

Overview

HP Z440 Workstation



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

Overview



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

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Form Factor Operating Systems

Minitower

Preinstalled:

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

Supported:

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

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

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® SR2P8 E5-1680 v4 processor	8	3.4	20	2400	YES	YES	2, 4, 6	140
Intel® Xeon® SR2PK E5-1660 v4 processor	8	3.2	20	2400	YES	YES	2, 4, 6	140
Intel® Xeon® SR2P7 E5-1650 v4 processor	6	3.6	15	2400	YES	YES	2, 2, 4	140
Intel® Xeon® SR2PF E5-1630 v4 processor	4	3.7	10	2400	YES	YES	1, 1, 3	140
Intel® Xeon® E5-1620 v4 processor	4	3.5	10	2400	YES	YES	1, 3	140
Intel® Xeon® E5-1607 v4 processor	4	3.1	10	2133	NO	YES	N/A	140
Intel® Xeon® E5-1603 v4 processor	4	2.8	10	2133	NO	YES	N/A	140
Intel Xeon E5-1680 v3 processor	8	3.2	20	2133	YES	YES	3, 6	140
Intel Xeon E5-1660 v3 processor	8	3.0	20	2133	YES	YES	3, 5	140
Intel Xeon E5-2630 v3 processor	8	2.4	20	1866	YES	YES	2, 8	85
Intel Xeon E5-1650 v3 processor	6	3.5	15	2133	YES	YES	1, 3	140
Intel Xeon E5-1630 v3 processor	4	3.7	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1620 v3 processor	4	3.5	10	2133	YES	YES	1, 1	140
Intel Xeon E5-1607 v3 processor	4	3.1	10	1866	NO	YES	N/A	140

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Intel Xeon E5-1603 v3 processor	4	2.8	10	1866	NO	YES	N/A	140
Intel Xeon SR2P3 E5-2637 v4 processor	4	3.5	15	2400	YES	YES	1, 2	135
Intel Xeon E5-2623 v4 processor	4	2.6	10	2133	YES	YES	2, 6	85
<p>¹The specifications shown in this column represent the following: (all core maximum turbo steps, one core maximum turbo steps). Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.</p> <p>NOTE: Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z440 Workstation does not support dual processor configurations.</p>								

Available Processors Disclaimers

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

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

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

Color Jack Black

Convertibility No

Expansion Slots (see system board section for more details) **Slot 1 (top):**
PCI Express Gen2 x1 with open-ended connector*
Full-height, Half-length

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

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

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

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

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

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

Expansion Bays (see storage section for more details) 2 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed)
 2 external 5.25" bays

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

1 dedicated 9.5mm slim optical disk drive bay

Front I/O 4 USB 3.0, 1 Headset, 1 Microphone

Internal I/O 2 USB 2.0 ports available with a single 2x5 header. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. The 2x5 header also supports up to one 15-in-1 Media Card Reader.
 1 USB 3.0 port available by a 2x10 header.

Rear I/O 4 USB 3.0, 2 USB 2.0, 2 PS/2, 1 RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out.
 Serial supported with optional connector on PCI bracket cabled to system board connector.

Interfaces Supported 15-in-1 Media Card Reader (optional)
 6-channel SATA interface (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported).
 USB 2.0, USB 3.0

On-board RAID Support RAID 0, 1, 10 (Factory integrated)
 RAID 5 (NOT Factory integrated)

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

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

H: 17.0" [431.8mm]
 W: 6.65" [168.91mm]
 D: 17.5" [444.7mm] (measured to the rear of service panel)

Maximum Dimensions:

H: 17.0" [431.8mm]
 W: 6.65" [168.91mm]
 D: 17.9" [455.7mm] (measured to the rear padlock loop)

Rack Dimensions 4U

Weight Exact weights depend upon configuration.
 Minimum: 11.0 kg (24.3 lbs.)
 Standard: 13.5 kg (29.8 lbs.)
 Maximum: 17.5 kg (38.5 lbs.)

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

Overview

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® E5-1600 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® E5-1603 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		

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

Monitors / Displays

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

Supported by all operating systems available from HP
Screen size measured diagonally

Storage / Hard Drives

SAS Hard Drives

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

Supported Components

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

NOTES:

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

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

NOTE: SAS controller add-in card required

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

Removable Boot Drive option

SATA Hard Drives

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

NOTES:

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

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

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

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

Removable Boot Drive option

Supported Components

SATA Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
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 2TB SATA 6Gb/s SSD	Y	Y	Y6P08AA	
HP 256GB SATA* 6Gb/s SED SSD	Y	N		
HP 256GB SATA 6Gb/s SED Opal 2 SSD	Y	Y	G7U67AA	
HP 512GB SATA SED SSD	Y	Y	N8T26AA	
HP Enterprise Class 240GB SATA SSD	Y	Y	T3U07AA	
HP Enterprise Class 480GB SATA SSD	Y	Y	T3U08AA	

NOTES:

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

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

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

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

PCIe Solid State Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
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 G2 256GB TLC SSD	Y	Y	Y1T46AA	
HP Z Turbo Drive G2 512GB TLC SSD	Y	Y	Y1T49AA	
HP Z Turbo Drive G2 1TB TLC SSD	Y	Y	Y1T52AA	
HP Z Turbo Drive G2 256GB SED SSD	Y	Y	Y1T55AA	
HP Z Turbo Drive G2 512GB SED SSD	Y	Y	Y1T58AA	
HP Z Turbo Drive Quad Pro				
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	Note 2
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Y	Y	N2M99AA	Note 2
HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	Y	Y	T9H99AA	Note 2
HP Z Turbo Drive G2 1TB TLC SSD	Y	Y	Y1T52AA	
HP Z Turbo Drive G2 256GB TLC SSD	Y	Y	Y1T46AA	

Supported Components

HP Z Turbo Drive G2 512GB TLC SSD	Y	Y	Y1T49AA	
HP Z Turbo Drive Quad Pro 256GB SSD module	N	Y	N2N00AA	Note 1
HP Z Turbo Drive Quad Pro 512GB SSD module	N	Y	N2N01AA	Note 1
HP Z Turbo Drive Quad Pro 1TB SSD module	N	Y	T9J00AA	Note 1
HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Y	Y	N2M99AA	
HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	Y	Y	T9H99AA	
Intel 750 Series AIC PCIe SSD				
Intel 750 Series AIC 400GB PCIe SSD	Y	Y	Y4A61AV	
Intel 750 Series AIC 800GB PCIe SSD	Y	Y	Y4A62AV	
Intel 750 Series AIC 1.2TB PCIe SSD	Y	Y	Y4A63AV	

NOTES:

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

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

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

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

NOTE 1: M.2 SSD module only

NOTE 2: Dual M.2 SSD modules plus carrier

Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
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, 4
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, 4
LSI iBBU9 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.

Supported Components

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

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

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

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

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards
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
NVIDIA® Quadro® P400 2GB Graphics	Y	Y	1ME43AA		2
NVIDIA® Quadro® P600 2GB Graphics	Y	Y	1ME42AA		2
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA		2
Mid-range 3D					
NVIDIA® Quadro® K1200 4GB Graphics	Y	Y	L4D16AA		2
NVIDIA® Quadro® K2200 4GB Graphics	Y	Y	J3G88AA	Note 5	2
NVIDIA® Quadro® M2000 4GB Graphics	Y	Y	T7T60AA	Note 5, 6	2
NVIDIA® Quadro® P1000 4GB Graphics	Y	Y	1ME01AA		2
NVIDIA® Quadro® P2000 5GB Graphics	Y	Y	1ME41AA	Note 5	2
Radeon Pro™ WX4100 4GB Graphics	Y	Y	Z0B15AA	Note 5, 6	2

Supported Components

AMD FirePro W4300 4GB Graphics	Y	Y	T7T58AA	Note 5, 6	2
AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA	Note 5, 6	2
High End 3D					
NVIDIA® Quadro® M4000 8GB Graphics	Y	Y	M6V52AA	Notes 3, 4	2
NVIDIA® Quadro® M5000 8GB Graphics	Y	Y	M6V53AA	Notes 3, 4	1
NVIDIA® Quadro® P4000 8GB Graphics	Y	Y	1ME40AA	Notes 3, 4	1
NVIDIA® Quadro® P5000 16GB Graphics	Y	Y	Z0B13AA	Notes 3, 4	1
AMD FirePro™ W7100 8GB Graphics	Y	Y	J3G93AA	Notes 3, 4	1
Radeon Pro™ WX7100 8GB Graphics	Y	Y	Z0B14AA	Notes 3, 4	2
Ultra 3D					
NVIDIA® Quadro® P6000 24GB Graphics	Y	Y	Z0B12AA	Notes 3, 4	1
NVIDIA® Quadro® Sync II	N	Y	1WT20AA		

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).

