

### Overview

#### HP Z440 Workstation



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

### Overview



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

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| <b>Form Factor</b>          | Minitower                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Operating Systems</b>    | <p>Preinstalled:</p> <ul style="list-style-type: none"> <li>• Microsoft Windows 8.1 Pro 64-bit*</li> <li>• Windows 8.1 Pro 64 downgrade to Windows 7 Professional 64-bit</li> <li>• Microsoft Windows 8.1 64-bit*</li> <li>• Microsoft Windows 8.1 Emerging Market</li> <li>• Microsoft Windows 7 Professional 64-bit</li> <li>• Ubuntu 14.04</li> <li>• HP Installer Kit for Linux (includes drivers for 64-bit OS versions of RHEL 6.6, RHEL 7, SUSE Linux Enterprise Desktop 11, Ubuntu 14.04)</li> <li>• Red Hat® Enterprise Linux Desktop (Paper license with 1 year support; no preinstalled OS)</li> </ul> <p>Supported:</p> <ul style="list-style-type: none"> <li>• Windows 7 Enterprise 64-bit</li> <li>• Windows 8/8.1 Enterprise 64-bit</li> <li>• Red Hat Enterprise Linux Desktop 6, 7</li> <li>• SUSE Linux Enterprise Desktop 11 SP3</li> </ul> <p><b>Notes:</b> For detailed OS/hardware support information for Linux, see:<br/> <a href="http://www.hp.com/support/linux_hardware_matrix">http://www.hp.com/support/linux_hardware_matrix</a></p> |
| <b>Available Processors</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Name                              | Cores | Clock Speed (GHz) | Cache (MB) | Memory Speed (MHz) | Hyper-Threading | Featuring Intel® vPro™ Technology | Intel® Turbo Boost Technology <sup>1</sup> | TDP (W) |
|-----------------------------------|-------|-------------------|------------|--------------------|-----------------|-----------------------------------|--------------------------------------------|---------|
| Intel® Xeon® E5-1680 v3 processor | 8     | 3.2               | 20         | 2133               | YES             | YES                               | 3, 6                                       | 140     |
| Intel Xeon E5-1660 v3 processor   | 8     | 3.0               | 20         | 2133               | YES             | YES                               | 3.5                                        | 140     |
| Intel Xeon E5-2630 v3 processor   | 8     | 2.4               | 20         | 1866               | YES             | YES                               | 2, 8                                       | 85      |
| Intel Xeon E5-1650 v3 processor   | 6     | 3.5               | 15         | 2133               | YES             | YES                               | 1, 3                                       | 140     |
| Intel Xeon E5-1630 v3 processor   | 4     | 3.7               | 10         | 2133               | YES             | YES                               | 1, 1                                       | 140     |
| Intel Xeon E5-1620 v3 processor   | 4     | 3.5               | 10         | 2133               | YES             | YES                               | 1, 1                                       | 140     |
| Intel Xeon E5-1607 v3 processor   | 4     | 3.1               | 10         | 1866               | NO              | YES                               | N/A                                        | 140     |
| Intel Xeon E5-1603 v3 processor   | 4     | 2.8               | 10         | 1866               | NO              | YES                               | N/A                                        | 140     |

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

**NOTE:** Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z440 Workstation does not support dual processor configurations.

### Overview

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|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Available Processors</b>                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Disclaimers</b>                                                 | <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: <a href="http://www.intel.com/products/processor_number/">http://www.intel.com/products/processor_number/</a> 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: <a href="http://www.intel.com/info/em64t">http://www.intel.com/info/em64t</a> for more information.</p> <p>Quad-Core, Six-Core, and Eight-Core technologies are designed to improve performance of multithreaded software products and hardware-aware multitasking operating systems and may require appropriate operating system software for full benefits. Check with software provider to determine suitability. Not all customers or software applications will necessarily benefit from use of these technologies.</p> |
| <b>Color</b>                                                       | Jack Black                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Convertibility</b>                                              | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Expansion Slots (see system board section for more details)</b> | <p><b>Slot 1 (top):</b><br/>PCI Express Gen2 x1 with open-ended connector*<br/>Full-height, Half-length</p> <p><b>Slot 2:</b><br/>PCI Express Gen3 x16<br/>Full-height, Full-length (with extender)</p> <p><b>Slot 3:</b><br/>PCI Express Gen2 x4 with open-ended connector*<br/>Full-height, Full-length (with extender)</p> <p><b>Slot 4:</b><br/>PCI Express Gen3 x8 with open-ended connector*<br/>Full-height, Full-length (with extender)</p> <p><b>Slot 5:</b><br/>PCI Express Gen3 x16<br/>Full-height, Full-length (with extender)</p> <p><b>Slot 6:</b><br/>PCI 32bit/33MHz<br/>Full-height, Full-length (with extender)</p> <p>* Open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Expansion Bays (see storage section for more details)</b>       | <p>2 internal 3.5" bays (with acoustic dampening rail assemblies pre-installed)<br/>2 external 5.25" bays</p> <ul style="list-style-type: none"> <li>• 3rd and 4th 3.5" HDD each occupy one external bay</li> <li>• 3rd and 4th 2.5" HDD/SSD occupy a single external bay within a 2:1 carrier)</li> </ul> <p>1 dedicated 9.5mm slim optical disk drive bay</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### Overview

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| <b>Front I/O</b>                          | 4 USB 3.0, 1 Headset, 1 Microphone                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Internal I/O</b>                       | 2 USB 2.0 ports available with a single 2x5 header. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. The 2x5 header also supports up to one 15-in-1 Media Card Reader.<br>1 USB 3.0 port available by a 2x10 header.                                                                                       |
| <b>Rear I/O</b>                           | 4 USB 3.0, 2 USB 2.0, 2 PS/2, 1 RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out.<br>Serial supported with optional connector on PCI bracket cabled to system board connector.                                                                                                                                                                                                                                                          |
| <b>Interfaces Supported</b>               | 15-in-1 Media Card Reader (optional)<br>6-channel SATA interface (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported).<br>USB 2.0, USB 3.0                                                                                                                                                                                                                             |
| <b>On-board RAID Support</b>              | RAID 0, 1, 10<br>Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, and 10)                                                                                                                                                                                                                                                                                                                                    |
| <b>Chassis Dimensions (H x W x D)</b>     | <b>Footprint Dimensions:</b><br>H: 17.0" [431.8mm]<br>W: 6.65" [168.91mm]<br>D: 17.5" [444.7mm] (measured to the rear of service panel)<br><br><b>Maximum Dimensions:</b><br>H: 17.0" [431.8mm]<br>W: 6.65" [168.91mm]<br>D: 17.9" [455.7mm] (measured to the rear padlock loop)                                                                                                                                                      |
| <b>Rack Dimensions</b>                    | 4U                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Weight</b>                             | Exact weights depend upon configuration.<br>Minimum: 11.0 kg (24.3 lbs.)<br>Standard: 13.5 kg (29.8 lbs.)<br>Maximum: 17.5 kg (38.5 lbs.)                                                                                                                                                                                                                                                                                             |
| <b>Temperature</b>                        | Operating: 5° to 35°C (40° to 95°F)<br>Non-operating: -40° to 60°C (-40° to 140°F)                                                                                                                                                                                                                                                                                                                                                    |
| <b>Humidity</b>                           | Operating: 8% to 85% relative humidity, non-condensing<br>Non-operating: 8% to 90% relative humidity, non-condensing                                                                                                                                                                                                                                                                                                                  |
| <b>Maximum Altitude (non-pressurized)</b> | Operating: 3,048m (10,000ft)<br>Non-operating: 9,144m (30,000ft)                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Power Supply</b>                       | <b>ENTRY</b><br>525 watts wide-ranging, active Power Factor Correction, 85% Efficient, with no 6-pin graphics power cable<br><br>The Z440 525W power supply efficiency report can be found at this link:<br><a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf</a> |

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|                                       | <p><b>HIGH-END</b></p> <p>700 watts wide-ranging, active Power Factor Correction, 90% Efficient, with two graphics power cables<br/>700w PSU will support up to 225w of graphics</p> <p>The Z440 700W power supply efficiency report can be found at this link:<br/><a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf</a></p> |
| <b>Workstation ISV Certifications</b> | <p>See the latest list of certifications at<br/><a href="http://www.hp.com/united-states/campaigns/workstations/partnerships.html">http://www.hp.com/united-states/campaigns/workstations/partnerships.html</a></p>                                                                                                                                                                                                                                                                               |

### Supported Components

#### Processors

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

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

#### Monitors / Displays

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

#### Storage / Hard Drives

##### SAS Hard Drives

|                                            | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|--------------------------------------------|--------------------|------------|------------------------|---------------|
| <b>SAS Hard Drives for HP Workstations</b> |                    |            |                        |               |
| 600GB SAS 15K rpm 6Gb/s 3.5" HDD           | Y                  | Y          | VM647AA                |               |
| 300GB SAS 15K rpm 6Gb/s 3.5" HDD           | Y                  | Y          | LU967AA                |               |
| HP 1.2TB SAS 10K SFF HDD                   | Y                  | Y          | E2P04AA                |               |
| HP 600GB SAS 10K SFF HDD                   | Y                  | Y          | A2Z21AA                |               |
| HP 300GB SAS 10K SFF HDD                   | Y                  | Y          | A2Z20AA                |               |
| 600GB SAS 15K SFF HDD                      | Y                  | Y          | L5B75AA                |               |
| 300GB SAS 15K SFF HDD                      | Y                  | Y          | L5B74AA                |               |

##### NOTES:

\*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

### Supported Components

Up to (4) 3.5-inch 15K rpm SAS drives: 300, 600 GB; 2.4 TB max

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

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

SAS controller add-in card required

3rd and 4th SFF SAS HDDs will be automatically installed into a single 2:1 5.25" external bay adapter

Removable Boot Drive option

### SATA Hard Drives

|                                                          | Factory<br>Configured | Option Kit | Option<br>Kit Part<br>Number | Support<br>Notes |
|----------------------------------------------------------|-----------------------|------------|------------------------------|------------------|
| <b>SATA (Serial ATA) Hard Drives for HP Workstations</b> |                       |            |                              |                  |
| 500GB SATA 7200 rpm 6Gb/s 3.5" HDD                       | Y                     | Y          | LQ036AA                      |                  |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD                         | Y                     | Y          | LQ037AA                      |                  |
| 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          | D8N29AA                      |                  |

#### NOTES:

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

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

Removable Boot Drive option

### SATA Solid State Drives

|                                                      | Factory<br>Configured | Option Kit | Option<br>Kit Part<br>Number | Support<br>Notes |
|------------------------------------------------------|-----------------------|------------|------------------------------|------------------|
| <b>HP Solid State Drives (SSDs) for Workstations</b> |                       |            |                              |                  |
| HP 128GB* SATA 6Gb/s SSD                             | Y                     | Y          | A3D25AA                      |                  |
| HP 256GB* SATA 6Gb/s SSD                             | Y                     | Y          | A3D26AA                      |                  |
| HP 512GB* SATA 6Gb/s SSD                             | Y                     | Y          | D8F30AA                      |                  |
| HP 1TB SATA* 6Gb/s SSD                               | Y                     | Y          | F3C96AA                      |                  |
| HP 256GB SATA* 6Gb/s SED SSD                         | Y                     | N          |                              |                  |
| 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                      |                  |
| HP 256GB SATA 6Gb/s SED Opal 2 SSD                   | Y                     | Y          | G7U67AA                      |                  |

#### NOTES:

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

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



### Supported Components

Up to (4) 2.5-inch Intel Pro 1500 6Gb/s SATA Solid State Drive: 180 GB; 720 GB max

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

3rd and 4th SSDs will be automatically installed into a single 2:1 5.25" external bay adapter

### PCIe Solid State Drives

|                                      | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|--------------------------------------|--------------------|------------|------------------------|---------------|
| <b>PCIe SSDs for HP Workstations</b> |                    |            |                        |               |
| HP Z Turbo Drive 512GB SSD           | Y                  | Y          | G3G89AA                |               |
| HP Z Turbo Drive 256GB SSD           | Y                  | Y          | G3G88AA                |               |

#### NOTES:

\*For storage drives, GB = 1 billion bytes. TB = 1 trillion bytes. Actual formatted capacity is less. Up to 30GB of system disk is reserved for system recovery software.

Up to (2) PCI Express Solid State Drives: 256, 512 GB; 1.0 TB max

**NOTE:** PCIe SSDs are not available with SAS controller or SAS HDDs

### Hard Drive Controllers

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

### Supported Components

SATA hardware RAID is supported on Linux systems that have support for the Intel RSTe technology. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit

[http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix) for RAID capabilities with Linux.

All drives must be identical in type and capacity.

RAID arrays greater than 2 TB are fully supported.

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

[http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

**NOTE 2:** Specific user-configured hardware SAS RAID configurations are supported on this Linux system.

IS: Striping of 2 or more HDDs into a single logical volume

IM: Mirroring of 2 HDDs into a single logical volume

IME: Mirroring of 3 or more HDDs into a single logical volume.

For details, please visit [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

### Graphics

|                                          | Factory Configured | Option Kit | Option Kit Part Number | Support Notes | Supported # of cards | Mixed? |
|------------------------------------------|--------------------|------------|------------------------|---------------|----------------------|--------|
| <b>Professional 2D</b>                   |                    |            |                        |               |                      |        |
| NVIDIA NVS 310 512MB Graphics            | Y                  | Y          | A7U59AA                | Note 1        | 3                    |        |
| NVIDIA NVS 315 1GB Graphics              | Y                  | Y          | E1U66AA                | Note 1        | 3                    |        |
| NVIDIA NVS 510 2GB Graphics              | Y                  | Y          | C2J98AA                | Note 2        | 2                    |        |
| <b>Graphics Cable Adapters</b>           |                    |            |                        |               |                      |        |
| HP DisplayPort to Dual Link DVI Adapter  | Y                  | Y          | NR078AA                |               | 1                    |        |
| HP DisplayPort To DVI-D Adapter          | Y                  | Y          | FH973AA                |               | 1                    |        |
| HP DisplayPort To DVI-D Adapter (2-Pack) | Y                  | N          |                        |               | 1                    |        |
| HP DisplayPort To DVI-D Adapter (4-Pack) | Y                  | N          |                        |               | 1                    |        |
| HP DisplayPort To DVI-D Adapter (6-Pack) | Y                  | N          |                        |               | 1                    |        |
| HP DisplayPort To VGA Adapter            | Y                  | Y          | AS615AA                |               | 1                    |        |
| HP DisplayPort To VGA Adapter 2nd        | Y                  | N          |                        |               | 1                    |        |
| <b>Entry 3D</b>                          |                    |            |                        |               |                      |        |
| NVIDIA Quadro K620 2GB Graphics          | Y                  | Y          | J3G87AA                |               | 2                    |        |
| NVIDIA Quadro K420 1GB Graphics          | Y                  | Y          | J3G86AA                |               | 2                    |        |
| <b>Mid-range 3D</b>                      |                    |            |                        |               |                      |        |
| NVIDIA Quadro K2200 4GB Graphics         | Y                  | Y          | J3G88AA                | Note 5        | 2                    |        |
| AMD FirePro W2100 2GB Graphics           | Y                  | Y          | J3G91AA                |               | 2                    |        |
| AMD FirePro W5100 4GB Graphics           | Y                  | Y          | J3G92AA                | Note 5, 6     | 2                    |        |
| <b>High End 3D</b>                       |                    |            |                        |               |                      |        |
| NVIDIA Quadro K4200 4GB Graphics         | Y                  | Y          | J3G89AA                | Notes 3, 4    | 1                    |        |
| NVIDIA Quadro K5200 8GB Graphics         | Y                  | Y          | J3G90AA                | Notes 3, 4    | 1                    |        |
| NVIDIA Quadro K6000 12GB Graphics        | Y                  | Y          | C2J96AA                | Notes 3, 4    | 1                    |        |
| AMD FirePro W7100 8GB Graphics           | Y                  | Y          | J3G93AA                | Notes 3, 4    | 1                    |        |

### Supported Components

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

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

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

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

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

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

#### High Performance GPU Computing

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

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

Tesla K40 configurations require the addition of either NVIDIA Quadro K620 1st graphics or NVIDIA Quadro K2200 1st graphics. Configurations available early 2015.

