

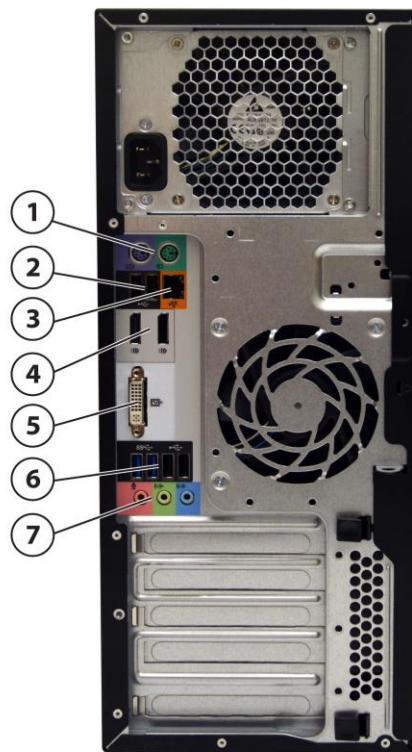
Overview

HP Z230 Tower Workstation



1. Optional Handle* in Top 5.25" Bay
2. Optional 14-in-1 Media Card Reader
3. Optional External Slim Optical Drive Bay
4. Power Button
5. Front I/O (in top to bottom order): 1 USB 2.0 Battery Charging Port, 1 USB 2.0 port, 2 USB 3.0 (blue) ports, Headphone, Microphone

Overview



1. PS/2 ports (keyboard, mouse)
2. 2 USB 2.0
3. RJ-45 to integrated GBE
4. 2 DisplayPort (DP 1.2) output from Intel HD graphics (available on selected processors only)
5. DVI-I single link
6. 2 USB 3.0, 2 USB 2.0
7. 1 Audio Line In, 1 Audio Line Out, 1 Microphone

Overview

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|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Form Factor | Minitower |
| Operating Systems | <p>Preinstalled:</p> <ul style="list-style-type: none"> Windows 7 Professional 32/64 Windows 7 Professional 64-bit (National Academic) Windows 8.1 Pro 64-bit Windows 8.1 Standard 64-bit Windows 8.1 Single Language (EM) Windows 8.1 Simplified Chinese Edition 64-bit Windows 8.1 Pro Downgrade to Windows 7 Professional 32/64 Windows 8.1 Pro Downgrade to Windows 7 Professional 32/64 (National Academic) HP Installer Kit for Linux (includes drivers for 64-bit OS versions of REL 6.6 and REL 7, SUSE Linux Enterprise Desktop (SLED) 11, Ubuntu 14.04) Ubuntu 14.04 SUSE Linux Enterprise Desktop 11 64-bit (90 day license) Red Hat Enterprise Linux Workstation (1 year paper license available; Preinstall not available) <p>Supported:</p> <ul style="list-style-type: none"> Windows 10 64-bit Windows 8/8.1 Enterprise 64-bit Windows 7 Enterprise 32/64 Red Hat Enterprise Linux Desktop/Workstation 6, 7 <p>NOTES: For detailed OS/hardware support information for Linux, see: http://www.hp.com/support/linux_hardware_matrix</p> |

| Name | Cores | Clock Speed (GHz) | Intel® Turbo Boost Technology ¹ | Cache (MB) | Memory Speed (MT/s) | Hyper-Threading | Integrated Graphics | Featuring Intel® vPro™ Technology | TDP (W) |
|----------------------------------|-------|-------------------|--------------------------------------------|------------|---------------------|-----------------|-------------------------|-----------------------------------|---------|
| Intel® Xeon® processor E3-1281v3 | 4 | 3.7 | 4.1 | 8 | 1600 | Y | N/A | Y | 80W |
| Intel® Xeon® processor E3-1280v3 | 4 | 3.6 | 4.0 | 8 | 1600 | Y | N/A | Y | 80W |
| Intel® Xeon® processor E3-1271v3 | 4 | 3.6 | 4.0 | 8 | 1600 | Y | N/A | Y | 80W |
| Intel® Xeon® processor E3-1246v3 | 4 | 3.5 | 3.9 | 8 | 1600 | Y | Intel HD Graphics P4600 | Y | 84W |
| Intel® Xeon® processor E3-1245v3 | 4 | 3.4 | 3.8 | 8 | 1600 | Y | Intel HD Graphics P4600 | Y | 84W |
| Intel® Xeon® processor E3-1241v3 | 4 | 3.5 | 3.9 | 8 | 1600 | Y | N/A | Y | 80W |
| Intel® Xeon® processor E3-1240v3 | 4 | 3.4 | 3.8 | 8 | 1600 | Y | N/A | Y | 80W |
| Intel® Xeon® processor E3-1231v3 | 4 | 3.4 | 3.8 | 8 | 1600 | Y | N/A | Y | 80W |
| Intel® Xeon® processor E3-1226v3 | 4 | 3.3 | 3.7 | 8 | 1600 | N | Intel HD Graphics P4600 | Y | 84W |
| Intel® Xeon® processor E3-1225v3 | 4 | 3.2 | 3.6 | 8 | 1600 | N | Intel HD Graphics P4600 | Y | 84W |
| Intel® Core™ i7-4790 processor | 4 | 3.6 | 4.0 | 8 | 1600 | Y | Intel HD Graphics 4600 | Y | 84W |

Overview

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|---------------------------------|---|-----|-----|---|------|---|------------------------|---|-----|
| Intel® Core™ i5-4690 processor | 4 | 3.5 | 3.9 | 6 | 1600 | N | Intel HD Graphics 4600 | Y | 84W |
| Intel® Core™ i5-4590 processor | 4 | 3.3 | 3.7 | 6 | 1600 | N | Intel HD Graphics 4600 | Y | 84W |
| Intel® Core™ i3-4350 processor | 2 | 3.6 | NA | 4 | 1600 | Y | Intel HD Graphics 4600 | N | 54W |
| Intel® Core™ i3-4170 processor | 2 | 3.7 | NA | 3 | 1600 | Y | Intel HD Graphics 4400 | N | 54W |
| Intel® Core™ i3-4160 processor | 2 | 3.6 | NA | 3 | 1600 | Y | Intel HD Graphics 4400 | N | 54W |
| Intel® Core™ i3-4150 processor | 2 | 3.5 | NA | 3 | 1600 | Y | Intel HD Graphics 4400 | N | 54W |
| Intel® Pentium® G3240 processor | 2 | 3.1 | NA | 3 | 1333 | N | Intel HD Graphics | N | 54W |

¹The specifications shown in this column represent the maximum turbo frequency with one core active. Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

| | |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Available Processor Disclaimers | <p>Integrated Intel® HD graphics is not supported on the Intel Xeon processor E3-1230v3, E3-1240v3, E3-1270v3 or E3-1280v3.</p> <p>Intel® Xeon E3, Intel Core i3 and Intel Pentium processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.</p> <p>Intel's numbering is not a measurement of higher performance. Processor numbers differentiate features within each processor family, not across different processor families. See: http://www.intel.com/products/processor_number/ for details.</p> <p>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.</p> <p>Dual-Core and Quad-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.</p> |
| Color | Jack Black |
| Expansion Slots (see system board section for more details) | <p>1 PCIe Gen3 x16 slot</p> <p>1 PCIe Gen2 x4 slot /x16 connector</p> <p>1 PCIe Gen2 x1 slot/x4 connector</p> <p>1 PCIe Gen2 x1 slot</p> <p>1 PCI slot 32-bit</p> <p>In the PCIe Gen3 x16 slot, if it is not being used for a graphics card, only cards certified as After Market Options for this platform are supported.</p> |
| Expansion Bays (see storage section for more details) | <ul style="list-style-type: none"> • 2 external Half Height 5.25" Bays • 1 external Slim Optical Drive Bay • 2 internal 3.5" Drive Bays |

Overview

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| | <ul style="list-style-type: none"> • 1 internal 2.5" Drive Bay |
| Front I/O | 2 USB 3.0, 1 USB 2.0, 1 USB 2.0 Charging Data Port, 1 Headphone, and 1 Microphone. |
| Internal I/O | 1 USB 3.0 and 3 USB 2.0 ports available as 2 separate 2x10(3.0 x1, 2.0 x1) and 2x5(2.0 x2) header: supports one HP Internal USB 2.0 Port Kit and one USB 3.0 Media Card Reader. |
| Rear I/O | 1 DVI-I Single Link and 2 DisplayPort (DP 1.2) outputs from Intel HD graphics (available on specific processors only); 2 USB 3.0 ports, 4 USB 2.0 ports, 1 serial port (optional), 1 parallel port (optional), 2 PS/2, RJ-45 (LoM), 1 Audio Line-in, and 1 Audio Line-out, Microphone; 2 IEEE 1394b ports (optional). |
| Interfaces Supported | 14-in-1 Media Card Reader (optional) |
| Chassis Dimensions (H x W x D) | Standard minitower orientation: 399mm x 170mm x 442mm (15.7 x 6.7 x 17.4 in) |
| Weight | <p>Exact weights depend upon configuration:</p> <p>Minimum: 8.8 kg (19.4 lb) Typical*: 9.5 kg (20.94 lb) Maximum: 11.8 kg (26.01 lb) Supported Weight (desktop orientation): 35 kg (77 lb) * Typical weight when configured with 2 3.5" hard drives, 1 optical drive, 2 DIMMs and 1 NVIDIA Quadro K600 graphics card</p> |
| Temperature | <p>Operating: 40° to 95°F (5° to 35°C) Non-operating: -40° to 140°F (-40° to 60°C)</p> <p>NOTES: Derate the maximum operating temperature by one degree C (1.8 degrees F) for every 305m (1,000 ft) altitude over 1,524m (5,000 ft).</p> |
| Humidity | <p>Operating: 8% to 85% Non-operating: 8% to 90%</p> |
| Maximum Altitude (non-pressurized) | <p>Operating: 3,000 m; 10,000 ft Non-operating: 9,100 m; 30,000 ft</p> |
| Power Supply | <p>400 watts wide-ranging, active Power Factor Correction, 92% Efficient 320W Standard Efficiency wide-ranging, active PFC Power Supply option available in some countries. The Power Supply Efficiency Report for the 400W 92% Efficiency Power Supply may be found at the following link: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_704427-001%20(DPS-400AB-19%20A)_400W_ECOS%203496_Report.pdf</p> |
| Backup Devices | For a complete listing of compatible DAT tape drives, LTO tape drives and RDX Removable Disk Backup System offerings, please visit http://www.hp.com/go/connect |
| Chipset | Intel® C226 chipset |
| Memory | 4 DIMM slots, supporting up to 32GB ECC/non-ECC, DDR3 1600 MT/s |
| Memory disclaimers | The CPUs determine the speed at which the memory is clocked. If a 1333 MT/s capable CPU is used in the system, the maximum speed the memory will run at is 1333 MT/s regardless of the specified speed of |

Overview

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|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | the memory. |
| 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 | Support Notes |
|-------------------------------------------------------------------------------------------------------------------|--------------------|------------|---------------|
| Intel® Xeon® processor E3-1200 v3 family (Z230) | | | |
| Intel® Xeon® processor E3-1281v3, Quad-Core, 8 MB cache, 3.7 GHz, up to 4.1 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1280v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1271v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1246v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1245v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1241v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1240v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1231v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1226v3, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| Intel® Xeon® processor E3-1225v3, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology | Y | N | See Note 2 |
| 4th generation Intel® Core™ processor family | | | |
| Intel® Core™ i7-4790 processor, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology | Y | N | See Note 3 |
| Intel® Core™ i5-4690 processor, Quad-Core, 6 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology | Y | N | See Note 3 |
| Intel® Core™ i5-4590 processor, Quad-Core, 6 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology | Y | N | See Note 3 |
| Intel® Core™ i3-4350 processor, Dual-Core, 4 MB cache, 3.6 GHz | Y | N | See Note 2 |
| Intel® Core™ i3-4170 processor, Dual-Core, 3 MB cache, 3.7 GHz | | | |
| Intel® Core™ i3-4160 processor, Dual-Core, 3 MB cache, 3.6 GHz | Y | Y | |
| Intel® Core™ i3-4150 processor, Dual-Core, 3 MB cache, 3.5 GHz | Y | N | See Note 2 |
| Dual Core Intel® Pentium® Processors (Z230) | | | |

Supported Components

Intel® Pentium® G3240 processor, Dual-Core, 3 MB cache, 3.1 GHz Y N See Note 2

NOTE 1: Intel HD Graphics P4600 supports workstation-specific graphics drivers for improved compatibility and performance on select professional applications, compared to Intel HD Graphics 4600.