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
	HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM	T9V41AA	1,2
	HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM	T9V40AA	1,2
	HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM	T9V39AA	1,2
	HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM	T9V38AA	1,2

NOTES:

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

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 or that include 32GB DIMMs require the HP Z440 Memory Cooling Solution, which is available both CTO (J2R51AV) and AMO (J2R52AA).

Supported Components

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

Multimedia and Audio Devices

Supported Components

Multimedia and Audio Devices

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

Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP SlimTray Optical Drives				
HP 9.5mm Slim 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.

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
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Supported Components

Integrated Intel® I218LM PCIe GbE Controller	Y	N		
Intel® Ethernet I210-T1 PCIe NIC	Y	Y	E0X95AA	
HP X520 10GbE Dual Port Adapter	Y	Y	C3N52AA	
HP 10GbE SFP+ SR Transceiver	Y	Y	C3N53AA	
HP 361T PCIe Dual Port Gigabit NIC	N	Y	C3N37AA	Note 1
Intel® Ethernet I350-T2 2-Port 1Gb NIC	Y	Y	V4A91AA	
Intel® Ethernet I350-T4 4-port 1Gb NIC	N	Y	W8X25AA	Note 1
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 Z240/Z440 Depth Adjust Fixed Rail Rack Kit	N	Y	WH340AA	
HP Keyed Cable Lock 10mm	N	Y	T1A62AA	

Input Devices

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

NOTE 1: Combo kit includes wireless mouse

Other Hardware

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

Supported Components

Note 1: The HP Z440 Memory Cooling Solution is available to add to any configuration for improved system cooling, but is required for any memory configuration using more than 4x DIMMs or that uses 32GB DIMMs.

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

- 1 x LSI 9217 SAS Controller
- 1 x NVIDIA® Quadro® P5000
- 1 x AMD Radeon Pro WX 7100
- 2 x AMD FirePro W4300
- 2 x NVIDIA® Quadro® M2000
- 3 x NVIDIA NVS 310/315
- 1 x NVIDIA® Quadro® M4000
- 1 x NVIDIA® Quadro® M5000
- 1 x NVIDIA® Quadro® K4200
- 1 x NVIDIA® Quadro® K5200
- 2 x AMD FirePro W5100
- 1 x AMD FirePro W7100
- 1 x 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

HP Linux Installer Kit

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

High end

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, 16GB and 32GB
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 Configuration Table	Please refer to the table below for details on how supported memory configurations are installed in your system.

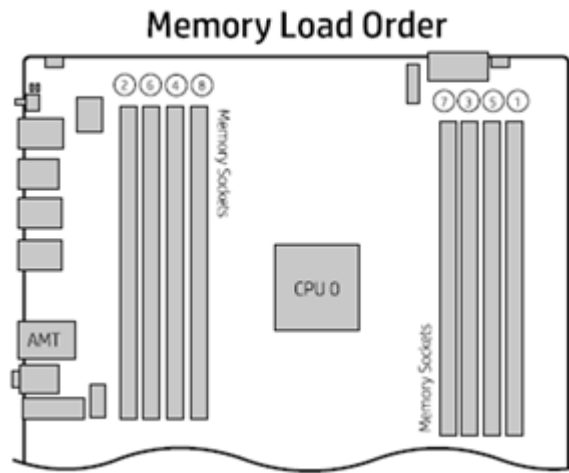
* For 32 bit operating systems, there is a memory limit of 4GB.

~ 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
128 GB		32 GB		32 GB			32 GB		32 GB	Best
256 GB		32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	32 GB	Best
Slot Load Order		1	5	3	7	8	4	6	2	

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

System Technical Specifications



Maximum Memory Supports up to 256GB

Memory Configuration (Supported) Only ECC DIMMs are supported.

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

PCI Express Connectors

- Slot 1 (top):
PCI Express Gen2 x1
Full-height, Half-length
- Slot 2:
PCI Express Gen3 x16
Full-height, Full-length (with extender)
- Slot 3:
PCI Express Gen2 x4 with open-ended connector**
Full-height, Full-length (with extender)
- Slot 4:
PCI Express Gen3 x8 with open-ended connector**
Full-height, Full-length (with extender)
- Slot 5:
PCI Express Gen3 x16
Full-height, Full-length (with extender)

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

PCI Connectors (5.0V)

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

System Technical Specifications

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. Requires Optional PCIe card
	Serial Attached SCSI	Requires Optional PCIe card
	Integrated RAID	SATA: RAID 0, 1 SSATA: RAID 0, 1, 10 <ul style="list-style-type: none"> • 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
IEEE 1394 Connector(s)	Parallel	No
	AUX IN (audio)	No
	Front	None
	Rear	2 IEEE 1394b (requires optional PCIe card)
USB Connector(s)	Internal	None
	Front	4 USB 3.0
	Rear	4 USB 3.0 2 USB 2.0
	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.

System Technical Specifications

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	Trusted Platform Module (TPM) 1.2 (Infineon SLB 9660). Common Criteria EAL4+ Certified. Upgradable to TPM 2.0 through Firmware v5.51 upgrade (Infineon SLB9665). Convertible to FIPS 140-2 Certified mode. (TPM 2.0 is not available for Win 7 32-bit.). When the SLB 9660 is converted (via Firmware v5.51) to TPM 2.0 mode then it is renamed as SLB 9665. Once converted to TPM2.0 the SLB9665 is CC EAL4+ certified. CG TPM Certified products list: http://www.trustedcomputinggroup.org/certification/tpmcertifiedproducts/			
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	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	
	Yes, 90% Efficient		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/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf		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	
FEMP Standby Power Compliant @115V (<2W in S5 – Power Off)	Yes		Yes	
EuP Compliant @ 230V (<0.5 W in S5 – Power Off)	Yes		Yes	

System Technical Specifications

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	2.19 W
	Off (S5)	0.825 W	0.784 W	1.024 W	0.985 W	0.851 W	0.772 W
	Zero Power Mode (ErP)	0.190 W		0.382 W		0.178 W	

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

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 / 1x Slim DVD-ROM SATA					
	Power Supply	700W 90% Custom PSU					
	Other	N/A					

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

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

System Technical Specifications

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

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 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 DVDRW 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)	61.88 W		61.39 W		62.35 W	
	Windows Busy Typ(S0)	296.64 W		290.88 W		303.03 W	
	Windows Busy Max (S0)	338.63 W		334.85 W		333.11 W	
	Sleep (S3)	3.99 W	3.91 W	4.02 W	4.04 W	3.99 W	3.91 W

System Technical Specifications

	Off (S5)	0.86 W	0.764 W	1.02 W	0.91 W	0.86 W	0.76 W
	Zero Power Mode (ErP)	0.166 W		0.305 W		0.165 W	
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
Hard drive Operating (random reads)		3.3	15
DVD-ROM Operating (sequential reads)		4.3	30

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)

System Technical Specifications

Non-operating:

½-sine: 160 cm/s, 2-3ms (~105g)

square: 422 cm/s, 20g

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

Vibration

Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/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 derated by 1° C (1.8° F) per 305 m (1,000 ft.) elevation increase

Physical Security and Serviceability

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

System Technical Specifications

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
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
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System/Emergency ROM Flash Recovery	Recovers corrupted system BIOS.
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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
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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:
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- 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

System Technical Specifications

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

Access Panel Key Lock No

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

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

Trusted Platform Module Chip Infineon TPM 1.2 Certified

Integrated Chassis Handles Yes, Front handle and dedicated rear recess

Power Supply Requires T15 Torx or flat blade screwdriver

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

Flash ROM Yes

Diagnostic Power Switch LED on board Yes

Clear Password Jumper Yes

Clear CMOS Button Yes

CMOS Battery Holder Yes

DIMM Connectors Yes

BIOS

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

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

ATAPI ATAPI Removable Media Device BIOS Specification Version 1.0.

