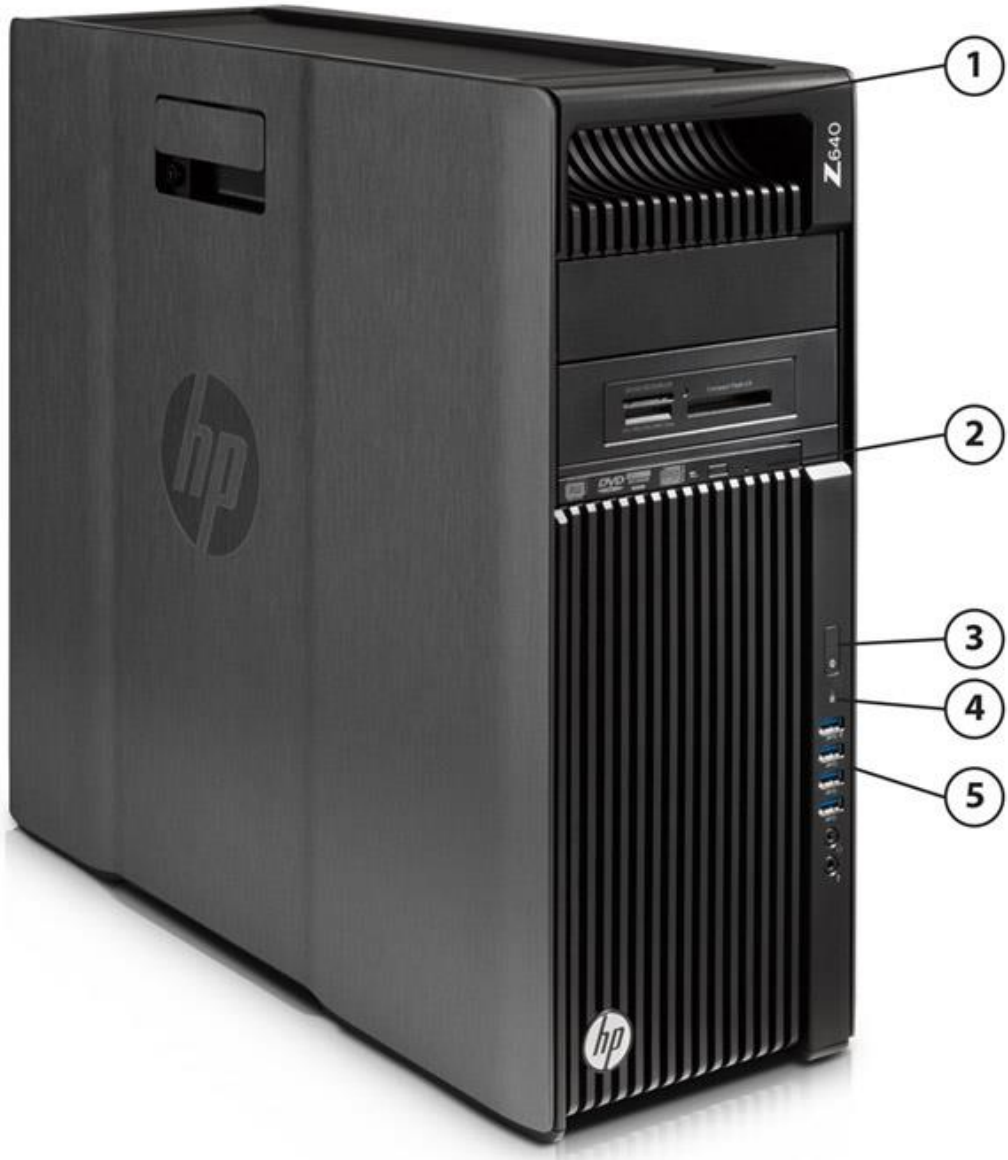
Overview

HP Z640 Workstation



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

Overview

6. 2 External 5.25” Bays
7. 2 Internal 3.5” Bays
8. 6 6Gb/s SATA Ports
9. Rear Flip-Up Handle
10. 925W, 90% Efficient Power Supply
11. 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
12. Intel® Xeon® Processors: E5-1600 v3 family or E5-2600 v3/v4 family
13. 4 DIMM Slots for DDR4 ECC Registered Memory
14. 2nd CPU and Memory Riser Module with 4 DIMM slots
15. 2 PCIe x16 Gen 3 Slots
16. 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot

Overview

Overview

Overview

Form Factor Rackable Minitower

Operating Systems Preinstalled:

- Windows 10 Pro 64-bit
- Windows 10 Pro 64 to Windows 7 Professional 64-bit
- Windows 10 Home 64 High-end
- Windows 7 Professional 64-bit
- Windows 8.1 Pro 64-bit
- 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)	QPI (GT/s)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® Turbo Boost Technology[1]	TDP (W)
Intel® Xeon® E5-1680 v4 processor	8	3.4	20	2400	–	YES	YES	2, 4, 6	140
Intel® Xeon® E5-1660 v4 processor	8	3.2	20	2400	–	YES	YES	2, 4, 6	140
Intel® Xeon® E5-1650 v4 processor	6	3.6	15	2400	–	YES	YES	2, 2, 4	140
Intel® Xeon® E5-1630 v4 processor	4	3.7	10	2400	–	YES	YES	1, 1, 3	140
Intel® Xeon® E5-1620 v4 processor	4	3.5	10	2400	–	YES	YES	1, 3	140
Intel® Xeon® E5-1607 v4 processor	4	3.1	10	2133	–	NO	YES	N/A	140
Intel® Xeon® E5-1603 v4 processor	4	2.8	10	2133	–	NO	YES	N/A	140
Intel® Xeon® E5-1680 v3 processor	8	3.2	20	2133	–	YES	YES	3, 6	140
Intel® Xeon® E5-1660 v3 processor	8	3.0	20	2133	–	YES	YES	3, 5	140
Intel® Xeon® E5-1650 v3 processor	6	3.5	15	2133	–	YES	YES	1, 3	140
Intel® Xeon® E5-1630 v3 processor	4	3.7	10	2133	–	YES	YES	1, 1	140
Intel® Xeon® E5-1620 v3 processor	4	3.5	10	2133	–	YES	YES	1, 1	140
Intel® Xeon® E5-1607 v3 processor	4	3.1	10	1866	–	NO	YES	N/A	140
Intel® Xeon® E5-1603 v3 processor	4	2.8	10	1866	–	NO	YES	N/A	140

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Intel® Xeon® E5-1680 v3 processor	8	3.2	20	2133	–	YES	YES	3, 6	140
Intel® Xeon® E5-2699 v3 processor	18	2.3	45	2133	9.6	YES	YES	5, 13	145
Intel® Xeon® E5-2697 v3 processor	14	2.6	35	2133	9.6	YES	YES	5, 10	145
Intel® Xeon® E5-2695 v3 processor	14	2.3	35	2133	9.6	YES	YES	5, 10	120
Intel® Xeon® E5-2683 v3 processor	14	2.0	35	2133	9.6	YES	YES	5, 10	120
Intel® Xeon® E5-2690 v3 processor	12	2.6	30	2133	9.6	YES	YES	5, 9	135
Intel® Xeon® E5-2680 v3 processor	12	2.5	30	2133	9.6	YES	YES	4, 8	120
Intel® Xeon® E5-2670 v3 processor	12	2.3	30	2133	9.6	YES	YES	3, 8	120
Intel® Xeon® E5-2660 v3 processor	10	2.6	25	2133	9.6	YES	YES	3, 7	105
Intel® Xeon® E5-2650 v3 processor	10	2.3	25	2133	9.6	YES	YES	3, 7	105
Intel® Xeon® E5-2667 v3 processor	8	3.2	20	2133	9.6	YES	YES	2, 4	135
Intel® Xeon® E5-2640 v3 processor	8	2.6	20	1866	8.0	YES	YES	2, 8	90
Intel® Xeon® E5-2630 v3 processor	8	2.4	20	1866	8.0	YES	YES	2, 8	85
Intel® Xeon® E5-2643 v3 processor	6	3.4	20	2133	9.6	YES	YES	2, 3	135
Intel® Xeon® E5-2620 v3 processor	6	2.4	15	1866	8.0	YES	YES	2, 8	85
Intel® Xeon® E5-2609 v3 processor	6	1.9	15	1600	6.4	NO	YES	N/A	85
Intel® Xeon® E5-2603 v3 processor	6	1.6	15	1600	6.4	NO	YES	N/A	85
Intel® Xeon® E5-2637 v3 processor	4	3.5	15	2133	9.6	YES	YES	1, 2	135
Intel® Xeon® E5-2623 v3 processor	4	3.0	10	1866	8.0	YES	YES	3, 5	105
Intel® Xeon® E5-2699 v4 processor	22	2.2	55	2400	9.6	YES	YES	6, 14	145
Intel® Xeon® E5-2697 v4 processor	18	2.3	45	2400	9.6	YES	YES	5, 13	145
Intel® Xeon® E5-2695 v4 processor	18	2.1	45	2400	9.6	YES	YES	5, 12	120
Intel® Xeon® E5-2690 v4 processor	14	2.6	35	2400	9.6	YES	YES	6, 9	135
Intel® Xeon® E5-2683 v4 processor	16	2.1	40	2400	9.6	YES	YES	5, 9	120
Intel® Xeon® E5-2680 v4 processor	14	2.4	35	2400	9.6	YES	YES	5, 9	120
Intel® Xeon® E5-2667 v4 processor	8	3.2	25	2400	9.6	YES	YES	3, 4	135
Intel® Xeon® E5-2660 v4 processor	14	2.0	35	2400	9.6	YES	YES	4, 12	105
Intel® Xeon® E5-2650 v4 processor	12	2.2	30	2400	9.6	YES	YES	3, 7	105
Intel® Xeon® E5-2643 v4 processor	6	3.4	20	2400	9.6	YES	YES	2, 3	135

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Intel® Xeon® E5-2640 v4 processor	10	2.4	25	2133	8.0	YES	YES	2, 10	90
Intel® Xeon® E5-2637 v4 processor	4	3.5	15	2400	9.6	YES	YES	1, 2	135
Intel® Xeon® E5-2630 v4 processor	10	2.2	25	2133	8.0	YES	YES	2, 9	85
Intel® Xeon® E5-2623 v4 processor	4	2.6	10	2133	8.0	YES	YES	2, 6	85
Intel® Xeon® E5-2620 v4 processor	8	2.1	20	2133	8.0	YES	YES	2, 9	85
Intel® Xeon® E5-2609 v4 processor	8	1.7	20	1866	6.4	NO	YES	N/A	85
Intel® Xeon® E5-2603 v4 processor	6	1.7	15	1866	6.4	NO	YES	N/A	85

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

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

Available Processor Disclaimers

When ordering two processors, the second processor must be the same as the first. Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.