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

NOTE 3: Supported on 700W PSU chassis only.

#### Memory

| CTO                                   | Option Kit Part Number | Support Notes |
|---------------------------------------|------------------------|---------------|
| <b>DDR4-2133 ECC Registered DIMMs</b> |                        |               |
| 16GB DDR4-2133 ECC Registered RAM     | J9P83AA                | 1,2           |
| 8GB DDR4-2133 ECC Registered RAM      | J9P82AA                | 1,2           |
| 4GB DDR4-2133 ECC Registered RAM      | J9P81AA                | 1,2           |
| <b>Memory Cooling Solution</b>        |                        |               |
| HP Z440 Memory Cooling Solution       | J2R52AA                | 3             |

#### NOTES:

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

Each processor supports up to 4 channels of DDR4 memory. To realize full performance at least 1 DIMM must be inserted into each channel.

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

**NOTE 1:** ONLY registered DDR4 DIMMs are supported.

DDR3 DIMMs ARE NOT SUPPORTED.

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

The HP Z440 Memory Cooling Solution is available to add to any configuration for improved system cooling, but is required for proper memory cooling on any Z440 configuration with greater than 4 memory DIMMs installed. It can only be installed on the HP Z440 Workstation.

**NOTE 3:** If a user installs greater than 4 memory DIMMs in a Z440 system without also installing the HP

### Supported Components

Z440 Memory Cooling Solution, they will be presented with an F1 boot stop requiring a manual override each time the system is rebooted.

### Multimedia and Audio Devices

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

### Optical and Removable Storage

|                                           | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-------------------------------------------|--------------------|------------|------------------------|---------------|
| <b>HP SlimTray Optical Drives</b>         |                    |            |                        |               |
| HP 9.5mm Slim SuperMulti DVD Writer       | Y                  | Y          | K3R64AA                |               |
| HP 9.5mm Slim DVD-ROM Drive               | Y                  | Y          | K3R63AA                | Note 1        |
| HP 9.5mm Slim BDXL Blu-Ray Writer         | Y                  | Y          | K3R65AA                | Note 2        |
| <b>HP 15-in-1 Media Card Reader</b>       |                    |            |                        |               |
| HP 15-in-1 Media Card Reader              | Y                  | Y          | G1S79AA                |               |
| <b>HP DX115 Removable Drive Enclosure</b> |                    |            |                        |               |
| HP DX115 Removable HDD Frame/Carrier      | N                  | Y          | FZ576AA                | Note 3        |
| HP DX115 Removable HDD Carrier            | N                  | Y          | NB792AA                |               |

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

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

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

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

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

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

### Controller Cards

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

**NOTE 1:** Compatible with NVIDIA Quadro K620, K2200, K4200, and K5200 only.

### Networking and Communications

| Factory | Option | Option | Support Notes |
|---------|--------|--------|---------------|
|---------|--------|--------|---------------|

### Supported Components

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

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

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

### Racking and Physical Security

|                                                   | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---------------------------------------------------|--------------------|------------|------------------------|---------------|
| HP Solenoid Hood Lock & Hood Sensor               | Y                  | Y          | DE618A                 |               |
| HP Business PC Security Lock Kit                  | N                  | Y          | PV606AA                |               |
| HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit | N                  | Y          | WH340AA                |               |

### Input Devices

|                                                 | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-------------------------------------------------|--------------------|------------|------------------------|---------------|
| HP PS/2 Keyboard                                | Y                  | Y          | QY774AA                |               |
| HP USB Keyboard                                 | Y                  | Y          | QY776AA                |               |
| HP USB Smart Card Keyboard                      | Y                  | Y          | E6D77AA                |               |
| HP Wireless Keyboard and Mouse                  | Y                  | Y          | QY449AA                |               |
| HP PS/2 Mouse                                   | Y                  | Y          | QY775AA                |               |
| HP USB Optical Mouse                            | Y                  | Y          | QY777AA                |               |
| HP USB 1000dpi Laser Mouse                      | Y                  | Y          | QY778AA                |               |
| HP USB Optical 3-Button 2.9M OEM Mouse          | N                  | Y          | ET424AA                |               |
| HP SpaceMouse Pro USB 3D Input Device           | N                  | Y          | B4A20AA                |               |
| HP SpacePilot Pro 3D USB Intelligent Controller | N                  | Y          | WH343AA                |               |

### Other Hardware

|                                      | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|--------------------------------------|--------------------|------------|------------------------|---------------|
| HP Z440 Memory Cooling Solution      | Y                  | Y          | J2R52AA                | Note 1        |
| HP Z440 Fan and Front Card Guide Kit | Y                  | Y          | J9P80AA                | Note 2        |
| HP Internal USB Port Kit             | N                  | Y          | EM165AA                | Note 3        |
| HP eSATA PCI Cable Kit               | Y                  | Y          | GM110AA                | Note 4        |
| HP Serial Port Adapter               | Y                  | Y          | PA716A                 |               |

### Supported Components

|                                       |   |   |         |            |
|---------------------------------------|---|---|---------|------------|
| HP Optical Bay HDD Mounting Bracket   | N | Y | NQ099AA |            |
| HP Power Cord Kit                     | N | Y | DM293A  |            |
| HP Workstation Mouse Pad              | Y | N |         | Japan only |
| HP ENERGY STAR® Enabled Configuration | Y | N |         |            |

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

**Note 2:** Required for the following graphics configurations:

- 3 x NVIDIA NVS 310/315
- 1 x NVIDIA Quadro K4200
- 1 x NVIDIA Quadro K5200
- 1 x NVIDIA Quadro K6000

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

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

### Software

|                                       | Factory<br>Configured | Option Kit | Option Kit<br>Part<br>Number | Support Notes |
|---------------------------------------|-----------------------|------------|------------------------------|---------------|
| HP Performance Advisor                | Y                     | Y          |                              | Note 1        |
| HP Remote Graphics Software (RGS) 6.0 | Y                     | Y          |                              | Note 2        |
| MS Office Home & Business 2013        | Y                     | N          |                              | Note 3        |
| Cyberlink PowerDVD and Power2Go       | Y                     | N          |                              |               |
| Foxit PhantomPDF Express              | Y                     | N          |                              |               |

**NOTE 1:** Available as a free download here: [www.hp.com/go/performanceadvisor](http://www.hp.com/go/performanceadvisor)

**NOTE 2:** Supported operating systems:

- Windows 7 Professional 32/64
- Windows 8 Professional 32/64
- RHEL v6.5
- SLED 11 SP3

For more information, go to: [www.hp.com/go/rqs](http://www.hp.com/go/rqs)

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

### Operating Systems

#### Support Notes

|                                                                   |                     |
|-------------------------------------------------------------------|---------------------|
| Windows 8.1 Pro 64-bit*                                           |                     |
| Windows 8.1 64-bit                                                |                     |
| Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit        |                     |
| Windows® 7 Professional 64-bit                                    | (National Academic) |
| HP Linux Installer Kit                                            |                     |
| Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr) | Note 1              |
| Ubuntu 14.04                                                      |                     |

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

### System Technical Specifications

#### System Board

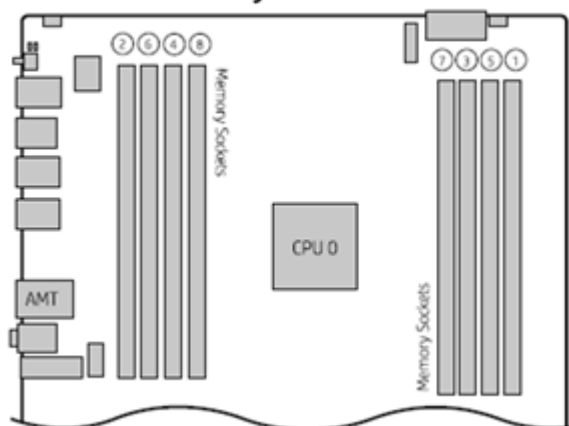
|                                   |                                                                                                                                                                                                                                                                                                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>System Board Form Factor</b>   | Main System Board:<br>24 x 31 cm<br>9.6 x 12.2 inches                                                                                                                                                                                                                                                |
| <b>Processor Socket</b>           | Single LGA2011 R3                                                                                                                                                                                                                                                                                    |
| <b>Chipset</b>                    | Intel® C612 Chipset                                                                                                                                                                                                                                                                                  |
| <b>Super I/O Controller</b>       | Nuvoton NPCD379H (SIO-12)                                                                                                                                                                                                                                                                            |
| <b>Memory Expansion Slots</b>     | 8 DDR4 memory slots                                                                                                                                                                                                                                                                                  |
| <b>Memory Type Supported</b>      | DDR4, RDIMM (Registered), ECC: 4GB, 8GB and 16GB                                                                                                                                                                                                                                                     |
| <b>Memory Modes</b>               | Channel Interleaved                                                                                                                                                                                                                                                                                  |
| <b>Memory Speed Supported</b>     | 1600MT/s, 1866MT/s and 2133MT/s                                                                                                                                                                                                                                                                      |
| <b>Memory Protection</b>          | ECC available on data, parity on address and command                                                                                                                                                                                                                                                 |
| <b>Memory</b>                     |                                                                                                                                                                                                                                                                                                      |
| <b>Memory Configuration Table</b> | <p>Please refer to the table below for details on how supported memory configurations are installed in your system.</p> <p>* For 32 bit operating systems, there is a memory limit of 4GB.</p> <p>~ Although technically possible, these configurations are not available to order at this time.</p> |

|                 |       | CPU 0                 |       |               |       |            |               |       |                       |                      |
|-----------------|-------|-----------------------|-------|---------------|-------|------------|---------------|-------|-----------------------|----------------------|
|                 |       | Front Slots           |       |               |       | Rear Slots |               |       |                       |                      |
| Capacity        | Notes | DIMM1                 | DIMM2 | DIMM3         | DIMM4 | DIMM5      | DIMM6         | DIMM7 | DIMM8                 | Rating               |
| 4 GB            | *     | 4 GB                  |       |               |       |            |               |       |                       | Fair                 |
| 8 GB            |       | 4 GB<br>8 GB          |       |               |       |            |               |       | 4 GB                  | Good<br>Fair         |
| 12 GB           |       | 4 GB                  |       | 4 GB          |       |            |               |       | 4 GB                  | Better               |
| 16 GB           |       | 4 GB<br>8 GB          |       | 4 GB          |       |            | 4 GB          |       | 4 GB<br>8 GB          | Best<br>Good         |
| 32 GB           |       | 4 GB<br>8 GB<br>16 GB | 4 GB  | 4 GB<br>8 GB  | 4 GB  | 4 GB       | 4 GB<br>8 GB  | 4 GB  | 4 GB<br>8 GB<br>16 GB | Best<br>Best<br>Good |
| 48 GB           | ~     | 8 GB                  | 4 GB  | 8 GB          | 4 GB  | 4 GB       | 8 GB          | 4 GB  | 8 GB                  | Best                 |
| 64 GB           |       | 8 GB<br>16 GB         | 8 GB  | 8 GB<br>16 GB | 8 GB  | 8 GB       | 8 GB<br>16 GB | 8 GB  | 8 GB<br>16 GB         | Best<br>Best         |
| 96 GB           | ~     | 16 GB                 | 8 GB  | 16 GB         | 8 GB  | 8 GB       | 16 GB         | 8 GB  | 16 GB                 | Best                 |
| 128 GB          |       | 16 GB                 | 16 GB | 16 GB         | 16 GB | 16 GB      | 16 GB         | 16 GB | 16 GB                 | Best                 |
| Slot Load Order |       | 1                     | 5     | 3             | 7     | 8          | 4             | 6     | 2                     |                      |

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

### System Technical Specifications

Memory Load Order



|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum Memory</b>                   | Supports up to 128GB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Memory Configuration (Supported)</b> | Only ECC DIMMs are supported.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Note on Maximum Memory</b>           | Maximum memory capacities assume 64-bit operating systems such as Windows 8.1 64-bit, Windows 7 Ultimate 64-bit, or Windows 7 Professional 64-bit. Windows 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>PCI Express Connectors</b>           | <p>Slot 1 (top):<br/>PCI Express Gen2 x1<br/>Full-height, Half-length</p> <p>Slot 2:<br/>PCI Express Gen3 x16<br/>Full-height, Full-length (with extender)</p> <p>Slot 3:<br/>PCI Express Gen2 x4 with open-ended connector**<br/>Full-height, Full-length (with extender)</p> <p>Slot 4:<br/>PCI Express Gen3 x8 with open-ended connector**<br/>Full-height, Full-length (with extender)</p> <p>Slot 5:<br/>PCI Express Gen3 x16<br/>Full-height, Full-length (with extender)</p> <p>** Open-ended connector allows a greater bandwidth (e.g. x16) card to be installed physically into a lower bandwidth connector/slot.</p> |
| <b>PCI Connectors (5.0V)</b>            | <p>Slot 6:<br/>PCI 32bit/33MHz<br/>Full-height, Full-length (with extender)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