NOTE 2: These processors support either ECC or non-ECC memory

NOTE 3: These processors support only non-ECC memory

Monitors / Displays

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 ZR2740w 27-inch LED Backlit IPS Monitor
 HP ZR2440w 24-inch LED Backlit IPS Monitor
 HP ZR2330w 23-inch IPS LED Backlit Monitor

Supported by all Operating Systems available from HP

Screen Size Diagonally Measured

Hard Drives

SATA Hard Drives

SATA (Serial ATA) Hard Drives for HP Workstations

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|------------------------------------------|--------------------|------------|----------------------------------------------|---------------|
| 500GB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | LQ036AA | |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | LQ037AA | |
| 2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | QB576AA | |
| 3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | QF298AA | |
| 4TB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | K4T76AA | |
| 500GB SATA 7.2K SED SFF HDD | Y | N | (not available today as After Market Option) | |
| 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid) | Y | Y | M7S54AA | |

SATA Solid State Drives 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 | |
| Intel Pro 1500 180GB SATA SSD | Y | Y | F5Z70AA | |
| Samsung Enterprise 240GB SATA SSD | Y | Y | F0W94AA | |
| Samsung Enterprise 480GB SATA SSD | Y | Y | F0W95AA | |

Supported Components

Intelligent Disk Caching

Intelligent Disk Caching

64GB SSD Disk Cache Module

| Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|--------------------|------------|----------------------------------------------|------------------------|
| Y | N | (not available today as After Market Option) | Not supported on Linux |

NOTE: Intelligent Disk Caching SSD module uses Intel's Smart Response Technology. The SSD acts only as cache for the HDD and does not show up as a logical volume.

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

Hard Drive Controllers

Integrated SATA Controller (Z230)

Integrated SATA Controller, RAID 0,1 supported: 5x 6 Gb/s ports

| Factory Configured | Option Kit | Support Notes |
|--------------------|------------|---------------|
| Y | N | |

Factory integrated RAID on motherboard for SATA drives

RAID 0 Configuration – Striped Array

Y N

RAID 1 Configuration – Mirrored Array

Y N

SATA hardware RAID is not supported on Linux systems. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. All drives must be identical in type and capacity

Boot volume/RAID array must be less than 2 TB (for 32-bit Windows).

NOTE 1: Requires identical hard drives (speeds, capacity, interface).

Graphics

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes | Supported # of cards | Mixed? |
|---------------------------------------------------------------|--------------------|------------|------------------------|--------------------------------------------------------------------------------------|----------------------|--------|
| Integrated Intel HD Graphics Media Accelerators (Z230) | | | | | | |
| Intel HD Graphics P4600 | Y | N | | Available on Intel® Xeon® E3-12x5 v3 processors only. See Note 1. | 1 | NO |
| Intel HD Graphics 4600 | Y | N | | Available on Intel Core™ i7-4xxx/ Core i5-4xxx/ Core i3-4330 processors. See Note 1. | 1 | NO |
| Intel HD Graphics 4400 | Y | N | | Available on | 1 | NO |

Supported Components

| | | | | | | |
|------------------------------------------|---|---|---------|-----------------------------------------------------------------------------------------------------|---|-----|
| Intel HD Graphics | Y | N | | Intel Core i3-4130 processor. See Note 1. Available on Intel Pentium® 3220 processor. See Note 1 | 1 | NO |
| Professional 2D | | | | | | |
| NVIDIA NVS 310 512MB Graphics | Y | Y | A7U59AA | Can be mixed with one NVS 510 | 2 | YES |
| NVIDIA NVS 315 1GB Graphics | Y | Y | E1U66AA | | 1 | NO |
| NVIDIA NVS 510 2GB Graphics | Y | Y | C2J98AA | Can be mixed with one NVS 310 | 1 | YES |
| Graphics Cable Adapters | | | | | | |
| HP DisplayPort to Dual Link DVI Adapter | Y | Y | NR078AA | | 1 | |
| HP DisplayPort To DVI-D Adapter (4-Pack) | Y | N | | | 1 | |
| HP DisplayPort To DVI-D Adapter (2-Pack) | Y | N | | | 1 | |
| HP DisplayPort To DVI-D Adapter | Y | Y | FH973AA | | 1 | |
| HP DisplayPort To VGA Adapter | Y | Y | AS615AA | | 1 | |
| Entry 3D | | | | | | |
| AMD FirePro W2100 2GB Graphics | Y | Y | J3G91AA | | 2 | |
| NVIDIA Quadro K420 1GB Graphics | Y | Y | J3G86AA | | 2 | |
| NVIDIA Quadro K620 2GB Graphics | Y | Y | J3G87AA | | 1 | |
| Mid-range 3D | | | | | | |
| AMD FirePro W5100 4GB Graphics | N | Y | C2K00AA | | 1 | |
| NVIDIA Quadro K2000 2GB Graphics | Y | Y | C2J93AA | | 1 | |
| NVIDIA Quadro K2200 4GB Graphics | Y | Y | J3G88AA | | 1 | |
| High End 3D | | | | | | |
| AMD FirePro W7000 4GB Graphics | N | Y | C2K00AA | Requires 400W PSU. Not supported with 320W | 1 | NO |

Supported Components

| Component | Supported | Option Kit Part Number | Support Notes |
|----------------------------------|-----------|------------------------|------------------------------------------------------------|
| AMD FirePro W7100 8GB Graphics | N | J3G93AA | PSU. Requires 400W PSU. Not supported with 320W PSU. |
| NVIDIA Quadro K4200 4GB Graphics | Y | J3G89AA | Requires 400W PSU. Not supported with 320W PSU. |

NOTE 1: Intermixing integrated Intel HD graphics and discrete graphics cards in order to drive more than three displays can be enabled using the Computer (F10) Setup Utility. However, HP recommends using only discrete graphics when four or more displays are required to be supported.

Memory

Sub-Section Description/Notes

Intel® Xeon E3, Intel Core i3 and Intel Pentium processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.

CTO

Support Notes

DDR3-1600 nECC Unbuffered DIMMs CTO

- HP 32GB (4x8GB) DDR3-1600 nECC RAM
- HP 16GB (2x8GB) DDR3-1600 nECC RAM
- HP 16GB (4x4GB) DDR3-1600 nECC RAM
- HP 8GB (2x4GB) DDR3-1600 nECC RAM
- HP 4GB (1x4GB) DDR3-1600 nECC RAM

DDR3-1600 ECC Unbuffered DIMMs - CTO

- HP 32GB (4x8GB) DDR3-1600 ECC RAM
- HP 16GB (2x8GB) DDR3-1600 ECC RAM
- HP 16GB (4x4GB) DDR3-1600 ECC RAM
- HP 8GB (2x4GB) DDR3-1600 ECC RAM
- HP 4GB (2x2GB) DDR3-1600 ECC RAM
- HP 4GB (1x4GB) DDR3-1600 ECC RAM

Sub-Section Description/Notes

Two channels of DDR3 memory are supported. To realize full performance at least one DIMM must be inserted into each channel.

AMO

Option Kit Part Number

Support Notes

DDR3-1600 nECC Unbuffered DIMMs AMO

- HP 8GB (1x8GB) DDR3-1600 non-ECC RAM
- HP 4GB (1x4GB) DDR3-1600 nECC RAM

- B1S54AA
- B1S53AA

DDR3-1600 ECC Unbuffered DIMMs - AMO

- HP 8GB (1x8GB) DDR3-1600 ECC RAM
- HP 4GB (1x4GB) DDR3-1600 ECC RAM
- HP 2GB (1x2GB) DDR3-1600 ECC RAM

- A2Z50AA
- A2Z48AA
- A2Z47AA

NOTE: Only unbuffered DDR3 DIMMs are supported.

The CPUs determine the speed at which the memory is clocked. If a 1333 MHz capable CPU is used in the system, the maximum speed the memory will run at is 1333 MHz regardless of the specified speed of the

Supported Components

memory.

Multimedia and Audio Devices

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-------------------------------------------|--------------------|------------|------------------------|---------------|
| HP Thin USB Powered Speakers, Low Halogen | N | Y | KK912AA | |
| Integrated Realtek HD ALC221 Audio | Y | N | | |

Optical and Removable Storage

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---------------------------------------------|--------------------|------------|------------------------|------------------------------|
| HP Slim DVD-ROM Drive | Y | Y | E5Z82AA | For use as 1st Optical Drive |
| HP Slim SuperMulti DVDRW SATA Drive | Y | Y | E5Z80AA | For use as 1st Optical Drive |
| HP Slim Blu-ray Writer | Y | Y | E5Z81AA | For use as 1st Optical Drive |
| HP 16X DVD-ROM SATA Drive (non Lightscribe) | Y | Y | AR629AA | For use as 2nd Optical Drive |
| HP 16X DVD+/-RW SuperMulti SATA Drive | Y | Y | QS208AA | For use as 2nd Optical Drive |
| HP 15-in-1 Media Card Reader | Y | Y | F4N90AA | |

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.

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.

Controller Cards

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

NOTE 1: For the HP Z230 CMT Workstation the 1394b card is only supported on Slots 3, 4, or 5

NOTE 2: Note 2: Four USB 3.0 ports are available integrated on the motherboard (2 front, 2 rear).

Supported Components

Integrated USB 3.0 ports are supported under Microsoft Windows 7 or Microsoft Windows 8 operating systems only.

