported Components

NVIDIA Quadro M4000 8GB Graphics	Y	Y	M6V52AA	Notes 3, 4	2	Y
NVIDIA Quadro M5000 8GB Graphics	Y	Y	M6V53AA	Notes 3, 4	1	Y
AMD FirePro W7100 8GB Graphics	Y	Y	J3G93AA	Notes 3, 4	1	Y

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
DDR4-2133 ECC Registered DIMMs		
16GB DDR4-2133 ECC Registered RAM	J9P83AA	1,2
8GB DDR4-2133 ECC Registered RAM	J9P82AA	1,2
4GB DDR4-2133 ECC Registered RAM	J9P81AA	1,2
HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM	T9V40AA	
HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM	T9V39AA	
HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM	T9V38AA	

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).

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
HP SlimTray Optical Drives				
HP 9.5mm Slim SuperMulti DVD Writer	Y	Y	K3R64AA	
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	Note 1
HP 9.5mm Slim BDXL Blu-Ray Writer	Y	Y	K3R65AA	Note 2
HP 15-in-1 Media Card Reader				
HP 15-in-1 Media Card Reader	Y	Y	G1S79AA	
HP DX115 Removable Drive Enclosure				
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.

Supported Components

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

	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	

Supported Components

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		

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:
- 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
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
Windows 8.1 Pro 64-bit	
Windows® 7 Professional 64-bit	(National Academic)
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.

System Technical Specifications

System Board

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

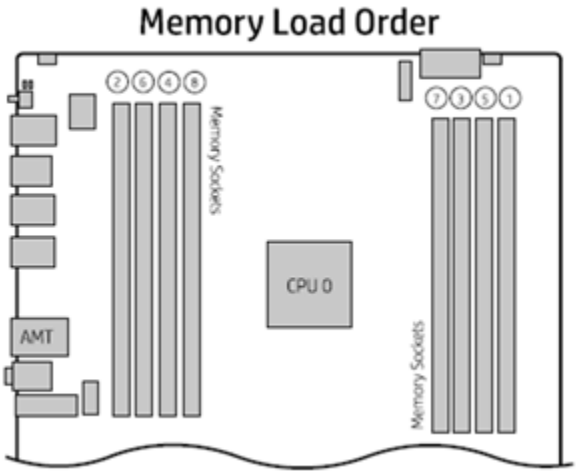
* For 32 bit operating systems, there is a memory limit of 4GB.

~ 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
Slot Load Order		1	5	3	7	8	4	6	2	

System Technical Specifications

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



Maximum Memory	Supports up to 128GB
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

Supported Drive Interfaces	**SATA**	2 SATA @6Gb/s, supports RAID 0,1 and NCQ. 4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	Serial Attached SCSI	Requires Optional PCIe card
	Integrated RAID	SATA: RAID 0, 1 SSATA: RAID 0, 1, 10 • RAID 0 configuration - striped array (supported and configure to order) • RAID 1 configuration - mirrored array (supported and configure to order) • RAID 5 parity striping (supported but not configure to order) • RAID 10 striped and mirrored array *HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead.
	Integrated Graphics	No
	Network Controller	Integrated Intel I-218 Gbit LAN Supports the following management functionalities: Intel AMT9.1, TXT, DASH 1.1, WOL, VLAN, Teaming and PXE 2.1
	External SATA (eSATA)	Supported on all SATA and sSATA ports configurable with optional eSATA* cable kit * hot plug / hot swap not supported with eSATA
	IDE connector	No
	Floppy connector	No
	Serial	1 internal header
	2nd Serial	No
	Parallel	No
	AUX IN (audio)	No
IEEE 1394 Connector(s)	**Front**	None
	Rear	2 IEEE 1394b (requires optional PCIe card)
	Internal	None
USB Connector(s)	**Front**	4 USB 3.0
	Rear	4 USB 3.0 2 USB 2.0

System Technical Specifications

	Internal	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.
HD Integrated Audio	Realtek ALC221	
Flash ROM	Yes	
CPU Fan Header	Yes	
Chassis Fan Header	1 Rear System Chassis Fan Header	
Front PCI Fan Header	Yes	
Front Control Panel/Speaker Header	Yes	
CMOS Battery Holder - Lithium	Yes	
Integrated Trusted Platform Module	Infineon TPM 1.2 Certified	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes	
Clear Password Jumper	Yes	
Serial Port	1 internal header	
Parallel Port	No	
Keyboard/Mouse	USB or PS/2	
Power Supply		