BBS BIOS Boot Specification v1.01.

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

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

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

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

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

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

SMBIOS System Management BIOS 2.7, for system management information.

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

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

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

- NORMAL - normal temperature ranges.

System Technical Specifications

- **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 2.3.1

Revision

ACPI Advanced Configuration and Power Management Interface, Version 4.0

ATA (IDE) AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b

CD Boot "El Torito" Bootable CD-ROM Format Specification Version 1.0

EDD - Enhanced Disk Drive Specification Version 1.1

- BIOS Enhanced Disk Drive Specification Version 3.0

EHCI Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0

PCI PCI Local Bus Specification, Revision 2.3

PCI Power Management Specification, Revision 1.1

PCI Firmware Specification, Revision 3.0, Draft .7

PCI Express PCI Express Base Specification, Revision 2.0

PCI Express Base Specification, Revision 3.0

System Technical Specifications

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

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

Low Halogen Statement HP Inc. is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis. This product is low-halogen except for power cords, external cables and peripherals. The following customer-configurable internal components may not be low-halogen: 3 ½" SAS HDDs and LSI 9217-4i4e SAS ROC RAID Card. Service parts obtained after purchase may not be low-halogen.

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

System Technical Specifications

HP Inc. Corporate Environmental Information

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

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

Additional Information

ISO 14001 certificates:

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

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

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

- Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- EPEAT Gold registered in the United States. See <http://www.epeat.net> for registration status in your country. EPEAT® registered where applicable. EPEAT registration varies by country. See <http://www.epeat.net> for registration status by country. Search keyword *generator* on HP's 3rd party option store for solar energy accessory at <http://www.hp.com/go/options>

Packaging

HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html

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

Packaging Materials

Internal

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

External

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

Manageability

Industry Standard Specifications

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

- DASH 1.1 (via Intel® LAN on motherboard)

Intel Active Management Technology (AMT)

Intel® Active Management Technology (AMT) 9.1

An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 9.1 includes the following advanced management functions:

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

System Technical Specifications

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

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

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

Remote Manageability Software Solutions

The HP Z440 Workstation is supported on the following remote manageability software consoles:

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

System Software Manager Service, Support, and Warranty

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

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

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

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

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

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

Product Change Notification

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

System Technical Specifications

- PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition.
 - Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.
-

Stable & Consistent Offerings

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

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

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

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

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

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

Stable & Consistent Offerings

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

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

Technical Specifications - Processors

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

Technical Specifications - Hard Drives

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 overhead, including settling)	Single Track 0.4 ms (max)
	Average 3.6 ms
	Full Stroke 7.3 ms
Rotational Speed	10,000 rpm
Logical Blocks	585,937,500
Operating Temperature	41° to 131° F (5° to 55° C)

Technical Specifications - Hard Drives

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 overhead, including settling)	Single Track 1.0 ms
	Average 11 ms
	Full Stroke 18 ms
Rotational Speed	7,200 rpm
Logical Blocks	3,907,029,168
Operating Temperature	41° to 131° F (5° to 55° C)

Technical Specifications - Hard Drives

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)

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

Capacity	1TB
Protocol	SATA
Form Factor	3.5"
Controller	AHCI
Reliability (MTBF)	2.0M hours
Rated Power On Hours	8760/yr
Annualized Failure Rate (based on Rated POH)	<0.62%
Rated for 24/7/365 operation	YES
Physical Size (Height)	1 in; 2.54 cm
Physical Size (Width)	4 in; 10.17 cm
Media Diameter	3.5 in; 8.9 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 0.32ms
	Average 7.45ms
	Full Stroke 14.2ms
Operating Temperature	41° to 140° F (5° to 60° C)
Performance	Sequential Read up to 226MB/s
	Sequential Write up to 226MB/s
Enterprise Class Features	High Reliability

Technical Specifications - Hard Drives

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)
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)

Technical Specifications - Hard Drives

SATA SSDs for HP Workstations

HP 128GB SATA 6Gb/s SSD

Capacity	128GB
Protocol	SATA
Form Factor	2.5"
Controller	AHCI
NAND Type	MLC
Endurance	100TBW (TB Written)
Reliability (MTTF)	1.5M hours
Physical Size (Height)	0.28 in; 0.7 cm
Physical Size (Width)	2.5 in; 6.36 cm
Interface	SATA 6Gb/s
Synchronous Transfer Rate (Maximum)	Up to 550MB/s (Sequential Read)
Operating Temperature	32° to 158° F (0° to 70° C)
Performance	
	Sequential Read 560 MB/s
	Sequential Write 400 MB/s
	Random Read 90K IOPS
	Random Write 88K IOPS

HP 256GB SATA 6Gb/s SSD

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

HP 256GB SATA 6Gb/s SED Opal 2 SSD

Capacity	256GB
Protocol	SATA
Form Factor	2.5"
Controller	AHCI
NAND Type	MLC
Endurance	200TBW (TB Written)
Reliability (MTTF)	1.5M hours
Physical Size (Height)	0.28 in; 0.7 cm
Physical Size (Width)	2.5 in; 6.36 cm
Interface	6Gb/s SATA

Technical Specifications - Hard Drives

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

Technical Specifications - Hard Drives

HP 1TB SATA 6Gb/s SSD	Capacity	1TB	
	Protocol	SATA	
	Form Factor	2.5"	
	Controller	AHCI	
	NAND Type	MLC	
	Endurance	400TBW (TB Written)	
	Reliability (MTTF)	1.5M hours	
	Physical Size (Height)	0.28 in; 0.7 cm	
	Physical Size (Width)	2.5 in; 6.36 cm	
	Interface	SATA 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 550MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	560 MB/s
		Sequential Write	510 MB/s
		Random Read	100K IOPS
		Random Write	88K IOPS
HP 2TB SATA 6Gb/s SSD	Capacity	2TB	
	Protocol	SATA	
	Form Factor	2.5"	
	Controller	AHCI	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability (MTTF)	1.5M hours	
	Physical Size (Height)	0.28 in; 0.7 cm	
	Physical Size (Width)	2.5 in; 6.36 cm	
	Interface	SATA 6Gb/s	
	Synchronous Transfer Rate (Maximum)	Up to 550MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	530 MB/s
		Sequential Write	500 MB/s
		Random Read	92K IOPS
		Random Write	83K IOPS
HP Enterprise Class 240GB SATA SSD	Capacity	240GB	
	Protocol	SATA	
	Form Factor	2.5"	
	Controller	AHCI	
	NAND Type	MLC	
	Endurance	920TBW (TB Written)	
	Reliability (MTTF)	2.0M hours	
	Physical Size (Height)	0.28 in; 0.7 cm	
	Physical Size (Width)	2.5 in; 6.36 cm	
	Interface	6Gb/s SATA	

Technical Specifications - Hard Drives

Synchronous Transfer Rate (Maximum)	Up to 600MB/s	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	420 MB/s
	Sequential Write	290 MB/s
	Random Read	63K IOPS
	Random Write	18K IOPS
Enterprise Class Features	High Endurance NAND Power Loss Protection End-to-End Data Protection	

HP Enterprise Class 480GB SATA SSD

Capacity	480GB	
Protocol	SATA	
Form Factor	2.5"	
Controller	AHCI	
NAND Type	MLC	
Endurance	1850TBW (TB Written)	
Reliability (MTTF)	2.0M hours	
Physical Size (Height)	0.28 in; 0.7 cm	
Physical Size (Width)	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)	
Performance	Sequential Read	420 MB/s
	Sequential Write	380 MB/s
	Random Read	63K IOPS
	Random Write	23K IOPS
Enterprise Class Features	High Endurance NAND Power Loss Protection End-to-End Data Protection	

PCIe SSDs for HP Workstations

HP Z Turbo Drive 256GB SSD

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

Capacity	512GB
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Technical Specifications - Hard Drives