### System Technical Specifications

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

### System Technical Specifications

|                                                               |                                                                                                                                                                                                                                                                                                                                    |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|                                                               |                                                                                                                                                                                                                                                                                                                                    | half of the 2x5 header.                    |                                                                                                                                                                                                                                                                                                                                    |            |
|                                                               |                                                                                                                                                                                                                                                                                                                                    | 1 USB 3.0 port available by a 2x10 header. |                                                                                                                                                                                                                                                                                                                                    |            |
| HD Integrated Audio                                           | Realtek ALC221                                                                                                                                                                                                                                                                                                                     |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Flash ROM                                                     | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| CPU Fan Header                                                | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Chassis Fan Header                                            | 1 Rear System Chassis Fan Header                                                                                                                                                                                                                                                                                                   |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Front PCI Fan Header                                          | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Front Control Panel/Speaker Header                            | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| CMOS Battery Holder - Lithium                                 | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Integrated Trusted Platform Module                            | Infineon TPM 1.2 Certified                                                                                                                                                                                                                                                                                                         |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Power Supply Headers                                          | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Power Switch, Power LED & Hard Drive LED Header               | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Clear Password Jumper                                         | Yes                                                                                                                                                                                                                                                                                                                                |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Serial Port                                                   | 1 internal header                                                                                                                                                                                                                                                                                                                  |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Parallel Port                                                 | No                                                                                                                                                                                                                                                                                                                                 |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Keyboard/Mouse                                                | USB or PS/2                                                                                                                                                                                                                                                                                                                        |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Power Supply                                                  |                                                                                                                                                                                                                                                                                                                                    |                                            |                                                                                                                                                                                                                                                                                                                                    |            |
| Power Supply                                                  | 700W 90% Efficient, Custom PSU<br>(Wide-Ranging, Active PFC)                                                                                                                                                                                                                                                                       |                                            | 525W 85% Efficient, Custom PSU<br>(Wide-Ranging, Active PFC)                                                                                                                                                                                                                                                                       |            |
| Operating Voltage Range                                       | 90–269 VAC                                                                                                                                                                                                                                                                                                                         |                                            | 90–269 VAC                                                                                                                                                                                                                                                                                                                         |            |
| Rated Voltage Range                                           | 100-240 VAC                                                                                                                                                                                                                                                                                                                        | 118 VAC                                    | 100-240 VAC                                                                                                                                                                                                                                                                                                                        | 118 VAC    |
| Rated Line Frequency                                          | 50–60 Hz                                                                                                                                                                                                                                                                                                                           | 400 Hz                                     | 50–60 Hz                                                                                                                                                                                                                                                                                                                           | 400 Hz     |
| Operating Line Frequency Range                                | 47–66 Hz                                                                                                                                                                                                                                                                                                                           | 393–407 Hz                                 | 47–66 Hz                                                                                                                                                                                                                                                                                                                           | 393–407 Hz |
| Rated Input Current                                           | 100-240V @ 9.5A                                                                                                                                                                                                                                                                                                                    | 118V @ 9.5A                                | 100-240V @ 7A                                                                                                                                                                                                                                                                                                                      | 118V @ 7A  |
| Heat Dissipation<br>(Configuration and software dependent)    | Typical = 1648 btu/hr (415 kg-cal/hr)<br>Max = 2746 btu/hr (692 kg-cal/hr)                                                                                                                                                                                                                                                         |                                            | Typical = 1311 btu/hr (330 kg-cal/hr)<br>Max = 2185 btu/hr (551 kg-cal/hr)                                                                                                                                                                                                                                                         |            |
| Power Supply Fan                                              | 92x25 mm variable speed                                                                                                                                                                                                                                                                                                            |                                            | 92x25 mm variable speed                                                                                                                                                                                                                                                                                                            |            |
| ENERGY STAR Qualified<br>(Configuration dependent)            | Yes                                                                                                                                                                                                                                                                                                                                |                                            | Yes                                                                                                                                                                                                                                                                                                                                |            |
| 80 PLUS® Compliant                                            | Yes, 90% Efficient<br><br>The Z440 700W power supply efficiency report can be found at this link:<br><a href="http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf">http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf</a> |                                            | Yes, 85% Efficient<br><br>The Z440 525W power supply efficiency report can be found at this link:<br><a href="http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf">http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf</a> |            |
| FEMP Standby Power Compliant @115V<br>(<2W in S5 – Power Off) | Yes                                                                                                                                                                                                                                                                                                                                |                                            | Yes                                                                                                                                                                                                                                                                                                                                |            |
| EuP Compliant @ 230V                                          | Yes                                                                                                                                                                                                                                                                                                                                |                                            | Yes                                                                                                                                                                                                                                                                                                                                |            |

### System Technical Specifications

|                                                                                                                   |                              |                              |
|-------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------|
| <b>(&lt;0.5 W in S5 – Power Off)</b>                                                                              |                              |                              |
| <b>CECP Compliant @ 220V (&lt;4W in S3 – Suspend to RAM)</b>                                                      | Yes; Configuration dependent | Yes; Configuration dependent |
| <b>Power Consumption in sleep mode (as defined by ENERGY STAR) – Suspend to RAM (S3) (Instantly Available PC)</b> | <15w                         | <15w                         |
| <b>Built-in Self Test LED</b>                                                                                     | Yes                          | Yes                          |
| <b>Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)</b>                             | Yes                          | Yes                          |
|                                                                                                                   |                              |                              |
| <b>Hood Lock Header</b>                                                                                           | Yes                          |                              |
| <b>Hood Sensor Header</b>                                                                                         | Yes                          |                              |
| <b>Memory Fan</b>                                                                                                 | 1 Memory Fan Header          |                              |

### System Technical Specifications

### System Configuration

|                                                             |                       |                                           |              |               |              |               |              |
|-------------------------------------------------------------|-----------------------|-------------------------------------------|--------------|---------------|--------------|---------------|--------------|
| <b>Example Configuration #1</b><br>ENERGY STAR<br>QUALIFIED | Processor             | 1x Intel Xeon E5-1603 v3 (Quad-Core)      |              |               |              |               |              |
|                                                             | Memory                | 1x 4GB DDR4-2133 Registered RAM           |              |               |              |               |              |
|                                                             | Graphics              | 1x NVIDIA NVS 310                         |              |               |              |               |              |
|                                                             | Disks / Optical       | 1x 500GB SATA 7200 / 1x Slim DVD-ROM SATA |              |               |              |               |              |
|                                                             | Power Supply          | 525W 85% Custom PSU                       |              |               |              |               |              |
|                                                             | Other                 | N/A                                       |              |               |              |               |              |
|                                                             |                       |                                           |              |               |              |               |              |
| <b>Energy Consumption</b>                                   |                       | 115 VAC                                   |              | 230 VAC       |              | 100 VAC       |              |
|                                                             |                       | LAN Enabled                               | LAN Disabled | LAN Enabled   | LAN Disabled | LAN Enabled   | LAN Disabled |
|                                                             | Windows Idle (S0)     | 51.01 W                                   |              | 51.29 W       |              | 53.01 W       |              |
|                                                             | Windows Busy Typ(S0)  | 112.95 W                                  |              | 110.62 W      |              | 113.96 W      |              |
|                                                             | Windows Busy Max (S0) | 117.16 W                                  |              | 112.45 W      |              | 114.67 W      |              |
|                                                             | Sleep (S3)            | 2.34 W                                    | 2.19 W       | 2.54 W        | 2.41 W       | 2.33 W        | 2.19 W       |
|                                                             | Off (S5)              | 0.825 W                                   | 0.784 W      | 1.024 W       | 0.985 W      | 0.851 W       | 0.772 W      |
|                                                             | Zero Power Mode (ErP) | 0.190 W                                   |              | 0.382 W       |              | 0.178 W       |              |
| <b>Heat Dissipation (Btu/hr)</b>                            |                       | 115 VAC                                   |              | 230 VAC       |              | 100 VAC       |              |
|                                                             |                       | LAN Enabled                               | LAN Disabled | LAN Enabled   | LAN Enabled  | LAN Disabled  | LAN Enabled  |
|                                                             | Windows Idle (S0)     | 174.06 Btu/hr                             |              | 175.02 Btu/hr |              | 180.89 Btu/hr |              |
|                                                             | Windows Busy Typ(S0)  | 385.39 Btu/hr                             |              | 377.4 Btu/hr  |              | 388.83 Btu/hr |              |
|                                                             | Windows Busy Max (S0) | 399.75 Btu/hr                             |              | 383.68 Btu/hr |              | 391.25 Btu/hr |              |
|                                                             | Sleep (S3)            | 7.98 Btu/hr                               | 7.49 Btu/hr  | 8.68 Btu/hr   | 8.21 Btu/hr  | 7.95 Btu/hr   | 7.47 Btu/hr  |
|                                                             | Off (S5)              | 2.18 Btu/hr                               | 2.67 Btu/hr  | 3.49 Btu/hr   | 3.36 Btu/hr  | 2.90 Btu/hr   | 2.63 Btu/hr  |
|                                                             | Zero Power Mode (ErP) | 0.649 Btu/hr                              |              | 1.303 Btu/hr  |              | 0.607 Btu/hr  |              |

|                                                             |                       |                                           |              |             |              |              |              |
|-------------------------------------------------------------|-----------------------|-------------------------------------------|--------------|-------------|--------------|--------------|--------------|
| <b>Example Configuration #2</b><br>ENERGY STAR<br>QUALIFIED | Processor             | 1x Intel Xeon E5-1630 v3 (Quad-Core)      |              |             |              |              |              |
|                                                             | Memory                | 2x 4GB DDR4-2133 Registered RAM           |              |             |              |              |              |
|                                                             | Graphics              | 1x NVIDIA Quadro K620                     |              |             |              |              |              |
|                                                             | Disks / Optical       | 1x 500GB SATA 7200 / 1x Slim DVD-ROM SATA |              |             |              |              |              |
|                                                             | Power Supply          | 700W 90% Custom PSU                       |              |             |              |              |              |
|                                                             | Other                 | N/A                                       |              |             |              |              |              |
|                                                             |                       |                                           |              |             |              |              |              |
| <b>Energy Consumption (Watts)</b>                           |                       | 115 VAC                                   |              | 230 VAC     |              | 100 VAC      |              |
|                                                             |                       | LAN Enabled                               | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled  | LAN Disabled |
|                                                             | Windows Idle (S0)     | 62.25 W                                   |              | 61.50 W     |              | 62.31 W      |              |
|                                                             | Windows Busy Typ(S0)  | 112.48 W                                  |              | 111.39 W    |              | 113.48 W     |              |
|                                                             | Windows Busy Max (S0) | 136.87 W                                  |              | 129.05 W    |              | 113.64 W     |              |
|                                                             | Sleep (S3)            | 2.25 W                                    | 2.147 W      | 2.41 W      | 2.30 W       | 2.25 W       | 2.14 W       |
|                                                             | Off (S5)              | 0.821 W                                   | 0.775 W      | 1.024 W     | 0.925 W      | 0.842 W      | 0.769 W      |
|                                                             | Zero Power Mode (ErP) | 0.167 W                                   |              | 0.306 W     |              | 0.158 W      |              |
| <b>Heat Dissipation</b>                                     |                       | 115 VAC                                   |              | 230 VAC     |              | 100 VAC      |              |
|                                                             |                       | LAN Enabled                               | LAN Disabled | LAN Enabled | LAN Enabled  | LAN Disabled | LAN Enabled  |
|                                                             |                       |                                           |              |             |              |              |              |
|                                                             |                       |                                           |              |             |              |              |              |
|                                                             |                       |                                           |              |             |              |              |              |
|                                                             |                       |                                           |              |             |              |              |              |
|                                                             |                       |                                           |              |             |              |              |              |
|                                                             |                       |                                           |              |             |              |              |              |

### System Technical Specifications

|          |                       |               |             |               |             |               |             |
|----------|-----------------------|---------------|-------------|---------------|-------------|---------------|-------------|
| (Btu/hr) | Windows Idle (S0)     | 212.43 Btu/hr |             | 209.85 Btu/hr |             | 212.62 Btu/hr |             |
|          | Windows Busy Typ(S0)  | 383.78 Btu/hr |             | 380.06 Btu/hr |             | 387.19 Btu/hr |             |
|          | Windows Busy Max (S0) | 467.00 Btu/hr |             | 440.32 Btu/hr |             | 387.74 Btu/hr |             |
|          | Sleep (S3)            | 7.69 Btu/hr   | 7.31 Btu/hr | 8.21 Btu/hr   | 7.85 Btu/hr | 7.67 Btu/hr   | 7.31 Btu/hr |
|          | Off (S5)              | 2.80 Btu/hr   | 2.65 Btu/hr | 3.49 Btu/hr   | 3.16 Btu/hr | 2.87 Btu/hr   | 2.62 Btu/hr |
|          | Zero Power Mode (ErP) | 0.568 Btu/hr  |             | 1.043 Btu/hr  |             | 0.538 Btu/hr  |             |

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

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

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

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

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

### System Technical Specifications

|                                     |                       |                |              |                |             |                |             |
|-------------------------------------|-----------------------|----------------|--------------|----------------|-------------|----------------|-------------|
|                                     | Sleep (S3)            | 3.99 W         | 3.91 W       | 4.02 W         | 4.04 W      | 3.99 W         | 3.91 W      |
|                                     | Off (S5)              | 0.86 W         | 0.764 W      | 1.02 W         | 0.91 W      | 0.86 W         | 0.76 W      |
|                                     | Zero Power Mode (ErP) | 0.166 W        |              | 0.305 W        |             | 0.165 W        |             |
| <b>Heat Dissipation</b><br>(Btu/hr) |                       | 115 VAC        |              | 230 VAC        |             | 100 VAC        |             |
|                                     |                       | LAN Enabled    | LAN Disabled | LAN Enabled    | LAN Enabled | LAN Disabled   | LAN Enabled |
|                                     | Windows Idle (S0)     | 211.16 Btu/hr  |              | 209.47 Btu/hr  |             | 212.75 Btu/hr  |             |
|                                     | Windows Busy Typ(S0)  | 1012.14 Btu/hr |              | 992.48 Btu/hr  |             | 1033.94 Btu/hr |             |
|                                     | Windows Busy Max (S0) | 1155.41 Btu/hr |              | 1142.51 Btu/hr |             | 1136.57 Btu/hr |             |
|                                     | Sleep (S3)            | 13.6 Btu/hr    | 13.4 Btu/hr  | 13.7 Btu/hr    | 13.8 Btu/hr | 13.6 Btu/hr    | 13.4 Btu/hr |
|                                     | Off (S5)              | 2.94 Btu/hr    | 2.60 Btu/hr  | 3.49 Btu/hr    | 3.11 Btu/hr | 2.91 Btu/hr    | 2.58 Btu/hr |
|                                     | Zero Power Mode (ErP) | 0.565 Btu/hr   |              | 1.042 Btu/hr   |             | 0.563 Btu/hr   |             |

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

### DECLARED NOISE EMISSIONS

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

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

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

| <b>Declared Noise Emissions</b><br>(in accordance with ISO 7779 and ISO 9296) |                                               | <b>Sound Power</b><br>(LWAd, bels) | <b>Deskside Sound Pressure</b><br>(LpAm, decibels) |
|-------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------|----------------------------------------------------|
|                                                                               | <b>Idle</b>                                   | 4.2                                | 26                                                 |
|                                                                               | <b>Hard drive Operating</b><br>(random reads) | 4.3                                | 27                                                 |

### System Technical Specifications

|  |                                                |     |    |
|--|------------------------------------------------|-----|----|
|  | <b>DVD-ROM Operating</b><br>(sequential reads) | 4.6 | 31 |
|--|------------------------------------------------|-----|----|