Power Supply	700W 90% Efficient, Custom PSU (Wide-Ranging, Active PFC)		525W 85% Efficient, Custom PSU (Wide-Ranging, Active PFC)	
Operating Voltage Range	90–269 VAC		90–269 VAC	
Rated Voltage Range	100-240 VAC	118 VAC	100-240 VAC	118 VAC
Rated Line Frequency	50–60 Hz	400 Hz	50–60 Hz	400 Hz
Operating Line Frequency Range	47–66 Hz	393–407 Hz	47–66 Hz	393–407 Hz
Rated Input Current	100-240V @ 9.5A	118V @ 9.5A	100-240V @ 7A	118V @ 7A
Heat Dissipation (Configuration and software dependent)	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)	
Power Supply Fan	92x25 mm variable speed		92x25 mm variable speed	
ENERGY STAR Qualified (Configuration dependent)	Yes Yes, 90% Efficient		Yes Yes, 85% Efficient	
80 PLUS® Compliant	The Z440 700W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/		The Z440 525W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/	

System Technical Specifications

	HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf	HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf
FEMP Standby Power Compliant @115V (<2W in S5 – Power Off)	Yes	Yes
EuP Compliant @ 230V (<0.5 W in S5 – Power Off)	Yes	Yes
CECP Compliant @ 220V (<4W in S3 – Suspend to RAM)	Yes; Configuration dependent	Yes; Configuration dependent
Power Consumption in sleep mode (as defined by ENERGY STAR) – Suspend to RAM (S3) (Instantly Available PC)	<15w	<15w
Built-in Self Test LED	Yes	Yes
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes	Yes

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

System Technical Specifications

System Configuration

Example Configuration #1 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	2.19W
	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	

Example Configuration #2 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 / 1xSlim 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	

System Technical Specifications

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	
	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	

Example Configuration #3	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 SuperMulti DVDRW SATA					
	Power Supply	525W 85% 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)	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	
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)	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	

Example Configuration #4	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 SuperMulti DVDRW SATA

System Technical Specifications

	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)	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
	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	
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)	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

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

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	3.2	14
	Hard drive Operating (random reads)	3.3	15
	DVD-ROM Operating (sequential reads)	4.3	30

System Technical Specifications

System Configuration (High-end)	**Processor Info**	1x Intel Xeon E5-1660 v3 3.20 GHz
	Memory Info	1 – 16 GB DDR4 2133 MT/s RDIMM
	Graphics Info	1x NVIDIA Quadro K4200
	Disks/Optical/Floppy	2x 600 GB SAS 15K RPM 3.5" HDD 1x Blu-ray DVD-RW

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		**Sound Power** (LWAd, bels)	**Deskside Sound Pressure** (LpAm, decibels)
	Idle	4.2	26
	Hard drive Operating (random reads)	4.3	27
	DVD-ROM Operating (sequential reads)	4.6	31

ENVIRONMENTAL DATA

Environmental Requirements

Temperature

Operating: 5° to 35° C (40° to 95° F)
Non-operating: -40° to 60° C (-40° to 140° F)

Humidity

Operating: 8% to 85% RH, non-condensing
Non-operating: 8% to 90% RH, non-condensing

Maximum Altitude

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

Dynamic (new)

Shock

Operating: ½-sine: 40g, 2-3ms (~62 cm/sec)
Non-operating:
½-sine: 160 cm/s, 2-3ms (~105g)
square: 422 cm/s, 20g

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

Vibration

Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz
Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz

NOTE: Values do not indicate continuous vibration.