HP Z Turbo Drive 512GB SSD	Protocol	PCIe	
	Form Factor	Half-height, half-length	
	Controller	AHCI	
	NAND Type	MLC	
	Endurance	292TB	
	Interface	PCI Express 2.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance		
		Sequential Read	1170 MB/s
		Sequential Write	950 MB/s
		Random Read	122K IOPS
	Random Write	72K IOPS	
HP Z Turbo Drive G2 256GB SSD	Capacity	256GB	
	Protocol	PCIe	
	Form Factor	Half-height, half-length	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	146TB	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance		
		Sequential Read	2150 MB/s
	Sequential Write	1260 MB/s	
	Random Read	300K IOPS	
	Random Write	100K IOPS	
HP Z Turbo Drive G2 512GB SSD	Capacity	512GB	
	Protocol	PCIe	
	Form Factor	Half-height, half-length	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	292TB	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance		
		Sequential Read	2150 MB/s
	Sequential Write	1550 MB/s	
	Random Read	300K IOPS	
	Random Write	100K IOPS	
HP Z Turbo Drive G2 1TB SSD	Capacity	1TB	
	Protocol	PCIe	
	Form Factor	Half-height, half-length	

Technical Specifications - Hard Drives

Controller	NVMe	
NAND Type	MLC	
Endurance	600TB	
Reliability (MTTF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	2500 MB/s
	Sequential Write	1550 MB/s
	Random Read	210K IOPS
	Random Write	130K IOPS

Technical Specifications - Hard Drives

HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Capacity	512GB	
	Protocol	PCIe	
	Form Factor	PCIe Card, Full Height PCIe Slot	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	146TB	
	Reliability (MTBF)	1.5M hours	
	Interface	PCIe Gen3 x4 architecture	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	2150 MB/s
		Sequential Write	1260 MB/s
		Random Read	300K IOPS
		Random Write	100K IOPS
HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD	Capacity	1TB	
	Protocol	PCIe	
	Form Factor	PCIe Card, Full Height PCIe Slot	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	292TB	
	Reliability (MTBF)	1.5M hours	
	Interface	PCIe Gen3 x4 architecture	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	2150 MB/s
		Sequential Write	1550 MB/s
		Random Read	300K IOPS
		Random Write	100K IOPS
HP Z Turbo Drive G2 256GB SED SSD	Capacity	256GB	
	Protocol	PCIe	
	Form Factor	Half-height, half-length	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	150TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	Sequential Read	3100 MB/s
		Sequential Write	1400 MB/s
		Random Read	330K IOPS
		Random Write	280K IOPS
Self-Encrypting Drive Support	OPAL 2		

Technical Specifications - Hard Drives

HP Z Turbo Drive G2 512GB SED SSD

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

HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD

Capacity	512GB								
Protocol	PCIe								
Form Factor	PCIe Card, Full Height PCIe Slot								
Controller	NVMe								
NAND Type	MLC								
Endurance	146TB								
Reliability (MTBF)	1.5M hours								
Interface	PCIe Gen3 x4 architecture								
Operating Temperature	32° to 158° F (0° to 70° C)								
Performance	<table> <tr> <td>Sequential Read</td> <td>2150 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1260 MB/s</td> </tr> <tr> <td>Random Read</td> <td>300K IOPS</td> </tr> <tr> <td>Random Write</td> <td>100K IOPS</td> </tr> </table>	Sequential Read	2150 MB/s	Sequential Write	1260 MB/s	Random Read	300K IOPS	Random Write	100K IOPS
Sequential Read	2150 MB/s								
Sequential Write	1260 MB/s								
Random Read	300K IOPS								
Random Write	100K IOPS								

HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD

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

HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD

Capacity	2TB
Protocol	PCIe

Technical Specifications - Hard Drives

	Form Factor	PCIe Card, Full Height PCIe Slot								
	Controller	NVMe								
	NAND Type	MLC								
	Endurance	600TB								
	Interface	PCI Express 3.0 x4 electrical x4 physical								
	Operating Temperature	32° to 158° F (0° to 70° C)								
	Performance	<table border="0"> <tr> <td>Sequential Read</td> <td>3200 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1800 MB/s</td> </tr> <tr> <td>Random Read</td> <td>430K IOPS</td> </tr> <tr> <td>Random Write</td> <td>320K IOPS</td> </tr> </table>	Sequential Read	3200 MB/s	Sequential Write	1800 MB/s	Random Read	430K IOPS	Random Write	320K IOPS
Sequential Read	3200 MB/s									
Sequential Write	1800 MB/s									
Random Read	430K IOPS									
Random Write	320K IOPS									
HP Z Turbo Drive G2 256GB TLC SSD	Capacity	256GB								
	Protocol	PCIe								
	Form Factor	M.2 in Half-height, half-length card								
	Controller	NVMe								
	NAND Type	3D TLC								
	Endurance	75TBW (TB Written)								
	Reliability (MTBF)	1.5M hours								
	Interface	PCI Express 3.0 x4 electrical x4 physical								
	Operating Temperature	32° to 158° F (0° to 70° C)								
	Performance	<table border="0"> <tr> <td>Sequential Read</td> <td>2800 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>320 MB/s (1100 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>250K IOPS</td> </tr> <tr> <td>Random Write</td> <td>180K IOPS</td> </tr> </table>	Sequential Read	2800 MB/s	Sequential Write	320 MB/s (1100 MB/s max/Turbo)	Random Read	250K IOPS	Random Write	180K IOPS
Sequential Read	2800 MB/s									
Sequential Write	320 MB/s (1100 MB/s max/Turbo)									
Random Read	250K IOPS									
Random Write	180K IOPS									
HP Z Turbo Drive G2 512GB TLC SSD	Capacity	512GB								
	Protocol	PCIe								
	Form Factor	M.2 in Half-height, half-length card								
	Controller	NVMe								
	NAND Type	3D TLC								
	Endurance	150TBW (TB Written)								
	Reliability (MTBF)	1.5M hours								
	Interface	PCI Express 3.0 x4 electrical x4 physical								
	Operating Temperature	32° to 158° F (0° to 70° C)								
	Performance	<table border="0"> <tr> <td>Sequential Read</td> <td>2800 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>660 MB/s (1600 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>260K IOPS</td> </tr> <tr> <td>Random Write</td> <td>260K IOPS</td> </tr> </table>	Sequential Read	2800 MB/s	Sequential Write	660 MB/s (1600 MB/s max/Turbo)	Random Read	260K IOPS	Random Write	260K IOPS
Sequential Read	2800 MB/s									
Sequential Write	660 MB/s (1600 MB/s max/Turbo)									
Random Read	260K IOPS									
Random Write	260K IOPS									
HP Z Turbo Drive G2 1TB TLC SSD	Capacity	1TB								
	Protocol	PCIe								
	Form Factor	M.2 in Half-height, half-length card								
	Controller	NVMe								
	NAND Type	3D TLC								
	Endurance	300TBW (TB Written)								

Technical Specifications - Hard Drives

	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 3000 MB/s
		Sequential Write 1150 MB/s (1700 MB/s max/Turbo)
		Random Read 360K IOPS
		Random Write 330K IOPS
HP Z Turbo Drive G2 256GB TLC SSD	Capacity	256GB
	Protocol	PCIe
	Form Factor	M.2 in Half-height, half-length card
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	75TBW (TB Written)
	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 2800 MB/s
		Sequential Write 320 MB/s (1100 MB/s max/Turbo)
		Random Read 250K IOPS
		Random Write 180K IOPS
HP Z Turbo Drive G2 512GB TLC SSD	Capacity	512GB
	Protocol	PCIe
	Form Factor	M.2 in Half-height, half-length card
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	150TBW (TB Written)
	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 2800 MB/s
		Sequential Write 660 MB/s (1600 MB/s max/Turbo)
		Random Read 260K IOPS
		Random Write 260K IOPS
HP Z Turbo Drive G2 1TB SSD	Capacity	1TB
	Protocol	PCIe
	Form Factor	M.2 in Half-height, half-length card
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	300TBW (TB Written)