Networking and Communications

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---------------------------------------------|--------------------|------------|------------------------|-------------------|
| Integrated Intel I217LM PCIe GbE Controller | Y | N | | See Notes 1, 2, 3 |
| Intel Ethernet I210-T1 PCIe NIC | Y | Y | E0X95AA | See Notes 3, 4 |
| HP X520 10GbE Dual Port Adapter | Y | Y | C3N52AA | |
| HP 10GbE SFP+ SR Transceiver | Y | Y | C3N53AA | |
| Intel 6205 802.11 a/b/g/n PCIe x1 WLAN Card | N | Y | E0X93AA | |

NOTE 1: The integrated network connection is required to support Intel vPro Technology.

NOTE 2: If AMT is enabled network teaming with the integrated LAN port is not possible.

NOTE 3: "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.

NOTE 4: The Intel Ethernet I210-T1 PCIe NIC is supported on the following operating systems:

- Microsoft Windows 7 and Windows 8 32-bit and 64-bit versions
- Red Hat Enterprise Linux(RHEL)
- SLED 11.

Racking and Physical Security

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---------------------------------------------------|--------------------|------------|------------------------|---------------|
| HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit | N | Y | WH340AA | |
| HP Solenoid Lock and Hood (TWR) Sensor | Y | Y | E0X96AA | |
| HP Business PC Security Lock Kit | N | Y | PV606AA | |
| HP UltraSlim Cable Lock Kit | N | Y | H4D73AA | |

Input Devices

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-------------------------------------------------|--------------------|------------|------------------------|---------------|
| HP SpacePilot Pro 3D USB Intelligent Controller | N | Y | WH343AA | |
| HP SpaceMouse Pro USB 3D Input Device | N | Y | B4A20AA | |
| HP USB 1000dpi Laser Mouse | Y | Y | QY778AA | |
| HP USB Optical 3-Button Mouse | Y | Y | DY651A | |
| HP USB Optical Mouse | Y | Y | QY777AA | |
| HP PS/2 Mouse | Y | Y | QY775AA | |
| HP 2.4GHz Wireless Keyboard & Mouse | N | Y | NB896AA | |
| HP USB CCID SmartCard Keyboard | Y | Y | BV813AA | |
| HP USB Keyboard | Y | Y | QY776AA | |
| HP PS/2 Keyboard | Y | Y | QY774AA | |
| 3Dconnexion CADMouse | Y | Y | M5C35AA | |

Supported Components

Other Hardware

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|----------------------------------------|--------------------|------------|------------------------|---------------|
| HP Power Cord Kit | N | Y | DM293A | |
| HP Workstation Mouse Pad | Y | N | | Japan only |
| HP Serial Port Adapter | Y | Y | PA716A | |
| HP ENERGY STAR Qualified Configuration | Y | N | | |
| HP Parallel Port Adapter Kit | N | Y | KD061AA | |
| HP Internal USB Port Kit | N | Y | EM165AA | |
| HP eSATA PCI Cable Kit | Y | Y | FH966AA | |

Software

| | Factory Configured | Option Kit | Support Notes |
|---------------------------------------|--------------------|------------|-----------------|
| HP Performance Advisor | Y | N | See Note 1 |
| HP Remote Graphics Software (RGS) 6.0 | Y | N | See Note 2 |
| PDF Complete - Corporate Edition | Y | N | |
| MS Office Home & Business 2013 | Y | N | |
| Cyberlink PowerDVD and Power2Go | Y | N | |
| HP PC Hardware Diagnostics UEFI | Y | N | Windows OS only |
| HP Client Security Software | Y | Y | |

NOTE 1: Supports, and preinstalled with, Windows 7 and Windows 8 only. Also available as a free download from <http://www.hp.com/go/performanceadvisor>

NOTE 2: Supported Operating Systems:

- [Windows 7 Professional](#)
- [Windows 8 Pro](#)
- [RHEL v5.2 - v6.3](#)
- [SLED 11 SP2](#)

Operating Systems

Support Notes

| | |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Genuine Windows® 7 Professional 32-bit | See http://www.microsoft.com/windows/windows-7/ for support details. |
| Genuine Windows® 7 Professional 64-bit | See http://www.microsoft.com/windows/windows-7/ for support details. |
| Windows 8.1 Pro 64-bit | |
| Windows 8.1 Simplified Chinese Edition 64-bit | |
| Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit | |
| Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit | |
| Windows 8.1 Pro Downgrade to Windows 7 Professional 32-bit (National Academic) | |
| Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit (National Academic) | |
| Windows 8.1 Standard 64-bit | |
| HP Linux Installer Kit | See http://h20331.www2.hp.com/hpsub/cache/537200- |

Supported Components

SUSE Linux Enterprise Desktop 11

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

Ubuntu Linux 14.04

[0-0-225-121.html](#)

See <http://www.suse.com/products/desktop/>

See <http://www.redhat.com/rhel/desktop/>

System Technical Specifications

| System Board | | | | | | | | | |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------|------------------------|---------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Board Form Factor | ATX 27.69 x 24.38 mm (10.9 x 9.6 inches) | | | | | | | | |
| Processor Socket | Single LGA-1150 | | | | | | | | |
| CPU Bus Speed | DMI | | | | | | | | |
| Chipset | Intel® PCH C226 | | | | | | | | |
| Memory Expansion Slots | 4 DDR3 memory slots | | | | | | | | |
| Memory Type Supported | DDR3, UDIMM (Unbuffered), ECC& non-ECC | | | | | | | | |
| Memory Modes | Non-Interleaved for single channel. Interleaved when both channels are populated. | | | | | | | | |
| Memory Speed Supported | 1600MT/s DDR3 | | | | | | | | |
| Memory Protection | ECC available on data | | | | | | | | |
| Maximum Memory | 32GB | | | | | | | | |
| Memory Configuration (Supported) | 4GB and 8GB non-ECC/ 2GB, 4GB and 8GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed on the same system. NOTE: Maximum memory capacities assume 64-bit operating systems, such as Genuine Windows® 7 Professional 64-Bit or Red Hat Linux 64-bit. 32-bit Windows Operating Systems support up to 4 GB. | | | | | | | | |
| PCI Express Connectors | <ul style="list-style-type: none"> • 1 PCI Express Gen3 slot x16 mechanical/ x16 electrical (full height, full length) • 1 PCI Express Gen2 slot x4 mechanical/ x1 electrical (full height) • 1 PCI Express Gen2 slot x16 mechanical/ x4 electrical (full height, full length) • 1 PCI Express Gen2 slot x1 mechanical/ x1 electrical (full height) <p>In the PCIe Gen3 (x16 electrical/x16 mechanical) slot, if it is not being used for a graphics card, only cards certified as After Market Options for this platform are supported.</p> | | | | | | | | |
| PCI Connectors (5.0V) | 1 PCI slot, full height, full length | | | | | | | | |
| Supported Drive Interfaces | <table border="1"> <tbody> <tr> <td>SATA</td> <td>Integrated (5) Serial ATA interfaces (6Gb/s SATA). One port can optionally be used for eSATA. RAID 0 and 1 supported. Factory integrated RAID is Microsoft Windows only. RAID 5 is supported by Software XOR.</td> </tr> <tr> <td>Serial Attached SCSI</td> <td>None</td> </tr> <tr> <td>Integrated RAID</td> <td>NOTE: Requires identical hard drives (speeds, capacity, interface)</td> </tr> <tr> <td>Integrated Graphics</td> <td> <p>Intel HD Graphics 4600 (on Core i5/i7-4xxx processors); Intel HD Graphics P4600 (on Intel Xeon E3-12x5v3 processors).</p> <p>Based on Unified Memory Architecture (UMA)- a region of system memory is reserved and dedicated to the graphics display.</p> <p>Support for Microsoft DirectX 11, OpenGL 4.0 and OpenCL 1.2 on Intel HD Graphics P4600; 1 DVI-I and 2 DP 1.2 graphics ports integrated in motherboard; Supports up to three simultaneous displays across DP & DVI-I outputs.</p> <p>Max. resolution supported on DVI- I ports: 1920x1200 @60Hz Max. resolution supported on DP 1.2 ports: 3840x2160 @60Hz</p> </td> </tr> </tbody> </table> | SATA | Integrated (5) Serial ATA interfaces (6Gb/s SATA). One port can optionally be used for eSATA. RAID 0 and 1 supported. Factory integrated RAID is Microsoft Windows only. RAID 5 is supported by Software XOR. | Serial Attached SCSI | None | Integrated RAID | NOTE: Requires identical hard drives (speeds, capacity, interface) | Integrated Graphics | <p>Intel HD Graphics 4600 (on Core i5/i7-4xxx processors); Intel HD Graphics P4600 (on Intel Xeon E3-12x5v3 processors).</p> <p>Based on Unified Memory Architecture (UMA)- a region of system memory is reserved and dedicated to the graphics display.</p> <p>Support for Microsoft DirectX 11, OpenGL 4.0 and OpenCL 1.2 on Intel HD Graphics P4600; 1 DVI-I and 2 DP 1.2 graphics ports integrated in motherboard; Supports up to three simultaneous displays across DP & DVI-I outputs.</p> <p>Max. resolution supported on DVI- I ports: 1920x1200 @60Hz Max. resolution supported on DP 1.2 ports: 3840x2160 @60Hz</p> |
| SATA | Integrated (5) Serial ATA interfaces (6Gb/s SATA). One port can optionally be used for eSATA. RAID 0 and 1 supported. Factory integrated RAID is Microsoft Windows only. RAID 5 is supported by Software XOR. | | | | | | | | |
| Serial Attached SCSI | None | | | | | | | | |
| Integrated RAID | NOTE: Requires identical hard drives (speeds, capacity, interface) | | | | | | | | |
| Integrated Graphics | <p>Intel HD Graphics 4600 (on Core i5/i7-4xxx processors); Intel HD Graphics P4600 (on Intel Xeon E3-12x5v3 processors).</p> <p>Based on Unified Memory Architecture (UMA)- a region of system memory is reserved and dedicated to the graphics display.</p> <p>Support for Microsoft DirectX 11, OpenGL 4.0 and OpenCL 1.2 on Intel HD Graphics P4600; 1 DVI-I and 2 DP 1.2 graphics ports integrated in motherboard; Supports up to three simultaneous displays across DP & DVI-I outputs.</p> <p>Max. resolution supported on DVI- I ports: 1920x1200 @60Hz Max. resolution supported on DP 1.2 ports: 3840x2160 @60Hz</p> | | | | | | | | |