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

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

Color

Hematite Brushed Aluminum and HP Black

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

Slot 1 (top):
PCI Express Gen2 x1 with open-ended connector*
Full-height, Half-length
(Not available when 2nd processor/memory module is installed)

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)

Overview

	Slot 5: PCI Express Gen3 x16 Full-height, Full-length (with extender) **Slot 6:** PCI 32bit/33MHz Full-height, Full-length (with extender) * Open-ended connector allows a greater bandwidth (e.g., x16) card to be installed physically into a lower bandwidth connector/slot.
Expansion Bays (see Storage section for more details)	2 internal 3.5" bays (with acoustic dampening rail assemblies preinstalled) 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
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.
Internal USB	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.
Chassis Dimensions (H x W x D)	Footprint Dimensions: H: 17.45” [442.9mm] W: 6.75” [171.45mm] D: 18.3” [464.8mm] (measured to the rear of service panel) Maximum Dimensions: H: 17.45” [442.9mm] W: 6.75” [171.45mm] D: 18.65” [473.3mm] (measured to rear PCIe retainer clips) Rack utilization: 4U
System Weight	Actual weight depends upon configuration Minimum configuration: 15.0 kg (33.1 lbs.) Typical configuration: 17.0 kg (37.5 lbs.) Maximum configuration: 21.8 kg (48.0 lbs.)
Temperature	**Operating:** 5° to 35°C (40° to 95° F) **Non-operating** -40° to 60°C (-40° to 140°F)
Humidity	**Operating:** 8% to 85% relative humidity, non-condensing **Non-operating** 8% to 90% relative humidity, non-condensing
	Operating: 3,048m (10,000ft)

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Maximum Altitude (non-pressurized)	**Non-operating**	9,144m (30,000ft)
Power Supply	Tool-free 925W 90% Efficient wide-ranging, active Power Factor Correction, with two graphics power cables The Power Supply Efficiency Report for this product may be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf	
Interfaces Supported	15-in-1 Media Card Reader (optional) 6-channel SATA interfaces (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported). USB 2.0, USB 3.0 Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, 5, and 10)	
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® E5-1680 v4 3.4 2400 8C CPU	Y	N		
Intel® Xeon® E5-1660 v4 3.2 2400 8C CPU	Y	N		
Intel® Xeon® E5-1650 v4 3.6 2400 6C CPU	Y	N		
Intel® Xeon® E5-1630 v4 3.7 2400 4C CPU	Y	N		
Intel® Xeon® E5-1620 v4 3.5 2400 4C CPU	Y	N		
Intel® Xeon® E5-1607 v4 3.1 2133 4C CPU	Y	N		
Intel® Xeon® E5-1603 v4 2.8 2133 4C CPU	Y	N		
Intel® Xeon® E5-1600 v3 Series CPU				
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		
Z640 Intel® Xeon® E5-2600 v3 Series CPU				
Intel® Xeon® E5-2630 v3 2.4 1866 8C CPU	Y	Y	J9P98AA	
Intel® Xeon® E5-2643 v3 3.4 2133 6C CPU	Y	Y	J9P93AA	
Intel® Xeon® E5-2620 v3 2.4 1866 6C CPU	Y	Y	J9Q00AA	
Intel® Xeon® E5-2600 v4 Series CPU				
Intel® Xeon® E5-2699 v4 2.2 2400 22C 2ndCPU	Y	Y	T9U26AA	
Intel® Xeon® E5-2697 v4 2.3 2400 18C 2ndCPU	Y	Y	T9U25AA	
Intel® Xeon® E5-2695 v4 2.1 2400 18C 2ndCPU	Y	Y	T9U24AA	
Intel® Xeon® E5-2690 v4 2.6 2400 14C 2ndCPU	Y	Y	T9U23AA	
Intel® Xeon® E5-2683 v4 2.1 2400 16C 2ndCPU	Y	Y	T9U22AA	
Intel® Xeon® E5-2680 v4 2.4 2400 14C 2ndCPU	Y	Y	T9U21AA	
Intel® Xeon® E5-2667 v4 3.2 2400 8C 2ndCPU	Y	Y	T9U20AA	
Intel® Xeon® E5-2660 v4 2.0 2400 14C 2ndCPU	Y	Y	T9U19AA	
Intel® Xeon® E5-2650 v4 2.2 2400 12C 2ndCPU	Y	Y	T9U18AA	
Intel® Xeon® E5-2643 v4 3.4 2400 6C 2ndCPU	Y	Y	T9U17AA	
Intel® Xeon® E5-2640 v4 2.4 2133 10C 2ndCPU	Y	Y	T9U16AA	
Intel® Xeon® E5-2637 v4 3.5 2400 4C 2ndCPU	Y	Y	T9U15AA	
Intel® Xeon® E5-2630 v4 2.2 2133 10C 2ndCPU	Y	Y	T9U14AA	
Intel® Xeon® E5-2623 v4 2.6 2133 4C 2ndCPU	Y	Y	T9U13AA	
Intel® Xeon® E5-2620 v4 2.1 2133 8C 2ndCPU	Y	Y	T9U12AA	
Intel® Xeon® E5-2609 v4 1.7 1866 8C 2ndCPU	Y	Y	T9U11AA	
Intel® Xeon® E5-2603 v4 1.7 1866 6C 2ndCPU	Y	Y	T9U10AA	

Note 1: When ordering two processors, the second processor must be the same as the first. Intel processor numbers are not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.

Supported Components

Multi-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits; check with software provider to determine suitability; Not all customers or software applications will necessarily benefit from use of these technologies.
64-bit computing on Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processor will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. See: http://www.intel.com/info/em64t for more information.
Z640 processor AMO kits include:
- 2nd CPU/Memory Module (riser)
- processor
- heatsink

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

Monitors / Displays

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

Supported Components

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	
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 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	W0R10AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	Y	Y	W0R10AA	
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	Y	D8N29AA	
1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)	Y	Y	M7S54AA	

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

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

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

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

Removable Boot Drive option

SATA Solid State Drives (SSDs)	**HP Solid State Drives (SSDs) for Workstations**				
	HP 128GB SATA 6Gb/s SSD	Y	Y	A3D25AA	
	HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA	
	HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA	
	HP 1TB SATA 6Gb/s SSD	Y	Y	F3C96AA	
	HP 256GB SATA 6Gb/s SED Opal 2 SSD			G7U67AA	
	HP 512GB SATA SED SSD	Y	Y	N8T26AA	
	HP Enterprise Class 240GB SATA SSD	Y	Y	T3U07AA	
	HP Enterprise Class 480GB SATA SSD	Y	Y	T3U08AA	
	NOTES:				
	Up to (4) 2.5-inch 6Gb/s SATA Solid State Drives: 128, 256, 512 GB, 1 TB; 4.0 TB max				
	Up to (1) 2.5-inch 6Gb/s SATA Self-Encrypting Solid State Drive (SED SSD): 256 GB Opal 2, 512 GB Opal 2				
	Up to (4) 2.5-inch HP Enterprise Class 6Gb/s SATA Solid State Drives: 240, 480 GB; 1.9 TB max.				
	3rd and 4th SSDs require and will be automatically installed into a single 2:1 5.25" external bay adapter. This hardware is required when installing 3rd/4th SSDs using Aftermarket Option (AMO) drives.				
PCIe SSDs	**PCIe SSDs for HP Workstations**				
	HP Z Turbo Drive 512GB SSD	Y	Y	G3G89AA	
	HP Z Turbo Drive 256GB SSD	Y	Y	G3G88AA	
	HP Z Turbo Drive G2 512GB SSD	Y	Y	M1F74AA	
	HP Z Turbo Drive G2 256GB SSD	Y	Y	M1F73AA	
	HP Z Turbo Drive G2 1TB SSD	Y	Y	T9H98AA	
	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 G2 1TB TLC SSD	Y	Y	Y1T52AA	
	HP Z Turbo Drive G2 512GB TLC SSD	Y	Y	Y1T49AA	
	HP Z Turbo Drive G2 256GB TLC SSD	Y	Y	Y1T46AA	
	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	Y	Y	T9J00AA	Note 1
	HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD	Y	Y	N2M98AA	
	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	

Supported Components

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
PCIe SSDs are not available with SAS controller or SAS HDDs

NOTE 1: M.2 SSD module only
NOTE 2: Dual M.2 SSD modules plus carrier

NOTES

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

Hard Drive Controllers

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

SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit http://www.hp.com/support/linux_hardware_matrix for RAID capabilities with Linux.
All drives must be identical in type and capacity.
RAID arrays greater than 2 TB are fully supported.
NOTE 1: Requires hard drives with identical speed, capacity, and interface.
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

Supported Components

Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
Professional 2D						
NVIDIA NVS 310 1GB Graphics	Y	Y	M6V51AA	Note 1	3	
NVIDIA NVS 315 1GB Graphics	Y	Y	E1U66AA	Note 2	4	-
NVIDIA NVS 510 2GB Graphics	Y	Y	C2J98AA	Note 1	2	-
Entry 3D						
NVIDIA Quadro K620 2GB Graphics	Y	Y	J3G87AA		2	Yes
NVIDIA Quadro K420 2GB Graphics	Y	Y	N1T07AA		2	Yes
AMD FirePro W2100 2GB Graphics	Y	Y	J3G91AA		2	Yes
Mid-range 3D						
NVIDIA Quadro K1200 4GB Graphics	Y	Y	L4D16AA		2	Yes
NVIDIA Quadro K2200 4GB Graphics	Y	Y	J3G88AA		2	Yes
NVIDIA Quadro M2000 4GB Graphics	Y	Y	T7T60AA		2	
AMD FirePro W4300 4GB Graphics	Y	Y	T7T58AA		2	Yes
AMD FirePro W5100 4GB Graphics	Y	Y	J3G92AA		2	Yes
High End 3D						
NVIDIA Quadro M4000 8GB Graphics	Y	Y	M6V52AA		2	Yes
NVIDIA Quadro M5000 8GB Graphics	Y	Y	M6V53AA		1	Yes
NVIDIA Quadro M6000 24GB Graphics	Y	Y	T7T61AA		1	Yes
AMD FirePro W7100 8GB Graphics	Y	Y	J3G93AA		2	Yes

NOTE 1: If 1st card is NVS 510, 2nd card must be NVS 510 or NVS 310.
NOTE 2: 4th NVS 310 or NVS 315 supported as AMO-only

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

NOTE 1: Tesla K40 is supported with QK5200, QK620 or QK2200.
Not supported with 2 graphics cards.
Not supported with OS WIN7 32-bit.
Not supported with OS WIN8.0.