Cooling

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

Physical Security and Serviceability

System Technical Specifications

Access Panel	Tool-less Includes system board and memory information.
Optical Drive	Tool-less
Hard Drives	Tool-less
Expansion Cards	Tool-less
Processor Socket	Tool-less
Green User Touch Points	Yes, on primary serviceable components.
Color-coordinated Cables and Connectors	Yes
Memory	Tool-less
System Board	Screw-In
Dual Color Power and HD LED on Front of Computer	Yes
Configuration Record SW	Yes
Over-Temp Warning on Screen	Yes, at POST screen on reboot
Restore CD/DVD Set	Restores the computer to its original factory shipping image; can be obtained via HP Support.
Dual Function Front Power Switch	Yes, causes a fail-safe power off when held for 4 seconds
Padlock Support	Yes (optional): Locks side cover and secures chassis from theft 7.0 mm (0.2756 in) diameter padlock loop at rear of system
Cable Lock Support	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system
Universal Chassis Clamp Lock Support	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
Solenoid Lock and Hood Sensor	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
Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control	Yes, enables or disables serial, USB, audio, and network ports
Removable Media Write/Boot Control	Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)
Power-On Password	Yes, prevents an unauthorized person from booting up the workstation
Setup Password	Yes, prevents an unauthorized person from changing the workstation configuration
3.3V Aux Power LED on System PCA	Yes
NIC LEDs (integrated) (Green & Amber)	Yes
CPUs and Heatsinks	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

System Technical Specifications

Power Supply Diagnostic LED	Yes
Front Power Button	Yes, ACPI multi-function
Rear Power Button	Yes
Front Power LED	Yes, white (normal), red (fault)
Front Hard Drive Activity LED	Yes, white
Front ODD Activity LED	Yes, on device
Internal Speaker	Yes
System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
Cooling Solutions	Air cooled forced convection heatsinks
Power Supply Fans	92 mm x 92 mm x 25 mm (non-serviceable)
CPU Heatsink Fan	92 mm x 25 mm, 6-wire, PWM
Chassis Fan	Front: (Optional) 92 mm x 92mm x 25 mm, 4-wire, PWM Rear: 92 mm x 92mm x 25 mm, 4-wire, PWM
Memory Heatsink Fan	Dual 60 mm x 60 mm x 25 mm, 6-wire, PWM, Blindmate
HP PC Hardware Diagnostics UEFI	HP Vision Diagnostics Offline Edition The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to: • Run diagnostics • View the hardware configuration of the system Key features and benefits HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision Diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are: • Testing and diagnosing apparent hardware failures • Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance • Sending configuration information to another location for more in-depth analysis • Entered using F2

System Technical Specifications

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.

System Technical Specifications

Memory Change Alert	Alerts management console if memory is removed or changed.
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console.
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and 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.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location.
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time.
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system.
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing.
Auto Setup when new hardware installed	System automatically detects addition of new hardware.
Keyboard-less Operation	The system can be booted without a keyboard.
Localized ROM Setup	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
Asset Tag	The user or MIS to set a unique tag string in non-volatile memory.
Per-slot Control	Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.
Adaptive Cooling	Control parameters are set according to detected hardware configuration for optimal acoustics.
Pre-boot Diagnostics	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
Industry Standard Specification Support	
Industry Standard	Revision Supported by the BIOS
UEFI Specification Revision	2.3.1
ACPI	Advanced Configuration and Power Management Interface, Version 4.0
ATA (IDE)	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b

System Technical Specifications

CD Boot	"El Torito" Bootable CD-ROM Format Specification Version 1.0
EDD	- Enhanced Disk Drive Specification Version 1.1 - BIOS Enhanced Disk Drive Specification Version 3.0
EHCI	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
PCI	PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7
PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification
SMBIOS	System Management BIOS Reference Specification, Version 2.7 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

System Technical Specifications

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

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

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

End-of-Life Management and Recycling
Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.

Hewlett-Packard Corporate Environmental Information
For more information about HP's commitment to the environment:
Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html

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

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

Additional Information

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

http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstatio.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

- 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
- 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

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

Service, Support, and Warranty

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

NOTE 1: Terms and conditions may vary by country. Certain restrictions and exclusions apply.
NOTE 2: On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.
NOTE 3: Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.
HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at: http://www.hp.com/hps/carepack. Service levels and response times for HP Care Packs may vary depending on your geographic location.

Product Change Notification

- Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile.
- PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition.
- Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.