System Technical Specifications

| | | |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Network Controller | Integrated Ethernet PHY Connection I217LM. Management capabilities: WOL, PXE 2.1 and AMT 9 |
| | External SATA (eSATA) | 1 port eSATA capable (SATA 5) with optional eSATA After-Market Option cable kit. |
| | IDE connector | No |
| | Floppy connector | No |
| | Serial | 1 internal header (requires optional Serial Port Adapter Kit) |
| | 2nd Serial | No |
| | Parallel | 1 internal header (optional Parallel Port Adapter required) |
| | HD Integrated Audio | Yes |
| | CD-ROM input (Audio) | No |
| | AUX input (Audio) | No |
| IEEE 1394 Connector(s) | Rear | 2 IEEE 1394b ports (requires optional PCIe 1394b card) |
| | Internal | No |
| USB Connector(s) | Front | 2 USB 3.0, 1 USB 2.0, 1 USB 2.0 Charging Data Port. |
| | Rear | 2 USB 3.0, 4 USB 2.0 |
| | Internal | 1 USB 3.0 and 3 USB 2.0 ports available as 2 separate 2x10(3.0 x1, 2.0 x1) and 2x5(2.0 x2) headers: supports 1 HP Internal USB Port Kits plus one USB 3.0 Media Card Reader. |
| HD Integrated Audio | Yes | |
| Flash ROM | Yes | |
| CPU Fan Header | Yes | |
| Chassis Fan Header | 1 Rear System Chassis Fan Header, 1 Optional Front Chassis Fan Header | |
| Front Control Panel/Speaker Header | Yes | |
| CMOS Battery Holder - Lithium | Yes | |
| Integrated Trusted Platform Module | Integrated TPM 1.2. The TPM module disabled where restricted by law, i.e. Russia. | |
| Power Supply Headers | Yes | |
| Power Switch, Power LED & Hard Drive LED Header | Yes | |
| Clear Password Jumper | Yes | |
| Keyboard/Mouse | USB or PS/2 | |
| | 400W Wide Ranging, Active PFC, 92% Efficient; (Note: 320W Standard Efficiency wide-ranging, active PFC Power Supply option available in some countries). The Z230 Tower 400W PSU Efficiency Report can be found at this link: http://www.plugloadsolutions.com/psu_reports/HEWLETT-PACKARD%20COMPANY_704427-001%20(DPS-400AB-19%20A)_400W_ECOS%203496_Report.pdf | |
| Operating Voltage Range | 90-269 VAC | |
| Rated Voltage Range | 100-240 VAC | |
| Rated Line Frequency | 50-60 Hz | |
| Operating Line Frequency Range | 47-66 Hz | |
| Rated Input Current | 6A @ 100-240V | |

System Technical Specifications

| | |
|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Heat Dissipation | Typical: 444 btu/hr (112 kcal/hr) Maximum: 1484 btu/hr (374 kcal/hr) |
| Power Supply Fan | 92mm x 92mm x 25mm 4-wire PWM |
| ENERGY STAR® qualified (Config Dependent) | Yes |
| CECP Compliant @ 220V | Yes |
| FEMP Standby Power Compliant | Yes, with Wake-on-LAN disabled: <2W in S5- Power Off |
| Built-in Self Test (BIST) LED | Yes |
| Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V) | Yes |
| Hood Lock Header | Yes |
| ErP Lot 6- Tier 1 Compliance @ 230V (<1W in S5- Power Off) | Yes |
| ErP Lot 6- Tier 2 Compliance @ 230V (<0.5W in S5- Power Off) | Yes |
| Declared Noise Emissions (Entry-level and High-end configurations) | |

System Configurations

| | | |
|---------------------------------|-----------------------------|---------------------------------------------------|
| Example Configuration #1 | TBD | |
| Example Configuration #2 | Processor Info | 1x Intel Xeon E3-1280v3 3.6 8MB 4C HT 84W GTO CPU |
| | Memory Info | 8GB (2x 4GB) 1600 MT/s DDR3 ECC |
| | Graphics Info | 1x NVIDIA Quadro K620 2GB Graphics |
| | Disks/Optical/Floppy | 2x SATA 2 TB 7.2k rpm/ 1xDVD-RW, 1x DVD-ROM |
| | PSU | 400W 92% |
| | OS /BIOS | -- |

| Energy Consumption (Watts) | 115 VAC | | 230 VAC | | 100 VAC | | |
|-----------------------------------|-------------------|--------------|-------------|--------------|-------------|--------------|------------|
| | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | |
| Windows Idle (S0) | 35.4 W | | 37.4 W | | 35.8 W | | |
| Windows Busy Typ (S0) | 128 W | | 129 W | | 130 W | | |
| Windows Busy Max (S0) | 153 W | | 152 W | | 154 W | | |
| Sleep (S3) | 1.67 W | 1.58 W | 1.86 W | 1.77 W | 1.65 W | 1.57 W | |
| Off (S5) | 0.92 W | 0.85 W | 1.11 W | 1.03 W | 0.91 W | 0.83 W | |
| Zero Power Mode (EuP) | 0.28 W | | 0.45 W | | 0.26 W | | |
| Heat Dissipation (Btu/hr) | 115 VAC | | 230 VAC | | 100 VAC | | |
| | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | |
| | Windows Idle (S0) | | 121 btu/hr | | 128 btu/hr | | 122 btu/hr |
| Windows Busy Typ (S0) | | 437 btu/hr | | 440 btu/hr | | 444 btu/hr | |

System Technical Specifications

| | | | | | | | |
|--|-----------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Windows Busy Max (S0) | 522 btu/hr | | 519 btu/hr | | 525 btu/hr | |
| | Sleep (S3) | 5.70 btu/hr | 5.39 btu/hr | 6.35 btu/hr | 6.04 btu/hr | 5.63 btu/hr | 5.36 btu/hr |
| | Off (S5) | 3.14 btu/hr | 2.90 btu/hr | 3.79 btu/hr | 3.51 btu/hr | 3.11 btu/hr | 2.83 btu/hr |
| | Zero Power Mode (EuP) | 0.96 btu/hr | | 1.54 btu/hr | | 0.89 btu/hr | |

| | | |
|---------------------------------|-----------------------------|---------------------------------------------------|
| Example Configuration #3 | Processor Info | 1x Intel Xeon E3-1280v3 3.6 8MB 4C HT 84W GTO CPU |
| | Memory Info | 32GB (4x 8GB) 1600 MT/s DDR3 ECC |
| | Graphics Info | 1x NVIDIA Quadro K2000 2GB Graphics |
| | Disks/Optical/Floppy | 3x SATA 2 TB 7.2k rpm/ 1xDVD-RW, 1x DVD-ROM |
| | PSU | 400W 92% |
| | OS /BIOS | -- |

| | | | | | | | | |
|-----------------------------------|--|-----------------------|--------------|-------------|--------------|-------------|--------------|--------|
| Energy Consumption (Watts) | | 115 VAC | | 230 VAC | | 100 VAC | | |
| | | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | |
| | | Windows Idle (S0) | 46.4 W | | 48.5 W | | 47.2 W | |
| | | Windows Busy Typ (S0) | 149 W | | 150 W | | 152 W | |
| | | Windows Busy Max (S0) | 181 W | | 180 W | | 183 W | |
| | | Sleep (S3) | 2.68 W | 2.57 W | 2.87 W | 2.77 W | 2.68 W | 2.57 W |
| | | Off (S5) | 0.92 W | 0.85 W | 1.11 W | 1.03 W | 0.91 W | 0.83 W |
| | | Zero Power Mode (EuP) | 0.28 W | | 0.45 W | | 0.26 W | |

| | | | | | | | | |
|----------------------------------|--|-----------------------|--------------|-------------|--------------|-------------|--------------|-------------|
| Heat Dissipation (Btu/hr) | | 115 VAC | | 230 VAC | | 100 VAC | | |
| | | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | |
| | | Windows Idle (S0) | 158 btu/hr | | 165 btu/hr | | 161 btu/hr | |
| | | Windows Busy Typ (S0) | 508 btu/hr | | 512 btu/hr | | 519 btu/hr | |
| | | Windows Busy Max (S0) | 618 btu/hr | | 614 btu/hr | | 624 btu/hr | |
| | | Sleep (S3) | 9.14 btu/hr | 8.77 btu/hr | 9.79 btu/hr | 9.45 btu/hr | 9.14 btu/hr | 8.77 btu/hr |
| | | Off (S5) | 3.14 btu/hr | 2.90 btu/hr | 3.79 btu/hr | 3.51 btu/hr | 3.11 btu/hr | 2.83 btu/hr |
| | | Zero Power Mode (EuP) | 0.96 btu/hr | | 1.54 btu/hr | | 0.89 btu/hr | |

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

| | | |
|-------------------------------------------|-----------------------|-------------------------------------------------------|
| System Configuration (Entry level) | Processor Info | Intel Core i3-4130 |
| | Memory Info | 4GB (2x2GB) 1600 MT/s |
| | Graphics Info | Integrated Intel HD Graphics 4400 |
| | Disks/Optical | 1x 500 GB 7200 RPM SATA HDD; DVD-RW SuperMulti ODD |

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

System Technical Specifications

| | | |
|----------------------------------------|-----------------------|------------------------------------------------------|
| System Configuration (High-end) | Processor Info | Intel Xeon E3-1280v3 3.6 GHz |
| | Memory Info | 16GB (4x4GB) DDR3 1600 MT/s |
| | Graphics Info | NVIDIA Quadro K600 graphics |
| | Disks/Optical | 2x 1.0TB 7200rpm SATA HDDs; DVD-RW SuperMulti ODD |

| Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296) | | Sound Power (LWAd, bels) | Deskside Sound Pressure (LpAm, decibels) |
|-------------------------------------------------------------------------------|------------------------------------------------|---------------------------------|-------------------------------------------------|
| | Idle | 3.4 | |
| | Hard drive Operating (random reads) | 3.5 | |
| | DVD-ROM Operating (sequential reads) | | |

| | | |
|-----------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environmental Requirements | Temperature | Operating: 40° to 95° F (5° to 35° C) Non-operating: -40° to 140° F (-40° to 60° C) |
| | Humidity | Operating: 8% to 85% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing |
| | Maximum Altitude | Operating: 3,000 m (10,000 ft) Non-operating: 9,100 m (30,000 ft) |
| | Dynamic (new) | Shock Operating: ½-sine: 40g, 2-3ms Non-operating: ½-sine: 160 cm/s, 2-3ms (~100g) square: 422 cm/s, 20g Vibration Operating random: 0.5g (rms), 5-300 Hz Non-operating random: 2.0g (rms), 10-500 Hz NOTES: Values represent individual shock events and do not indicate repetitive shock events. Values do not indicate continuous vibration. |
| | Cooling | Above 1524 m (5,000 ft) altitude, maximum operating temperature is de-rated by 1.8° F (1° C) per 305 m (1000 ft) elevation increase |

| Physical Security and Serviceability | |
|------------------------------------------------|-----------------------------------------------------------|
| Access Panel | Tool-less Includes system board and memory information |
| Optical Drive | Tool-less |
| Hard Drives | Tool-less |
| Expansion Cards | Tool-less |
| Processor Socket | Tool-less |
| Green User Touch Points | Yes, on tool-less internal chassis mechanisms |
| Color-coordinated Cables and Connectors | Yes |
| Memory | Tool-less |