Supported Components

Graphics Cable Adapters

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported # of cards	Supported Mixed?
HP DisplayPort To DVI-D Adapter (4-Pack)	Y	N			1	-
HP DisplayPort To VGA Adapter 2nd	Y	N			1	-
HP DisplayPort To DVI-D Adapter (6-Pack)	Y	N			1	-
HP DisplayPort To DVI-D Adapter (2-Pack)	Y	N			1	-
HP DisplayPort to Dual Link DVI Adapter	Y	Y	NR078AA		1	-
HP DisplayPort To VGA Adapter	Y	Y	AS615AA		1	-
HP DisplayPort To DVI-D Adapter	Y	Y	FH973AA		1	-

Memory

CTO

DDR4-2133 ECC Registered DIMMs	Option Kit Part Number	Support Notes
8GB DDR4-2133 ECC Registered RAM	J9P82AA	1,2
16GB DDR4-2133 ECC Registered RAM	J9P83AA	1,2

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

NOTES:

For details on the supported memory configurations on the HP Z640 Workstation, please refer to the System Technical Specifications - System Board section of this document.
Each processor supports up to 4 channels of DDR4 memory. To realize full performance at least 1 DIMM must be inserted into each channel.

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

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

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

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 SuperMulti DVD Writer	Y	Y	K3R64AA	
HP 9.5mm Slim DVD-ROM Drive	Y	Y	K3R63AA	Note 1
HP 9.5mm Slim BDXL Blu-Ray Writer	Y	Y	K3R65AA	Note 2
HP DX115 Removable Drive Enclosure				
HP DX115 Removable HDD Frame/Carrier	N	Y	FZ576AA	Note 3
HP DX115 Removable HDD Carrier	N	Y	NB792AA	Note 4
HP 15-in-1 Media Card Reader				
HP 15-in-1 Media Card Reader	Y	Y	G1S79AA	

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

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

NOTE 1: Not supported as a 2nd Optical Drive.
NOTE 2: Cannot be ordered in combination with another Blu-ray Writer.
NOTE 3: Only one DX115 device can be installed into Z640. This device can only be installed into the top optical (5.25") bay.
NOTE 4: Carrier requires a Z640 to have the DX115 frame installed. This part number is for the carrier only.

Supported Components

Controller Cards

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

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

Networking and Communications

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

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

Supported Components

HP USB Optical Mouse	Y	Y	QY777AA	
HP USB 1000dpi Laser Mouse	Y	Y	QY778AA	
HP USB Optical 3-Button 2.9M OEM Mouse	Y	Y	ET424AA	
HP 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
HP Internal USB Port Kit	N	Y	EM165AA	Note 1
HP eSATA PCI Cable Kit	N	Y	GM110AA	Note 2
HP Serial Port Adapter	Y	Y	PA716A	
HP Optical Bay HDD Mounting Bracket	N	Y	NQ099AA	Note 3
HP 2.5in HDD/SSD 2-in-1 ODD Bay Bracket	N	Y	K4T74AA	Note 4
HP Power Cord Kit	N	Y	DM293A	
HP Workstation Mouse Pad	Y	N		Japan only
HP ENERGY STAR® Enabled Configuration	Y	N		

Note 1: The HP Internal USB Port kit has a single USB 2.0 type A connector.
Note 2: No hot plug / hot swap supported
Note 3: NQ099AA used to install 3rd/4th 3.5" HDDs in Z640 in the factory or when purchasing Aftermarket Option (AMO) drives
Note 4: K4T74AA used to install 3rd/4th 2.5" HDD/SSDs in Z640 in the factory or when purchasing Aftermarket Option (AMO) drives

Software

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

NOTE 1: Available as a free download here: http://www.hp.com/go/performanceadvisor
NOTE 2: Supported operating systems:
- Windows 7 Professional 32/64
- Windows 8.1 Professional 32/64
- RHEL v6.3, 7
- SLED 11 SP3

Supported Components

For more information, go to: http://www.hp.com/go/rgs
NOTE 3: Must select as a Configure to Order option.

Operating Systems

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

NOTE 1: Windows 10 Home High-End, not supported with dual-processor configurations
NOTE 2: This second OS must be ordered with the HP Linux Intaller 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 2nd CPU/Memory Board (optional): 14.9 x 29.2 cm 5.85 x 11.50 inches
Processor Socket	LGA2011R3 1st CPU on system board 2nd CPU on optional 2nd CPU/Memory Module
CPU Bus Speed	QPI: Up to 9.6GT/second, depending on processor
Chipset	Intel C612 Chipset
Super I/O Controller	Nuvoton NPCD379H (SIO-12)
Memory Expansion Slots	4 on system board(CPU0) + 4 on optional 2nd CPU/Memory Module(CPU1)
Memory Type Supported	DDR4, RDIMM (Registered), ECC: 4GB, 8GB and 16GB DDR4, LRDIMM (Load Reduced), ECC: 32GB
Memory Modes	NUMA (Non-Uniform Memory Architecture), Memory Node Interleave
Memory Speed Supported	1600MT/s, 1866MHz and 2133MT/s

System Technical Specifications

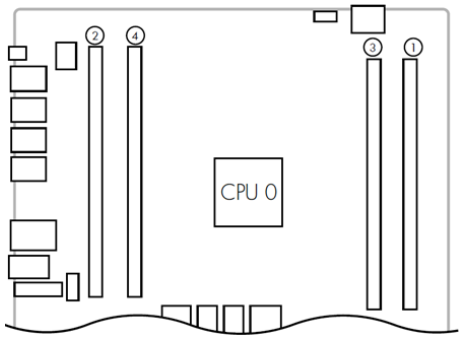
		Single Processor				
		CPU 0				
		Front Slots		Rear Slots		
Capacity	Notes	DIMM1	DIMM3	DIMM6	DIMM8	Rating
4 GB	*	4 GB				Fair
8 GB		4 GB 8 GB			4 GB	Good Fair
12 GB		4 GB	4 GB		4 GB	Better
16 GB		4 GB 8 GB	4 GB	4 GB	4 GB 8 GB	Best Good
24 GB	~	8 GB	4 GB	4 Gb	8 GB	Better
32 GB		8 GB 16 GB	8 GB	8 GB	8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

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

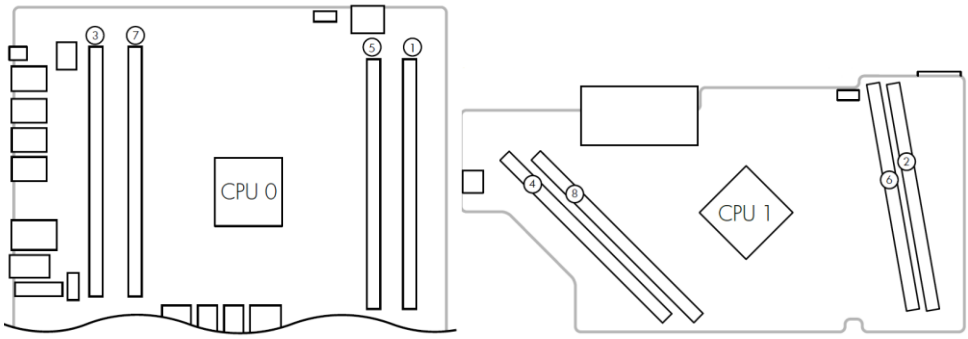
System Technical Specifications

Memory Loading Order:

Load Order for Single Processor Configuration



Load Order for Dual Processor Configuration



Maximum Memory

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

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

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

Memory Configuration (Supported)

- Not all memory configurations possible are represented above.
- Only Registered and LR ECC DIMMs are supported.
- Do not install memory modules into memory slots if corresponding processor is not installed.
- Dual processor configurations with memory modules installed for only one processor is not supported.
- RDIMM (Registered) and LRDIMM (Load Reduced) memory cannot be mixed. All memory installed in the system must be either RDIMM or LRDIMM.

