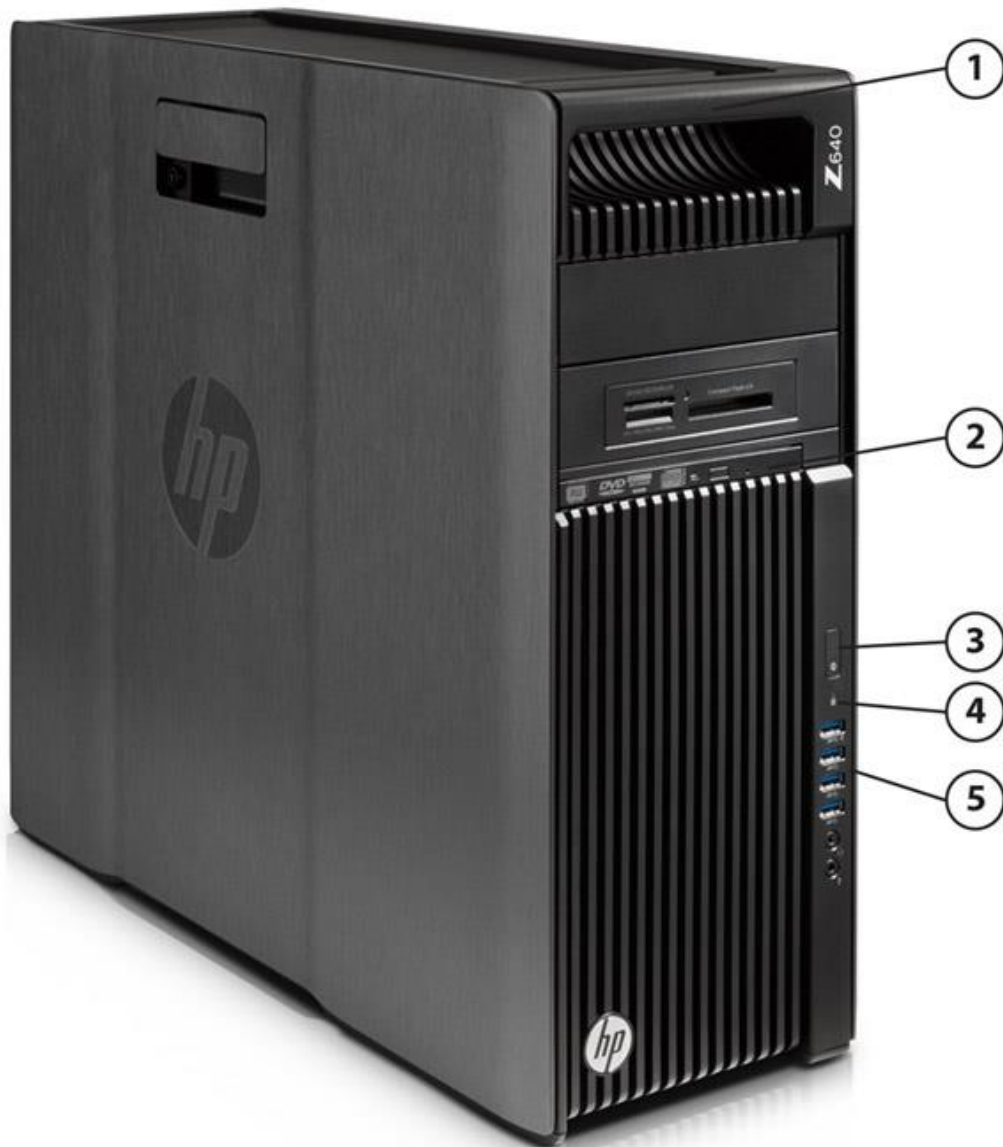


### Overview

#### HP Z640 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



- |                                                                                                                                 |                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 6. 2 External 5.25" Bays                                                                                                        | 12. Intel® Xeon® Processors: E5-1600 v3 family or E5-2600 v3/v4 family |
| 7. 2 Internal 3.5" Bays                                                                                                         | 13. 4 DIMM Slots for DDR4 ECC Registered Memory                        |
| 8. 6 6Gb/s SATA Ports                                                                                                           | 14. 2 <sup>nd</sup> CPU and Memory Riser Module with 4 DIMM slots      |
| 9. Rear Flip-Up Handle                                                                                                          | 15. 2 PCIe x16 Gen 3 Slots                                             |
| 10. 925W, 90% Efficient Power Supply                                                                                            | 16. 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot      |
| 11. Rear I/O: Rear Power Button, 4 USB 3.0, 2 USB 2.0, PS/2 Ports, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out |                                                                        |

### Overview

### Overview

### Overview

**Form Factor** Rackable Minitower

**Operating Systems** Preinstalled:

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

Supported:

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

**Notes:** For detailed OS/hardware support information for Linux, see:  
[http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix)