Stable & Consistent Offerings

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

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

Processors	Product #	Offering
	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

Stable & Consistent Offerings

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

Optical and Removable Storage	Product #	Offering
	F5W18AV	Slim SuperMulti DVDRW SATA 1st Optical Disk Drive
	G8U22AV	Slim SuperMulti DVDRW SATA 2nd Optical Disk Drive

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

STORAGE/HARD DRIVES

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

	overhead, including settling)	**Full Stroke**	7.3 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	585,937,500	
	Operating Temperature	41° to 131° F (5° to 55° C)	
HP 600GB SAS 10K SFF HDD	**Capacity**	600GB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	SAS 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Cache	multi-segmentable cache buffer	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.4 ms (max)
		Average	3.6 ms
		Full Stroke	7.3 ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	1,172,123,568	
	Operating Temperature	41° to 131° F (5° to 55° C)	
HP 1.2TB SAS 10K SFF HDD	**Capacity**	1.2TB	
	Height	0.6 in; 1.53 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	SAS 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.18ms (max)
		Average	3.5ms
		Full Stroke	7.17ms
	Rotational Speed	10,000 rpm	
	Logical Blocks	2,344,225,968	
	Operating Temperature	41° to 131° F (5° to 55° C)	

Technical Specifications - Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations	**500GB SATA 7200 rpm 6Gb/s 3.5" HDD**	**Capacity**	500GB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	16MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
			Average	11 ms
			Full Stroke	21 ms
		Rotational Speed	7,200 rpm	
		Logical Blocks	976,773,168	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	1TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	1TB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0Gb/s), NCQ enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
		Buffer	64MB	
		Cache	Adaptive	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	2 ms
			Average	11 ms
			Full Stroke	21 ms
		Rotational Speed	7,200 rpm	
		Operating Temperature	41° to 131° F (5° to 55° C)	
	2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	2.0TB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	Serial ATA (6.0 Gb/s), NCQ Enabled	
		Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
		Buffer	64MB	
		Seek Time (typical reads, includes controller	**Single Track**	1.0 ms
			Average	11 ms
			Full Stroke	18 ms

	overhead, including settling)		
	Rotational Speed	7,200 rpm	
	Logical Blocks	3,907,029,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	3.0TB	
	Height	1 in; 2.54 cm	
	Width	**Media Diameter**	3.5 in; 8.9 cm
		Physical Size	4.0 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 6.0 Gb/s	
	Buffer	64MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.6 ms
		Average	11 ms
		Full Stroke	Not Specified
	Rotational Speed	7,200 rpm	
	Operating Temperature	41° to 140° F (5° to 60° C)	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	**Capacity**	4TB	
	Height	0.275 in; 0.7 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Buffer	128MB	
	Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	0.7ms
		Average	8.5ms
		Full Stroke	15.7ms
	Rotational Speed	7,200 rpm	
	Operating Temperature	32° to 140° F (0° to 60° C)	
500GB SATA 7.2K SED SFF HDD	**Capacity**	500GB	
	Height	0.275 in; 0.7 cm	
	Width	**Media Diameter**	2.5 in; 6.36 cm
		Physical Size	2.75 in; 6.99 cm
	Interface	Serial ATA (6Gb/s)	

Technical Specifications - Hard Drives

		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	32MB	
		Seek Time (typical reads, includes controller overhead, including settling)	**Single Track**	1ms
			Average	4.2ms
			Full Stroke	25ms (typical)
		Rotational Speed	7,200 rpm	
		Operating Temperature	32° to 140° F (0° to 60° C)	
	1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	**Capacity**	1TB	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
			Physical Size	4 in; 10.17 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Buffer	64MB standard HDD cache buffer	
		Cache	8GB NAND flash	
		Rotational Speed	7200 rpm	
		Operating Temperature	32° to 140° F (0° to 60° C)	
HP Solid State Drives (SSDs) for Workstations	**HP 128GB SATA 6Gb/s SSD**	**Capacity**	128GB	
		Height	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP 256GB SATA 6Gb/s SSD	**Capacity**	256GB	
		Height	0.28 in; 0.7 cm	
		Interface	SATA 6Gb/s	
		Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
		Operating Temperature	32° to 158° F (0° to 70° C)	