PCI Express Connectors

Slot 1 (top):
PCI Express Gen2 x1 with open-ended connector*
Full-height, Half-length
(not available when 2nd CPU/Memory Module is installed)

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

Slot 3:

System Technical Specifications

	PCI Express Gen2 x4 with open-ended connector* Full-height, Full-length (with extender) **Slot 4:** PCI Express Gen3 x8 with open-ended connector* Full-height, Full-length (with extender) **Slot 5:** PCI Express Gen3 x16 Full-height, Full-length (with extender) * Open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot	
PCI Connectors (5.0V)	**Slot 6:** PCI 32bit/33MHz Full-height, Full-length (with extender)	
Supported Drive Interfaces	**SATA**	2 SATA @6Gb/s, supports RAID 0, 1 and NCQ. 4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ. Factory integrated RAID is Microsoft Windows only.
	Serial Attached SCSI	Requires Optional PCIe card
Integrated RAID	SATA: RAID 0, 1 SSATA: RAID 0, 1, 10 RAID 0 configuration - striped array (supported and configure to order) RAID 1 configuration - mirrored array (supported and configure to order) RAID 5 parity striping (supported but not configure to order) RAID 10 striped and mirrored array. *HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead	
Integrated Graphics	No	
Network Controller	Integrated Intel I-218 Gbit LAN Memory Integrated 3KB receive buffer and 3KB transmit buffer Data rates supported 10/100/1000 Mb/s Compliance IEEE 802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i 802.3u, 802.3x, 802.3z Bus architecture PCIe 1.0 x1 and SMBus Power requirement 0.5 watts Boot ROM support Network transfer rates: 10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s	

	100BASE-TX (half-duplex) 100 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s 100BASE-TX (full-duplex) 200 Mb/s Management capabilities: WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostics. AMT 9.1 support, vPro compliant	
SATA Connectors	Supported on all SATA and sSATA ports configurable with optional eSATA* After-Market Option cable kit) * hot plug / hot swap not supported with eSATA	
IEEE 1394 Connector(s)	**Front**	None
	Rear	2 IEEE 1394b (requires optional PCIe card)
	Internal	None
USB Connector(s)	**Front**	4 - USB 3.0
	Rear	4 - USB 3.0 2 - USB 2.0
	Internal	One 2x5 header with two USB 2.0 ports. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. One 2x10 header with one USB 3.0 port.
HD Integrated Audio	Realtek ALC221	
Flash ROM	Yes	
CPU Fan Header	One for each CPU socket	
Chassis Fan Header	Rear System Chassis Fan Header Front System Chassis Fan Header	
CMOS Battery Holder – Lithium	Yes	
Power Supply Headers	Yes	
Power Switch, Power LED & Hard Drive LED Header	Yes (includes speaker and intrusion sensor signals)	
Clear Password Jumper	Yes	
Serial Port	One internal header	
Parallel Port	No	
Keyboard/Mouse	PS/2	

System Technical Specifications

Z640 Required Power Supply Info

Power Supply	925W 90% Efficient, Custom PSU (Wide Ranging, Active PFC)	
Operating Voltage Range	90–269 VAC	
Rated Voltage Range	100–240 V	118 V
Rated Line Frequency	50–60 Hz	400 Hz
Operating Line Frequency Range	47–66 Hz	393–407 Hz
Rated Input Current	11.3 A @ 100-240 V	11.3 A @ 400 V
Heat Dissipation (Configuration and software dependent)	Typical = 2105 btu/hr (530 kcal/hr) Maximum = 3629 btu/hr (914 kcal/hr)	
Power Supply Fan	92x25 mm variable speed	
ENERGY STAR Qualified (Configuration dependent)	Yes Yes, 90% Efficient	
80 PLUS® Compliant	The Z640 925W power supply efficiency report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf	
FEMP Standby Power Compliant @115V (<2W in S5 - Power Off)	Yes	
EuP Compliant @ 230V (<0.5 W in S5 - Power Off)	Yes	
CECP Compliant @ 220V (<4W in S3 - Suspend to RAM)	Yes; Configuration dependent	
Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC)	<20W	
Built-in Self-Test LED	Yes	
Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)	Yes	

Access Panel Solenoid Lock Header	Yes
Access Panel Intrusion	Yes
Sensor Header	Integrated in Front User Interface (Power Switch, Power LED, HDD LED, Speaker) Cable
Multibay Header	No
Integrated Gigabit Ethernet	Integrated Intel I-218 Gbit LAN
Wake on LAN	Yes
ASF 1.0/2.0 (Alert Standard Format)	No
TPM	Infineon TPM 1.2 Certified
Password Clear Header	Yes
AUX IN (audio)	No
Clear CMOS Button	Yes
Memory Fan Header	CPU0 Memory Fan Header; CPU1 Memory Fan Header

System Technical Specifications

SYSTEM CONFIGURATION

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

Example Z640 Configuration #2	Processor	2x Intel® Xeon® E5-2643 v3 (Dual Six-core)					
	Memory	8x 8GB DDR4-2133 (Registered DIMM)					
	Graphics	1x NVIDIA Quadro K5200					
	Disks/Optical	4x 2TB SATA 7200 ; 1x Slim SuperMulti DVDRW SATA					
	Power Supply	925W 90% Custom PSU					
	Other	N/A					
Energy Consumption		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	82.62 W		82.36 W		83.10 W	
	Windows Busy Typ (S0)	399.09 W		397.52 W		399.46 W	
	Windows Busy Max (S0)	497.57 W		495.56 W		492.48 W	
	Sleep (S3)	4.718 W	4.612 W	4.864 W	4.759 W	4.699 W	4.581 W
	Off (S5)	0.992 W	0.813 W	1.042 W	0.988 W	0.823 W	0.793 W
	Zero Power Mode (ErP)	0.204 W		0.384 W		0.202 W	
Heat Dissipation**		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	281.90 btu/hr		281.01 btu/hr		283.54 btu/hr	
	Windows Busy Typ (S0)	1361.70 btu/hr		1356.34 btu/hr		1362.95 btu/hr	
	Windows Busy Max (S0)	1697.71 btu/hr		1690.85 btu/hr		1680.34 btu/hr	

System Technical Specifications

	Sleep (S3)	16.09 btu/hr	15.74 btu/hr	16.60 btu/hr	16.24 btu/hr	16.03 btu/hr	15.63 btu/hr
	Off (S5)	3.15 btu/hr	2.77 btu/hr	3.56 btu/hr	3.37 btu/hr	2.81 btu/hr	2.71 btu/hr
	Zero Power Mode (ErP)	0.694 btu/hr		1.311 btu/hr		0.689 btu/hr	

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

System Configuration (Entry level)	**Processor Info**	1x Intel® Xeon® E5-2650 v3 2.30 GHz
	Memory Info	2x 8 GB DDR4-2133 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	3.3	16
	Hard drive Operating (random reads)	3.5	17
	DVD-ROM Operating (sequential reads)	4.5	31

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

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

ENVIRONMENTAL DATA

Environmental Requirements	**Temperature**	Operating: 5°C to 35°C (40°F to 95°F) Non-operating: -40°C to 60°C (-40°F to 140°F)
	Humidity	Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing
	Maximum Altitude	Operating: 3,048 m (10,000 ft) Non-operating: 9,144 m (30,000 ft)
	Dynamic (new)	Shock

	Operating: ½-sine: 40 g, 2-3ms (~62 cm/sec) Non-operating: ½-sine: 160 cm/s, 2-3ms (~105 g) square: 20 g, 422 cm/s **NOTE**: Values represent individual shock events and do not indicate repetitive shock events. Vibration Operating random: 0.5 g (rms), 5-300 Hz, up to 0.0025 g²/Hz Non-operating random: 2.0 g (rms), 5-500 Hz, up to 0.0150 g²/Hz **NOTE:** Values do not indicate continuous vibration.
Cooling	Above 1524m (5,000 ft.) altitude, maximum operating temperature is de-rated by 1°C (1.8°F) per 305m (1,000 ft.) elevation increase

Physical Security and Serviceability

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

System Technical Specifications

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

System Technical Specifications

CPU Heatsink Fan	1st CPU: 1 - 92mm Optional 2nd CPU: 1 - 92mm
Memory Heatsink Fan	Optional 2nd CPU/Memory Module: rear bank: 1 - 80mm.
HP Vision Diagnostics Offline Edition	HP Vision Diagnostics Offline Edition The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to: • Run diagnostics • View the hardware configuration of the system Key features and benefits HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are: • Testing and diagnosing apparent hardware failures • Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance • Sending configuration information to another location for more in-depth analysis Entered using F2
Access Panel Key Lock	Yes, prevents removal of the access panel and all internal components including devices installed in the external 5.25" bays.
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	Yes, Infineon TPM 1.2 Certified
Integrated Chassis Handles	Yes
Power Supply	Tool-less. Includes integrated handle.
PCI Card Retention	Yes, tool-less Rear (all)

System Technical Specifications

	Middle (full-height cards) Front (full-length cards with extender)
Flash ROM	SPI ROM
Diagnostic Power Switch LED on board	Yes
Clear Password Jumper	Yes
Clear CMOS Button	Yes
CMOS Battery Holder	Yes
DIMM Connectors	Yes

BIOS

BIOS 32-bit Services	Standard BIOS 32-Bit Service Directory Proposal v0.4
PCI 3.0 Support	Full BIOS support for PCI Express through industry standard interfaces
ATAPI	ATAPI Removable Media Device BIOS Specification Version 1.0
BBS	BIOS Boot Specification v1.01
WMI Support	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
BIOS Boot Spec 1.01+	Provides more control over how and from what devices the workstation will boot
BIOS Power On	Users can define a specific date and time for the system to power on
ROM Based Computer Setup Utility (F10)	Review and customize system configuration settings controlled by the BIOS
System/Emergency ROM Flash Recovery with Video	Recovers system BIOS in corrupted Flash ROM
Replicated Setup	Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
SMBIOS	System Management BIOS 2.7 for system management information
Boot Control	Disables the ability to boot from removable media on supported devices

System Technical Specifications

Memory Change Alert	Alerts management console if memory is removed or changed
Thermal Alert	Monitors the temperature state within the chassis. Three modes: • NORMAL - normal temperature ranges. • ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown. • SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.
Remote ROM Flash	Provides secure, fail-safe ROM image management from a central network console
ACPI (Advanced Configuration and Power Management Interface)	Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 4.0 for full compatibility with 64-bit operating systems.
Ownership Tag	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen
Remote Wakeup/Remote Shutdown	System administrators can power on, restart, and power off a client computer from a remote location
Instantly Available PC (Suspend to RAM - ACPI sleep state S3)	Allows for very low power consumption with quick resume time
Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)	Allows a new or existing system to boot over the network and download software, including the operating system
ROM revision levels	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
System board revision level	Allows management SW to read revision level of the system board Revision level is digitally encoded into the HW and cannot be modified
Start-up Diagnostics (Power-on Self-Test)	Assesses system health at boot time with selectable levels of testing
Auto Setup when new hardware installed	System automatically detects the 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

System Technical Specifications

Asset Tag	Allows 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	Fan control parameters are set according to detected hardware configuration for optimal acoustics
Pre-boot Diagnostics	Early (pre-video) critical errors are reported via beeps and blinks on the power LED

Industry Standard Specification Support

UEFI Specification Revision	2.3.1
Industry Standard	Revision Supported by the BIOS
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 0.7
PCI Express	PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0
PMM	POST Memory Manager Specification, Version 1.01
SATA	• Serial ATA Specification, Revision 1.0a • Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 • Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0
SPD	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
TPM	Trusted Computing Group TPM Specification Version 1.2
UHCI	Universal Host Controller Interface Design Guide, Revision 1.1
USB	Universal Serial Bus Revision 1.1 Specification

System Technical Specifications

	Universal Serial Bus Revision 2.0 Specification
	Universal Serial Bus Revision 3.0 Specification
SMBIOS	System Management BIOS Reference Specification, Version 2.7

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

Social and Environmental Responsibility

Eco-Label Certifications & Declarations

This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

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

Batteries

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

The battery in this product does not contain:

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

Restricted Material Usage

This product meets the material restrictions specified in HP's General Specification for the Environment. http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf
Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.