Technical Specifications - Hard Drives

		Reliability (MTTF)	1.5M hours								
		Interface	PCI Express 3.0 x4 electrical x4 physical								
		Operating Temperature	32° to 158° F (0° to 70° C)								
		Performance	<table border="0"> <tr> <td>Sequential Read</td> <td>3000 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1150 MB/s (1700 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>360K IOPS</td> </tr> <tr> <td>Random Write</td> <td>330K IOPS</td> </tr> </table>	Sequential Read	3000 MB/s	Sequential Write	1150 MB/s (1700 MB/s max/Turbo)	Random Read	360K IOPS	Random Write	330K IOPS
Sequential Read	3000 MB/s										
Sequential Write	1150 MB/s (1700 MB/s max/Turbo)										
Random Read	360K IOPS										
Random Write	330K IOPS										
HP Z Turbo Drive G2 256GB SED SSD		Capacity	256GB								
		Protocol	PCIe								
		Form Factor	M.2 in Half-height, half-length card								
		Controller	NVMe								
		NAND Type	3D MLC								
		Endurance	150TBW (TB Written)								
		Reliability (MTBF)	1.5M hours								
		Interface	PCI Express 3.0 x4 electrical x4 physical								
		Operating Temperature	32° to 158° F (0° to 70° C)								
		Performance	<table border="0"> <tr> <td>Sequential Read</td> <td>3100 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1400 MB/s</td> </tr> <tr> <td>Random Read</td> <td>330K IOPS</td> </tr> <tr> <td>Random Write</td> <td>280K IOPS</td> </tr> </table>	Sequential Read	3100 MB/s	Sequential Write	1400 MB/s	Random Read	330K IOPS	Random Write	280K IOPS
Sequential Read	3100 MB/s										
Sequential Write	1400 MB/s										
Random Read	330K IOPS										
Random Write	280K IOPS										
		Self-Encrypting Drive Support	OPAL 2								
HP Z Turbo Drive G2 512GB SED SSD		Capacity	512GB								
		Protocol	PCIe								
		Form Factor	M.2 in Half-height, half-length card								
		Controller	NVMe								
		NAND Type	3D MLC								
		Endurance	300TBW (TB Written)								
		Reliability (MTBF)	1.5M hours								
		Interface	PCI Express 3.0 x4 electrical x4 physical								
		Operating Temperature	32° to 158° F (0° to 70° C)								
		Performance	<table border="0"> <tr> <td>Sequential Read</td> <td>3200 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1700 MB/s</td> </tr> <tr> <td>Random Read</td> <td>330K IOPS</td> </tr> <tr> <td>Random Write</td> <td>300K IOPS</td> </tr> </table>	Sequential Read	3200 MB/s	Sequential Write	1700 MB/s	Random Read	330K IOPS	Random Write	300K IOPS
Sequential Read	3200 MB/s										
Sequential Write	1700 MB/s										
Random Read	330K IOPS										
Random Write	300K IOPS										
		Self-Encrypting Drive Support	OPAL 2								
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)								

Technical Specifications - Hard Drives

HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	Capacity	2x1TB (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)
HP Z Turbo Drive Quad Pro 1TB SSD module	Capacity	1TB (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)

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

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

Intel 750 Series AIC 1.2TB PCIe SSD	Capacity	1.2TB
	Protocol	PCIe
	Form Factor	PCIe Card, Half Height
	Controller	NVMe
	NAND Type	MLC
	Endurance	127TBW (TB Written)

Technical Specifications - Hard Drives

Reliability (MTBF)	1.2M hours	
Operating Temperature	1.2TB	
Performance	Sequential Read	2500 MB/s
	Sequential Write	1200 MB/s
	Random Read	460K IOPS
	Random Write	290K IOPS

Technical Specifications - Hard Drive Controllers

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

Technical Specifications - Graphics

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 × 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
	Display Output	<p>A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.</p> <p>Up to 2 displays in the following configurations:</p> <p>DisplayPort output:</p> <ul style="list-style-type: none"> • 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. <p>DVI-D output:</p> <ul style="list-style-type: none"> • 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 <p>HDMI output:</p> <ul style="list-style-type: none"> • 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

Technical Specifications - Graphics

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 adaptors included. Adapters must be ordered separately.
3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
4. Configurations of three NVS 310 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

NVIDIA NVS 315 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
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

Technical Specifications - Graphics

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.

Technical Specifications - Graphics

2. Factory configured NVS 310 graphics card have no cable adapters included. Adapters must be ordered separately.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

NVIDIA NVS 510 2GB Graphics	Form Factor Graphics Controller	<p>Low Profile, 2.713 inches × 6.3 inches, single slot</p> <p>NVS 510 GPU Core Clock: 797 MHz Memory Clock: 891 MHz CUDA Cores: 192</p>
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	<p>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)</p>
	Maximum Resolution	<p>Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 × 2160 @ 60Hz)</p> <p>Note: This card supports up to four displays. For Windows XP, only 2 active displays are supported.</p>
	Image Quality Features	10-bit internal display processing, including hardware support for 10-bit scan-out
	Display Output	<p>DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.</p> <p>Digital Display Support</p> <p>DisplayPort Output</p> <ul style="list-style-type: none"> • 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. <p>DVI-D Output</p> <ul style="list-style-type: none"> • 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. <p>HDMI Output</p> <ul style="list-style-type: none"> • 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.

Technical Specifications - Graphics

Analog Display Support

VGA display output

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

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

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

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

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

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

NVIDIA® Quadro® K620 2GB Graphics

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
Maximum Resolution	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz
Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
Display Output	1 Dual-link DVI-I connector

Technical Specifications - Graphics

	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	<ol style="list-style-type: none"> 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

Technical Specifications - Graphics

Image Quality Features	<p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p> <p>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo</p>
Display Output	<p>Maximum number of displays:</p> <ul style="list-style-type: none"> - 2 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors <p>Maximum number of DisplayPort displays possible (may require MST and/or HBR2):</p> <ul style="list-style-type: none"> - 4 1920x1200 - 2 2560x1600 - 1 3840x2160 <p>Maximum number of monitors across all available Quadro K420 outputs is 4.</p>
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	<p>DX11, OpenGL 4.4</p> <p>Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran</p>
Available Graphics Drivers	<p>Microsoft Windows 8.1</p> <p>Microsoft Windows 8</p> <p>Microsoft Windows 7</p> <p>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p>
Notes	<ol style="list-style-type: none"> 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® P400 2GB Graphics	Form Factor	<p>Dimensions: 2.713" H x 5.7" L</p> <p>Single Slot, Low Profile</p> <p>Cooling: Active</p> <p>Weight: 129 grams</p>
	Graphics Controller	<p>NVIDIA® Quadro® P400 Graphics Card</p> <p>GP107-825 GPU</p> <p>256 CUDA cores</p> <p>Max Power: 30 Watts</p>
	Bus Type	PCI Express 3.0 x16
	Memory	<p>Size: 2 GB GDDR5, 2000 MHz</p> <p>Memory Interface: 64-bit</p> <p>Memory Bandwidth: 32 GB/s</p>
	Connectors	3mDP Outputs*

Technical Specifications - Graphics

Maximum Resolution	DisplayPort 1.4: - up to 3x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST)
Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
Display Output	3 mDP Connectors
Shading Architecture	Full Microsoft DirectX 12 Shader Model 5.1
Supported Graphics APIs	OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL
Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 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	<p>*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports.</p> <p>Note 1: Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles.</p> <p>Note 2: AMO kits for P400, P600, P1000 and Adapters will ship in July 2017.</p> <ul style="list-style-type: none"> • Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits. • If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> - 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables - 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables
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NVIDIA® Quadro® P600 2GB Graphics	Form Factor	Dimensions: 2.713" H x 5.7" L Single Slot, Low Profile Cooling: Active Weight: 129 grams
	Graphics Controller	NVIDIA® Quadro® P600 Graphics Card GP107-850 GPU 384 CUDA cores Max Power: 40 Watts
	Bus Type	PCI Express 3.0 x16
	Memory	Size: 2 GB GDDR5, 2000 MHz Memory Interface: 128-bit Memory Bandwidth: 64 GB/s
	Connectors	4mDP Outputs*
	Maximum Resolution	DisplayPort 1.4: - up to 4x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST)
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support

Technical Specifications - Graphics

Display Output	4 mDP Connectors
Shading Architecture	Full Microsoft DirectX 12 Shader Model 5.1
Supported Graphics APIs	OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL
Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 7 Linux
Notes	<p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> <p>*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports. Note 1: Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles. Note 2: AMO kits for P400, P600, P1000 and Adapters will ship in July 2017.</p> <ul style="list-style-type: none"> • Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits. • If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> - 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables - 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables

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:

Technical Specifications - Graphics

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

DL-DVI(I) output:

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

Single Link-DVI(I) output:

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

VGA (via adapter cable):

- 2048 x 1536 x 32 bpp at 85 Hz

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

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).