Technical Specifications - Hard Drives

HP 256GB SATA 6Gb/s SED SSD	**Capacity**	256GB	
	Height	0.28 in; 0.7 cm	
	Width	**Physical Size**	2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	
HP 512GB SATA 6Gb/s SSD	**Capacity**	512GB	
	Height	0.28 in; 0.7 cm	
	Width	**Physical Size**	2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 500MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	
HP 512GB SATA SED SSD	**Capacity**	512GB	
	Height	0.28 in; 0.7 cm	
	Width	**Physical Size**	2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Operating Temperature	32° to 158° F (0° to 70° C)	
HP 1TB SATA 6Gb/s SSD	**Capacity**	1TB	
	Height	0.28 in; 0.7 cm	
	Width	**Physical Size**	2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 550MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	
HP Enterprise Class 240GB SATA SSD	**Capacity**	240GB	
	Height	0.28 in; 0.7 cm	
	Width	**Physical Size**	2.5 in; 6.36 cm
	Interface	6Gb/s SATA	
	Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Capacity	480GB	

Technical Specifications - Hard Drives

	HP Enterprise Class 480GB SATA SSD	**Height**	0.28 in; 0.7 cm	
		Width	**Physical Size**	2.5 in; 6.36 cm
		Interface	6Gb/s SATA	
		Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
		Operating Temperature	32° to 158° F (0° to 70° C)	
PCIe SSDs for HP Workstations	**HP Z Turbo Drive 256GB SSD**	**Capacity**	256GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP Z Turbo Drive 512GB SSD	**Capacity**	512GB	
		Interface	PCI Express 2.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP Z Turbo Drive G2 256GB SSD	**Capacity**	256GB	
		Interface	PCI Express 3.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP Z Turbo Drive G2 512GB SSD	**Capacity**	512GB	
		Interface	PCI Express 3.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
	HP Z Turbo Drive G2 1TB SSD	**Capacity**	1TB	
		Interface	PCI Express 3.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	

Technical Specifications - Hard Drives

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

HARD DRIVE CONTROLLERS

LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card	**PCI Bus**	8 lanes, PCI Express 3.0	
	RAID Levels	Offers Integrated RAID (0, 1, 1E and 10)	
	PCI Data Burst Transfer Rate	Half Duplex x8, PCIe, 8000 MB/s	
	SAS Bandwidth	**Half Duplex**	600 MB/s per lane
	PCI Card Type	3.3V Add-in Card	
	PCI Voltage	12 V ± 10%	
	PCI Power	9.8W typical, Airflow min 200 LFM	
	Bracket	Full height and low profile	
	Certification Level	PCI Express 3.0 compliant	
	SAS Processor	LSI SAS2308/ Fusion MPT 2.0	
	Internal Connectors	One x4 internal mini-SAS (SFF8087)	
	External Connectors	One x4 external mini-SAS (SFF8088)	
	Maximum Number of SCSI Devices	256 Non-RAID SAS/SATA devices	
	LED Indicators	N/A	
LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit	**PCI Bus**	x8 lane PCIe 3.0 compliant	
	RAID Levels	RAID 0, 1, 5, and 6	
	PCI Data Burst Transfer Rate	RAID spans 10, 50 and 60	
	PCI Card Type	Low profile, single PCIe slot design with full height bracket.	
	PCI Voltage	+3.3V Add-in Card	
	PCI Power	+3.3V, +12V	
	Bracket	PCI-Express 3.0	
	Certification Level	Eight 6Gb/s and 3Gb/s compatible SAS/SATA ports	
	SAS Processor	LSISAS2208 Dual-Core RAID on Chip (ROC)	
	Internal Connectors	Two SAS SFF8087 x4 (Mini-SAS)	
	External Connectors	None	
	Maximum Number of SCSI Devices	Up to 128 SAS and/or SATA hard drives and SSDs	
	LED Indicators	**Heartbeat LED on card**	

GRAPHICS

NVIDIA NVS 310 1GB Graphics	**Form Factor**	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 310 GPU: GF119-825
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GBB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/
	Connectors	2x DisplayPort 1.2
	Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
	Image Quality Features	The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
	Display Output	Up to 2 displays in the following configurations: DisplayPort output: • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. DVI-D output: • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors

- Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors

HDMI output:

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

VGA display output:

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

	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.1
	Available Graphics Drivers	Windows 8.1 Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adpaters included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters. 4. Configurations of three NVS 310 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).
NVIDIA NVS 315 1 GB Graphics	**Form Factor**	Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 315 (using GF119-825 GPU) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink
	Bus Type	PCI Express x16, 2.0 compliant

Technical Specifications - Graphics

Memory	Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
Connectors	DMS-59 output Cables included: - For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable
Maximum Resolution	Maximum number of displays supported: 2 Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz
Image Quality Features	See Display Output section. The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 or later A full range of video resolutions are supported including 1080p, 1080i, 720p, 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: 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**	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 MHz Memory Clock: 891 MHz CUDA Cores: 192
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	Four mini-DisplayPort. Four mini-DisplayPort-to-DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)
	Maximum Resolution	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz) Note: This card supports up to four displays. For Windows XP, only 2 active displays are supported.
	Image Quality Features	10-bit internal display processing, including hardware support for 10-bit scan-out

Technical Specifications - Graphics

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.