### ENVIRONMENTAL DATA

|                                   |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmental Requirements</b> | <b>Temperature</b>      | Operating: 5° to 35° C (40° to 95° F)<br>Non-operating: -40° to 60° C (-40° to 140° F)                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | <b>Humidity</b>         | Operating: 8% to 85% RH, non-condensing<br>Non-operating: 8% to 90% RH, non-condensing                                                                                                                                                                                                                                                                                                                                                                             |
|                                   | <b>Maximum Altitude</b> | Operating: 3,000 m (10,000 feet)<br>Non-operating: 9,100 m (30,000 feet)                                                                                                                                                                                                                                                                                                                                                                                           |
|                                   | <b>Dynamic (new)</b>    | <b>Shock</b><br>Operating: ½-sine: 40g, 2-3ms (~62 cm/sec)<br>Non-operating:<br>½-sine: 160 cm/s, 2-3ms (~105g)<br>square: 422 cm/s, 20g<br><b>NOTE:</b> Values represent individual shock events and do not indicate repetitive shock events.<br><br><b>Vibration</b><br>Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz<br>Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz<br><b>NOTE:</b> Values do not indicate continuous vibration. |
|                                   | <b>Cooling</b>          | Above 1524 m (5,000 ft.) altitude, maximum operating temperature is de-rated by 1° C (1.8° F) per 305 m (1,000 ft.) elevation increase                                                                                                                                                                                                                                                                                                                             |

### Physical Security and Serviceability

|                                                         |                                                                                               |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <b>Access Panel</b>                                     | Tool-less<br>Includes system board and memory information.                                    |
| <b>Optical Drive</b>                                    | Tool-less                                                                                     |
| <b>Hard Drives</b>                                      | Tool-less                                                                                     |
| <b>Expansion Cards</b>                                  | Tool-less                                                                                     |
| <b>Processor Socket</b>                                 | Tool-less                                                                                     |
| <b>Green User Touch Points</b>                          | Yes, on primary serviceable components.                                                       |
| <b>Color-coordinated Cables and Connectors</b>          | Yes                                                                                           |
| <b>Memory</b>                                           | Tool-less                                                                                     |
| <b>System Board</b>                                     | Screw-In                                                                                      |
| <b>Dual Color Power and HD LED on Front of Computer</b> | Yes                                                                                           |
| <b>Configuration Record SW</b>                          | Yes                                                                                           |
| <b>Over-Temp Warning on Screen</b>                      | Yes, at POST screen on reboot                                                                 |
| <b>Restore CD/DVD Set</b>                               | Restores the computer to its original factory shipping image; can be obtained via HP Support. |

### System Technical Specifications

|                                                                           |                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dual Function Front Power Switch</b>                                   | Yes, causes a fail-safe power off when held for 4 seconds                                                                                                                                                                                                                         |
| <b>Padlock Support</b>                                                    | Yes (optional): Locks side cover and secures chassis from theft<br>7.0 mm (0.2756 in) diameter padlock loop at rear of system                                                                                                                                                     |
| <b>Cable Lock Support</b>                                                 | Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft<br>3 mm x 7 mm slot at rear of system                                                                                                                                                      |
| <b>Universal Chassis Clamp Lock Support</b>                               | Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable<br>Threaded feature at rear of system                                                                     |
| <b>Solenoid Lock and Hood Sensor</b>                                      | Yes (optional)<br>The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed |
| <b>Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control</b> | Yes, enables or disables serial, USB, audio, and network ports                                                                                                                                                                                                                    |
| <b>Removable Media Write/Boot Control</b>                                 | Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media)                                                                                                                                                                         |
| <b>Power-On Password</b>                                                  | Yes, prevents an unauthorized person from booting up the workstation                                                                                                                                                                                                              |
| <b>Setup Password</b>                                                     | Yes, prevents an unauthorized person from changing the workstation configuration                                                                                                                                                                                                  |
| <b>3.3V Aux Power LED on System PCA</b>                                   | Yes                                                                                                                                                                                                                                                                               |
| <b>NIC LEDs (integrated) (Green &amp; Amber)</b>                          | Yes                                                                                                                                                                                                                                                                               |
| <b>CPUs and Heatsinks</b>                                                 | A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less                                                                                                                                                |
| <b>Power Supply Diagnostic LED</b>                                        | Yes                                                                                                                                                                                                                                                                               |
| <b>Front Power Button</b>                                                 | Yes, ACPI multi-function                                                                                                                                                                                                                                                          |
| <b>Rear Power Button</b>                                                  | Yes                                                                                                                                                                                                                                                                               |
| <b>Front Power LED</b>                                                    | Yes, white (normal), red (fault)                                                                                                                                                                                                                                                  |
| <b>Front Hard Drive Activity LED</b>                                      | Yes, white                                                                                                                                                                                                                                                                        |
| <b>Front ODD Activity LED</b>                                             | Yes, on device                                                                                                                                                                                                                                                                    |
| <b>Internal Speaker</b>                                                   | Yes                                                                                                                                                                                                                                                                               |
| <b>System/Emergency ROM Flash Recovery</b>                                | Recovers corrupted system BIOS.                                                                                                                                                                                                                                                   |
| <b>Cooling Solutions</b>                                                  | Air cooled forced convection heatsinks                                                                                                                                                                                                                                            |
| <b>Power Supply Fans</b>                                                  | 92 mm x 92 mm x 25 mm (non-serviceable)                                                                                                                                                                                                                                           |
| <b>CPU Heatsink Fan</b>                                                   | 92 mm x 25 mm, 6-wire, PWM                                                                                                                                                                                                                                                        |
| <b>Chassis Fan</b>                                                        | Front:<br>(Optional) 92 mm x 92mm x 25 mm, 4-wire, PWM<br><br>Rear:<br>92 mm x 92mm x 25 mm, 4-wire, PWM                                                                                                                                                                          |



### System Technical Specifications

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Memory Heatsink Fan</b>                  | Dual 60 mm x 60 mm x 25 mm, 6-wire, PWM, Blindmate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>HP PC Hardware Diagnostics UEFI</b>      | <p>HP Vision Diagnostics Offline Edition</p> <p>The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to:</p> <ul style="list-style-type: none"> <li>• Run diagnostics</li> <li>• View the hardware configuration of the system</li> </ul> <p>Key features and benefits</p> <p>HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision Diagnostics helps provide higher system availability.</p> <p>Typical uses of the Vision Diagnostics are:</p> <ul style="list-style-type: none"> <li>• Testing and diagnosing apparent hardware failures</li> <li>• Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance</li> <li>• Sending configuration information to another location for more in-depth analysis</li> <li>• Entered using F2</li> </ul> |
| <b>Access Panel Key Lock</b>                | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>ACPI-Ready Hardware</b>                  | <p>Advanced Configuration and Power Management Interface (ACPI).</p> <ul style="list-style-type: none"> <li>• Allows the system to wake from a low-power mode.</li> <li>• 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</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Trusted Platform Module Chip</b>         | Infineon TPM 1.2 Certified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Integrated Chassis Handles</b>           | Yes, Front handle and dedicated rear recess                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Power Supply</b>                         | Requires T15 Torx or flat blade screwdriver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>PCIe Card Retention</b>                  | Yes, rear (all), middle (all), front (full-length cards with extender, using HP Z4 Fan and Front Card Guide Kit)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Flash ROM</b>                            | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Diagnostic Power Switch LED on board</b> | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Clear Password Jumper</b>                | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Clear CMOS Button</b>                    | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>CMOS Battery Holder</b>                  | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>DIMM Connectors</b>                      | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

### BIOS



### System Technical Specifications

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <b>BIOS 32-bit Services</b>                                                   | Standard BIOS 32-bit Service Directory Proposal v0.4                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>PCI 3.0 Support</b>                                                        | Full BIOS support for PCI Express through industry standard interfaces.                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>ATAPI</b>                                                                  | ATAPI Removable Media Device BIOS Specification Version 1.0.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>BBS</b>                                                                    | BIOS Boot Specification v1.01.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>WMI Support</b>                                                            | 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.                                                                                                                                                                                                                                                        |
| <b>BIOS Boot Spec 1.01+</b>                                                   | Provides more control over how and from what devices the workstation will boot.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>BIOS Power On</b>                                                          | Users can define a specific date and time for the system to power on.                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>ROM Based Computer Setup Utility (F10)</b>                                 | Review and customize system configuration settings controlled by the BIOS.                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>System/Emergency ROM Flash Recovery with Video</b>                         | Recovers system BIOS in corrupted Flash ROM.                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Replicated Setup</b>                                                       | Saves BIOS settings to diskette or USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).                                                                                                                                                                                                                                                         |
| <b>SMBIOS</b>                                                                 | System Management BIOS 2.7, for system management information.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Boot Control</b>                                                           | Disables the ability to boot from removable media on supported devices.                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Memory Change Alert</b>                                                    | Alerts management console if memory is removed or changed.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Thermal Alert</b>                                                          | Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"> <li>• NORMAL - normal temperature ranges.</li> <li>• ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.</li> <li>• SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.</li> </ul> |
| <b>Remote ROM Flash</b>                                                       | Provides secure, fail-safe ROM image management from a central network console.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>ACPI (Advanced Configuration and Power Management Interface)</b>           | Allows the system to enter and resume from low power modes (sleep states).<br>Enables an operating system to control system power consumption based on the dynamic workload.<br>Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.<br>Supports ACPI 4.0 for full compatibility with 64-bit operating systems.                                                                       |
| <b>Ownership Tag</b>                                                          | A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Remote Wakeup/Remote Shutdown</b>                                          | System administrators can power on, restart, and power off a client computer from a remote location.                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Instantly Available PC (Suspend to RAM - ACPI sleep state S3)</b>          | Allows for very low power consumption with quick resume time.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)</b> | Allows a new or existing system to boot over the network and download software, including the operating system.                                                                                                                                                                                                                                                                                                                                                                  |
| <b>ROM revision levels</b>                                                    | Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.                                                                                                                                                                                                                                               |
| <b>System board revision level</b>                                            | Allows management SW to read revision level of the system board.<br>Revision level is digitally encoded into the HW and cannot be modified.                                                                                                                                                                                                                                                                                                                                      |
| <b>Start-up Diagnostics (Power-on Self-Test)</b>                              | Assesses system health at boot time with selectable levels of testing.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Auto Setup when new</b>                                                    | System automatically detects addition of new hardware.                                                                                                                                                                                                                                                                                                                                                                                                                           |

### System Technical Specifications

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| <b>hardware installed</b>                      |                                                                                                                                                                                              |
| <b>Keyboard-less Operation</b>                 | The system can be booted without a keyboard.                                                                                                                                                 |
| <b>Localized ROM Setup</b>                     | Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.                                                                      |
| <b>Asset Tag</b>                               | The user or MIS to set a unique tag string in non-volatile memory.                                                                                                                           |
| <b>Per-slot Control</b>                        | Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually.                                                                                           |
| <b>Adaptive Cooling</b>                        | Control parameters are set according to detected hardware configuration for optimal acoustics.                                                                                               |
| <b>Pre-boot Diagnostics</b>                    | (Pre-video) critical errors are reported via beeps and blinks on the power LED.                                                                                                              |
| <b>Industry Standard Specification Support</b> |                                                                                                                                                                                              |
| <b>Industry Standard</b>                       | Revision Supported by the BIOS                                                                                                                                                               |
| <b>UEFI Specification Revision</b>             | 2.3.1                                                                                                                                                                                        |
| <b>ACPI</b>                                    | Advanced Configuration and Power Management Interface, Version 4.0                                                                                                                           |
| <b>ATA (IDE)</b>                               | AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b                                                                                                                             |
| <b>CD Boot</b>                                 | "El Torito" Bootable CD-ROM Format Specification Version 1.0                                                                                                                                 |
| <b>EDD</b>                                     | - Enhanced Disk Drive Specification Version 1.1<br>- BIOS Enhanced Disk Drive Specification Version 3.0                                                                                      |
| <b>EHCI</b>                                    | Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0                                                                                                                    |
| <b>PCI</b>                                     | PCI Local Bus Specification, Revision 2.3<br>PCI Power Management Specification, Revision 1.1<br>PCI Firmware Specification, Revision 3.0, Draft .7                                          |
| <b>PCI Express</b>                             | PCI Express Base Specification, Revision 2.0<br>PCI Express Base Specification, Revision 3.0                                                                                                 |
| <b>PMM</b>                                     | POST Memory Manager Specification, Version 1.01                                                                                                                                              |
| <b>SATA</b>                                    | Serial ATA Specification, Revision 1.0a<br>Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5<br>Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0                            |
| <b>SPD</b>                                     | PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B                                                                                                                           |
| <b>TPM</b>                                     | Trusted Computing Group TPM Specification Version 1.2                                                                                                                                        |
| <b>UHCI</b>                                    | Universal Host Controller Interface Design Guide, Revision 1.1                                                                                                                               |
| <b>USB</b>                                     | Universal Serial Bus Revision 1.1 Specification<br><br>Universal Serial Bus Revision 2.0 Specification<br><br>Universal Serial Bus Revision 3.0 Specification                                |
| <b>SMBIOS</b>                                  | System Management BIOS Reference Specification, Version 2.7<br><br>External BIOS simulator found at: <a href="http://h20464.www2.hp.com/index.html">http://h20464.www2.hp.com/index.html</a> |

### Social and Environmental Responsibility

|                                                    |                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Eco-Label Certifications &amp; Declarations</b> | <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"> <li>ENERGY STAR® (energy-saving features available on selected configurations-Windows only)</li> <li>US Federal Energy Management Program (FEMP)</li> </ul> |
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### System Technical Specifications

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|                                                            | <ul style="list-style-type: none"> <li>China Energy Conservation Program</li> <li>The ECO declaration (TED)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Batteries</b>                                           | <p>The battery in this product complies with EU Directive 2006/66/EC</p> <p>Battery size: CR2032 (coin cell)</p> <p>Battery type: Lithium Metal</p> <p>The battery in this product does not contain:</p> <ul style="list-style-type: none"> <li>Mercury greater than 5ppm by weight</li> <li>Cadmium greater than 10ppm by weight</li> <li>Lead greater than 40ppm by weight</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Restricted Material Usage</b>                           | <p>This product meets the material restrictions specified in HP's General Specification for the Environment. <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/qse.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/qse.pdf</a></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>                                                                                                                                                                                                                                                                          |
| <b>Low Halogen Statement</b>                               | <p>This product is low-halogen except for power cords, external cables and peripherals. The following customer-configurable internal components may not be low-halogen: 3 ½" SAS HDDs and LSI 9217-4i4e SAS ROC RAID Card. Service parts obtained after purchase may not be low-halogen.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>End-of-Life Management and Recycling</b>                | <p>Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <a href="http://www.hp.com/recycle">http://www.hp.com/recycle</a> 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>                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hewlett-Packard Corporate Environmental Information</b> | <p>For more information about HP's commitment to the environment:</p> <p>Global Citizenship Report <a href="http://www.hp.com/hpinfo/globalcitizenship/qcreport/index.html">http://www.hp.com/hpinfo/globalcitizenship/qcreport/index.html</a></p> <p>Eco-label certifications<br/><a href="http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html">http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html</a></p> <p>ISO 14001 certificates:<br/><a href="http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html">http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html</a></p>                                                                                                                                                          |
| <b>Additional Information</b>                              | <ul style="list-style-type: none"> <li>This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.<br/><a href="http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstatio.html">http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstatio.html</a></li> <li>Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.</li> <li>EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See <a href="http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24">http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24</a> for registration status in your country.</li> </ul> |
| <b>Packaging</b>                                           | <p>HP Workstation product packaging meets the HP General Specification for the Environment at <a href="http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html">http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html</a></p> <ul style="list-style-type: none"> <li>Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment</li> <li>Does not contain ozone-depleting substances (ODS)</li> <li>Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed</li> </ul>                                                                                                                                                                                                                |