System Technical Specifications

| | |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Board | Screw-In |
| Dual Color Power and HD LED on Front of Computer | Yes |
| Configuration Record SW | Yes |
| Over-Temp Warning on Screen | Yes |
| Restore CD/DVD Set | Consists of an operating system DVD (OSDVD) and a driver DVD (DRDVD). OSDVD restores the original operating system. DRDVD will provide all drivers for the system. The DRDVD may also contain applications that originally shipped with the system for optional installation. Applications can also be obtained from HP.com. OSDVD and DRDVD are orderable with the system and available from HP Support. |
| Dual Function Front Power Switch | Yes, causes a fail-safe power off when held for 4 seconds |
| Padlock Support | Yes (optional): Locks side cover and secures chassis from theft 0.22-in diameter padlock loop at rear of system |
| Cable Lock Support | Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3 mm x 7 mm slot at rear of system |
| Universal Chassis Clamp Lock Support | Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system |
| Solenoid Lock and Hood Sensor | Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed. |
| Rear Port Control Cover | Yes, locks rear IO cables to prevent cable theft |
| Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control | Yes, enables or disables serial, USB, audio, and network ports |
| Removable Media Write/Boot Control | Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media) |
| Power-On Password | Yes, prevents an unauthorized person from booting up the workstation |
| Setup Password | Yes, prevents an unauthorized person from changing the workstation configuration |
| 3.3V Aux Power LED on System PCA | Yes |
| NIC LEDs (integrated) (Green & Amber) | Yes |
| CPUs and Heatsinks | A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less |
| Power Supply Diagnostic LED | Yes |
| Front Power Button | Yes, ACPI multi-function |
| Front Power LED | Yes, blue (normal), red (fault) |
| Front Hard Drive Activity LED | Yes, green |
| Front ODD Activity LED | Yes |
| Internal Speaker | Yes |
| System/Emergency ROM Flash Recovery | Recovers corrupted system BIOS. |

System Technical Specifications

| | |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cooling Solutions | Air cooled forced convection |
| Power Supply Fans | 92mm x 92mm x 25mm 4-wire PWM (non-serviceable) |
| CPU Heatsink Fan | Mainstream (<=95W): 92 mm x 92 mm x 25 mm 4-wire PWM |
| Chassis Fan | 92mm x 92mm x 25mm 4-wire PWM (non-serviceable) |
| Memory Heatsink Fan | No |
| HP PC Hardware Diagnostics UEFI | HP PC Hardware Diagnostics (UEFI) enables hardware level testing outside the operating system on many components. The diagnostics can be invoked by pressing F2 at POST, and is available as a download from HP Support. |
| Access Panel Key Lock | No |
| ACPI-Ready Hardware | Advanced Configuration and Power Management Interface (ACPI). <ul style="list-style-type: none"> 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. |
| Integrated Chassis Handles | Rear Recessed Handle; optional Optical Bay Front Handle available. |
| Power Supply | Requires T15 Torx or flat blade screwdriver |
| PCI Card Retention | Yes, rear (all), middle (optional), front (full-length cards with extender) |
| Flash ROM | Yes |
| Diagnostic Power Switch LED on board | Yes |
| Clear Password Jumper | Yes |
| Clear CMOS Button | Yes |
| CMOS Battery Holder | Yes |
| DIMM Connectors | Yes |

| | |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BIOS | |
| BIOS 32-bit Services | Standard BIOS 32-bit Service Directory Proposal v0.4 |
| PCI 3.0 Support | Full BIOS support for PCI Express through industry standard interfaces. |
| ATAPI | ATAPI Removable Media Device BIOS Specification Version 1.0. |
| BBS | BIOS Boot Specification v1.01. Provides more control over how and from what devices the workstation will boot. |
| 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 Power On | Users can define a specific day-of-week 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 USB flash device in human readable file. Repsetup.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup). |
| SMBIOS | System Management BIOS 2.7.1, for system management information. |

System Technical Specifications

| | |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Boot Control | Disables the ability to boot from removable media on supported devices. |
| Memory Change Alert | Alerts management console if memory is removed or changed. |
| Thermal Alert | Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"> • 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. Updates can be performed before starting the OS. Updates can be periodically scheduled. |
| 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. |
| ASF 2.0 Compliant | No. |
| Instantly Available PC (Suspend to RAM - ACPI sleep state S3) | Allows for very low power consumption with quick resume time. |
| Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server) | Allows a new or existing system to boot over the network and download software, including the operating system. |
| ROM revision levels | Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information. |
| System board revision level | Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified. |
| Start-up Diagnostics (Power-on Self-Test) | Assesses system health at boot time with selectable levels of testing. |
| Auto Setup when new hardware installed | System automatically detects addition of new hardware. |
| Keyboard-less Operation | The system can be booted without a keyboard. |
| Localized ROM Setup | Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings. |
| Asset Tag | Enables the user or IT administrator to set a unique tag string in non-volatile memory. |
| Per-slot Control | Allows I/O slot parameters (option ROM enable/disable) to be configured individually. |
| Adaptive Cooling | Control parameters are set according to detected hardware configuration for optimal acoustics. |
| Pre-boot Diagnostics | (Pre-video) critical errors are reported via beeps and blinks on the power LED. |
| Intel® Active Management Technology (AMT) | AMT 9.0; Allows workstation status to be monitored on a remote console |
| Digitally and Cryptographically Signed | Helps to prevent the installation of unauthorized versions of a BIOS (a rogue BIOS) from a virus, malware, or other code that could lead to compromised system security, data access, physical service, |

System Technical Specifications

| | |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BIOS | or even system board replacement. |
| Master Boot Record Protection | A feature in the HP BIOS that prevents changes and/or infections to the Master Boot Record. Useful in protecting from viruses |
| Boot Block Emergency Recovery Mode (BIOS Recovery) | The HP BIOS offers a write-protected boot block ROM that provides recovery from a failed flashing of the computer BIOS. This special recovery mode prevents the system from becoming unusable or "bricked" when a BIOS update is interrupted. |
| Industry Standard Specification Support | |
| Industry Standard | Revision Supported by the BIOS |
| UEFI Specification Revision | UEFI 2.3.1 |
| ACPI | Advanced Configuration and Power Management Interface, Version 4.0 |
| ASF | Alert Standard Format Specification, Version 2.0 |
| 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 |
| 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 ATAII: Extensions to Serial ATA 1.0, Revision 1.0a - Serial ATAII Cables and Connectors Volume 2 Gold - SATA-IO SATA Revision 3.0 Specification |
| SPD | PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B |
| TPM | Trusted Computing Group TPM Specification Version 1.2 |
| USB | Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification |

Social and Environmental Responsibility

| | |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Eco-Label Certifications & Declarations | <p>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:</p> <ul style="list-style-type: none"> ENERGY STAR® (energy-saving features available on selected configurations-Windows only) US Federal Energy Management Program (FEMP) China Energy Conservation Program IT ECO declaration |
| Batteries | <p>The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal</p> <p>The battery in this product does not contain:</p> |

System Technical Specifications

| | |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <ul style="list-style-type: none"> Mercury greater than 5ppm by weight Cadmium greater than 10ppm by weight Lead greater than 40ppm by weight |
| Restricted Material Usage | <p>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</p> <p>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.</p> |
| Low Halogen Statement | <p>This product is low halogen except for power cords, cables and peripherals, as well as the following customer-configurable internal components: Creative Recon3D PCIe Audio Card is not Low Halogen. Service parts obtained after purchase may not be Low Halogen.</p> |
| End-of-Life Management and Recycling | <p>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.</p> |
| Hewlett-Packard Corporate Environmental Information | <p>For more information about HP's commitment to the environment: Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</p> <p>Eco-label certifications http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html</p> <p>ISO 14001 certificates: http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html</p> |
| Additional Information | <ul style="list-style-type: none"> This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC. Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043. This product is >90% recycle-able when properly disposed of at end of life EPEAT Gold registered in the U.S. EPEAT registration varies by country. See http://www.epeat.net for registration status by country. |
| Packaging | <p>HP Workstation product packaging meets the HP General Specification for the Environment at http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html</p> <ul style="list-style-type: none"> 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 | <p>Cushions made from fabricated recycled expanded-polyethylene (EPE) or recycled expanded-polypropylene (EPP). May also be made from recycled molded paper-pulp (MPP).</p> |
| External | <p>Carton made from corrugated fiberboard with at least 25% recycled content.</p> |

System Technical Specifications

| Manageability | |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Intel Active Management Technology (AMT) | <p>An advanced set of remote management features and functionality which provides network 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 8.0 includes the following advanced management functions:</p> <ul style="list-style-type: none"> • Power Management (on, off, reset) • Hardware Inventory (includes BIOS and firmware revisions) • Hardware Alerting • Agent Presence • System Defense Filters • SOL/IDER • Cisco NAC/SDN Support • ME Wake-on-LAN • 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 PC connects to the IT or service provider console for maintenance. Remote PCs can get required patches, be inventoried, etc by connecting to their IT console or Service Provider when it's convenient • 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 • Wireless AMT functionality on Desktop (WoDT) • Enhanced KVM resolution |
| Intel® vPro™ Technology | <p>The HP Z230 workstations support Intel vPro technology when purchased with a vPro technology capable CPU: Intel® Xeon® processor E3-1200v3 family or 4th Generation Intel Core i5/i7 processors with Intel VT and Intel TXT technology</p> |
| Remote Manageability Software Solutions | <p>Visit: http://www.hp.com/go/easydeploy</p> |
| System Software Manager | <p>Visit: http://www.hp.com/go/ssm</p> |
| Service, Support, and Warranty | <ul style="list-style-type: none"> • 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 |
| | <p>As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of hardware and software designed and tested to work with all HP Z Workstation platforms through their end of life. These components and their corresponding HP Workstation platform compatibility are outlined in this section. HP Stable & Consistent Offerings are available worldwide to all HP Workstation customers—no special programs,</p> |

System Technical Specifications

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|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 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. |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Technical Specifications - Processors

Intel® Xeon® processor E3-1281v3, Quad-Core, 8 MB cache, 3.7 GHz, up to 4.1 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1280v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1271v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1270v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1246v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1245v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1241v3, Quad-Core, 8 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1240v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1231v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1230v3, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1226v3, Quad-Core, 8 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology
Intel® Xeon® processor E3-1225v3, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology

Intel® Core™ i7-4790 processor, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology
Intel® Core™ i5-4690 processor, Quad-Core, 6 MB cache, 3.5 GHz, up to 3.9 GHz with Intel Turbo Boost Technology
Intel® Core™ i5-4590 processor, Quad-Core, 6 MB cache, 3.3 GHz, up to 3.7 GHz with Intel Turbo Boost Technology
Intel® Core™ i3-4350 processor, Dual-Core, 4 MB cache, 3.6 GHz
Intel® Core™ i3-4170 processor, Dual-Core, 3 MB cache, 3.7 GHz
Intel® Core™ i3-4160 processor, Dual-Core, 3 MB cache, 3.6 GHz
Intel® Core™ i3-4150 processor, Dual-Core, 3 MB cache, 3.5 GHz

Intel® Pentium® G3240 processor, Dual-Core, 3 MB cache, 3.1 GHz

Technical Specifications - Hard Drives

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 |
| | Physical Size 4 in; 10.17 cm |
| Interface | Serial ATA (6.0Gb/s), NCQ enabled |
| Synchronous Transfer Rate (Maximum) | Up to 600 MB/s |
| Buffer | 32MB |
| 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) |