Low Halogen Statement

This product is low-halogen except for power cords, external cables and peripherals. The following customer-configurable internal components may not be low-halogen: 3 ½" SAS HDDs, LSI 9270-8i SAS ROC RAID Card, and LSI 9217-4i4e SAS ROC RAID Card. Service parts obtained after purchase may not be low-halogen.

End-of-Life Management and Recycling

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

Hewlett-Packard Corporate Environmental Information

For more information about HP's commitment to the environment:

Global Citizenship Report: http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html

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

System Technical Specifications

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

Additional Information

- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstatio.html
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24 for registration status in your country.

Packaging

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

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

Packaging Materials

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

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

Manageability

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

- DASH 1.1 required functionalities via Intel LAN on motherboard

Intel Active Management Technology (AMT) Intel® Active Management Technology (AMT) 9.1

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

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

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

Intel® vPro™ Technology

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

- Intel® Xeon® processor E5-1600 v3 product family or E5-2600 v3/v4 product family featuring Intel® vPro™ Technology
- Intel® C612 chipset
- Intel® I218LM GbE LAN

Remote Manageability Software Solutions

The HP Z640 Workstation is supported on the following remote manageability software consoles:

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

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

System Software Manager

For questions or support for SSM, please visit: http://www.hp.com/go/ssm

Service, Support, and Warranty

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

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

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

System Technical Specifications

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

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

Product Change Notification

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

Stable & Consistent Offerings

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

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

Processors	Product #	Offering
	J6F22AV	Intel® Xeon® E5-1603 v3 2.8GHz 4-core 10MB 1866
	J6F20AV	Intel® Xeon® E5-1620 v3 3.5GHz 4-core 10MB 2133
	J6F19AV	Intel® Xeon® E5-1630 v3 3.7GHz 4-core 10MB 2133
	J6F31AV	Intel® Xeon® E5-2643 v3 3.4GHz 6-core 20MB 2133 1st
	J6F49AV	Intel® Xeon® E5-2643 v3 3.4GHz 6-core 20MB 2133 2nd
	J6F38AV	Intel® Xeon® E5-2620 v3 2.4GHz 6-core 15MB 1866 1st
	J6F56AV	Intel® Xeon® E5-2620 v3 2.4GHz 6-core 15MB 1866 2nd
	J6F36AV	Intel® Xeon® E5-2630 v3 2.4GHz 8-core 20MB 1866 1st
	J6F54AV	Intel® Xeon® E5-2630 v3 2.4GHz 8-core 20MB 1866 2nd

Hard Drives	Product #	Offering
	J3J74AV	500GB 7200 RPM SATA 1st Hard Disk Drive
	J3J95AV	500GB 7200 RPM SATA 2nd Hard Disk Drive
	J3K16AV	500GB 7200 RPM SATA 3rd Hard Disk Drive
	J3K36AV	500GB 7200 RPM SATA 4th Hard Disk Drive
	J3J75AV	1TB 7200 RPM SATA 1st Hard Disk Drive
	J3J96AV	1TB 7200 RPM SATA 2nd Hard Disk Drive
	J3K17AV	1TB 7200 RPM SATA 3rd Hard Disk Drive
	J3K37AV	1TB 7200 RPM SATA 4th Hard Disk Drive

Graphics	Product #	Offering
	J1P91AV	NVIDIA NVS 510 2GB 1st Graphics
	J1Q03AV	NVIDIA NVS 510 2GB 2nd Graphics
	J1P93AV	NVIDIA Quadro K620 2GB 1st Graphics
	J1Q05AV	NVIDIA Quadro K620 2GB 2nd Graphics
	J1P94AV	NVIDIA Quadro K2200 4GB 1st Graphics
	J1Q06AV	NVIDIA Quadro K2200 4GB 2nd Graphics
	J1P98AV	AMD FirePro W2100 2GB 1st Graphics
	J1Q09AV	AMD FirePro W2100 2GB 2nd Graphics

Memory	Product #	Offering
	G8X26AV	8GB DDR4-2133 (1x8GB) Registered RAM 1CPU
	G8X30AV	16GB DDR4-2133 (2x8GB) Registered RAM 1CPU

Stable & Consistent Offerings

	G8X37AV	16GB DDR4-2133 (2x8GB) Registered RAM 2CPU
	G8X31AV	32GB DDR4-2133 (4x8GB) Registered RAM 1CPU
	G8X38AV	32GB DDR4-2133 (4x8GB) Registered RAM 2CPU
	G8X41AV	64GB DDR4-2133 (8x8GB) Registered RAM 2CPU
	G8X32AV	32GB DDR4-2133 (2x16GB) Registered RAM 1CPU
	G8X40AV	32GB DDR4-2133 (2x16GB) Registered RAM 2CPU
	G8X33AV	64GB DDR4-2133 (4x16GB) Registered RAM 1CPU
	G8X42AV	128GB DDR4-2133 (8x16GB) Registered RAM 2CPU

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

Technical Specifications - Processors

Intel® Xeon® E5-1603 v4 2.8 2133 4C CPU	
Intel® Xeon® E5-1607 v4 3.1 2133 4C CPU	
Intel® Xeon® E5-1620 v4 3.5 2400 4C CPU	
Intel® Xeon® E5-1630 v4 3.7 2400 4C CPU	
Intel® Xeon® E5-1650 v4 3.6 2400 6C CPU	
Intel® Xeon® E5-1660 v4 3.2 2400 8C CPU	
Intel® Xeon® E5-1680 v4 3.4 2400 8C CPU	
Intel® Xeon® E5-1630 v3 3.7 2133 4C CPU	
Intel® Xeon® E5-1620 v3 3.5 2133 4C CPU	
Intel® Xeon® E5-1603 v3 2.8 1866 4C CPU	
Intel® Xeon® E5-2603 v3 1.6 1600 6C CPU	J9Q02AA
Intel® Xeon® E5-2609 v3 1.9 1600 6C CPU	J9Q01AA
Intel® Xeon® E5-2620 v3 2.4 1866 6C CPU	J9Q00AA
Intel® Xeon® E5-2623 v3 3.0 1866 4C CPU	J9P99AA
Intel® Xeon® E5-2630 v3 2.4 1866 8C CPU	J9P98AA
Intel® Xeon® E5-2640 v3 2.6 1866 8C CPU	J9P97AA
Intel® Xeon® E5-2637 v3 3.5 2133 4C CPU	J9P96AA
Intel® Xeon® E5-2650 v3 2.3 2133 10C CPU	J9P95AA
Intel® Xeon® E5-2660 v3 2.6 2133 10C CPU	J9P94AA
Intel® Xeon® E5-2643 v3 3.4 2133 6C CPU	J9P93AA
Intel® Xeon® E5-2670 v3 2.3 2133 12C CPU	J9P92AA
Intel® Xeon® E5-2680 v3 2.5 2133 12C CPU	J9P91AA
Intel® Xeon® E5-2683 v3 2.0 2133 14C CPU	J9P90AA
Intel® Xeon® E5-2667 v3 3.2 2133 8C CPU	J9P89AA
Intel® Xeon® E5-2690 v3 2.6 2133 12C CPU	J9P88AA
Intel® Xeon® E5-2695 v3 2.3 2133 14C CPU	J9P87AA
Intel® Xeon® E5-2697 v3 2.6 2133 14C CPU	J9P86AA
Intel® Xeon® E5-2699 v3 2.3 2133 18C CPU	J9P85AA
Z640 Intel® Xeon® E5-2643 v4 3.4 2400 6C 2ndCPU	
Z640 Intel® Xeon® E5-2640 v4 2.4 2133 10C 2ndCPU	T9U16AA
Z640 Intel® Xeon® E5-2637 v4 3.5 2400 4C 2ndCPU	T9U15AA
Z640 Intel® Xeon® E5-2630 v4 2.2 2133 10C 2ndCPU	T9U14AA
Z640 Intel® Xeon® E5-2623 v4 2.6 2133 4C 2ndCPU	T9U13AA
Z640 Intel® Xeon® E5-2620 v4 2.1 2133 8C 2ndCPU	T9U12AA
Z640 Intel® Xeon® E5-2609 v4 1.7 1866 8C 2ndCPU	T9U11AA
Z640 Intel® Xeon® E5-2603 v4 1.7 1866 6C 2ndCPU	T9U10AA

STORAGE/HARD DRIVES

SAS Hard Drives for HP Workstations	**600GB SAS 15K SFF HDD**	**Capacity**	600GB	
		Height	5.9 in; 15 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
		Interface	12Gb/s SAS	
		Synchronous Transfer Rate (Maximum)	Up to 1200 MB/s (SAS single port)	
		Buffer	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)	
	600GB SAS 15K SFF HDD	**Capacity**	600GB	
		Height	5.9 in; 15 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm
		Interface	12Gb/s SAS	
		Synchronous Transfer Rate (Maximum)	Up to 1200 MB/s (SAS single port)	
		Buffer	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)	
	300GB SAS 10K rpm 6Gb/s 3.5" 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	
		Synchronous Transfer Rate (Maximum)	Up to 600 MB/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)	
	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	

Technical Specifications – Storage / Hard Drives & SSDs

		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	
		Cache	multi-segmentable cache buffer	
		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)	
SATA 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**	1 Terabyte (1000 GB)	
		Height	1 in; 2.54 cm	
		Width	**Media Diameter**	3.5 in; 8.9 cm

Technical Specifications – Storage / Hard Drives & SSDs

		Physical Size	4 in; 10.17 cm
	Interface	Serial ATA (6.0Gb/s), NCQ enabled	
	Synchronous Transfer Rate (Maximum)	Up to 600 MB/s	
	Interface	Serial ATA (6.0Gb/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**	2 ms
		Average	11 ms
		Full Stroke	21 ms
	Rotational Speed	7,200 rpm	
	Logical Blocks	1,953,525,168	
	Operating Temperature	41° to 131° F (5° to 55° C)	
2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD	**Capacity**	2TB	
	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 600MB/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)	
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	7200 rpm	
	Operating Temperature	41° to 140° F (5° to 60° C)	