### System Technical Specifications

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|                            | <ul style="list-style-type: none"> <li>• Maximizes the use of post-consumer recycled content materials in packaging materials</li> <li>• All packaging material is recyclable</li> <li>• All packaging material is designed for ease of disassembly</li> <li>• Reduced size and weight of packages to improve transportation fuel efficiency</li> <li>• Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards formatting</li> </ul> |
| <b>Packaging Materials</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Internal</b>            | Cushions and plastic bags made of low density polyethylene (LDPE).                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>External</b>            | Outer carton, accessories carton, and insert made of corrugated paper board.                                                                                                                                                                                                                                                                                                                                                                                       |

### Manageability

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Industry Standard Specifications</b>         | <p>This product meets the following industry standard specifications for manageability functionality:</p> <ul style="list-style-type: none"> <li>• DASH 1.1 (via Intel® LAN on motherboard)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Intel Active Management Technology (AMT)</b> | <p>Intel® Active Management Technology (AMT) 9.1</p> <p>An advanced set of remote management features and functionality providing IT administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 9.1 includes the following advanced management functions:</p> <ul style="list-style-type: none"> <li>• Power Management (on, off, reset, graceful shutdown, sleep and hibernate) <ul style="list-style-type: none"> <li>◦ Support in Max Power Savings (Shutdown and Hibernate Modes)</li> </ul> </li> <li>• Hardware Inventory (includes BIOS and firmware revisions)</li> <li>• Hardware Alerting</li> <li>• Agent Presence</li> <li>• System Defense Filters</li> <li>• Serial Over LAN (SOL)</li> <li>• IDE Redirect</li> <li>• ME Wake-on-LAN (WOL)</li> <li>• DASH 1.1 compliance</li> <li>• IPv6 Support</li> <li>• 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</li> <li>• Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance.</li> <li>• Remote Alerts - automatically alert IT or service provider if issues arise</li> <li>• Access Monitor - Provides oversight into Intel® AMT actions to support security requirements</li> <li>• PC Alarm Clock</li> <li>• Microsoft NAP Support</li> <li>• Host Base set-up and configuration</li> <li>• Management Engine (ME) firmware roll back</li> <li>• Local Time Sync to UTC</li> <li>• Remote Memory Dump Command - Creates memory dump for debug</li> </ul> |
| <b>Intel® vPro™ Technology</b>                  | <p>The HP Z440 Workstation supports Intel® vPro technology when configured as outlined below:</p> <ul style="list-style-type: none"> <li>• Intel® Xeon processor E5-1600 v3 or E5-2600 v3 product family featuring Intel® vPro Technology</li> <li>• Intel® C612 chipset</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

### System Technical Specifications

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|                                                | <ul style="list-style-type: none"> <li>Intel® I218LM GbE LAN</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Remote Manageability Software Solutions</b> | <p>The HP Z440 Workstation is supported on the following remote manageability software consoles:</p> <ul style="list-style-type: none"> <li>LANDesk Management Suite (HP recommended solution)</li> <li>Microsoft System Center Configuration Manager</li> <li>HP Client Automation Enterprise</li> </ul> <p>For questions or support for manageability needs, please visit <a href="http://www.hp.com/go/easydeploy">http://www.hp.com/go/easydeploy</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>System Software Manager</b>                 | <p>For questions or support for SSM, please visit: <a href="http://www.hp.com/go/ssm">http://www.hp.com/go/ssm</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Service, Support, and Warranty</b>          | <p>On-site Warranty and Service (<b>Note 1</b>): Three-years, limited warranty and service offering delivers on-site, next business-day (<b>Note 2</b>) service for parts and labor and includes free telephone support (<b>Note 3</b>) 8am - 5pm. Global coverage (<b>Note 2</b>) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the original warranty and service offering.</p> <p><b>NOTE 1:</b> Terms and conditions may vary by country. Certain restrictions and exclusions apply.<br/> <b>NOTE 2:</b> On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.<br/> <b>NOTE 3:</b> Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.</p> <p>HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: <a href="http://www.hp.com/go/lookuptool">http://www.hp.com/go/lookuptool</a>. Additional HP Care Pack Services information by product is available at: <a href="http://www.hp.com/hps/carepack">http://www.hp.com/hps/carepack</a>. Service levels and response times for HP Care Packs may vary depending on your geographic location.</p> |
| <b>Product Change Notification</b>             | <ul style="list-style-type: none"> <li>Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile.</li> <li>PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition.</li> <li>Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### Stable & Consistent Offerings

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

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

| Processors  | Product # | Offering                                      |
|-------------|-----------|-----------------------------------------------|
|             | J6S68AV   | Intel Xeon E5-1620 v3 3.5GHz 4-core 10MB 2133 |
|             | J6S71AV   | Intel Xeon E5-2630 v3 2.4GHz 8-core 20MB 1866 |
| Hard Drives | Product # | Offering                                      |
|             | J3H77AV   | 500GB 7200 RPM SATA 1st Hard Disk Drive       |
|             | J3H98AV   | 500GB 7200 RPM SATA 2nd Hard Disk Drive       |
|             | J3J19AV   | 500GB 7200 RPM SATA 3rd Hard Disk Drive       |
|             | J3J39AV   | 500GB 7200 RPM SATA 4th Hard Disk Drive       |
|             | J3H78AV   | 1TB 7200 RPM SATA 1st Hard Disk Drive         |
|             | J3H99AV   | 1TB 7200 RPM SATA 2nd Hard Disk Drive         |
|             | J3J20AV   | 1TB 7200 RPM SATA 3rd Hard Disk Drive         |
|             | J3J40AV   | 1TB 7200 RPM SATA 4th Hard Disk Drive         |
| Graphics    | Product # | Offering                                      |
|             | J1P69AV   | NVIDIA NVS 510 2GB 1st Graphics               |
|             | J1P81AV   | NVIDIA NVS 510 2GB 2nd Graphics               |
|             | J1P71AV   | NVIDIA Quadro K620 2GB 1st Graphics           |
|             | J1P83AV   | NVIDIA Quadro K620 2GB 2nd Graphics           |
|             | J1P72AV   | NVIDIA Quadro K2200 4GB 1st Graphics          |
|             | J1P84AV   | NVIDIA Quadro K2200 4GB 2nd Graphics          |
|             | J1P76AV   | AMD FirePro W2100 2GB 1st Graphics            |
|             | J1P85AV   | AMD FirePro W2100 2GB 2nd Graphics            |
| Memory      | Product # | Offering                                      |
|             | G8U28AV   | 8GB DDR4-2133 (1x8GB) Registered RAM          |
|             | G8U32AV   | 16GB DDR4-2133 (2x8GB) Registered RAM         |
|             | G8U34AV   | 32GB DDR4-2133 (4x8GB) Registered RAM         |
|             | G8U36AV   | 64GB DDR4-2133 (8x8GB) Registered RAM         |
|             | G8U35AV   | 32GB DDR4-2133 (2x16GB) Registered RAM        |
|             | G8U37AV   | 64GB DDR4-2133 (4x16GB) Registered RAM        |
|             | G8U38AV   | 128GB DDR4-2133 (8x16GB) Registered RAM       |

Stable & Consistent Offerings

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



### Technical Specifications - Hard Drives

#### STORAGE/HARD DRIVES

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

**600GB SAS 15K rpm  
6Gb/s 3.5" HDD**

|                                                                                    |                                      |
|------------------------------------------------------------------------------------|--------------------------------------|
| <b>Capacity</b>                                                                    | 600GB                                |
| <b>Height</b>                                                                      | 1 in; 2.54 cm                        |
| <b>Width</b>                                                                       | <b>Media Diameter</b> 3.5 in; 8.9 cm |
|                                                                                    | <b>Physical Size</b> 4 in; 10.17 cm  |
| <b>Interface</b>                                                                   | SAS                                  |
| <b>Synchronous Transfer Rate (Maximum)</b>                                         | 6.0 Gb/s                             |
| <b>Buffer</b>                                                                      | 16 MB                                |
| <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 0.2 ms           |
|                                                                                    | <b>Average</b> 3.4 ms                |
|                                                                                    | <b>Full Stroke</b> 6.6 ms            |
| <b>Rotational Speed</b>                                                            | 15,000 rpm                           |
| <b>Logical Blocks</b>                                                              | 1,172,123,568 - 512 byte blocks      |
| <b>Operating Temperature</b>                                                       | 50° to 95° F (10° to 35° C)          |

**300GB SAS 15K rpm  
6Gb/s 3.5" HDD**

|                                                                                    |                                      |
|------------------------------------------------------------------------------------|--------------------------------------|
| <b>Capacity</b>                                                                    | 300GB                                |
| <b>Height</b>                                                                      | 1 in; 2.54 cm                        |
| <b>Width</b>                                                                       | <b>Media Diameter</b> 3.5 in; 8.9 cm |
|                                                                                    | <b>Physical Size</b> 4 in; 10.17 cm  |
| <b>Interface</b>                                                                   | SAS                                  |
| <b>Synchronous Transfer Rate (Maximum)</b>                                         | 6Gb/s                                |
| <b>Buffer</b>                                                                      | 16MB                                 |
| <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 0.2 ms           |
|                                                                                    | <b>Average</b> 3.4 ms                |
|                                                                                    | <b>Full Stroke</b> 6.6 ms            |
| <b>Rotational Speed</b>                                                            | 15,000 rpm                           |
| <b>Operating Temperature</b>                                                       | 50° to 95° F (10° to 35° C)          |

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

|                                                                                    |                                       |
|------------------------------------------------------------------------------------|---------------------------------------|
| <b>Capacity</b>                                                                    | 600GB                                 |
| <b>Height</b>                                                                      | 5.9 in; 15 cm                         |
| <b>Width</b>                                                                       | <b>Media Diameter</b> 2.5 in; 6.36 cm |
| <b>Interface</b>                                                                   | 12Gb/s SAS                            |
| <b>Synchronous Transfer Rate (Maximum)</b>                                         | up to 1200 MB/s (SAS single port)     |
| <b>Cache</b>                                                                       | 128MB                                 |
| <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Average</b> 2.0ms                  |
| <b>Rotational Speed</b>                                                            | 15K rpm                               |
| <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)           |

### Technical Specifications - Hard Drives

|                                 |                                                                                    |                                   |                  |
|---------------------------------|------------------------------------------------------------------------------------|-----------------------------------|------------------|
| <b>HP 300GB SAS 10K SFF HDD</b> | <b>Capacity</b>                                                                    | 300GB                             |                  |
|                                 | <b>Height</b>                                                                      | 5.9 in; 15 cm                     |                  |
|                                 | <b>Width</b>                                                                       | <b>Media Diameter</b>             | 2.5 in; 6.36 cm  |
|                                 | <b>Interface</b>                                                                   | 12Gb/s SAS                        |                  |
|                                 | <b>Synchronous Transfer Rate (Maximum)</b>                                         | up to 1200 MB/s (SAS single port) |                  |
|                                 | <b>Cache</b>                                                                       | 128MB                             |                  |
|                                 | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Average</b>                    | 2.0ms            |
|                                 | <b>Rotational Speed</b>                                                            | 15K rpm                           |                  |
|                                 | <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)       |                  |
|                                 |                                                                                    |                                   |                  |
| <b>HP 300GB SAS 10K SFF HDD</b> | <b>Capacity</b>                                                                    | 300GB                             |                  |
|                                 | <b>Height</b>                                                                      | 0.6 in; 1.53 cm                   |                  |
|                                 | <b>Width</b>                                                                       | <b>Media Diameter</b>             | 2.5 in; 6.36 cm  |
|                                 |                                                                                    | <b>Physical Size</b>              | 2.75 in; 6.99 cm |
|                                 | <b>Interface</b>                                                                   | SAS 6Gb/s                         |                  |
|                                 | <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600MB/s                     |                  |
|                                 | <b>Buffer</b>                                                                      | 64MB                              |                  |
|                                 | <b>Cache</b>                                                                       | multi-segmentable cache buffer    |                  |
|                                 | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b>               | 0.4 ms (max)     |
|                                 |                                                                                    | <b>Average</b>                    | 3.6 ms           |
|                                 |                                                                                    | <b>Full Stroke</b>                | 7.3 ms           |
|                                 | <b>Rotational Speed</b>                                                            | 10,000 rpm                        |                  |
|                                 | <b>Logical Blocks</b>                                                              | 585,937,500                       |                  |
|                                 | <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)       |                  |
|                                 |                                                                                    |                                   |                  |
| <b>HP 600GB SAS 10K SFF HDD</b> | <b>Capacity</b>                                                                    | 600GB                             |                  |
|                                 | <b>Height</b>                                                                      | 0.6 in; 1.53 cm                   |                  |
|                                 | <b>Width</b>                                                                       | <b>Media Diameter</b>             | 2.5 in; 6.36 cm  |
|                                 |                                                                                    | <b>Physical Size</b>              | 2.75 in; 6.99 cm |
|                                 | <b>Interface</b>                                                                   | SAS 6Gb/s                         |                  |
|                                 | <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600MB/s                     |                  |
|                                 | <b>Buffer</b>                                                                      | 64MB                              |                  |
|                                 | <b>Cache</b>                                                                       | multi-segmentable cache buffer    |                  |
|                                 | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b>               | 0.4 ms (max)     |
|                                 |                                                                                    | <b>Average</b>                    | 3.6 ms           |
|                                 |                                                                                    | <b>Full Stroke</b>                | 7.3 ms           |
|                                 | <b>Rotational Speed</b>                                                            | 10,000 rpm                        |                  |
|                                 | <b>Logical Blocks</b>                                                              | 1,172,123,568                     |                  |
|                                 | <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)       |                  |
|                                 |                                                                                    |                                   |                  |

### Technical Specifications - Hard Drives

#### HP 1.2TB SAS 10K SFF HDD

|                                                                                    |                                       |
|------------------------------------------------------------------------------------|---------------------------------------|
| <b>Capacity</b>                                                                    | 1.2TB                                 |
| <b>Height</b>                                                                      | 0.6 in; 1.53 cm                       |
| <b>Width</b>                                                                       | <b>Media Diameter</b> 2.5 in; 6.36 cm |
|                                                                                    | <b>Physical Size</b> 2.75 in; 6.99 cm |
| <b>Interface</b>                                                                   | SAS 6Gb/s                             |
| <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600MB/s                         |
| <b>Buffer</b>                                                                      | 64MB                                  |
| <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 0.18ms (max)      |
|                                                                                    | <b>Average</b> 3.5ms                  |
|                                                                                    | <b>Full Stroke</b> 7.17ms             |
| <b>Rotational Speed</b>                                                            | 10,000 rpm                            |
| <b>Logical Blocks</b>                                                              | 2,344,225,968                         |
| <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)           |

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

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

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

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

|                                                                                    |                                      |
|------------------------------------------------------------------------------------|--------------------------------------|
| <b>Capacity</b>                                                                    | 1TB                                  |
| <b>Height</b>                                                                      | 1 in; 2.54 cm                        |
| <b>Width</b>                                                                       | <b>Media Diameter</b> 3.5 in; 8.9 cm |
|                                                                                    | <b>Physical Size</b> 4 in; 10.17 cm  |
| <b>Interface</b>                                                                   | Serial ATA (6.0Gb/s), NCQ enabled    |
| <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600 MB/s                       |
| <b>Buffer</b>                                                                      | 64MB                                 |
| <b>Cache</b>                                                                       | Adaptive                             |
| <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 2 ms             |
|                                                                                    | <b>Average</b> 11 ms                 |
|                                                                                    | <b>Full Stroke</b> 21 ms             |
| <b>Rotational Speed</b>                                                            | 7,200 rpm                            |