Technical Specifications - Graphics

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
	Maximum Resolution	Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
	Display Output	VGA: <ul style="list-style-type: none"> • 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): <ul style="list-style-type: none"> • Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): <ul style="list-style-type: none"> • Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: <ul style="list-style-type: none"> • 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

Technical Specifications - Graphics

Available Graphics Drivers	<p>API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p> <p>Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p>
Notes	<ol style="list-style-type: none"> 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
 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)

Technical Specifications - Graphics

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	<p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p> <p>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo</p>
Display Output	<p>Maximum number of displays - 4 direct attached monitors</p> <p>Maximum number of monitors across all available Quadro M2000 outputs is 4.</p>
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	<p>OpenGL 4.5 DirectX 12</p> <p>API support includes: CUDA C, CUDA C++, DirectCompute 5.0, and OpenCL software</p>
Available Graphics Drivers	<p>Microsoft Windows 10 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p>
Notes	<ol style="list-style-type: none"> 1. Quadro M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

NVIDIA® Quadro® P1000 4GB Graphics	Form Factor	<p>Dimensions: 2.713" H x 5.7" L Single Slot, Low Profile Cooling: Active Weight: 129 grams</p>
	Graphics Controller	<p>NVIDIA® Quadro® P1000 Graphics Card GP107-860 GPU 640 CUDA cores Max Power: 47 Watts</p>
	Bus Type	PCI Express 3.0 x16
	Memory	<p>Size: 4 GB GDDR5, 2500 MHz Memory Interface: 128-bit memory interface Memory Bandwidth: 80 GB/s memory bandwidth</p>
	Connectors	4mDP Outputs*
	Maximum Resolution	DisplayPort 1.4:

Technical Specifications - Graphics

	- up to 4x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST)
Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
Display Output	4 mDP Connectors
Shading Architecture	Full Microsoft DirectX 12 Shader Model 5.1
Supported Graphics APIs	OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL
Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 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	*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports. Note 1: Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles. Note 2: AMO kits for P400, P600, P1000 and Adapters will ship in July 2017. <ul style="list-style-type: none"> • Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits. • If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> - 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables - 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables

NVIDIA Quadro P2000 5GB Graphics

Form Factor	Dimensions: 4.4"Hx7.9"L Single Slot Cooling: Active Weight: 260 grams
Graphics Controller	NVIDIA Quadro P2000 Graphics Card Power: 75 Watts
Bus Type	PCI Express 3.0 x16
Memory	Size: 5GB GDDR5 Memory Bandwidth: 140 GB/s Memory Width: 160-bit
Connectors	4x DisplayPort 1.4 Factory Configured Option: No adapter included with card After Market Option: No video cable adapter included

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 5120 x 2880 x 24 bpp @ 60Hz
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DP 1.3 & 1.4 ready.

DL-DVI(I) output:

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

Single Link-DVI(I) output:

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

HDMI 2.0 (requires DP to HDMI adapter):

- 5120 x 2880 x 24 bpp @ 60Hz

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, NVIDIA® Mosaic and nView.

Display Output

Maximum number of displays

- 4 direct attached monitors

Maximum number of monitors across all available Quadro P2000 outputs is 4.

Shading Architecture

Shader Model 5.1

Supported Graphics APIs

OpenGL® 4.5

DirectX® 12

API support includes:

CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran software

Available Graphics Drivers

Microsoft Windows 10

Microsoft Windows 7 Professional 64bit

Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

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

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

Notes

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

Technical Specifications - Graphics

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

Technical Specifications - Graphics

ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support.

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: <ul style="list-style-type: none"> • up to 4096x2160 x 30 bpp @ 60Hz Dual Link DVI(I) (requires adapter cable): <ul style="list-style-type: none"> • up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I)(requires adapter): <ul style="list-style-type: none"> • up to 1920 x 1200 x 32 bpp @ 60Hz VGA(requires adapter): <ul style="list-style-type: none"> • up to 1920 x 1200 x 32 bpp @ 60Hz
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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)

Technical Specifications - Graphics

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

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

Technical Specifications - Graphics

- 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

Technical Specifications - Graphics

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

Technical Specifications - Graphics

GPU: GM204 with 1664 CUDA cores
Power: 120 Watts

Bus Type

PCI Express 3.0 x16

Memory

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

Connectors

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

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

Maximum Resolution

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

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

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

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

Image Quality Features

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

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

Full OpenGL quad buffered stereo support

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

Display Output

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

Maximum number of DisplayPort displays possible:
- 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.

Technical Specifications - Graphics

Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.5 DirectX 12
	API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions
	HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. Configurations using the Quadro M4000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

NVIDIA® Quadro® M5000 8GB Graphics	Form Factor	Dimensions: 4.4" H x 10.5" L Dual Slot, Full Height Cooling: Active Weight: 525 grams (without extender)
	Graphics Controller	NVIDIA® Quadro® M5000 GPU: GM204 with 2048 CUDA cores Power: 150 Watts
	Bus Type	PCI Express 3.0 x16
	Memory	Size: 8GB GDDR5 ECC capable Memory bandwidth: 211GB/s Memory Width: 256-bit
	Connectors	1 Dual Link DVI-I 4 DisplayPort 1.2a
		Factory configured option: No adapter included with card. After market option kit: No adaptor included with card.
		Additional DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories
	Maximum Resolution	DisplayPort:

Technical Specifications - Graphics

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

DL-DVI(I) output:

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

Single Link-DVI(I) output:

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

VGA (via adapter cable):

- 2048 x 1536 x 32 bpp at 85 Hz

Image Quality Features

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

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

Full OpenGL quad buffered stereo support.

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

Display Output

Maximum number of displays

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

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

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

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

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

OpenGL 4.5
DirectX 12

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

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

Technical Specifications - Graphics

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® P4000 8GB Graphics

Form Factor

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

Graphics Controller

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

Bus Type

PCI Express 3.0 x16

Memory

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

Connectors

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

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

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

Maximum Resolution

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

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

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

DisplayPort:

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

Technical Specifications - Graphics

	Using two DP outputs, the P4000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.
Image Quality Features	Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView
Display Output	Maximum number of displays - 4 direct attached monitors
	Maximum number of monitors across all available Quadro P4000 outputs is 4.
Shading Architecture	Shader Model 5.1
Supported Graphics APIs	OpenGL 4.5 DirectX 12 Vulkan 1.0
	API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
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	<ol style="list-style-type: none"> 1. Quadro P4000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro P4000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

NVIDIA® Quadro® P5000 16GB Graphics	Form Factor	Full-Height Dual Slot (4.4" Height x 10.5" Length) Weight: 815 grams / 1.80 lbs
	Graphics Controller	Quadro™ P5000 graphics GPU: 2560 NVIDIA CUDA® Parallel Processing Cores Power: 180 Watts Cooling: Active
	Memory	16GB GDDR5X memory Memory Bandwidth: Up to 288 GB/s Memory Width: 256 bit ECC Memory (disabled by default)

Technical Specifications - Graphics

Connectors	<p>DP (x4) with HDR support DL-DVI(D) 3-pin mini-DIN connector SLI connector Quadro Sync connector (compatible with Quadro II Sync) One 8-pin auxiliary power connector</p> <p>Factory configured option: No video cable adapter included with card. After market option Kit: No video cable adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p>
Maximum Resolution	<p>5K support @ 60Hz 1x single-cable 5K monitor, or 2x dual-cable 5K monitors</p>
Image Quality Features	<p>Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView Desktop Management</p>
Display Outputs¹	<p>4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or up to 8K at 30Hz) 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1200 @ 120 Hz)</p>
GPU Architecture	NVIDIA Pascal™
Supported Graphics APIs	<p>DirectX® 12 , OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0 Developer API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
Available Graphics Drivers	<p>Windows® 10 64-bit Windows® 7 64-bit Linux 64-bit</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p>
Notes	<ol style="list-style-type: none"> Supports up to a total of 4 displays For HP Z440 Workstations, the 700W power supply option must be used. For HP Z840 Workstation configurations, the 1125W power supply option must be used for multiple P5000 configurations.