Technical Specifications – Storage / Hard Drives & SSDs

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	
4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)	**Capacity**	4TB	
	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 (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	5° to 60° F (-15° to 15.56° 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	

Technical Specifications – Storage / Hard Drives & SSDs

		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)	
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	
	Synchronous Transfer Rate (Maximum)	Up to 550MB/s (Sequential Read)	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**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	**Sequential Read**	560 MB/s
		Sequential Write	510 MB/s
		Random Read	100K IOPS
		Random Write	88K IOPS

Technical Specifications – Storage / Hard Drives & SSDs

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	**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	
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 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	

Technical Specifications – Storage / Hard Drives & SSDs

		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	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
HP Z Turbo Drive 512GB SSD	**Capacity**	512GB	
	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	
	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
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 (MTTF)	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 (MTTF)	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

Technical Specifications – Storage / Hard Drives & SSDs

HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD	**Capacity**	2TB	
	Protocol	PCIe	
	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	**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	**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
	Capacity	1TB	

Technical Specifications – Storage / Hard Drives & SSDs

HP Z Turbo Drive G2 1TB TLC SSD	**Protocol**	PCIe	
	Form Factor	M.2 in Half-height, half-length card	
	Controller	NVMe	
	NAND Type	3D TLC	
	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	**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	Half-height, half-length	
	Controller	NVMe	
	NAND Type	MLC	
	Endurance	150TBW (TB Written)	
	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**	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	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	**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 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)	
	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

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 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
	Certification Level	PCI-Express 3.0
	IO Bus	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 **NOTE:** HP Workstations do not support this many internal drives.
	LED Indicators	Heartbeat LED on card

Technical Specifications - Graphics

GRAPHICS

NVIDIA NVS 310 512MB 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: 512MB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s
	Connectors	2 x DisplayPort
	Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
	Image Quality Features	The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
	Display Output	Up to 2 displays in the following configurations: DisplayPort output: • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. DVI-D output: • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors • Drives two digital display at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors HDMI output: • NVS 310 is capable of driving two high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors VGA display output:

Technical Specifications - Graphics

		• Drives two analog display at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptor
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.1
	Available Graphics Drivers	Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Note	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured NVS 310 graphics card have no cable adpaters included. Adapters must be ordered separately. 3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.
NVIDIA NVS 310 1GB Graphics	**Form Factor**	Low Profile: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams
	Graphics Controller	NVIDIA NVS 310 GPU: GF119-825
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GBB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/
	Connectors	2x DisplayPort 1.2
	Maximum Resolution	Up to 2560 x 1600 (digital display) per display.
	Image Quality Features	The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.
	Display Output	Up to 2 displays in the following configurations:

DisplayPort output:

- Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card
- Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.

DVI-D output:

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

HDMI output:

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

VGA display output:

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

Shading Architecture Shader Model 5.0

Supported Graphics APIs DX11, OpenGL 4.1

Available Graphics Drivers

Windows 8.1
Windows 8
Genuine Windows 7 Professional (64-bit and 32-bit)
Red Hat Enterprise Linux(RHEL)
SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)

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

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

Notes

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

Technical Specifications - Graphics

NVIDIA NVS 315 1GB Graphics (for HP Workstations)	**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
	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 displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor VGA display output: - Drives two analog displays at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.
	Shading Architecture	Shader Model 5.0

Technical Specifications - Graphics

	Supported Graphics APIs	DX11, OpenGL 4.3
	Available Graphics Drivers	Windows 8 Microsoft Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Notes	1. The thermal solution used on this card is an active fan heatsink. 2. Factory configured graphics card includes DMS-59 to DVI cable. 3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).
NVIDIA NVS 510 2GB Graphics	**Form Factor**	Low Profile, 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVS 510 GPU Core Clock: 797 MHz Memory Clock: 891 MHz CUDA Cores: 192
	Bus Type	PCI Express x16, Generation 2.0
	Memory	2GB DDR3
	Connectors	Four mini-DisplayPort. Four mini-DisplayPort to DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)
	Maximum Resolution	Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz) **NOTE:** This card supports up to four displays. For Windows XP, only 2 active displays are supported.
	Image Quality Features	10-bit internal display processing, including hardware support for 10-bit scan-out
	Display Output	DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support. Digital Display Support 1. DisplayPort Output - Drives four DisplayPort enabled digital display at resolutions up to 3840 × 2160 at 60 Hz with reduced blanking, when connected natively using the 4 DisplayPort connectors on the NVS 510 graphics card. - DisplayPort Multi-Stream Topology (MST) Technology: Supports various combinations of display resolutions and number of displays when using DisplayPort multi stream topology technology - up to a maximum of 4 monitors at a resolution of 1920 × 1200 at 60 Hz with reduced blanking. 2. DVI-D Output - Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with

		reduced blanking using DisplayPort to DVI-D single-link cable adaptors. - Drives four digital displays at resolutions up to 2560× 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors. 3. HDMI Output - The NVS 510 graphics board is capable of driving four high definition (HD) panels up to resolutions of 1920 × 1080P at 60 Hz using DisplayPort to HDMI cable adaptors. Analog Display Support 1. VGA display output - Drives four analog displays at resolutions up to 1920 × 1200 at 60 Hz using DisplayPort to VGA cable adaptors.
	Supported Graphics APIs	Full Microsoft DirectX 11, Shader Model 5.0 support Full OpenGL 4.3 support
	Available Graphics Drivers	Genuine Windows 7 Professional (64-bit and 32-bit) Microsoft Windows XP Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Power Consumption	33.4 Watts
	Note	Heatsink cooler design is active.
Graphics Cable Adapters	**Note**	Graphics Cable Adapter option choice is available starting Feb 1 2013 for the following graphics cards: NVS 310, Quadro 410, Quadro K5000, FirePro V3900, FirePro W7000 New Graphics Cards introduced after Feb 1 2013 will be eligible for choosing Graphics Cable Adapters, unless otherwise specified. No cable choice for NVS 300, NVS 510. Maximum number of cables allowed is 8.
NVIDIA Quadro K420 1GB Graphics	**Form Factor**	Low Profile: 2.713 inches × 6.3 inches, single slot
	Graphics Controller	NVIDIA Quadro K420 GPU: GK107
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 1GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s
	Connectors	One dual-link DVI-I connector One DisplayPort connector
	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
	RAMDAC	400 MHz integrated RAMDAC
	Display Output	Maximum number of displays supported: 2
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.4 Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux
	Notes	1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro K420 includes one DP to DVI-D adapter.
NVIDIA Quadro K420 2GB Graphics	**Form Factor**	Low Profile: 2.713 inches × 6.3 inches Cooling: Active
	Graphics Controller	NVIDIA Quadro K420 GPU: GK107 with 192 CUDA cores Power: 41W
	Bus Type	PCI Express x16, 2.0 compliant
	Memory	Size: 2GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit
	Connectors	One dual-link DVI-I connector One DisplayPort connector Factory Configured: No video cable adapter included After market option kit: One DP-to-DVI adapter included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI

		- 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI - 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 - 3840 × 2160 × 30 bpp at 60 Hz •
	Image Quality Features	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection) Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo
	Display Output	Maximum number of displays: - 2 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors Maximum number of DisplayPort displays possible (may require MST and/or HBR2): - 4 1920x1200 - 2 2560x1600 - 1 3840x2160 Maximum number of monitors across all available Quadro K420 outputs is 4.
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	DX11, OpenGL 4.4 Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions
	Notes	1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro K420 includes one DP to DVI-D adapter. 3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.
NVIDIA Quadro 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

Technical Specifications - Graphics

	Max Power: 45 Watts
Bus Type	PCI Express 2.0 x16
Memory	2 GB GDDR3, 900 MHz 128-bit memory I/O path 29 GB/s memory bandwidth
Connectors	1 DL-DVI(I) output, 1 DisplayPort output Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories
Maximum Resolution	DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz
Image Quality Features	10-bit internal display processing pipeline 10-bit scan-out support
Display Output	1 Dual-link DVI-I connector 1 Display Port connector
Shading Architecture	Full Microsoft DirectX 11.1 Shader Model 5.0
Supported Graphics APIs	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
Notes	1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.

Technical Specifications - Graphics

NVIDIA Quadro K1200 4GB Graphics **NVIDIA Quadro K1200 4GB Graphics**	**Form Factor**	Dimensions: 2.71" H x 6.875" L Single Slot, Low Profile Cooling: Active Weight: ~175 grams
	Graphics Controller	NVIDIA Quadro K1200 Graphics Card GPU: GM107 with 512 CUDA cores Power: 46 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	Size: 4GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit
	Connectors	4 mini-DisplayPort 1.2a Factory Configured Option: 4 mini-DP-to-DP adapters included with card Option Kit: 4 mini-DP-to-DP adapters included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz
	Image Quality Features	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)
	Display Output	Maximum number of displays - 4 direct attached monitors Maximum number of DisplayPort displays possible: - 4 1920x1200 - 4 2560x1600 - 4 4096x2160 Maximum number of monitors across all available Quadro K1200 outputs is 4.
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4

Technical Specifications - Graphics

	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 4GB Graphics	**Form Factor**	4.38" H x 7.97" L Single Slot, Full Height Weight: 240 grams
	Graphics Controller	NVIDIA Quadro K2200 Graphics Card GM107 GPU 640 CUDA cores Max Power: 67.7 Watts
	Bus Type	PCI Express 2.0 x16
	Memory	4 GB GDDR5, 2500 MHz 128-bit memory I/O path 80 GB/s memory bandwidth
	Connectors	1 DL-DVI(I) output, 2 DisplayPort outputs Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories
	Maximum Resolution	DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz
	Display Output	VGA: • Requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters • 400 MHz integrated RAMDAC • Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): • Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): • Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: • Supports HBR2 and MST • Max resolution: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution) • Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2200 outputs is 4.
	Shading Architecture	Full Microsoft DirectX 11.1 Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4 DirectX 11.1 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 8.1 Microsoft Windows 8