Technical Specifications - Hard Drives

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

| | |
|------------------------------------------------------------------------------------|---------------------------------------|
| Capacity | 3.0TB |
| Height | 1 in; 2.54 cm |
| Width | Media Diameter 3.5 in; 8.9 cm |
| | Physical Size 4.0 in; 10.17 cm |
| Interface | Serial ATA (6.0Gb/s), NCQ enabled |
| Synchronous Transfer Rate (Maximum) | Up to 6.0 Gb/s |
| Buffer | 64MB |
| Seek Time (typical reads, includes controller overhead, including settling) | Single Track 0.6 ms |
| | Average 11 ms |
| | Full Stroke Not specified |
| Rotational Speed | 7200 rpm |
| Operating Temperature | 41° to 140° F (5° to 60° C) |

4TB SATA 7200 rpm 6Gb/s 3.5" HDD

| | |
|------------------------------------------------------------------------------------|--------------------------------------|
| 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) |
| Synchronous Transfer Rate (Maximum) | Up to 600MB/s |
| Buffer | 32MB |
| 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 | Up to 600MB/s |
| Synchronous Transfer Rate (Maximum) | 128MB |
| Buffer | 64MB |
| 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) |

Technical Specifications - Hard Drives

| | | |
|-----------------------------------------------------|--------------------------------------------|--------------------------------------|
| 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 | 7,200 rpm |
| | Operating Temperature | 32° to 140° F (0° to 60° C) |

HP Solid State Drives (SSDs) for Workstations

| | | |
|------------------------------------|--------------------------------------------|--------------------------------------|
| HP 128GB SATA 6Gb/s SSD | Capacity | 128GB |
| | Height | 0.28 in; 0.7 cm |
| | Width | Physical Size 2.5 in; 6.36 cm |
| | Interface | SATA 6Gb/s |
| | Synchronous Transfer Rate (Maximum) | Up to 500MB/s (Sequential Read) |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |

| | | |
|------------------------------------|--------------------------------------------|---------------------------------|
| HP 256GB SATA 6Gb/s SSD | Capacity | 256GB |
| | Height | 0.28 in; 0.7 cm |
| | Interface | SATA 6Gb/s |
| | Synchronous Transfer Rate (Maximum) | Up to 500MB/s (Sequential Read) |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |

| | | |
|-------------------------------------|--------------------------------------------|--------------------------------------|
| HP 500 GB SATA 6Gb/s SSD | Capacity | 500GB |
| | Height | 0.28 in; 0.7 cm |
| | Width | Physical Size 2.5 in; 6.36 cm |
| | Interface | 6Gb/s SATA |
| | Synchronous Transfer Rate (Maximum) | Up to 500MB/s (Sequential Read) |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |

| | | |
|------------------------------|--------------------------------------------|--------------------------------------|
| HP 1TB SATA 6Gb/s SSD | Capacity | 1TB |
| | Height | 0.28 in; 0.7 cm |
| | Width | Physical Size 2.5 in; 6.36 cm |
| | Interface | 6Gb/s SATA |
| | Synchronous Transfer Rate (Maximum) | Up to 500MB/s (Sequential Read) |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |

| | | |
|------------------------------------------|-----------------|--------------------------------------|
| Intel Pro 1500 180GB SATA SSD | Capacity | 180GB |
| | Width | Physical Size 2.5 in; 6.36 cm |

Technical Specifications - Hard Drives

| | | | |
|--|------------------------------------------|--------------------------------------------|--------------------------------------|
| | | Interface | 6Gb/s SATA |
| | | Synchronous Transfer Rate (Maximum) | 600 Mb/s |
| | | Operating Temperature | 32° to 158° F (0° to 70° C) |
| | Samsung Enterprise 240GB SATA SSD | Capacity | 240GB |
| | | Width | Physical Size 2.5 in; 6.36 cm |
| | | Interface | SATA 6Gb/s |
| | | Synchronous Transfer Rate (Maximum) | Up to 600MB/s |
| | Samsung Enterprise 480GB SATA SSD | Capacity | 480GB |
| | | Width | Physical Size 2.5 in; 6.36 cm |
| | | Interface | SATA 6Gb/s |
| | | Synchronous Transfer Rate (Maximum) | Up to 600MB/s |

| | | | |
|---------------------------------|-----------------------------------|------------------|--------------------------------------|
| Intelligent Disk Caching | 64GB SSD Disk Cache Module | Capacity | 64GB |
| | | Height | 0.28 in; 0.7 cm |
| | | Width | Physical Size 2.5 in; 6.36 cm |
| | | Interface | SATA 6Gb/s |

| | | | |
|--------------------------------------|-----------------------------------|------------------------------|-------------------------------------------|
| PCIe SSDs for HP Workstations | HP Z Turbo Drive 256GB SSD | Capacity | 256GB |
| | | Interface | PCI Express 2.0 x4 electrical x4 physical |
| | | Operating Temperature | 32° to 158° F (0° to 70° C) |
| | HP Z Turbo Drive 512GB SSD | Capacity | 512GB |
| | | Interface | PCI Express 2.0 x4 electrical x4 physical |
| | | Operating Temperature | 32° to 158° F (0° to 70° C) |

Technical Specifications - Graphics

| | | |
|----------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Intel HD Graphics (Z230/Z1G2) Integrated Intel HD Graphics (Z230/Z1G2) | Form Factor | Integrated in select Intel Xeon E3, Intel Core i7, and Intel Core i5 processors. |
| | | Check specific platform specifications for selections. |
| | Graphics Controller | Intel HD Graphics |
| | Memory | Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 64 MB to 512 MB via BIOS setting. Default size is 64 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel DVMT 5.0), to provide an optimal balance between graphics and system memory use. |
| | Connectors | Check system platform specifications where Intel HD Graphics are available. |
| | Maximum Resolution | Display Port: 2560 x 1600 DVI: 1920x1200 VGA: 2048x1536 Note: For DVI and VGA outputs, separate adapters may be required. |
| | Shading Architecture | Shader Model 5.0 |
| | Supported Graphics APIs | OpenGL 4.0 DirectX 11.1 |
| | Available Graphics Drivers | Windows 7 Windows 8.1 |
| | Form Factor | Integrated in select Intel Xeon E3, Intel Core i7, and Intel Core i5 processors. Check specific platform specifications for selections. |
| | Graphics Controller | Intel HD Graphics |
| | Memory | Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 64 MB to 512 MB via BIOS setting. Default size is 64 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel DVMT 5.0), to provide an optimal balance between graphics and system memory use. |
| | Connectors | Check system platform specifications where Intel HD Graphics are available. |
| | Maximum Resolution | Display Port: 2560 x 1600 |

Technical Specifications - Graphics

DVI: 1920x1200
VGA: 2048x1536

Note: For DVI and VGA outputs, separate adapters may be required.

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.0
DirectX 11.1

Available Graphics Drivers Windows 7
Windows 8.1

NVIDIA NVS 310 512MB Graphics

Form Factor Low Profile:
2.713 inches in height × 6.150 inches in length

Graphics Controller NVIDIA NVS 310

Bus Type PCI Express x16, 2.0 compliant

Memory Size: 512MB DDR3
Clock: 875Mhz
Memory Bandwidth: 14GB/s

Connectors 2 × DisplayPort 1.2

Maximum Resolution Up to 2560 × 1600 (digital display) per display.

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 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

Technical Specifications - Graphics

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 | 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>

| | |
|--------------------------|-------------------------------------------------------------------|
| Power Consumption | 19.5 Watts |
| Note | The thermal solution used on this card is an active fan heatsink. |

NVIDIA NVS 315 1GB Graphics (for HP Workstations)

| | |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Form Factor | Low Profile: 2.713 inches in height × 5.7 inches in length |
| 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:

Technical Specifications - Graphics

| | |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum Resolution | <ul style="list-style-type: none">- For CTO: DMS-59 to DVI cable- For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable Maximum number of displays supported: 2 Maximum Resolution Support: <ul style="list-style-type: none">- 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: <ul style="list-style-type: none">- 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 in the following configurations: DisplayPort output: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor VGA display output: <ul style="list-style-type: none">• Drives two analog display at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor. |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | DX11, OpenGL 4.3 |
| Available Graphics Drivers | Microsoft 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) |

Technical Specifications - Graphics

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 Graphics Controller

Low Profile, 2.713 inches × 6.3 inches, single slot

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)

Technical Specifications - Graphics

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)

Power Consumption Note

HP qualified drivers may be preloaded or available from the HP support Web site:
<http://welcome.hp.com/country/us/en/support.html>
33.4 Watts
Heatsink cooler design is active.

Graphics Cable Adapters Notes

Graphics Cable Adapter option choice is available starting Feb 1 2013 for the following graphics cards:
NVS 310, Quadro 410, Qaudro 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 410 512MB Graphics

Form Factor

Low Profile:
2.713 inches × 5.7 inches, single slot

Graphics Controller

NVIDIA Quadro 410

Bus Type

PCI Express x16, 3.0 compliant

Memory

Size: 512MB DDR3
Clock: 900MHz
Memory Bandwidth: 14GB/s

Connectors

One dual-link DVI-I connector
One DisplayPort connector

Maximum Resolution

Up to 2560 × 1600 (digital display) per display.

RAMDAC

400 MHz integrated RAMDAC

Display Output

Maximum resolution over DisplayPort: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Maximum resolution over DVI port: 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

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

Technical Specifications - Graphics

| | |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | DX11, OpenGL 4.2 |
| 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) 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>

NVIDIA Quadro K420 1GB Graphics

| | |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Form Factor | Low Profile, single slot Dimensions: 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: 1GB 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) |

Technical Specifications - Graphics

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

Dimensions: 2.713" H x 6.3" L
 Single Slot, Low Profile
 Cooling: Active
 Weight: 133 grams

Graphics Controller

NVIDIA Quadro K620
 GPU: GM107 GPU with 384 CUDA cores
 Power: 45 Watts

Bus Type

PCI Express 2.0 x16

Memory

Size: 2GB GDDR3
 Memory Bandwidth: 29 GB/s
 Memory Width: 128-bit

Connectors

1 DL-DVI(I)
 1 DisplayPort

Factory Configured: No video cable adapter included

Technical Specifications - Graphics

After market option kit: One DP-to-DVI adapter included with card

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

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

Image Quality Features

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

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 4096x2160

Maximum number of monitors across all available Quadro K620 outputs is 4.

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

OpenGL 4.4
DirectX 11

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

Technical Specifications - Graphics

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 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.
3. Full Height Profile bracket installed. Low Profile bracket included in after market kit.

AMD FirePro W5100 4GB Graphics

Form Factor

Dimensions: 2.713" H x 6.3" L
Single Slot, Low Profile
Cooling: Active
Weight: 133 grams

Graphics Controller

AMD FirePro W5100 graphics
GPU Frequency: 930Mhz
GPU: 768 Stream Processors organized into 12 Compute Units
Power: <75 Watts
Cooling: Active

Bus Type

PCI Express® x16, Generation 3.0

Memory

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

Connectors

4x Display Port 1.2 connectors with HBR2 and MST support.

Factory Configured: No video cable adapter included
After market option kit: No video cable adapter included

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

Maximum Resolution

DisplayPort:
- 4096x2160 @24bpp 60Hz

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

Single Link DVI:
- 1920x1200 (requires DP to DVI adapter)

VGA:
- 1920x1200 (requires DP to VGA adapter)

Image Quality Features

Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.