### Technical Specifications - Hard Drives

|                                               |                                                                                    |                                    |                  |
|-----------------------------------------------|------------------------------------------------------------------------------------|------------------------------------|------------------|
| <b>2.0TB SATA 7200 rpm<br/>6Gb/s 3.5" HDD</b> | <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)        |                  |
|                                               | <b>Capacity</b>                                                                    | 2.0TB                              |                  |
|                                               | <b>Height</b>                                                                      | 1 in; 2.54 cm                      |                  |
|                                               | <b>Width</b>                                                                       | <b>Media Diameter</b>              | 3.5 in; 8.9 cm   |
|                                               |                                                                                    | <b>Physical Size</b>               | 4 in; 10.17 cm   |
|                                               | <b>Interface</b>                                                                   | Serial ATA (6.0 Gb/s), NCQ Enabled |                  |
|                                               | <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600 MB/s                     |                  |
|                                               | <b>Buffer</b>                                                                      | 64MB                               |                  |
|                                               | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b>                | 1.0 ms           |
|                                               |                                                                                    | <b>Average</b>                     | 11 ms            |
|                                               |                                                                                    | <b>Full Stroke</b>                 | 18 ms            |
|                                               | <b>Rotational Speed</b>                                                            | 7,200 rpm                          |                  |
|                                               | <b>Logical Blocks</b>                                                              | 3,907,029,168                      |                  |
|                                               | <b>Operating Temperature</b>                                                       | 41° to 131° F (5° to 55° C)        |                  |
| <b>3.0TB SATA 7200 rpm<br/>6Gb/s 3.5" HDD</b> | <b>Capacity</b>                                                                    | 3.0TB                              |                  |
|                                               | <b>Height</b>                                                                      | 1 in; 2.54 cm                      |                  |
|                                               | <b>Width</b>                                                                       | <b>Media Diameter</b>              | 3.5 in; 8.9 cm   |
|                                               |                                                                                    | <b>Physical Size</b>               | 4.0 in; 10.17 cm |
|                                               | <b>Interface</b>                                                                   | Serial ATA (6.0Gb/s), NCQ enabled  |                  |
|                                               | <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 6.0 Gb/s                     |                  |
|                                               | <b>Buffer</b>                                                                      | 64MB                               |                  |
|                                               | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b>                | 0.6 ms           |
|                                               |                                                                                    | <b>Average</b>                     | 11 ms            |
|                                               |                                                                                    | <b>Full Stroke</b>                 | Not Specified    |
|                                               | <b>Rotational Speed</b>                                                            | 7,200 rpm                          |                  |
|                                               | <b>Operating Temperature</b>                                                       | 41° to 140° F (5° to 60° C)        |                  |
| <b>4TB SATA 7200 rpm<br/>6Gb/s 3.5" HDD</b>   | <b>Capacity</b>                                                                    | 4TB                                |                  |
|                                               | <b>Height</b>                                                                      | 0.275 in; 0.7 cm                   |                  |
|                                               | <b>Width</b>                                                                       | <b>Media Diameter</b>              | 2.5 in; 6.36 cm  |
|                                               |                                                                                    | <b>Physical Size</b>               | 2.75 in; 6.99 cm |
|                                               | <b>Interface</b>                                                                   | Serial ATA (6Gb/s), NCQ enabled    |                  |
|                                               | <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600MB/s                      |                  |
|                                               | <b>Buffer</b>                                                                      | 128MB                              |                  |
|                                               | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b>                | 0.7ms            |
|                                               |                                                                                    | <b>Average</b>                     | 8.5ms            |
|                                               |                                                                                    | <b>Full Stroke</b>                 | 15.7ms           |
|                                               | <b>Rotational Speed</b>                                                            | 7,200 rpm                          |                  |
|                                               | <b>Operating Temperature</b>                                                       | 32° to 140° F (0° to 60° C)        |                  |

### Technical Specifications - Hard Drives

|                                                      |                                                                                    |                                            |                                       |
|------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------|
| <b>500GB SATA 7.2K SED SFF HDD</b>                   | <b>Capacity</b>                                                                    | 500GB                                      |                                       |
|                                                      | <b>Height</b>                                                                      | 0.275 in; 0.7 cm                           |                                       |
|                                                      | <b>Width</b>                                                                       |                                            | <b>Media Diameter</b> 2.5 in; 6.36 cm |
|                                                      |                                                                                    |                                            | <b>Physical Size</b> 2.75 in; 6.99 cm |
|                                                      | <b>Interface</b>                                                                   | Serial ATA (6Gb/s)                         |                                       |
|                                                      | <b>Synchronous Transfer Rate (Maximum)</b>                                         | Up to 600MB/s                              |                                       |
|                                                      | <b>Buffer</b>                                                                      | 32MB                                       |                                       |
|                                                      | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 1ms                    |                                       |
|                                                      |                                                                                    | <b>Average</b> 4.2ms                       |                                       |
|                                                      |                                                                                    | <b>Full Stroke</b> 25ms (typical)          |                                       |
|                                                      | <b>Rotational Speed</b>                                                            | 7,200 rpm                                  |                                       |
|                                                      | <b>Operating Temperature</b>                                                       | 32° to 140° F (0° to 60° C)                |                                       |
| <b>HP Solid State Drives (SSDs) for Workstations</b> | <b>HP 128GB SATA 6Gb/s SSD</b>                                                     | <b>Capacity</b>                            | 128GB                                 |
|                                                      |                                                                                    | <b>Height</b>                              | 0.28 in; 0.7 cm                       |
|                                                      |                                                                                    | <b>Width</b>                               | <b>Physical Size</b> 2.5 in; 6.36 cm  |
|                                                      |                                                                                    | <b>Interface</b>                           | SATA 6Gb/s                            |
|                                                      |                                                                                    | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 500MB/s (Sequential Read)       |
|                                                      |                                                                                    | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)           |
|                                                      | <b>HP 256GB SATA 6Gb/s SSD</b>                                                     | <b>Capacity</b>                            | 256GB                                 |
|                                                      |                                                                                    | <b>Height</b>                              | 0.28 in; 0.7 cm                       |
|                                                      |                                                                                    | <b>Interface</b>                           | SATA 6Gb/s                            |
|                                                      |                                                                                    | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 500MB/s (Sequential Read)       |
|                                                      |                                                                                    | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)           |
|                                                      |                                                                                    |                                            |                                       |
|                                                      | <b>HP 256GB SATA 6Gb/s SED SSD</b>                                                 | <b>Capacity</b>                            | 256GB                                 |
|                                                      |                                                                                    | <b>Height</b>                              | 0.28 in; 0.7 cm                       |
|                                                      |                                                                                    | <b>Width</b>                               | <b>Physical Size</b> 2.5 in; 6.36 cm  |
|                                                      |                                                                                    | <b>Interface</b>                           | 6Gb/s SATA                            |
|                                                      |                                                                                    | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 500MB/s (Sequential Read)       |
|                                                      |                                                                                    | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)           |
|                                                      | <b>HP 512GB SATA 6Gb/s SSD</b>                                                     | <b>Capacity</b>                            | 512GB                                 |
|                                                      |                                                                                    | <b>Height</b>                              | 0.28 in; 0.7 cm                       |
|                                                      |                                                                                    | <b>Width</b>                               | <b>Physical Size</b> 2.5 in; 6.36 cm  |
|                                                      |                                                                                    | <b>Interface</b>                           | 6Gb/s SATA                            |
|                                                      |                                                                                    | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 500MB/s (Sequential Read)       |
|                                                      |                                                                                    | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)           |

### Technical Specifications - Hard Drives

|                                      |                                          |                                            |                                           |                 |
|--------------------------------------|------------------------------------------|--------------------------------------------|-------------------------------------------|-----------------|
|                                      | <b>HP 1TB SATA 6Gb/s SSD</b>             | <b>Capacity</b>                            | 1TB                                       |                 |
|                                      |                                          | <b>Height</b>                              | 0.28 in; 0.7 cm                           |                 |
|                                      |                                          | <b>Width</b>                               | <b>Physical Size</b>                      | 2.5 in; 6.36 cm |
|                                      |                                          | <b>Interface</b>                           | 6Gb/s SATA                                |                 |
|                                      |                                          | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 550MB/s (Sequential Read)           |                 |
|                                      |                                          | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)               |                 |
|                                      | <b>Samsung Enterprise 240GB SATA SSD</b> | <b>Capacity</b>                            | 240GB                                     |                 |
|                                      |                                          | <b>Width</b>                               | <b>Physical Size</b>                      | 2.5 in; 6.36 cm |
|                                      |                                          | <b>Interface</b>                           | SATA 6Gb/s                                |                 |
|                                      |                                          | <b>Synchronous Transfer Rate (Maximum)</b> | 600 Mb/s                                  |                 |
|                                      |                                          |                                            |                                           |                 |
|                                      | <b>Samsung Enterprise 480GB SATA SSD</b> | <b>Capacity</b>                            | 480GB                                     |                 |
|                                      |                                          | <b>Width</b>                               | <b>Physical Size</b>                      | 2.5 in; 6.36 cm |
|                                      |                                          | <b>Interface</b>                           | SATA 6Gb/s                                |                 |
|                                      |                                          | <b>Synchronous Transfer Rate (Maximum)</b> | 600 Mb/s                                  |                 |
|                                      |                                          |                                            |                                           |                 |
|                                      | <b>Intel Pro 1500 180GB SATA SSD</b>     | <b>Capacity</b>                            | 180GB                                     |                 |
|                                      |                                          | <b>Width</b>                               | <b>Physical Size</b>                      | 2.5 in; 6.36 cm |
|                                      |                                          | <b>Interface</b>                           | 6Gb/s SATA                                |                 |
|                                      |                                          | <b>Synchronous Transfer Rate (Maximum)</b> | 600 Mb/s                                  |                 |
|                                      |                                          | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)               |                 |
| <b>PCIe SSDs for HP Workstations</b> | <b>HP Z Turbo Drive 256GB SSD</b>        | <b>Capacity</b>                            | 256GB                                     |                 |
|                                      |                                          | <b>Interface</b>                           | PCI Express 2.0 x4 electrical x4 physical |                 |
|                                      |                                          | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)               |                 |
|                                      | <b>HP Z Turbo Drive 512GB SSD</b>        | <b>Capacity</b>                            | 512GB                                     |                 |
|                                      |                                          | <b>Interface</b>                           | PCI Express 2.0 x4 electrical x4 physical |                 |
|                                      |                                          | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)               |                 |

### Technical Specifications - Hard Drive Controllers

#### HARD DRIVE CONTROLLERS

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

### Technical Specifications - Graphics

#### GRAPHICS

##### NVIDIA NVS 310 512MB Graphics

|                               |                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Form Factor</b>            | Low Profile:<br>2.7 inches (H) x 5.7 inches (L), Half-Height                                                                                                                                                                                                                                   |
| <b>Weight:</b>                | ~142 grams                                                                                                                                                                                                                                                                                     |
| <b>Graphics Controller</b>    | NVIDIA NVS 310<br>GPU: GF119-825                                                                                                                                                                                                                                                               |
| <b>Bus Type</b>               | PCI Express x16, 2.0 compliant                                                                                                                                                                                                                                                                 |
| <b>Memory</b>                 | Size: 512MB DDR3<br>Clock: 875Mhz<br>Memory Bandwidth: 14GB/s                                                                                                                                                                                                                                  |
| <b>Connectors</b>             | 2 x DisplayPort                                                                                                                                                                                                                                                                                |
| <b>Maximum Resolution</b>     | Up to 2560 x 1600 (digital display) per display.                                                                                                                                                                                                                                               |
| <b>Image Quality Features</b> | The following video formats are supported: <ul style="list-style-type: none"> <li>- MPEG2</li> <li>- MPEG4 Part 2 Advanced Simple Profile</li> <li>- H.264 SVC codec support</li> <li>- Support for 3D Blu Ray</li> <li>- VC1</li> <li>- DivX version 3.11 and later</li> <li>- MVC</li> </ul> |

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 x 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 x 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.

DVI-D output:

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

HDMI output:



### Technical Specifications - Graphics

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

#### VGA display output:

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

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

DX11, OpenGL 4.1

#### Available Graphics Drivers

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

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

#### Notes

- The thermal solution used on this card is an active fan heatsink.
- Factory configured NVS 310 graphics card have no cable adaptors included. Adapters must be ordered separately.
- Option kit NVS 310 includes 2 DP to DVI-D cable adaptors.

#### NVIDIA NVS 315 1 GB Graphics

##### Form Factor

Low Profile:  
2.713 inches in height × 5.7 inches in length  
Weight: ~142 grams

##### Graphics Controller

NVIDIA NVS 315 (using GF119-825 GPU)  
Number of Cores: 48 CUDA cores  
Max. Power: 19.3W  
Cooling Solution: Active fan heatsink

##### Bus Type

PCI Express x16, 2.0 compliant

##### Memory

Size: 1GB DDR3  
Clock: 875Mhz  
Memory Bandwidth: 14GB/s

##### Connectors

DMS-59 output  
Cables included:  
- For CTO: DMS-59 to DVI cable  
- For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable

##### Maximum Resolution

Maximum number of displays supported: 2  
  
Maximum Resolution Support:  
- DMS-59 to VGA: 2048 × 1536 @ 85Hz  
- DMS-59 to DVI: 1980 × 1200 @ 60Hz  
- DMS-59 to DP: 2560 × 1600 @ 60Hz

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Image Quality Features</b>     | <p>See Display Output section.</p> <p>The following video formats are supported:</p> <ul style="list-style-type: none"><li>- MPEG2</li><li>- MPEG4 Part 2 Advanced Simple Profile</li><li>- H.264 SVC codec support</li><li>- Support for 3D Blu Ray</li><li>- VC1</li><li>- DivX version 3.11 or later</li></ul> <p>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.</p>                                                                                                                                                                                                              |
| <b>Display Output</b>             | <p>Up to 2 displays using one of the following DMS-59 cables:</p> <ul style="list-style-type: none"><li>- DMS-59 to DVI</li><li>- DMS-59 to VGA</li><li>- DMS-59 to DP</li></ul> <p>DisplayPort output:</p> <ul style="list-style-type: none"><li>• 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.</li></ul> <p>DVI-D output:</p> <ul style="list-style-type: none"><li>• Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor</li></ul> <p>VGA display output:</p> <ul style="list-style-type: none"><li>• Drives two analog displays at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.</li></ul> |
| <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Supported Graphics APIs</b>    | DX11, OpenGL 4.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Available Graphics Drivers</b> | <p>Windows 8</p> <p>Microsoft Windows 7 Professional (64-bit and 32-bit)</p> <p>Microsoft Windows XP Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux(RHEL)</p> <p>SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)</p> <p>HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:<br/><a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a></p> <p>SUSE Linux Enterprise drivers may also be obtained from:<br/><a href="ftp://download.nvidia.com/novell">ftp://download.nvidia.com/novell</a> or <a href="http://www.nvidia.com">http://www.nvidia.com</a></p>                                                                                                                       |
| <b>Notes</b>                      | <ol style="list-style-type: none"><li>1. The thermal solution used on this card is an active fan heatsink.</li><li>2. Factory configured NVS 310 graphics card have no cable adapters</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### Technical Specifications - Graphics

included. Adapters must be ordered separately.