Technical Specifications - Graphics

		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
	Note	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) Using two DP outputs, the M2000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.
	Image Quality Features	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection) Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo

Technical Specifications - Graphics

Display Output	Maximum number of displays - 4 direct attached monitors Maximum number of monitors across all available Quadro M2000 outputs is 4.
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.5 DirectX 12 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, and OpenCL software
Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. Quadro M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

Technical Specifications - Graphics

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

Technical Specifications - Graphics

AMD FirePro W4300 4GB Graphics	**Form Factor**	Low Profile, single slot (6.6” x 3.118”) Full Height, single slot (6.6" x 4.725")
	Graphics Controller	AMD FirePro W4300 graphics GPU Frequency: 930Mhz Memory Clock Speed: 1500Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <50 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	Connectors	4x Mini Display Port 1.2 connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	DisplayPort: - 4096x2160 @24bpp (3 x 4K @ 60Hz, 4 x 4K @ 30Hz)
	Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows GPU control of display refresh rates for tear-free and jitter-free image quality when rotating models or viewing video content.(Requires FreeSync compliant displays)
	Display Output	Max number of monitors supported using DisplayPort 1.2a: • 4 direct attached monitors • 6 using DP 1.2a with MST and HBR2 enabled monitors Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): • one 4096x2160 display • two 2560x1600 displays • four 1920x1200 displays
	Shading Architecture	Shader Model 5.0
	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

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. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details. 2. Configurations of two FirePro W4300 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).
AMD FirePro W5100 4GB Graphics	**Form Factor**	Full height, single slot (6.75" X 4.376")
	Graphics Controller	AMD FirePro W5100 graphics GPU Frequency: 930Mhz GPU: 768 Stream Processors organized into 12 Compute Units Power: <75 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	4GB GDDR5 memory Memory Bandwidth: up to 96 GB/s Memory Width: 128 bit
	Connectors	4x Display Port 1.2 connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
	Maximum Resolution	DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter)

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	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
	Available Graphics Drivers	Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details.
	Form Factor	Full height, single slot (6.75” X 4.376”)
NVIDIA Quadro M4000 8GB Graphics	**Form Factor**	Dimensions: 4.4” H x 9.5” L Single Slot, Full Height Cooling: Active Weight: 475 grams (without extender)
	Graphics Controller	NVIDIA Quadro M4000 GPU: GM204 with 1664 CUDA cores Power: 120 Watts

Technical Specifications - Graphics

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 × 1536 × 32 bpp at 85 Hz
Image Quality Features	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection) NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support Full OpenGL quad buffered stereo support Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies
Display Output	Maximum number of displays - 4 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors Maximum number of DisplayPort displays possible: - 4 1920x1200 - 4 2560x1600 - 4 4096x2160 - 2 5120x2880 (requires dual DP input capable 5k displays) Maximum number of monitors across all available Quadro M4000 outputs is 4.
Shading Architecture	Shader Model 5.0

Technical Specifications - Graphics

	Supported Graphics APIs	OpenGL 4.5 DirectX 12 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
	Notes	1. Configurations using the Quadro M4000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).
NVIDIA Quadro M5000 8GB Graphics	**Form Factor**	Dimensions: 4.4" H x 10.5" L Dual Slot, Full Height Cooling: Active Weight: 525 grams (without extender)
	Graphics Controller	NVIDIA Quadro M5000 GPU: GM204 with 2048 CUDA cores Power: 150 Watts
	Bus Type	PCI Express 3.0 x16
	Memory	Size: 8GB GDDR5 ECC capable Memory bandwidth: 211GB/s Memory Width: 256-bit
	Connectors	1 Dual Link DVI-I 4 DisplayPort 1.2a Factory configured option: No adapter included with card. After market option kit: No adaptor included with card. Additional DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories
	Maximum Resolution	DisplayPort: - up to four 4096 x 2160 x 30 bpp @ 60Hz displays - up to two 5120 x 2880 @ 60Hz displays - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output:

	- up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz
Image Quality Features	12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection) NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support. Full OpenGL quad buffered stereo support. Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies.
Display Output	Maximum number of displays - 4 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors Maximum number of DisplayPort displays possible (may require MST and/or HBR2): - 4 1920x1200 - 4 2560x1600 - 4 4096x2160 - 2 5120x2880 (requires dual DP input 5k displays) Maximum number of monitors across all available Quadro M5000 outputs is 4.
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.5 DirectX 12 API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran
Available Graphics Drivers	Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. Factory configured Quadro M5000 does not include a video cable adapter. Video cable adapters must be ordered separately.

2. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).
3. Configurations of a single Quadro M5000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

Technical Specifications - Graphics

NVIDIA Quadro M6000 24GB Graphics	**Form Factor**	4.4” H x 10.5” L Dual Slot Power: 250 Watts Weight: 1023 grams
	Graphics Controller	NVIDIA Quadro M6000 Graphics Card based on the GM200 GPU Core Count: 3072 Base Clock: 1026 MHz Boost Clock: 1152 MHz Idle Clock: 324 MHz
	Bus Type	PCI Express 3.0 x16
	Memory	24GB GDDR5 384-bit memory I/O path 317 GB/s memory bandwidth ECC Memory (disabled by default)
	Connectors	DP (x4) Dual-Link DVI-I Optional Stereo SLI connector Quadro Sync connector One 8-pin auxiliary power connector Factory configured option: No adapter included with card. Option Kit: No adaptor included with card. Dual-Link DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.
	Image Quality Features	• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP 1.3 support • NVIDIA 3D Vision™ technology • NVIDIA Premium Mosaic and nView
	Display Output	400 MHz integrated RAMDAC ● Maximum resolution over VGA (requires DVI to VGA cable or DP to VGA adapter): 2048 × 1536 × 32 bpp at 85 Hz Dual-link internal TMDS (DVI 1.0) ● Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link internal TMDS (DVI 1.0) ● Maximum resolution over digital port (single GPU and SLI mode):1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2a with MST and HBR2. Each DisplayPort connector has the following capabilities: ● Maximum pixel clock: 592 MPixel/s ● Maximum bandwidth: 17.2 Gbps

Technical Specifications - Graphics

		● Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz HDMI ● Maximum resolution (requires DP to HDMI adapter): 4096 × 2160 × 8 bpp at 60Hz
	Shading Architecture	Shader Model 5.0
	Supported Graphics APIs	Full OpenGL 4.4 Full DirectX 12 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran
	Available Graphics Drivers	Windows 10 Windows 8.1 Windows 8 Windows 7 Professional Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://www8.hp.com/us/en/drivers.html
	Notes	1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro M6000 to enable direct mapping of GPU to Virtual Machine. 2. No display output adapter included. 3. For HP Z840 Workstation configurations, the 1125W power supply option must be used.
AMD FirePro W7100 8GB Graphics	**Form Factor**	Full height, single slot (9.5” X 4.376”)
	Graphics Controller	AMD FirePro W7100 graphics GPU: 1792 Stream Processors organized into 28 Compute Units Power: <75 Watts Cooling: Active
	Bus Type	PCI Express® x16, Generation 3.0
	Memory	8GB GDDR5 memory Memory Bandwidth: up to 176 GB/s Memory Width: 256 bit
	Connectors	4x Display Port 1.2a connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included

Technical Specifications - Graphics

	Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.
Maximum Resolution	DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter)
Image Quality Features	Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling
Display Output	Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays
Shading Architecture	Shader Model 5.0
Supported Graphics APIs	OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle
Available Graphics Drivers	Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html
Notes	1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. 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.

Technical Specifications - High Performance GPU Computing

HIGH PERFORMANCE GPU COMPUTING

NVIDIA Tesla K40 Workstation Compute Processor	**Form Factor**	Size: 4.376 inches by 10.5 inches Slots: Dual Slot Power Connectors: One 6-pin and one 8-pin Weight: ~826 grams
	System Interface	PCI Express Gen3 ×16
	Video Outputs	None.
	Memory	12GB GDDR5, memory path: 384-bit memory clock: 3Ghz
	Peak Memory Bandwidth	288 GB/s
	Supported APIs	CUDA, OpenACC, OpenCL 1.2 API support includes: C, C++, Java, Python, and Fortran
	Supported Operating Systems	Windows 8 (64-bit) Genuine Windows 7 Professional (64-bit) Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit) SUSE Linux Enterprise Desktop 11 (64-bit) HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html Novell SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com
	Processor Cores	GK110B GPU Base Clock: 745 MHz Boost Clock: up to 875 MHz 2888 CUDA cores
	Power Consumption	~235 Watts **NOTE:** A 1125W PSU is required for any K40 configuration on the Z820

OPTICAL AND REMOVABLE STORAGE

HP 9.5mm Slim SuperMulti DVD Writer	**Description**	9.5mm height, tray-load	
	Mounting Orientation	Either horizontal or vertical	
	Interface Type	SATA/ATAPI	
	Dimensions (WxHxD)	128 x 9.5 x 127mm	
	Supported Media Types	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
	Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
		Full Stroke DVD	< 200 ms (seek)
		Full Stroke CD	< 200 ms (seek)
	Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
		DVD ROM Read	DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
	Power	Source	SATA DC power receptacle
		DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
		DC Current	5 VDC -< 800 mA typical, <1600 mA maximum
	Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
		Relative Humidity	10% to 80%
		Maximum Wet Bulb Temperature	84° F (29° C)
	Operating Systems Supported	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.	