Technical Specifications - Graphics

| | |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | High bandwidth scaler for high quality up and downscaling |
| Display Output | <p>Max number of monitors supported using DisplayPort 1.2a:</p> <ul style="list-style-type: none"> - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors <p>Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2):</p> <ul style="list-style-type: none"> - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | <p>OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle</p> |
| Available Graphics Drivers | <p>Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> |
| Notes | <ol style="list-style-type: none"> 1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details. 2. Configurations of two FirePro W5100 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA). |

| | | |
|---------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------|
| NVIDIA Quadro K2000 2GB Graphics | Form Factor | 4.38" H x 7.97" L Single Slot, Full Height |
| | Graphics Controller | NVIDIA Quadro K2000 Graphics Card Kepler GK107 GPU 384 CUDA cores Max Power: 51.1 Watts |
| | Bus Type | PCI Express 2.0 x16 |
| | Memory | 2 GB GDDR5, 2000 Mhz 128-bit memory I/O path 64 GB/s memory bandwidth |
| | Connectors | 1 DL-DVI(I) output, 2 DisplayPort outputs |

Technical Specifications - Graphics

| | |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <p>CTO: No video cable adapter included AMO: One DP-to-DVI adapter included with card</p> |
| | <p>Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories</p> |
| Maximum Resolution | <p>DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)</p> |
| Image Quality Features | <p>DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz</p> <ul style="list-style-type: none"> • 10-bit internal display processing pipeline • 10-bit scan-out support |
| Display Output | <p>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</p> <p>DL-DVI(I): - Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</p> <p>SL-DVI(I): - Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</p> <p>DisplayPort: - Supports HBR2 and MST - Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2000 DisplayPort connector at this resolution) - Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2000 DisplayPort connector: 4 with maximum resolution of 1920 x 1200</p> <p>Maximum number of monitors across all available Quadro K2000 outputs is 4.</p> |
| Shading Architecture | Full Microsoft DirectX 11 Shader Model 5 |
| Supported Graphics APIs | <p>OpenGL 4.3 DirectX 11 API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p> |
| Available Graphics Drivers | <p>Windows 8 Pro 64-bit Windows 8 (China) 64-bit Genuine Windows 7 Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux (RHEL) 5 Desktop/Workstation (64-bit) Red Hat Enterprise Linux(RHEL) 6 Desktop/Workstation SUSE Linux Enterprise Desktop 11 (64-bit)</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> |

Technical Specifications - Graphics

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

Notes

1. Quadro K2000 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K2000 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.

NVIDIA Quadro K2200 4GB Graphics

Form Factor

Dimensions: 4.376" H x 7.97" L
 Single Slot, Full Height
 Cooling: Active
 Weight: 240 grams

Graphics Controller

NVIDIA Quadro K2200 Graphics Card
 GPU: GM107 with 640 CUDA cores
 Power: 68 Watts

Bus Type

PCI Express 2.0 x16

Memory

Size: 4GB GDDR5
 Memory Bandwidth: 80 GB/s
 Memory Width: 128-bit

Connectors

1 DL-DVI(I)
 2 DisplayPort 1.2a

Factory Configured Option: No video cable adapter included
 Option Kit: One DP-to-DVI adapter included with card

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

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

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

Image Quality Features

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

Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo

Technical Specifications - Graphics

| | |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display Output | Maximum number of displays |
| | - 3 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors |
| | Maximum number of DisplayPort displays possible (may require MST and/or HBR2): - 4 1920x1200 - 4 2560x1600 - 2 4096x2160 |
| | Maximum number of monitors across all available Quadro K2200 outputs is 4. |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | OpenGL 4.4 DirectX 11.1 |
| | API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran |
| Available Graphics Drivers | Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions |
| | HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |
| Notes | <ol style="list-style-type: none"> 1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. 3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2). |

| | | |
|---------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMD FirePro W7000 4GB Graphics | Form Factor | Full height, full length, single slot |
| | Graphics Controller | AMD FirePro™ W7000 Professional Graphics Max Power: <150 Watts |
| | Bus Type | PCI Express™ x16, Generation 3.0 |
| | Memory | 4GB GDDR5, 153.6 GB/s bandwidth, ECC support |
| | Connectors | 4 x DisplayPort with HBR2 and MST support. No video adapters included. |
| | 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 |
| Display Output | <p>Max number of monitors supported using DisplayPort: 6</p> <p>Monitor chaining from a single DisplayPort options(subject to a max of 6 total monitors across all outputs, requires use of DisplayPort Monitors supporting MST or the use of DisplayPort hubs)</p> <ul style="list-style-type: none"> • 1 4096x2169 display • 2 2560x1600 displays • 4 1920x1200 displays |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | OpenGL® 4.2 with OpenGL Shading Language OpenCL 1.1 Microsoft® DirectX® 11.1 |
| Available Graphics Drivers | Windows 7 Professional (64-bit and 32-bit) Windows 8 (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) |
| Note | <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> <p>AMD Eyefinity technology can support multiple displays using a single enabled AMD FirePro™ professional graphics card; the number of supported displays varies by card model. Microsoft® Windows® 7, Windows Vista®, or Linux® is required in order to support more than 2 displays. Depending on the card model, native DisplayPort™ connectors and/or certified DisplayPort™ active or passive adapters to convert your monitor's native input to your card's DisplayPort™ or Mini-DisplayPort™ connector(s) may be required. See http://www.amd.com/firepro for details.</p> |

| | | |
|---------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 | <p>4x Display Port 1.2a connectors with HBR2 and MST support.</p> <p>Factory Configured: No video cable adapter included After market option kit: No video cable adapter included</p> <p>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are</p> |

Technical Specifications - Graphics

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 |

- Note**
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

Technical Specifications - Graphics

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.

| | | |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NVIDIA Quadro K4200 4GB Graphics | Form Factor Graphics Controller Bus Type Memory Connectors | <p>Dimensions: 4.376" H x 9.5" L</p> <p>Single Slot, Full Height</p> <p>Cooling: Active</p> <p>Weight: 461 grams (without extender)</p> <p>1 DL-DVI(I) 2 DisplayPort 1.2a</p> <p>Factory Configured Option: No video cable adapter included After market option kit: One DP-to-DVI adapter included with card</p> <p>Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories</p> |
| | Maximum Resolution | <p>DisplayPort:</p> <ul style="list-style-type: none"> - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) <p>DL-DVI(I) output:</p> <ul style="list-style-type: none"> - up to 2560 x 1600 x 32 bpp @ 60Hz <p>Single Link-DVI(I) output:</p> <ul style="list-style-type: none"> - up to 1920 x 1200 x 32 bpp @ 60Hz <p>VGA (via adapter cable):</p> <ul style="list-style-type: none"> - 2048 x 1536 x 32 bpp at 85 Hz |
| | Image Quality Features | <p>10-bit internal display processing (hardware support for 10-bit scanout for both windowed desktop and full screen, only available on Windows with Aero disabled and Linux)</p> <p>NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support</p> <p>Full OpenGL quad buffered stereo support</p> <p>Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies</p> |
| | Display Output | <p>Maximum number of displays</p> <ul style="list-style-type: none"> - 3 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors <p>Maximum number of DisplayPort displays possible (may require MST and/or HBR2):</p> |

Technical Specifications - Graphics

- 4 1920x1200
- 4 2560x1600
- 2 3840x2160

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

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.4
DirectX 11.1

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

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

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

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

Notes

1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K4200 offered as After Market Kits includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).
4. For HP Z440 Workstation applications, the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA), is required.

Technical Specifications - Multimedia and Audio Devices

**HP Thin USB Powered
Speakers**

Frequency Response F0 to 20kHz
(-3dB, 24-bit/96kHz input)

Dimensions (H x W x D) Speakers: 14.52 x 9.50 x 2.45 cm (5.72 x 3.74 x 0.96 in) per speaker

Technical Specifications - Optical and Removable Storage

| | | | |
|-------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| HP Slim DVD-ROM Drive | Description | 12.7mm high, tray-load | |
| | Mounting Orientation | Either horizontal or vertical | |
| | Interface Type | SATA/ATAPI | |
| | Dimensions (WxHxD) | 128 x 14 x 128mm | |
| | 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 (seek) |
| | | Full Stroke CD | <220 ms (seek) |
| | 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 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, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system. | |

| | | |
|--------------------------------------------|-----------------------------|-------------------------------|
| HP Slim SuperMulti DVDRW SATA Drive | Description | 12.7mm high, tray-load |
| | Mounting Orientation | Either horizontal or vertical |
| | Interface Type | SATA/ATAPI |
| | Dimensions (WxHxD) | 128 x 14 x 128mm |
| | Disc Formats | DVD-RAM |
| | | DVD+R |
| | | DVD+RW |
| | | DVD+R DL |
| | | DVD-R DL |
| | | DVD-R |
| DVD-RW | | |
| Disc Capacity | DVD-ROM | 8.5 GB DL or 4.7 GB standard |
| | Full Stroke DVD | < 230 ms (seek) |
| | Full Stroke CD | < 220ms (seek) |
| Maximum Data Transfer | CD ROM Read | CD-ROM, CD-R Up to 24X |

Technical Specifications - Optical and Removable Storage

| | | |
|-------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rates | | 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 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 |
| | Kit Contents | No driver is required for this device. Native support is provided by the operating system. HP SATA SuperMulti DVD Writer drive, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, installation guide, and DVD+R media. |
| | Approvals | © Copyright 2015 Hewlett-Packard Development Company, L.P. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein. The information contained herein is subject to change without notice. |

| | | |
|-------------------------------|-----------------------------|------------------------|
| HP Slim Blu-ray Writer | Description | HP Slim Blu-ray Writer |
| | Mounting Orientation | Horizontal |
| | Interface Type | SATA |
| | Dimensions (WxHxD) | 128 x 14 x 128mm |
| | Disc Formats | BD-ROM BD-R |

Technical Specifications - Optical and Removable Storage

| | | | |
|------------------------------------|-------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | BD-RE | |
| | | DVD-RAM | |
| | | DVD+R | |
| | | DVD+RW | |
| | | DVD+R DL | |
| | | DVD-R DL | |
| | | DVD-R | |
| | | DVD-RW | |
| | | CD-R | |
| | | CD-RW | |
| Disc Capacity | DVD-ROM | | 8.5 GB DL or 4.7 GB standard |
| | CD-ROM | | 650MB CD-ROM (Read Only) 800/700/650MB CD-Recordable (Read & Write) 700/650MB CD-Rewritable (Read & Write) 700/650MB High Speed CD-Rewritable (Read & Write) 700/650MB Ultra & Ultra+ Speed CD-Rewritable (Read & Write) |
| Access Times | Blu-ray | | 50 GB DL or 25 GB standard |
| | Full Stroke DVD | | < 200ms (seek) |
| | Full Stroke CD | | < 200ms (seek) |
| | Blu-ray | | < 230ms (seek) |
| | 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 | Up to 24X |
| | | CD-R | Up to 24X |
| | | CD-RW | Up to 24X |
| | DVD ROM Read | DVD-RAM | Up to 8X |
| | | DVD+RW | UUp 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 |