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.

Technical Specifications - Graphics

NVIDIA Quadro K620 2GB Graphics	**Form Factor**	2.713" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included Weight: 133 grams
	Graphics Controller	NVIDIA Quadro K620 Graphics Card GM107 GPU 384 CUDA cores Max Power: 45 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	2 GB GDDR3, 900 MHz 128-bit memory I/O path 29 GB/s memory bandwidth
	Connectors	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 Additional DVI-to-VGA, 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 - 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
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	1 Dual-link DVI-I connector 1 Display Port connector
	Shading Architecture	Full Microsoft DirectX 11.1 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
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html

	Notes	1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
NVIDIA Quadro K420 2GB Graphics	**Form Factor**	Low Profile: 2.713 inches × 6.3 inches Cooling: Active
	Graphics Controller	NVIDIA Quadro K420 GPU: GK107 with 192 CUDA cores Power: 41W
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 2GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit
	Connectors	One dual-link DVI-I connector One DisplayPort connector Factory Configured: No video cable adapter included After market option kit: One DP-to-DVI adapter included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI - 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI - 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 - 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 **NVIDIA Quadro K1200 4GB Graphics**	**Form Factor**	Dimensions: 2.71" H x 6.875" L Single Slot, Low Profile 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 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
	Connectors	4 mini-DisplayPort 1.2a

	Factory Configured Option: 4 mini-DP-to-DP adapters included with card Option Kit: 4 mini-DP-to-DP adapters included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
Maximum Resolution	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 × 1536 × 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)
Display Output	Maximum number of displays - 4 direct attached monitors Maximum number of DisplayPort displays possible: - 4 1920x1200 - 4 2560x1600 - 4 4096x2160 Maximum number of monitors across all available Quadro K1200 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
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 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).
NVIDIA Quadro K2200 4 GB Graphics	**Form Factor**	4.38" H x 7.97" L Single Slot, Full Height
	Weight:	240 grams
	Graphics Controller	NVIDIA Quadro K2200 Graphics Card GM107 GPU 640 CUDA cores Max Power: 67.7 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	4 GB GDDR5, 2500 Mhz 128-bit memory I/O path 80 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	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
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	VGA: • requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters • 400 MHz integrated RAMDAC • Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz

		DL-DVI(I): • Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): • Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: • Supports HBR2 and MST • Max resolution: 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.
	Shading Architecture	Full Microsoft DirectX 11.1 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
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device. 4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output.
NVIDIA Quadro M2000 4GB Graphics	**Form Factor**	Dimensions: 4.376" H x 6.6” L Single Slot, Full Height Cooling: Active

Technical Specifications - Graphics

	Weight: 239 grams
Graphics Controller	NVIDIA Quadro M2000 Graphics Card GPU: GM206 with 768 CUDA cores Power: 75 Watts
Bus Type	PCI Express 3.0 x16
Memory	Size: 4GB GDDR5 Memory Bandwidth: 105.7 GB/s Memory Width: 128-bit
Connectors	4x DisplayPort 1.2a Factory Configured Option: No video cable adapter included After Market Option: No video cable adapter included Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as accessories
Maximum Resolution	DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - up to 2560 x 1600 x 30 bpp @ 120 Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) Using two DP outputs, the M2000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.
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

Technical Specifications - Graphics

	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.
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
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenCL™ 1.2, DirectX® 11 and OpenGL 4.4
	Available Graphics Drivers	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: http://welcome.hp.com/country/us/en/support.html
	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 for details
AMD FirePro W4300 4GB Graphics	**Form Factor**	Low Profile, single slot (6.6" x 3.118") Full Height, single slot (6.6" x 4.725")
	Graphics Controller	AMD FirePro W4300 graphics GPU Frequency: 930Mhz Memory Clock Speed: 1500Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <50 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	Connectors	4x Mini Display Port 1.2 connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included