3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

|                                    |                               |                                                                                                                                                                                                                                   |
|------------------------------------|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NVIDIA NVS 510 2GB Graphics</b> | <b>Form Factor</b>            | Low Profile, 2.713 inches × 6.3 inches, single slot                                                                                                                                                                               |
|                                    | <b>Graphics Controller</b>    | NVS 510 GPU<br>Core Clock: 797 MHz<br>Memory Clock: 891 MHz<br>CUDA Cores: 192                                                                                                                                                    |
|                                    | <b>Bus Type</b>               | PCI Express x16, Generation 2.0                                                                                                                                                                                                   |
|                                    | <b>Memory</b>                 | 2GB DDR3                                                                                                                                                                                                                          |
|                                    | <b>Connectors</b>             | Four mini-DisplayPort.<br>Four mini-DisplayPort-to-DisplayPort adapters included.<br>(DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories) |
|                                    | <b>Maximum Resolution</b>     | Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 × 2160 @ 60Hz)                                                                                                                                       |
|                                    |                               | <b>Note:</b> This card supports up to four displays. For Windows XP, only 2 active displays are supported.                                                                                                                        |
|                                    | <b>Image Quality Features</b> | 10-bit internal display processing, including hardware support for 10-bit scan-out                                                                                                                                                |
|                                    | <b>Display Output</b>         | DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.                                                                                                                                                |
|                                    |                               | <b>Digital Display Support</b>                                                                                                                                                                                                    |

**DisplayPort Output**

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

**DVI-D Output**

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

**HDMI Output**

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

### Analog Display Support

### Technical Specifications - Graphics

#### VGA display output

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

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

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

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

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

**Notes** Heatsink cooler design is active.

#### NVIDIA Quadro K620 2GB Graphics

**Form Factor** 2.713" H x 6.3" L  
Single Slot, Low Profile  
Full Height Profile bracket installed  
Low Profile bracket included  
Weight: 133 grams

**Graphics Controller** NVIDIA Quadro K620 Graphics Card  
GM107 GPU  
384 CUDA cores  
Max Power: 45 Watts

**Bus Type** PCI Express 2.0 x16

**Memory** 2 GB GDDR3, 900 MHz  
128-bit memory I/O path  
29 GB/s memory bandwidth

**Connectors** 1 DL-DVI(I) output, 1 DisplayPort output  
Factory Configured: No video cable adapter included  
Option Kit: One DP-to-DVI adapter included with card

**Maximum Resolution** Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.  
DisplayPort 1.2:  
- up to 4096x2160 x 30 bpp @ 60Hz  
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)  
  
Dual Link DVI(I) output:  
- up to 2560 x 1600 x 32 bpp @ 60Hz  
  
Single Link-DVI(I) output:  
- up to 1920 x 1200 x 32 bpp @ 60Hz

**Image Quality Features** 10-bit internal display processing pipeline  
10-bit scan-out support

**Display Output** 1 Dual-link DVI-I connector  
1 Display Port connector

### Technical Specifications - Graphics

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

|                                        |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NVIDIA Quadro K420 1GB Graphics</b> | <b>Form Factor</b>                | Low Profile:<br>2.713 inches × 6.3 inches, single slot                                                                                                                                                                                                                                                                                                                                                                                              |
|                                        | <b>Graphics Controller</b>        | NVIDIA Quadro K420<br>GPU: GK107                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                        | <b>Bus Type</b>                   | PCI Express x16, 2.0 compliant                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                        | <b>Memory</b>                     | Size: 1GB DDR3<br>Clock: 891MHz<br>Memory Bandwidth: 29GB/s                                                                                                                                                                                                                                                                                                                                                                                         |
|                                        | <b>Connectors</b>                 | One dual-link DVI-I connector<br>One DisplayPort connector                                                                                                                                                                                                                                                                                                                                                                                          |
|                                        | <b>Maximum Resolution</b>         | VGA (via adapter cable): <ul style="list-style-type: none"> <li>• 2048 × 1536 × 32 bpp at 85 Hz</li> </ul> Dual-link DVI <ul style="list-style-type: none"> <li>• 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)</li> </ul> Single-link DVI <ul style="list-style-type: none"> <li>• 920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li> </ul> DisplayPort 1.2 <ul style="list-style-type: none"> <li>• 3840 × 2160 × 30 bpp at 60 Hz</li> </ul> |
|                                        | <b>RAMDAC</b>                     | 400 MHz integrated RAMDAC                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                        | <b>Display Output</b>             | Maximum number of displays supported: 2                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                        | <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                        | <b>Supported Graphics APIs</b>    | DX11, OpenGL 4.4<br>Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran                                                                                                                                                                                                                                                                                                                                        |
|                                        | <b>Available Graphics Drivers</b> | Microsoft Windows 8.1<br>Microsoft Windows 8<br>Microsoft Windows 7<br>Linux                                                                                                                                                                                                                                                                                                                                                                        |

### Technical Specifications - Graphics

#### Notes

1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.
2. Option kit Quadro K420 includes one DP to DVI-D adapter.

#### NVIDIA Quadro K2200 4 GB Graphics

#### Form Factor

4.38" H x 7.97" L  
Single Slot, Full Height

#### Weight:

240 grams

#### Graphics Controller

NVIDIA Quadro K2200 Graphics Card  
GM107 GPU  
640 CUDA cores  
Max Power: 67.7 Watts

#### Bus Type

PCI Express 2.0 x16

#### Memory

4 GB GDDR5, 2500 Mhz  
128-bit memory I/O path  
80 GB/s memory bandwidth

#### Connectors

1 DL-DVI(I) output, 2 DisplayPort outputs  
Factory Configured Option: No video cable adapter included  
Option Kit: One DP-to-DVI adapter included with card

#### Maximum Resolution

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

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

#### Image Quality Features

DL-DVI(I) output:  
- up to 2560 x 1600 x 32 bpp @ 60Hz  
10-bit internal display processing pipeline  
10-bit scan-out support

#### Display Output

VGA:  

- requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters
- 400 MHz integrated RAMDAC
- Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz

DL-DVI(I):  

- Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz

SL-DVI(I):  

- Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz

DisplayPort:  

- Supports HBR2 and MST
- Max resolution: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution)
- Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200

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

#### Shading Architecture

Full Microsoft DirectX 11.1 Shader Model 5.0

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Supported Graphics APIs</b>    | OpenGL 4.4<br>DirectX 11.1<br>API support includes:<br>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Available Graphics Drivers</b> | Microsoft Windows 8.1<br>Microsoft Windows 8<br>Microsoft Windows 7<br>Linux<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br><a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a>                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Notes</b>                      | <ol style="list-style-type: none"> <li>1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.</li> <li>2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.</li> <li>3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device.</li> <li>4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output.</li> </ol> |

|                                       |                            |                                                                            |
|---------------------------------------|----------------------------|----------------------------------------------------------------------------|
| <b>AMD FirePro W2100 2GB Graphics</b> | <b>Form Factor</b>         | Low Profile, half length (full-height bracket included)                    |
|                                       | <b>Graphics Controller</b> | AMD FirePro™ W2100 professional graphics<br>Power: <50W<br>Cooling: Active |
|                                       | <b>Bus Type</b>            | PCI Express® x8, Generation 3.0                                            |
|                                       | <b>Memory</b>              | 2GB DDR3 memory<br>Memory Bandwidth: 14.4 GB/s                             |
|                                       | <b>Connectors</b>          | 2x Display Port 1.2 connectors                                             |

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

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

|                           |                                                                                                                                                    |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum Resolution</b> | DisplayPort 1.2: <ul style="list-style-type: none"> <li>• up to 4096x2160 x 30 bpp @ 60Hz</li> </ul><br>Dual Link DVI(I) (requires adapter cable): |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|

### Technical Specifications - Graphics

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

Single Link-DVI(I)(requires adapter):

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

VGA(requires adapter):

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

#### Display Output

2 x DisplayPort® 1.2

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

OpenCL™ 1.2, DirectX® 11 and OpenGL 4.4

#### Available Graphics Drivers

Windows 8.1 (64-bit and 32-bit)

Windows 7 (64-bit and 32-bit)

Red Hat Enterprise Linux (RHEL)

SUSE Linux Enterprise Desktop 11(64-bit and 32-bit)

Ubuntu

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

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

#### Notes

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

#### AMD FirePro W5100 4GB Graphics

#### Form Factor

Full height, single slot (6.75" X 4.376")

#### Graphics Controller

AMD FirePro W5100 graphics

GPU Frequency: 930Mhz

GPU: 768 Stream Processors organized into 12 Compute Units

Power: <75 Watts

Cooling: Active

#### Bus Type

PCI Express® x16, Generation 3.0

#### Memory

4GB GDDR5 memory

Memory Bandwidth: up to 96 GB/s

Memory Width: 128 bit

#### Connectors

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

Factory Configured: No video cable adapter included

After market option kit: No video cable adapter included



### Technical Specifications - Graphics

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

#### Maximum Resolution

DisplayPort:  
- 4096x2160 @24bpp 60Hz

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

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

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

#### Image Quality Features

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

#### Display Output

Max number of monitors supported using DisplayPort 1.2a:  
- 4 direct attached monitors  
- 6 using DP 1.2a with MST and HBR2 enabled monitors

Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2):  
- one 4096x2160 display  
- two 2560x1600 displays  
- four 1920x1200 displays

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

OpenGL 4.4  
OpenCL 1.2 and 2.0  
DirectX 11.2 / 12  
AMD Mantle

#### Available Graphics Drivers

Windows 8.1 / 8 (64-bit and 32-bit)  
Windows® 7 (64-bit and 32-bit)  
Linux

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

#### Notes

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

### Technical Specifications - Graphics

|                                             |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             |                               | See <a href="http://www.amd.com/eyefinityfaq">www.amd.com/eyefinityfaq</a> for full details.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                             | <b>Form Factor</b>            | Full height, single slot (6.75" X 4.376")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>NVIDIA Quadro K4200<br/>4GB Graphics</b> | <b>Form Factor</b>            | 4.376" H x 9.5" L<br>Single Slot, Full Height                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                             | <b>Weight:</b>                | ~458 grams (without extender)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                             | <b>Graphics Controller</b>    | NVIDIA Quadro K4200 Graphics Card<br>Kepler GK104 GPU<br>1344 CUDA cores<br>Max Power: 108 Watts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                             | <b>Bus Type</b>               | PCI Express 2.0 x16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                             | <b>Memory</b>                 | 4 GB GDDR5, 2700 MHz<br>256-bit memory I/O path<br>173 GB/s memory bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                             | <b>Connectors</b>             | 1 DL-DVI(I) output, 2 DisplayPort outputs<br>CTO: No video cable adapter included<br>AMO: One DP-to-DVI adapter included with card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                             | <b>Maximum Resolution</b>     | Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories<br>DisplayPort:<br>- up to 3840 x 2160 x 30 bpp @ 60Hz<br>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                             | <b>Image Quality Features</b> | DL-DVI(I) output:<br>- up to 2560 x 1600 x 32 bpp @ 60Hz<br>10-bit internal display processing pipeline<br>10-bit scan-out support                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                             | <b>Display Output</b>         | VGA:<br><ul style="list-style-type: none"> <li>requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters</li> <li>400 MHz integrated RAMDAC</li> <li>Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz</li> </ul> DL-DVI(I):<br><ul style="list-style-type: none"> <li>Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz</li> </ul> SL-DVI(I):<br><ul style="list-style-type: none"> <li>Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz</li> </ul> DisplayPort:<br><ul style="list-style-type: none"> <li>Supports HBR2 and MST</li> <li>Max resolution: 3840 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K4200 DisplayPort connector at this resolution)</li> <li>Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K4200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200</li> </ul> |

### Technical Specifications - Graphics

#### HDMI:

- Requires use of DP-to-HDMI cable
- Max Resolution: 1920 x 1080 x 32 bpp @ 60Hz

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

#### Shading Architecture

Full Microsoft DirectX 11 Shader Model 5.0

#### Supported Graphics APIs

OpenGL 4.4  
DirectX 11.1  
API support includes:  
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

#### Available Graphics Drivers

Microsoft Windows 8.1  
Microsoft Windows 8  
Microsoft Windows 7  
Linux

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

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

#### Notes

1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K4200 offered as AMO includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device.
4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K4200 DisplayPort output.

#### NVIDIA Quadro K5200 8GB Graphics

#### Form Factor

4.376" H x 10.5" L  
Dual Slot

#### Weight:

~880 grams

#### Graphics Controller

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

#### Bus Type

PCI Express 3.0 x16

#### Memory

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

#### Connectors

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

Factory configured option: No adapter included with card.

### Technical Specifications - Graphics

Option Kit: No adaptor included with card.

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

#### Image Quality Features

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

#### Display Output

400 MHz integrated RAMDAC

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

Dual-link internal TMDS (DVI 1.0)

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

Single-link internal TMDS (DVI 1.0)

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

DisplayPort with MST and HBR2.

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

HDMI

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

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

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

#### Available Graphics Drivers

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

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

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

#### Notes

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

### Technical Specifications - Graphics

|                                              |                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NVIDIA Quadro K6000<br/>12GB Graphics</b> | <b>Form Factor</b>             | 4.376" H x 10.5" L<br>Dual Slot<br>Power: 234 Watts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                              | <b>Weight:</b>                 | ~880 grams                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                              | <b>Graphics Controller</b>     | NVIDIA Quadro K6000 Graphics Card based on the GK180 GPU<br>Core Count: 2880<br>Base Clock: 797 MHz<br>Boost Clock: 902 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                              | <b>Bus Type</b>                | PCI Express 3.0 x16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                              | <b>Memory</b>                  | 12GB GDDR5<br>384-bit memory I/O path<br>288 GB/s memory bandwidth<br>ECC Memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                              | <b>Connectors</b>              | DVI-I (1), DVI-D (1), DP (2), Optional 3D Stereo bracket with 3-pin mini-DIN connector.<br><br>Factory configured option: No adapter included with card.<br>Option Kit: No adaptor included with card.<br><br>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                              | <b>Image Quality Features</b>  | <ul style="list-style-type: none"> <li>• DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support</li> <li>• NVIDIA 3D Vision™ technology</li> <li>• NVIDIA Premium Mosaic and nView</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                              | <b>Display Output</b>          | 400 MHz integrated RAMDAC<br>Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz<br><br>Dual-link internal TMDS (DVI 1.0) <ul style="list-style-type: none"> <li>• Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)</li> </ul> Single-link internal TMDS (DVI 1.0) <ul style="list-style-type: none"> <li>• Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)</li> </ul> DisplayPort with MST and HBR2. <ul style="list-style-type: none"> <li>• Maximum resolution: 3840 × 2160 × 36 bpp at 60Hz</li> </ul> HDMI <ul style="list-style-type: none"> <li>• Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz</li> </ul> |
|                                              | <b>Shading Architecture</b>    | Shader Model 5.0<br>Full IEEE 754-2008 32-bit and 64-bit precision                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                              | <b>Supported Graphics APIs</b> | Full OpenGL 4.3<br>Full DirectX 11<br>CUDA API support includes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

### Technical Specifications - Graphics

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

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

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

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

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

#### Notes

1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA Quadro K6000 to enable direct mapping of GPU to Virtual Machine.
2. No display output adapter included.