Technical Specifications - Optical and Removable Storage

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

Technical Specifications - Optical and Removable Storage

	DVD-R DVD-RW CD-R CD-RW	
Disc Capacity	DVD-ROM	8.5 GB DL or 4.7 GB standard
	Blu-ray	25 GB (single-layer) 50 GB (dual-layer) 100/128 GB (BDXL)
	Full Stroke DVD	< 230 ms (seek)
	Full Stroke CD	< 220 ms (seek)
	Blu-ray	< 230 ms (seek) (Full Stroke Blu-ray)
	Startup Time	(Time to drive ready from tray loading) BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S DVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S DVD-RAM 45S CD-ROM 15S
Maximum Data Transfer Rates	CD ROM Read	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
	DVD ROM Read	DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X
	Blu-ray	BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-R Up to 6X BD-RE SL/DL Up to 6X
Power	Source	SATA DC power receptacle
	DC Power Requirements	5 VDC ± 5%-100 mV ripple p-p
	DC Current	5 VDC -900 mA typical, 2000mA maximum
Operating Environmental (all conditions non-condensing)	Temperature	41° to 122° F (5° to 50° C)
	Relative Humidity	10% to 80%
	Maximum Wet Bulb Temperature	84° F (29° C)

Technical Specifications - Optical and Removable Storage

	Operating Systems Supported	Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 No driver is required for this device. Native support is provided by the operating system.
	Kit Contents	9.5mm Slim BDXL Blu-Ray Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.
HP DX115 Removable Drive Enclosure	**Interface Type**	Compatible with SAS or SATA controllers. Offers 6Gb/s performance when used with 6Gb/s HDDs.
	Dimensions (WxHxD)	147.6mm W x 41.1mm H x 205mm L (5.81” W x 1.62” H x 8.08” L)
	Approvals	Frame and Carrier: 1.73 kg (3.8 lbs.) Carrier: 0.45 kg (1 lbs.)
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)

Technical Specifications - Optical and Removable Storage

	Memory Stick PRO-HG Duo MagicGate Memory Stick (MG) MagicGate Memory Stick Duo These additional media types are supported with a card adapter. Memory Stick Micro (M2) miniSD miniSD High Capacity Micro SD Memory Card (MicroSD) Micro SD High Capacity Memory Card (MicroSDHC) Test Parameters/Conditions - Power applied, unit operating on system ±5%
Operating Systems Supported	Windows 8 Pro (64-bit)* Windows 8.1 (64-bit)* Windows 8 (64-bit)* Windows 7 Ultimate (32-bit)** Windows 7 Ultimate (64-bit)** Windows 7 Professional (32-bit)** Windows 7 Professional (64-bit)** Windows 7 Home Basic** Windows 7 Home Premium (32-bit)** Windows 7 Home Premium (64-bit)** Windows Vista Business 64 Windows Vista Business 32 Windows Vista Home Basic 32 Windows XP Professional Windows XP Home 32 No driver is required for this device. Native support is provided by the operating system. Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See http://www.microsoft.com. Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. Seehttp://www.microsoft.com/windows/windows-7/ for details.
Kit Contents	Windows 8 Pro (64-bit)* Windows 8.1 (64-bit)* Windows 8 (64-bit)* Windows 7 Ultimate (32-bit)** Windows 7 Ultimate (64-bit)** Windows 7 Professional (32-bit)** Windows 7 Professional (64-bit)** Windows 7 Home Basic** Windows 7 Home Premium (32-bit)** Windows 7 Home Premium (64-bit)** Windows Vista Business 64 Windows Vista Business 32 Windows Vista Home Basic 32 Windows XP Professional Windows XP Home 32 No driver is required for this device. Native support is provided by the operating system.

Technical Specifications - Optical and Removable Storage

	Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See http://www.microsoft.com. Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. Seehttp://www.microsoft.com/windows/windows-7/ for details.
Approvals	USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0, Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT
Weight	0.35 lbs. (0.16 kg)

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 bilingual 9-Pin connectors (Rear)
	Internal Connectors	One 10-Pin Header connector
	System Requirements	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit, SLED 11 and RHEL 6. Intel i5 series or higher processor, min 2GB of RAM, 20GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot.
	Temperature – Operating	50° to 131° F (10° to 55° C)
	Temperature – Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity – Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit
HP Thunderbolt-2 PCIe 1-port I/O Card	**Data Transfer Rate**	Supports up to 20 Gb/s (20,000 Mb/s)
	Devices Supported	Thunderbolt™ certified devices
	Bus Type	PCIe card, full or half height PCIe slots
	Ports	One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear)
	Internal Connectors	One 5-Pin header connector
	System Requirements	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot.
	Temperature - Operating	50° to 131° F (10° to 55° C)
	Temperature - Storage	-22° to 140° F (-30° to 60° C)
	Relative Humidity - Operating	20% to 80%
	Compliances	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	Operating Systems Supported	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit..
	Kit Contents	HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bracket, DisplayPort to DisplayPort cable, internal header cables (2), user documentation and warranty card.

NETWORKING AND COMMUNICATIONS

Integrated Intel I218LM PCIe GbE Controller	**Connector**	RJ-45 (motherboard integration)
	Controller	Intel I218LM GbE platform LAN connect networking controller
	Memory	3 KB FIFO packet buffer memory (both Tx and Rx)
	Data Rates Supported	10/100/1000 Mbps
	Compliance	802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3x, 802.3z
	Bus Architecture	PCI Express 1.1 (x1) and SMBus
	Data Transfer Mode	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	Power Requirement	Requires 3.3V only (integrated regulators)
	Boot ROM Support	Yes
	Network Transfer Mode	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	Management Capabilities	WOL, auto MDI crossover, PXE, 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**	0C to 45C (32F to 113F)
	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 10GbE SFP+ SR Transceiver	**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

Technical Specifications - Networking and Communications

		ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
	Operating Temperature	32° to 131° F (0° to 55° C)
	Operating Humidity	10% to 95% non-condensing
	Dimensions (H x W x D)	5.3 x 2.5 in (13.50cm 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 X540-T2 10GbE Dual Port Adapter	**Operating Temperature**	32° to 131° F (0° to 55° C)
	Operating Humidity	5% to 95% non-condensing
	Dimensions (H x W x D)	Standard PCIe with full height bracket installed, half height bracket included. 0.7 x 2.7 x 6.0 in
	Operating System Driver Support	The HP driver drop is a unified package that includes the X540-T2 driver. It is the same driver as is used for the 561T. Currently, it includes drivers for Win7-32, Win7-x64, Win8-x64, and Win81-x64.
	Kit Contents	Intel X540 10Gb Ethernet Dual port adapter, Installation guide, Warranty card.
	NOTES	Windows Server 2012 R2, Windows Server 2012, Windows 8, Windows Server 2008 R2, Windows 7, Windows Server 2008 SP2, Windows Vista SP2, Windows Server 2003 R2, Windows Server 2003 SP2, Linux Stable Kernel version 3.x, 2.6,x, Red Hat Enterprise Linux 5, 6, SUSE Linux Enterprise Server 10, 11, FreeBSD 9, VMware ESX/ESXi. Note: Not all OS's supported on all HP Z Workstations.
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)

Technical Specifications - Networking and Communications

		FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs)
	Data Path Width	Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots
	Power Requirement	4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum
	Network Transfer Rate	10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s
	Operating Temperature	32° to 131° F (0° to 55° C)
	Operating Humidity	10% to 95% non-condensing
	Dimensions (H x W x D)	5.3 x 2.5 in (13.50cm 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 7260 802.11 a/b/g/n PCIe WLAN NIC	**Operating Humidity**	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
	Dimensions (H x W x D)	Native HMC: 26.8 x 30.0 x 2.4 mm Carrier Card Assembly 3.3 x 4.7 in (84 x 119 mm)
	Kit Contents	PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty.

NOTES:

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

	Operating Temperature	0 to 80 C

Technical Specifications - Networking and Communications

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

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

Summary of Changes

		Removed	Intel Pro 1500 180GB SATA SSD in Storage and supported components
November 1, 2015	From v10 to v11	Added	Storage PCIe notes, HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA Quadro M4000 8GB Graphics, NVIDIA Quadro M5000 8GB Graphics, notes from Other Hardware section;
		Changed	Controller Cards section notes; HP Remote Graphics Software (RGS) 7.1, MS Office Home & Business 2016 from Software section; Windows 8.1 Professional, Windows 10 Pro 64 and Windows 10 Pro downgrade to Windows 7 Professional 64, RHEL v6.6, 7 from Operative Systems section.
February 1, 2016	From v11 to v12	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 v12 to v13	Added	Windows 10 Home 64 High-end and Note in Overview and Supported Components; AMD FirePro W4300 4GB Graphics in Mid-Ranga Category, Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC in Networking and Communications
		Changed	Note 1 in Supported Components, Operative Systems
		Removed	Ubuntu 14.04 from Overview OS; NVIDIA NVS 310 512MB Graphics, NVIDIA Quadro K420 1GB Graphics in Graphics
March 31, 2016	From v13 to v14	Added	Intel® Xeon® E5-2600 v4 Series CPU, HP Z Turbo Drive G2 1TB SSD, AMD FirePro W2100 2GB Graphics, DDR4-2400 ECC Registered DIMMs
		Changed	Hard Drives, PCIe notes, Intel Active Management Technology updated with E5-2600 v4 processors
May 1, 2016	From v14 to v15	Added	M2000 and M6000 24GB graphics
		Changed	AMD W2100 from "mid-range 3D" to "entry 3D" category,
		Removed	K4200 and K5200 graphics
June 6, 2016	From v15 to v16	Added	E5-1600 v4 CPUs to Overview and Supported Components sections, Enterprise Class status to 4TB SATA HDD
		Removed	Win 8.1 to Win 7 downgrade offrering from Overview and Operating Systems under Supported Components sections
July 1, 2016	From v16 to v17	Added	Added HP USB Hardened Mouse and HP Keyed Cable Lock 10mm
September 1, 2016	From v17 to v18	Added	Z Turbo SED and notes for PCIe SSDs, Specs for SATA SSDs
		Removed	Windows 8.1, NVIDIA Quadro M6000 12GB Graphics
October 1, 2016	From v18 to v19	Added	PCIe TLC SSDs, 2) Added Intel 750 Series PCIe SSDs, 3), 1TB Enterprise HDD
		Removed	Intel® Xeon® E5 1600-2600 v3, HP Z Turbo Drive Quad Pro 2x256, 2x512, 4GB DDR4-2133 ECC Registered RAM, 32GB DDR4-2133 ECC Load Reduced (LR) RAM, Windows 8.1 Pro 64-bit, Windows 7 Professional 64-bit
November 1, 2016	From v19 to v20	Added	1TB SATA 7200 rpm HDD (Enterprise Class), HP Z Turbo Drive G2 TLC SSDs, HP Z Turbo Drive Quad Pro SSDs module, Intel 750 Series AIC SSDs
		Changed	Intel Xeon E5-2600 Series CPU and notes
		Removed	Intel Xeon E5-2600 v3 Series CPU and notes, 4, 32, and 64GB DDR4-2133 RAM DIMMs

Summary of Changes