Technical Specifications - Graphics

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

Maximum Resolution

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

Image Quality Features

Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.
High bandwidth scaler for high quality up and downscaling
Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows
GPU control of display refresh rates for tear-free and jitter-free image quality
when rotating models or viewing video content.(Requires FreeSync compliant displays)

Display Output

Max number of monitors supported using DisplayPort 1.2a:

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

Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2):

- one 4096x2160 display
- two 2560x1600 displays
- four 1920x1200 displays

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

OpenGL 4.4
OpenCL 2.0
DirectX 12.0

Available Graphics Drivers

Windows 10 (64-bit and 32-bit)
Windows® 7 (64-bit and 32-bit)
Linux

HP qualified drivers may be preloaded or available from the HP support Web site:
http://welcome.hp.com/country/us/en/support.html

Notes

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

2. Configurations of two FirePro W4300 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

AMD FirePro W5100 4GB Graphics	**Form Factor**	Full height, single slot (6.75" X 4.376")
	Graphics Controller	AMD FirePro W5100 graphics GPU Frequency: 930Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <75 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	Connectors	4x Display Port 1.2 connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling
	Display Output	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors

		Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
	Available Graphics Drivers	Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details.
	Form Factor	Full height, single slot (6.75” X 4.376”)
NVIDIA Quadro M4000 8GB Graphics	**Form Factor**	Dimensions: 4.4” H x 9.5” L Single Slot, Full Height Cooling: Active Weight: 475 grams (without extender)
	Graphics Controller	NVIDIA Quadro M4000 GPU: GM204 with 1664 CUDA cores Power: 120 Watts
	Bus Type	PCI Express 3.0 x16
	Memory	Size: 8GB GDDR5 Memory Bandwidth: 192 GB/s Memory Width: 256-bit

Technical Specifications - Graphics

Connectors	4 DisplayPort 1.2a Factory configured Option: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
Maximum Resolution	DisplayPort: - single DisplayPort up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz VGA (via adapter cable): - 2048 × 1536 × 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: - 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

Technical Specifications - Graphics

	Supported Graphics APIs	OpenGL 4.5 DirectX 12 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Configurations using the Quadro M4000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).
NVIDIA Quadro M5000 8GB Graphics	**Form Factor**	Dimensions: 4.4” H x 10.5” L Dual Slot, Full Height Cooling: Active Weight: 525 grams (without extender)
	Graphics Controller	NVIDIA Quadro M5000 GPU: GM204 with 2048 CUDA cores Power: 150 Watts
	Bus Type	PCI Express 3.0 x16
	Memory	Size: 8GB GDDR5 ECC capable Memory bandwidth: 211GB/s Memory Width: 256-bit
	Connectors	1 Dual Link DVI-I 4 DisplayPort 1.2a Factory configured option: No adapter included with card. After market option kit: No adaptor included with card.

Technical Specifications - Graphics

	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 × 1536 × 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

Technical Specifications - Graphics

		API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran
	Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Factory configured Quadro M5000 does not include a video cable adapter. Video cable adapters must be ordered separately. 2. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2). 3. Configurations of a single Quadro M5000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).
NVIDIA Quadro K4200 4GB Graphics	**Form Factor**	Dimensions: 4.376" H x 9.5" L Single Slot, Full Height Cooling: Active
	Weight:	461 grams (without extender)
	Graphics Controller	NVIDIA Quadro K4200 GPU: GK104-850 GPU with 1344 CUDA cores Power: 108 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	Size: 4GB GDDR5 Memory Bandwidth: 173 GB/s Memory Width: 256-bit
	Connectors	1 DL-DVI(I) 2 DisplayPort 1.2a 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 × 1536 × 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

Technical Specifications - Graphics

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

- 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 x 1600 x 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.

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
	Bus Type	8GB GDDR5 memory Memory Bandwidth: up to 176 GB/s Memory Width: 256 bit
	Memory	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.
	Connectors	DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling
	Display Output	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors

Technical Specifications - Graphics

	Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
Available Graphics Drivers	Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. See www.amd.com/eyefinityfaq 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.