#### AMD FirePro W7100 8GB Graphics

##### Form Factor

Full height, single slot (9.5" X 4.376")

##### Weight:

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

##### Graphics Controller

PCI Express® x16, Generation 3.0

##### Bus Type

8GB GDDR5 memory  
Memory Bandwidth: up to 176 GB/s  
Memory Width: 256 bit

##### Memory

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

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

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

##### Connectors

DisplayPort:  
- 4096x2160 @24bpp 60Hz

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

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

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | VGA:<br>- 1920x1200 (requires DP to VGA adapter)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Image Quality Features</b>     | Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.<br>High bandwidth scaler for high quality up and downscaling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Display Output</b>             | <p>Max number of monitors supported using DisplayPort 1.2a:</p> <ul style="list-style-type: none"> <li>- 4 direct attached monitors</li> <li>- 6 using DP 1.2a with MST and HBR2 enabled monitors</li> </ul> <p>Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2):</p> <ul style="list-style-type: none"> <li>- one 4096x2160 display</li> <li>- two 2560x1600 displays</li> <li>- four 1920x1200 displays</li> </ul>                                                                                                                                                                                                                                                                                                                                                           |
| <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Supported Graphics APIs</b>    | OpenGL 4.4<br>OpenCL 1.2 and 2.0<br>DirectX 11.2 / 12<br>AMD Mantle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Available Graphics Drivers</b> | Windows 8.1 / 8 (64-bit and 32-bit)<br>Windows® 7 (64-bit and 32-bit)<br>Linux                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                   | <p>HP qualified drivers may be preloaded or available from the HP support Web site:</p> <p><a href="http://welcome.hp.com/country/us/en/support.html">http://welcome.hp.com/country/us/en/support.html</a></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Notes</b>                      | <ol style="list-style-type: none"> <li>1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. See <a href="http://www.amd.com/eyefinityfaq">www.amd.com/eyefinityfaq</a> for full details.</li> <li>2. OpenGL 4.4 support available with driver 14.301.xxx or later.</li> <li>3. OpenCL 2.0 support planned in driver updates for early 2015.</li> <li>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.</li> </ol> |

### HIGH PERFORMANCE GPU COMPUTING

**NVIDIA Tesla K40  
Workstation Compute**

**Form Factor**

Size: 4.376 inches by 10.5 inches  
Slots: Dual Slot

### Technical Specifications - Graphics

#### Processor

Power Connectors: One 6-pin and one 8-pin

|                                    |                                                                                                                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Weight:</b>                     | ~826 grams                                                                                                                                                                      |
| <b>System Interface</b>            | PCI Express Gen3 ×16                                                                                                                                                            |
| <b>Video Outputs</b>               | None.                                                                                                                                                                           |
| <b>Memory</b>                      | 12GB GDDR5,<br>memory path: 384-bit<br>memory clock: 3Ghz                                                                                                                       |
| <b>Peak Memory Bandwidth</b>       | 288 GB/s                                                                                                                                                                        |
| <b>Supported APIs</b>              | CUDA, OpenACC, OpenCL 1.2 API support includes:<br>C, C++, Java, Python, and Fortran                                                                                            |
| <b>Supported Operating Systems</b> | Windows 8 (64-bit)<br>Genuine Windows 7 Professional (64-bit)<br>Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit)<br>SUSE Linux Enterprise Desktop 11 (64-bit) |

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

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

Novell SUSE Linux Enterprise drivers may also be obtained from:

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

|                        |                                                                                    |
|------------------------|------------------------------------------------------------------------------------|
| <b>Processor Cores</b> | GK110B GPU<br>Base Clock: 745 MHz<br>Boost Clock: up to 875 MHz<br>2888 CUDA cores |
|------------------------|------------------------------------------------------------------------------------|

|                          |            |
|--------------------------|------------|
| <b>Power Consumption</b> | ~235 Watts |
|--------------------------|------------|

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



### Technical Specifications – Optical and Removable Storage

#### OPTICAL AND REMOVABLE STORAGE

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

### Technical Specifications – Optical and Removable Storage

|                     |                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Kit Contents</b> | 9.5mm Slim SuperMulti DVD Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide |
|---------------------|-----------------------------------------------------------------------------------------------------------------|

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

|                     |                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------|
| <b>Kit Contents</b> | 9.5mm Slim DVD-ROM Drive, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide |
|---------------------|---------------------------------------------------------------------------------------------------------|

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

### Technical Specifications – Optical and Removable Storage

|                                                                |                                                                         |                                                                                                 |
|----------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|                                                                | DVD-R<br>DVD-RW<br>CD-R<br>CD-RW                                        |                                                                                                 |
| <b>Disc Capacity</b>                                           | DVD-ROM<br>Blu-ray                                                      | 8.5 GB DL or 4.7 GB standard<br>25 GB (single-layer)<br>50 GB (dual-layer)<br>100/128 GB (BDXL) |
|                                                                | Full Stroke DVD                                                         | < 230 ms (seek)                                                                                 |
|                                                                | Full Stroke CD                                                          | < 220 ms (seek)                                                                                 |
|                                                                | Blu-ray                                                                 | < 230 ms (seek) (Full Stroke Blu-ray)                                                           |
|                                                                | Startup Time                                                            | (Time to drive ready from tray loading)                                                         |
|                                                                |                                                                         | BD-ROM (SL/DL) 25S / 28S                                                                        |
|                                                                |                                                                         | BD-R (SL/DL) 25S / 28S                                                                          |
|                                                                |                                                                         | BD-RE (SL/DL) 25S / 28S                                                                         |
|                                                                |                                                                         | DVD-ROM (SL/DL) 18S / 18S                                                                       |
|                                                                |                                                                         | DVD-R (SL/DL) 25S / 25S                                                                         |
|                                                                |                                                                         | DVD-RW 25S                                                                                      |
|                                                                |                                                                         | DVD+R (SL/DL) 25S / 25S                                                                         |
|                                                                |                                                                         | DVD+RW 25S                                                                                      |
|                                                                |                                                                         | DVD-RAM 45S                                                                                     |
|                                                                |                                                                         | CD-ROM 15S                                                                                      |
| <b>Maximum Data Transfer Rates</b>                             | CD ROM Read                                                             | CD-ROM, CD-R Up to 24X                                                                          |
|                                                                |                                                                         | CD-RW Up to 24X                                                                                 |
|                                                                | DVD ROM Read                                                            | DVD-RAM Up to 8X                                                                                |
|                                                                |                                                                         | DVD+RW Up to 8X                                                                                 |
|                                                                |                                                                         | DVD-RW Up to 8X                                                                                 |
|                                                                |                                                                         | DVD+R DL Up to 8X                                                                               |
|                                                                |                                                                         | DVD-R DL Up to 8X                                                                               |
|                                                                |                                                                         | DVD-ROM Up to 8X                                                                                |
|                                                                |                                                                         | DVD-ROM DL Up to 8X                                                                             |
|                                                                |                                                                         | DVD+R Up to 8X                                                                                  |
|                                                                |                                                                         | DVD-R Up to 8X                                                                                  |
|                                                                | Blu-ray                                                                 | BD-ROM Up to 6X                                                                                 |
|                                                                |                                                                         | BD-ROM DL Up to 6X                                                                              |
|                                                                |                                                                         | BD-R Up to 6X                                                                                   |
|                                                                |                                                                         | BD-R DL Up to 6X                                                                                |
|                                                                |                                                                         | BD-R Up to 6X                                                                                   |
|                                                                |                                                                         | BD-RE SL/DL Up to 6X                                                                            |
| <b>Power</b>                                                   | Source                                                                  | SATA DC power receptacle                                                                        |
|                                                                | DC Power Requirements                                                   | 5 VDC $\pm$ 5%-100 mV ripple p-p                                                                |
|                                                                | DC Current                                                              | 5 VDC -900 mA typical, 2000mA maximum                                                           |
| <b>Operating Environmental (all conditions non-condensing)</b> | Temperature                                                             | 41° to 122° F (5° to 50° C)                                                                     |
|                                                                | Relative Humidity                                                       | 10% to 80%                                                                                      |
|                                                                | Maximum Wet Bulb Temperature                                            | 84° F (29° C)                                                                                   |
| <b>Operating Systems</b>                                       | Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit |                                                                                                 |

### Technical Specifications – Optical and Removable Storage

#### Supported

and 64-bit,  
Windows Vista Business 64\*, Windows Vista Business 32\*, Windows Vista Home Basic 32\*, Windows 2000, Windows XP Professional or Windows XP Home 32\*.  
Red Hat Enterprise Linux(RHEL) WS4\*\*, 5, 6 Desktop/Workstation  
SUSE Linux Enterprise Desktop 10 & 11

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

#### Kit Contents

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

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

#### HP DX115 Removable Drive Enclosure

##### Interface Type

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

##### Dimensions (WxHxD)

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

##### Approvals

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

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

##### Description

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

##### Interface Type

USB 3.0 High-speed interface  
**Note:** If there is a USB2 connection, USB2 transfer speeds are supported.

##### Dimensions (WxHxD)

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

##### Supported Media Types

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

### Technical Specifications – Optical and Removable Storage

#### MagicGate Memory Stick Duo

These additional media types are supported with a card adapter.

Memory Stick Micro (M2)

miniSD

miniSD High Capacity

Micro SD Memory Card (MicroSD)

Micro SD High Capacity Memory Card (MicroSDHC)

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

#### Operating Systems Supported

Windows 8 Pro (64-bit)\*

Windows 8.1 (64-bit)\*

Windows 8 (64-bit)\*

Windows 7 Ultimate (32-bit)\*\*

Windows 7 Ultimate (64-bit)\*\*

Windows 7 Professional (32-bit)\*\*

Windows 7 Professional (64-bit)\*\*

Windows 7 Home Basic\*\*

Windows 7 Home Premium (32-bit)\*\*

Windows 7 Home Premium (64-bit)\*\*

Windows Vista Business 64

Windows Vista Business 32

Windows Vista Home Basic 32

Windows XP Professional

Windows XP Home 32

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

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

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

#### Kit Contents

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

#### Approvals

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

#### Weight

0.35 lbs. (0.16 kg)

### Technical Specifications - Controller Cards

#### CONTROLLER CARDS

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

### Technical Specifications - Networking and Communications

#### NETWORKING AND COMMUNICATIONS

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

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

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

|                                           |                             |                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HP 361T PCIe Dual Port Gigabit NIC</b> | <b>Connector</b>            | Two RJ-45                                                                                                                                                                                                                                                                                                                     |
|                                           | <b>Controller</b>           | Intel® Ethernet I350 Controller                                                                                                                                                                                                                                                                                               |
|                                           | <b>Data Rates Supported</b> | 10/100/1000 Mbps, Half- and full-duplex                                                                                                                                                                                                                                                                                       |
|                                           | <b>Compliance</b>           | 802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588<br>PCIe v2.0 standard<br>RoHS (6 of 6)<br>FCC (U.S. only) Class B<br>DOC (Canada) Class B<br>CE EN 55024, EN55022 Class B<br>VCCI Class II<br>UL 1950<br>CSA 950<br>EN 60950<br>CE<br>ACPI 1.1a<br>Microsoft WHQL (Windows Hardware Quality Labs) |
|                                           | <b>Data Path Width</b>      | Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots                                                                                                                                                                                                                                                  |
|                                           |                             |                                                                                                                                                                                                                                                                                                                               |
|                                           |                             |                                                                                                                                                                                                                                                                                                                               |
|                                           |                             |                                                                                                                                                                                                                                                                                                                               |
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|                                           |                             |                                                                                                                                                                                                                                                                                                                               |
|                                           |                             |                                                                                                                                                                                                                                                                                                                               |
|                                           |                             |                                                                                                                                                                                                                                                                                                                               |

### Technical Specifications - Networking and Communications

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

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

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Humidity</b>     | Operating 10% to 90% (non-condensing)<br>Non-operating 5% to 95% (non-condensing)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Dimensions (H x W x D)</b> | Native HMC: 26.8 x 30.0 x 2.4 mm<br>Carrier Card Assembly 3.3 x 4.7 in (84 x 119 mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Kit Contents</b>           | PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Notes</b>                  | <ol style="list-style-type: none"> <li>1. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.</li> <li>2. Check latest software/driver release for updates on supported security features.</li> <li>3. Maximum output power may vary by country according to local regulations.</li> <li>4. In Power Save Polling mode and on battery power.</li> <li>5. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).</li> </ol> |



### Summary of Changes

#### SUMMARY OF CHANGES

| Date of change:  | Version History: |         | Description of change:                                                                                                                                                                                                                                                                                               |
|------------------|------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| August 21        | V1               | Added   | Style and technical specifications                                                                                                                                                                                                                                                                                   |
| October 1, 2014  | From v1 to v2    | Added   | Rack dimensions, note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs                                                                                                                                                                   |
|                  |                  | Changed | Turbo specs for E5-1660v3, Acoustics - only 1 ODD on the high-end config, not 2, Declared Noise Emissions section, Supported Components: Graphics, Optical and Removable Storage, Overview, Stable & Consistent, power supply configurations, Noise Emissions section, Updated Power Supply Configurations and table |
|                  |                  | Removed | Cyberlink MediaSuite, TPM 2.0 references, HP Power Assistant and PDF Complete                                                                                                                                                                                                                                        |
| December 3, 2014 | From v2 to v3    | Added   | HP Z440 Memory Cooling Solution, power cable descriptor in Overview and System Technical Specifications sections                                                                                                                                                                                                     |
| January 1, 2015  | From v3 to v4    | Added   | OS under Overview, and Support Components, Memory support matrix and load order                                                                                                                                                                                                                                      |
| February 1, 2015 | From v4 to v5    | Added   | AMD W5100, W7100 GPU, DX115 Removable HDD Frame/Carrier, 256GB SATA 6Gb/s SED OPAL 2 SSD from Supported Components                                                                                                                                                                                                   |
|                  |                  | Changed | Internal I/O USB, OS under overview, and Supported components.                                                                                                                                                                                                                                                       |
| March 1, 2015    | From v5 to v6    | Added   | Operating Systems: Red Hat and SUSE Support, 600 and 300GB SAS SFF HDD, 4TB SATA HD, HD Controller                                                                                                                                                                                                                   |
|                  |                  | Changed | HP Installer Kit for Linux, RAID, SAS and SATA Hard Drives Notes, ACPI support under BIOS section                                                                                                                                                                                                                    |
| April 1, 2015    | From v6 to v7    | Changed | Hard Drives Notes and Memory Notes in Supported Components section. Memory Speed Supported in System Board. Memory Info from System Configuration.                                                                                                                                                                   |
|                  |                  | Added   | Chassis Dimensions                                                                                                                                                                                                                                                                                                   |

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