NVIDIA® Quadro® K4200 4GB Graphics Form Factor

Dimensions: 4.376" H x 9.5" L
Single Slot, Full Height
Cooling: Active

Technical Specifications - Graphics

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 x 1536 x 32 bpp at 85 Hz
Image Quality Features	10-bit internal display processing (hardware support for 10-bit scanout for both windowed desktop and full screen, only available on Windows with Aero disabled and Linux) NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support Full OpenGL quad buffered stereo support Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies
Display Output	Maximum number of displays - 3 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors Maximum number of DisplayPort displays possible (may require MST and/or HBR2): - 4 1920x1200

Technical Specifications - Graphics

- 4 2560x1600
- 2 3840x2160

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

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.4
DirectX 11.1

API support includes:
CUDA C, CUDA C++, DirectCompute 5.0, OpenGL, 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

Technical Specifications - Graphics

Connectors	<p>DVI-I (1), DVI-D (1), DP (2),</p> <p>Factory configured option: No adapter included with card. Option Kit: No adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p>
Image Quality Features	<ul style="list-style-type: none"> • DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology
Display Output	<p>400 MHz integrated RAMDAC</p> <ul style="list-style-type: none"> • Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz <p>Dual-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) <p>Single-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> • Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) <p>DisplayPort with MST and HBR2.</p> <ul style="list-style-type: none"> • Maximum resolution: 4096 × 2160 × 30 bpp at 60Hz • Maximum resolution: 2560 × 1600 × 30bpp at 120Hz <p>HDMI</p> <ul style="list-style-type: none"> • Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	<p>OpenGL 4.4 DirectX 11 API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
Available Graphics Drivers	<p>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)</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p>
Notes	<ol style="list-style-type: none"> 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.

Technical Specifications - Graphics

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 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

Technical Specifications - Graphics

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	<ol style="list-style-type: none"> 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.

Radeon™ Pro WX 7100 8GB Graphics	Form Factor	Full-Height Single Slot (9.5" Length)
	Graphics Controller	Radeon™ Pro WX 7100 graphics GPU: 2304 Stream Processors organized into 36 Compute Units Power: 130 Watts Cooling: Active
	Memory	8GB GDDR5 memory Memory Bandwidth: 7 Gbps / 224 GB/s Memory Width: 256 bit
	Connectors	4x Display Port 1.4 – HDR ready connectors with HBR3 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	5K support @ 60Hz <ul style="list-style-type: none"> • 1x single-cable 5K monitor, or 2x dual-cable 5K monitors

Technical Specifications - Graphics

Image Quality Features Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling

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

GPU Architecture GCN 4th Generation

Supported Graphics APIs DirectX®12
OpenGL® 4.5
OpenCL™ 2.0
Vulkan™ 1.0

Available Graphics Drivers Windows 10 64-bit
Windows® 7 64-bit
Linux 64-bit

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

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

Notes

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

NVIDIA® Quadro® P6000 Form Factor
24GB Graphics

Full-Height Dual Slot (4.4" Height x 10.5" Length)
Weight: 967 grams / 2.14 lbs

Technical Specifications - Graphics

Graphics Controller	<p>Quadro™ P6000 graphics GPU: 3840 NVIDIA CUDA® Parallel Processing Cores Power: 250 Watts Cooling: Active</p>
Memory	<p>24GB GDDR5X memory Memory Bandwidth: Up to 432 GB/s Memory Width: 384 bit ECC Memory (disabled by default)</p>
Connectors	<p>DP (x4) with HDR support DL-DVI(I) 3-pin mini-DIN connector SLI connector Quadro Sync connector (compatible with Quadro II Sync) One 8-pin auxiliary power connector</p> <p>Factory configured option: No video cable adapter included with card. After market option Kit: No video cable adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p>
Maximum Resolution	<p>5K support @ 60Hz 1x single-cable 5K monitor, or 2x dual-cable 5K monitors</p>
Image Quality Features	<p>Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView</p>
Display Outputs¹	<p>4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or up to 8K at 30Hz) 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1200 @ 120 Hz)</p>
GPU Architecture	NVIDIA Pascal™
Supported Graphics APIs	<p>DirectX®12 , OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0 Developer API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p>
Available Graphics Drivers	<p>Windows® 10 64-bit Windows® 7 64-bit Linux 64-bit</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p>

Technical Specifications - Graphics

Notes

- 1- Supports up to a total of 4 displays
- 2- For HP Z440 Workstations, the 700W power supply option must be used.
- 3- For HP Z840 Workstation configurations, the 1125W power supply option must be used for multiple P5000 configurations.

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

Technical Specifications – Optical and Removable Storage

OPTICAL AND REMOVABLE STORAGE

HP 9.5mm Slim 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+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+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 10, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11	
	* No driver is required for this device. Native support is provided by the operating system.	
Kit Contents	HP SATA DVD Writer drive, installation guide.	

Technical Specifications – Optical and Removable Storage

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			

HP 9.5mm Slim BDXL Blu-Ray 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	BD-ROM	
		BD-R	
BD-RE			
DVD-RAM			
DVD+R			
DVD+RW			
DVD+R DL			
DVD-R DL			
DVD-R			
DVD-RW			
CD-R			
CD-RW			

Technical Specifications – Optical and Removable Storage

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
		DVD-R Up to 8X
		Blu-ray
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	

Technical Specifications – Optical and Removable Storage

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

Technical Specifications – Optical and Removable Storage

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

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

Operating Systems Supported

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

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

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

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

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

Kit Contents

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

Approvals

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

Weight

0.35 lbs. (0.16 kg)

Technical Specifications - Controller Cards

CONTROLLER CARDS

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.	

Technical Specifications - Networking and Communications

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, Multi-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)

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 (13.50 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)
	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	

Technical Specifications - Networking and Communications

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 Ethernet I350-T4 4-port 1Gb NIC	Connector	Four 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)
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	Power Requirement	5.0W (typical)
	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-T4 PCIe Quad Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Installation Guide.	

Technical Specifications - Networking and Communications

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	<ol style="list-style-type: none"> 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).
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, 2014	V1	Added	Style and technical specifications
October 1, 2014	From v1 to v2	Added	Rack dimensions, note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs
		Changed	Turbo specs for E5-1660v3, Acoustics - only 1 ODD on the high-end config, not 2, Declared Noise Emissions section, Supported Components: Graphics, Optical and Removable Storage, Overview, Stable & Consistent, power supply configurations, Noise Emissions section, Updated Power Supply Configurations and table
		Removed	Cyberlink MediaSuite, TPM 2.0 references, HP Power Assistant and PDF Complete
December 3, 2014	From v2 to v3	Added	HP Z440 Memory Cooling Solution, power cable descriptor in Overview and System Technical Specifications sections
January 1, 2015	From v3 to v4	Added	OS under Overview, and Support Components, Memory support matrix and load order
February 1, 2015	From v4 to v5	Added	AMD W5100, W7100 GPU, DX115 Removable HDD Frame/Carrier, 256GB SATA 6Gb/s SED OPAL 2 SSD from Supported Components
		Changed	Internal I/O USB, OS under overview, and Supported components.
March 1, 2015	From v5 to v6	Added	Operating Systems: Red Hat and SUSE Support, 600 and 300GB SAS SFF HDD, 4TB SATA HD, HD Controller
		Changed	HP Installer Kit for Linux, RAID, SAS and SATA Hard Drives Notes, ACPI support under BIOS section
April 1, 2015	From v6 to v7	Changed	Hard Drives Notes and Memory Notes in Supported Components section. Memory Speed Supported in System Board. Memory Info from System Configuration.
		Added	Chassis Dimensions
May 1, 2015	From v7 to v8	Added	Integrated RAID for PCIe SSDs and note in Hard Drive Controllers section
		Changed	Notes in Hard Drive Controllers sections, High Performance GPU Computing, and Other Hardware
July 1, 2015	From v8 to v9	Added	1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), HP Z Turbo Drive G2 512GB SSD, HP Z Turbo Drive G2 256GB SSD, and notes for Supported Components and Technical Specifications; 3Dconnexion CADMouse to Input Devices.
		Changed	Storage/Hard Drives section Descriptions/Notes
		Removed	600GB SAS 15K rpm 6Gb/s 3.5" HDD, 300GB SAS 15K rpm 6Gb/s 3.5" HDD
August 1, 2015	From v9 to v10	Added	Windows 10 64-bit, SUSE Linux Enterprise Desktop 11 SP3, 12 in OS, Overview; NVIDIA NVS 310 1GB Graphics in Professional 2D; NVIDIA® Quadro® K420 2GB Graphics in Entry 3D Graphics section; Intel Xeon E5-1630 v3 in Stable and consistent offerings in Stable and consistent offerings
		Changed	HP Solenoid Hood Lock & Hood Sensor in Supported Components, Racking and Physical Security section; Intel Xeon E5-1603 v3
		Removed	Windows 8.1 64-bit, Windows 8.1 Emerging Market, SUSE Linux Enterprise Desktop 11 SP3
September 1, 2015	From v10 to v11	Added	HP 512GB SATA SED SSD in Supported Components, Storage and Technical Specifications
		Changed	Notes for SATA SSDs, and PCI Express in Supported Components, HP Solenoid Hood Lock & Hood Sensor in Racking and Physical Security, Notes for Memory Cooling Solution in Other Hardware
		Removed	Intel Pro 1500 180GB SATA SSD