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 SuperMulti DVD Writer	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
		Full Stroke DVD	< 200 ms (seek)
		Full Stroke CD	< 200 ms (seek)
	Maximum Data Transfer Rates	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
	Power	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
	Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	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.	
	Kit Contents	9.5mm Slim SuperMulti DVD Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide	
HP 9.5mm Slim DVD-ROM Drive	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA / ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Disc Capacity	DVD-ROM	Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB
	Access Times	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)
	Power	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
	Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	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.	
	Kit Contents	9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide	
	Description	9.5mm height, tray-load	

Technical Specifications – Optical and Removable Storage

HP 9.5mm Slim BDXL Blu-Ray Writer	**Mounting Orientation**	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	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	
	Disc Capacity	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
	Maximum Data Transfer Rates	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

Technical Specifications – Optical and Removable Storage

			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
	Power	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
	Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	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.	
	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) 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

Technical Specifications – Optical and Removable Storage

	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. Seehttp://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)

CONTROLLER CARDS

HP IEEE 1394b FireWire PCIe Card	**Data Transfer Rate**	Supports up to 800 Mb/s
	Devices Supported	IEEE-1394 compliant devices
	Bus Type	PCIe card full height PCIe slots
	Ports	Two IEEE-1394b external 9-Pin connectors (Rear)
	Internal Connectors	One 10-Pin header connector
	System Requirements	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.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit
HP Thunderbolt-2 PCIe 1-port I/O Card	**Data Transfer Rate**	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables (2), user documentation and warranty card.

NETWORKING AND COMMUNICATIONS

Integrated Intel I218LM PCIe GbE Controller	**Connector**	RJ-45 (motherboard integration)
	Controller	Intel I218LM GbE platform LAN connect networking controller
	Memory	3 KB FIFO packet buffer memory (both Tx and Rx)
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3x, 802.3z
	Bus Architecture	PCI Express 1.1 (x1) and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V only (integrated regulators)
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostics AMT 9.1 support, vPro compliant
HP X520 10GbE Dual Port Adapter	**Hardware Certifications**	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
HP 10GbE SFP+ SR Transceiver	**Operating Temperature**	0°C to 45°C (32°F to 113°F)
	Operating Humidity	0% to 85%, noncondensing
	Dimensions (H x W x D)	0.47(h) x 0.54(w) x 2.19(d)inches (1.19 x 1.38 x 5.57 cm)
HP 361T PCIe Dual Port Gigabit NIC	**Connector**	Two RJ-45
	Controller	Intel® Ethernet I350 Controller
	Data Rates Supported	10/100/1000 Mbps, Half- and full-duplex
	Compliance	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.0 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950

		CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
	Operating Temperature	32° to 131°F (0° to 55° C)
	Operating Humidity	10% to 95% non-condensing
	Dimensions (H x W x D)	5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets)
	Operating System Driver Support	Windows 7 Professional 32-bit and 64-bit. Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11
	Kit Contents	HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Quick Install Card (QIC).
Intel Ethernet I350-T2 2-Port 1Gb NIC	**Connector**	Two RJ-45
	Controller	Intel® Ethernet I350 Controller
	Data Rates Supported	10/100/1000 Mbps, Half- and full-duplex
	Compliance	802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.1 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)

Technical Specifications - Networking and Communications

Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
Operating Temperature	32° to 131° F (0° to 55° C)
Operating Humidity	10% to 95% non-condensing
Dimensions (H x W x D)	5.3 x 2.5 in (13.50cm x 6.4 cm) (without brackets)
Operating System Driver Support	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
Kit Contents	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.

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

Operating Humidity	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
Dimensions (H x W x D)	Native HMC: 26.8 x 30.0 x 2.4 mm Carrier Card Assembly 3.3 x 4.7 in (84 x 119 mm)
Kit Contents	PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty.
Notes	1. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista. 2. Check latest software/driver release for updates on supported security features. 3. Maximum output power may vary by country according to local regulations. 4. In Power Save Polling mode and on battery power. 5. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

Technical Specifications - Networking and Communications

Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC	**Operating Temperature**	0 to 80 C
	Operating Humidity	Non-operating 50% to 90% RH non-condensing (at temperatures of 25C to 35C)
	Kit Contents	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	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

Summary of Changes

		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
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 for4TB 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

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