Technical Specifications - Optical and Removable Storage

| | | | | |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--|
| | | BD-R | Up to 6X | |
| | | BD-RE SL/DL | Up to 6X | |
| | | BD-RE TL | 4.8x | |
| Power | Source | SATA DC power receptacle | | |
| | DC Power Requirements | 5 VDC \pm 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 | 15% to 80% | | |
| | Maximum Wet Bulb Temperature | 84° F (29° C) | | |
| | Operating Systems Supported | 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 | HP Blue Laser RW Drive, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, installation guide. | | |
| Disclaimer | 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 DVD-ROM Drive | Description | 5.25-inch, half-height, tray-load | | |
| | Mounting Orientation | Either horizontal or vertical | | |
| | Interface Type | SATA/ATAPI | | |
| | Dimensions (WxHxD) | 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in) | | |
| | Disc Capacity | DVD-ROM | Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB | |
| | Access Times | DVD-ROM Single Layer | < 140 ms (typical) | |
| | | CD-ROM Mode 1 | < 125 ms (typical) | |
| | | Full Stroke DVD | < 250 ms (seek) | |
| | | Full Stroke CD | < 210 ms (seek) | |
| | Power | Source | SATA DC power receptacle | |
| | | DC Power Requirements | 5 VDC \pm 5%-100 mV ripple p-p 12 VDC \pm 5%-200 mV ripple p-p | |
| | | DC Current | 5 VDC - <1000 mA typical, < 1600 mA maximum 12 VDC - < 600 mA typical, < 1400 mA maximum | |
| | Operating Environmental (all conditions non- | Temperature | 41° to 122° F (5° to 50° C) | |
| Relative Humidity | | 10% to 90% | | |

Technical Specifications - Optical and Removable Storage

| | | |
|-------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| condensing) | Maximum Wet Bulb Temperature | 86° F (30° C) |
| | Operating Systems Supported | 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, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system. |

| | | | | |
|--------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------|------------------------------|--|
| HP DVD+/-RW Drive | Description | 5.25-inch, half-height, tray-load | | |
| | Mounting Orientation | Either horizontal or vertical | | |
| | Interface Type | SATA/ATAPI | | |
| | Dimensions (WxHxD) | 15.0 x 4.4 x 20.3 cm (5.9 x 1.7 x 8.0 in) | | |
| | Disc Formats | DVD-RAM | | |
| | | DVD+R | | |
| | | DVD+RW | | |
| | | DVD+R DL | | |
| | | DVD-R DL | | |
| | | DVD-R | | |
| | | DVD-RW | | |
| | Disc Capacity | DVD-ROM | 8.5 GB DL or 4.7 GB standard | |
| | | Full Stroke DVD | < 250 ms (seek) | |
| | | Full Stroke CD | < 210 ms (seek) | |
| Maximum Data Transfer Rates | CD ROM Read | CD-ROM, CD-R Up to 40X CD-RW Up to 32X | | |
| | DVD ROM Read | DVD-RAM | Up to 12X | |
| | | 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 16X | |
| | | DVD-ROM DL | Up to 8X | |
| | | DVD+R | Up to 16X | |
| | | DVD-R | Up to 16X | |
| Power | | Source | SATA DC power receptacle | |
| | DC Power Requirements | 5 VDC ± 5%-100 mV ripple p-p | | |
| | | 12 VDC ± 5%-200 mV ripple p-p | | |
| DC Current | 5 VDC -1000 mA typical, 1600 mA maximum 12 VDC -600 mA typical, 1400 mA maximum | | | |
| Operating Environmental (all conditions non- | Temperature | 41° to 122° F (5° to 50° C) | | |
| | Relative Humidity | 10% to 90% | | |

Technical Specifications - Optical and Removable Storage

| | | |
|-------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| condensing) | Maximum Wet Bulb Temperature | 86° F (30° C) |
| | Operating Systems Supported | 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 |
| | Kit Contents | No driver is required for this device. Native support is provided by the operating system. HP SATA SuperMulti DVD Writer Drive, Roxio Easy Media Creator software, Intervideo WinDVD Software, installation guide, and DVD+R media. |

| | | |
|-------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HP 14-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) |
| | 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) Memory Stick Memory Stick Select Memory Stick Duo (MS Duo) Memory Stick PRO (MS PRO) Memory Stick PRO Duo (MS PRO Duo) Memory Stick PRO-HG Duo MagicGate Memory Stick (MG) MagicGate Memory Stick Duo Note: 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) |
| | Operating Environmental (all conditions non-condensing) | 10°C 10% R.H. ≥ 24 hours 10°C 90% R.H. ≥ 24 hours 20°C 90% R.H. ≥ 24 hours 30°C 90% R.H. ≥ 24 hours 40°C 90% R.H. ≥ 24 hours |

Technical Specifications - Optical and Removable Storage

50°C 90% R.H. ≥ 24 hours
50°C 10% R.H. ≥ 24 hours

Extremes:
140°F (60°C) @ 80% R.H. for 96 hours
-22°F (-30°C) @ 20% R.H. for 48 hours
No power applied
Delta °C < 1.0°C/min
Delta % R.H. < 1.5% R.H./min

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

Operating Systems Supported

Windows 8 Pro (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.

Note: 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>.

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

Kit Contents

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

Approvals

USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only

Technical Specifications - Controller Cards

| | | | |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| HP IEEE 1394b FireWire PCIe Card | Data Transfer Rate | Supports up to 800 Mb/s | |
| | Devices Supported | IEEE-1394 compliant devices | |
| | Bus Type | PCIe card full height PCIe slots | |
| | Ports | Two IEEE-1394b external 9-Pin connectors (Rear) | |
| | Internal Connectors | One 10-Pin header connector | |
| | System Requirements | Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit, SLED 11 and RHEL 6. Intel i5 series or higher processor, min 2GB of RAM, 20GB Hard Drive, CD-ROM drive, built in sound system, Available PCIe slot. | |
| | Temperature - Operating | 50° to 131° F (10° to 55° C) | |
| | Temperature - Storage | -22° to 140° F (-30° to 60° C) | |
| | Relative Humidity - Operating | 20% to 80% | |
| | Compliances | FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC | |
| | Operating Systems Supported | Windows 8.1 64-bit, Windows 7 Professional 32-bit and 64-bit | |
| | HP Thunderbolt-2 PCIe 1-port I/O Card | Data Transfer Rate | Supports up to 20 Gb/s (20,000 Mb/s) |
| | | Devices Supported | Thunderbolt™ certified devices |
| Bus Type | | PCIe card, full or half height PCIe slots | |
| Ports | | One Thunderbolt™ 2 external 20-Pin output connectors (Rear) One full size DisplayPort input connector (Rear) | |
| Internal Connectors | | One 5-Pin header connector | |
| System Requirements | | Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 4-GB RAM, 20-GB Hard Drive, available PCIe slot. | |
| Temperature - Operating | | 50° to 131° F (10° to 55° C) | |
| Temperature - Storage | | -22° to 140° F (-30° to 60° C) | |
| Relative Humidity - Operating | | 20% to 80% | |
| Compliances | | FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC | |
| Operating Systems Supported | | Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit. | |
| Kit Contents | | HP Thunderbolt™ 2 PCIe 1-port I/O Card, full height and half height bulkhead bracket, DisplayPort cable, GPIO (General-Purpose Input/Output) cables(2), Installation documentation and warranty 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) | | |

Technical Specifications - Controller Cards

| | |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 bulkhead bracket, DisplayPort cable, GPIO (General-Purpose Input/Output) cables(2), Installation documentation and warranty card. |

Technical Specifications - Networking and Communications

| | | |
|------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Intel I217LM PCIe GbE Controller (Intel vPro with Intel AMT 9.0) | Connector | RJ-45 |
| | Controller | Intel I217LM GbE platform LAN connect networking controller |
| | Memory | 3 KB Tx and 3KB Rx FIFO packet buffer memory |
| | Data Rates Supported | 10/100/1000 Mbps |
| | Compliance | 802.1as/1588, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3z |
| | Bus Architecture | PCI Express 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 (integrated regulators for core Vdc) |
| | 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 | vPro, WOL, auto MDI crossover, PXE, iSCSI Boot, Multi-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 9.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD) |

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

| | | |
|-------------------------------------|-------------------------------|---------------------------------------------------------------|
| HP 10GbE SFP+ SR Transceiver | Operating Temperature | 0°C to 45°C (32°F to 113°F) |
| | Operating Humidity | 0% to 85%, noncondensing |
| | Dimensions (H x W x D) | 0.47(h) x 0.54(w) x 2.19(d) inches (1.19 x 1.38 x 5.57 cm) |

Summary of Changes

| Date of change: | Version History: | | Description of change: |
|------------------|------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | From v1 to v2 | | |
| June 1 | v17 to v18 | Added | IdNumber |
| Sept 4 | From v18 to v19 | Added | New and updated components, drives, GPU cards, and networking |
| November 1, 2014 | From v19 to v20 | Added | NVIDIA Quadro K620 2GB Graphics, NVIDIA Quadro K2200 4GB Graphics, HP 15-in-1 Media Card Reader, Ubuntu Linux 14.04 |
| | | Removed | Intel® Xeon® processor E3-1270v3, Intel® Xeon® processor E3-1230v3, Intel® Core™ i7-4771 processor, Intel® Core™ i3-4330 processor, Intel® Pentium® G3220 processor, NVIDIA Quadro 410 512MB Graphics, HP 14-in-1 Media Card Reader, Genuine Windows® 7 Ultimate 64-bit, Genuine Windows® 7 Home Premium 32-bit, Genuine Windows® 7 Home Premium 64-bit |
| December 1, 2014 | From v20 to v21 | Removed | NVIDIA Quadro K4200 4GB Graphics |
| January 1, 2014 | From v21 to v22 | Removed | Core i7, i5 and Intel Pentium Processors, 250, 500 and 1TB SATA 10k rpm HDDs |
| February 1, 2015 | From v22 to v23 | Added | Overview Operative Systems, Supported components, Graphics: AMD FirePro W5100 4GB Graphics, AMD FirePro W7100 8GB Graphics, NVIDIA Quadro K4200 4GB Graphics |
| April 1, 2015 | From v23 to v24 | Added | Operative Systems in Overview and Supported Components. 4TB SATA HDD |
| | | Changed | Memory Speed nomenclature throughout the document. 500GB SATA SED SFF HDD |
| May 1, 2015 | From v24 to v25 | Removed | HP 256GB SATA 6Gb/s SED Opal 1 SSD and NVIDIA Quadro K4000 3GB Graphics |
| June 1, 2015 | From v25 to v26 | Added | Intel® Core™ i3-4170 processor, 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), 3Dconnexion CADMouse |
| | | Removed | AMD FirePro V3900 1GB Graphics, NVIDIA Quadro K600 1GB Graphics, Removed 256GB SED Opal 1 SSD |
| August 1, 2015 | From v26 to v27 | Added | Windows 10 support from OS Overview |
| | | Changed | Preinstalled and supported from Overview OS |
| November 1, 2015 | From v27 to v28 | Changed | AMD FirePro W5100 4GB Graphics full specs |

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