Summary of Changes

November 1, 2015	From v11 to v12	Added	Storage PCIe notes, HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA® Quadro® M4000 8GB Graphics, NVIDIA® Quadro® M5000 8GB Graphics, Z440 HP Z Cooler and notes from Other Hardware section;
		Changed	Controller Cards section notes; HP Remote Graphics Software (RGS) 7.1, MS Office Home & Business 2016 from Software section; Windows 10 Pro 64 and Windows 10 Pro downgrade to Windows 7 Professional 64 from Operative Systems section.
January 1, 2016	From v12 to v13	Added	Updated Preinstalled OS in Overview section
February 1, 2016	From v13 to v14	Added	HP Enterprise Class 240GB SATA SSD and HP Enterprise Class 480GB SATA SSD, NVIDIA® Quadro® K1200 4GB Graphics, HP PS/2 Business Slim Keyboard, HP USB Business Slim Keyboard, HP Wireless Business Slim Keyboard
		Changed	SATA SSDs notes
		Removed	Samsung Enterprise 240GB SATA SSD, Samsung Enterprise 480GB SATA SSD, NVIDIA® Quadro® K5200 8GB Graphics, NVIDIA® Quadro® K6000 12GB Graphics.
March 1, 2016	From v14 to v15	Added	Windows 10 Home 64 High-end in Overview and Supported Components; AMD FirePro W4300 4GB Graphics in Mid-Range Category, Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC in Networking and Communications
		Removed	Ubuntu 14.04, and Windows 8.1 64-bit from Overview OS; NVIDIA NVS 310 512MB Graphics, NVIDIA® Quadro® K420 1GB Graphics in Graphics
March 31, 2015	From v15 to v16	Added	Intel Xeon E5-2600 v3 Series CPUs, HP Z Turbo Drive G2 1TB SSD, Intel Ethernet I350-T2 2-Port 1Gb NIC
		Changed	AMD FirePro W2100 2GB Graphics moved to Entry 3D; PCIe Drives and Memory notes; HP Solenoid Hood Lock & Hood Sensor option.
June 7, 2016	From v16 to v17	Added	Enterprise Class status for 4TB SATA HDD, HP USB Hardened Mouse, Intel Xeon E5-1600 v4 Series CPU, Note 6 for NVIDIA® Quadro® M2000
		Removed	Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit
July 1, 2016	From v17 to v18	Added	HP Keyed Cable Lock 10mm
September 1, 2016	From v18 to v19	Added	Z Turbo SED, and notes for PCIe SSDs, Specs for SATA SSDs
October 1, 2016	From v19 to v20	Added	Intel 750 Series PCIe SSDs, Added Z Turbo TLC SSDs, Added 1TB Enterprise HDD
		Removed	OS options, Xeon v3 processors, 4GB 2133 DIMMs
November 1, 2016	From v20 to v21	Added	1TB SATA 7200 rpm HDD (Enterprise Class), HP Z Turbo and Z Turbo Quad Pro SSD Drives
		Changed	PCIe drives note
		Removed	Intel Xeon v3 processors, 4GB DDR4-2133 RAM, Win 7, and 8.1 Pro 64-bit
January 1, 2017	From v21 to v22	Added	Radeon Pro WX 7100 8GB graphics, HP Z Turbo Drive G2 256GB TLC, HP Z Turbo Drive G2 512GB TLC, HP Z Turbo Drive G2 1TB TLC, 2TB SATA SSD, 9.5mm Slim DVD-Writer.
February 1, 2017	From v22 to v23	Changed	HP 9.5mm Slim SuperMulti DVD Writer specs and HP Inc. disclaimers
March 1, 2017	From v23 to v24	Added	NVIDIA Quadro P5000
April 1, 2017	From v24 to v25	Added	Hard Drive Controllers section note 4, Fan and Front Card Guide Components,
		Changed	SATA Hard Drives, HP Solid State Drives (SSDs) notes, Notes 5&6 to Mid-Range Quadro M2000, FirePro 4300Graphics and Radeon Pro WX7100, TPM content
April 14, 2017	From v25 to v26	Removed	The System Configuration (High-end) & Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296) subsections under The DECLARED NOISE EMISSIONS section was removed.
May 1, 2017	From v26 to v27	Added	The NVIDIA® Quadro® P2000 5GB Graphics to Mid-range 3D Graphics

Summary of Changes

		Changed	Changed The HP 9.5mm Slim SuperMulti DVD Writer for The HP 9.5mm Slim DVD Writer.
May 1, 2017	From v27 to v28	Added	In page 12 added notes 1 & 2 to all the memory parts, added HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM to Memory section, added new configurations to DIMM slots for capacities of 128GB & 256GB in the System Board section.
		Changed	Changed the Maximum Memory support from 128GB to 256GB, changed the Mixed support configuration in the Graphics section.
June 5, 2017	From v28 to v29	Added	NVIDIA Quadro P6000 24GB Graphics to Ultra 3D Graphics, NVIDIA Quadro P4000 to High-end 3D section, added NVIDIA Quadro P400 & P600 to Entry 3D Graphics section, added NVIDIA Quadro P1000 to Mid-range 3D section, Radeon Pro WX4100 4GB 1st GFX Graphics to Mid-range 3D section and added NVIDIA Quadro Sync II
		Changed	HP 9.5mm Slim DVD Writer Option Kit Part Number under Optical and Removable Storage section
		Removed	DVD-RAM as a supported format under the DVD writer section
July 6, 2017	From v29 to v30	Added	Intel Ethernet I350-T4 4-port 1Gb NIC to Networking and Communications section
		Changed	The Note 1 in the Other Hardware section, changed The Note 2 in the Memory section, changed The Note 2 for NVIDIA Quadro P400, P600, P1000 and changed the Operating Systems supported section for the NVIDIA Quadro Sync II
		Removed	The Tesla K40 as High Performance GPU Computing and removed Slim DVDRW SATA 1st & 2nd ODD from the Stable & Consistent Offerings section
August 21, 2017	From v30 to v31	Changed	EPEAT statement
September 6, 2017	From v31 to v32	Added	Memory footnotes
		Changed	Displays section and changed the info for the NVIDIA Quadro P4000 8GB Graphics
September 25, 2017	From v32 to v33	Changed	Graphics section
November 1, 2017	From v33 to v34	Changed	“for workstations” added to Windows 10 Pro 64 on OS section / Multi-core disclaimer updated.
August 9, 2018	From v34 to v35	Changed	Memory support
July 8, 2019	From v35 to v36	Changed	Racking and Physical Security section

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