### Available Processors

| Name                              | Cores | Clock Speed (GHz) | Cache (MB) | Memory Speed (MT/s) | QPI (GT/s) | Hyper-Threading | Featuring Intel® vPro™ Technology | Intel® Turbo Boost Technology <sup>1</sup> | TDP (W) |
|-----------------------------------|-------|-------------------|------------|---------------------|------------|-----------------|-----------------------------------|--------------------------------------------|---------|
| Intel® Xeon® E5-1680 v4 processor | 8     | 3.4               | 20         | 2400                | —          | YES             | YES                               | 2, 4, 6                                    | 140     |
| Intel® Xeon® E5-1660 v4 processor | 8     | 3.2               | 20         | 2400                | —          | YES             | YES                               | 2, 4, 6                                    | 140     |
| Intel® Xeon® E5-1650 v4 processor | 6     | 3.6               | 15         | 2400                | —          | YES             | YES                               | 2, 2, 4                                    | 140     |
| Intel® Xeon® E5-1630 v4 processor | 4     | 3.7               | 10         | 2400                | —          | YES             | YES                               | 1, 1, 3                                    | 140     |
| Intel® Xeon® E5-1620 v4 processor | 4     | 3.5               | 10         | 2400                | —          | YES             | YES                               | 1, 3                                       | 140     |
| Intel® Xeon® E5-1607 v4 processor | 4     | 3.1               | 10         | 2133                | —          | NO              | YES                               | N/A                                        | 140     |
| Intel® Xeon® E5-1603 v4 processor | 4     | 2.8               | 10         | 2133                | —          | NO              | YES                               | N/A                                        | 140     |
| Intel® Xeon® E5-1680 v3 processor | 8     | 3.2               | 20         | 2133                | —          | YES             | YES                               | 3, 6                                       | 140     |
| Intel® Xeon® E5-1660 v3 processor | 8     | 3.0               | 20         | 2133                | —          | YES             | YES                               | 3, 5                                       | 140     |
| Intel® Xeon® E5-1650 v3 processor | 6     | 3.5               | 15         | 2133                | —          | YES             | YES                               | 1, 3                                       | 140     |
| Intel® Xeon® E5-1630 v3 processor | 4     | 3.7               | 10         | 2133                | —          | YES             | YES                               | 1, 1                                       | 140     |
| Intel® Xeon® E5-1620 v3 processor | 4     | 3.5               | 10         | 2133                | —          | YES             | YES                               | 1, 1                                       | 140     |
| Intel® Xeon® E5-1607 v3 processor | 4     | 3.1               | 10         | 1866                | —          | NO              | YES                               | N/A                                        | 140     |
| Intel® Xeon® E5-1603 v3 processor | 4     | 2.8               | 10         | 1866                | —          | NO              | YES                               | N/A                                        | 140     |

### Overview

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

### Overview

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

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

### Available Processor Disclaimers

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

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

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

### Color

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

Hematite Brushed Aluminum and HP Black

#### Slot 1 (top):

PCI Express Gen2 x1 with open-ended connector\*

Full-height, Half-length

(Not available when 2nd processor/memory module is installed)

#### Slot 2:

PCI Express Gen3 x16

Full-height, Full-length (with extender)

#### Slot 3:

PCI Express Gen2 x4 with open-ended connector\*

Full-height, Full-length (with extender)

#### Slot 4:

PCI Express Gen3 x8 with open-ended connector\*

Full-height, Full-length (with extender)

### Overview

#### Slot 5:

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

#### Slot 6:

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

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

#### Expansion Bays (see Storage section for more details)

2 internal 3.5" bays (with acoustic dampening rail assemblies preinstalled)  
2 external 5.25" bays

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

1 dedicated 9.5mm slim optical disk drive bay

#### Front I/O

4 USB 3.0, 1 Headset, 1 Microphone

#### Rear I/O

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

#### Internal USB

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

#### Chassis Dimensions (H x W x D)

##### Footprint Dimensions:

H: 17.45" [442.9mm]  
W: 6.75" [171.45mm]  
D: 18.3" [464.8mm] (measured to the rear of service panel)

##### Maximum Dimensions:

H: 17.45" [442.9mm]  
W: 6.75" [171.45mm]  
D: 18.65" [473.3mm] (measured to rear PCIe retainer clips)

Rack utilization: 4U

#### System Weight

Actual weight depends upon configuration  
Minimum configuration: 15.0 kg (33.1 lbs.)  
Typical configuration: 17.0 kg (37.5 lbs.)  
Maximum configuration: 21.8 kg (48.0 lbs.)

#### Temperature

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

#### Humidity

**Operating:** 8% to 85% relative humidity, non-condensing  
**Non-operating** 8% to 90% relative humidity, non-condensing

### Overview

|                                           |                                                                                                                                                                                                                                                                                                                             |                   |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Maximum Altitude</b> (non-pressurized) | <b>Operating:</b>                                                                                                                                                                                                                                                                                                           | 3,048m (10,000ft) |
|                                           | <b>Non-operating</b>                                                                                                                                                                                                                                                                                                        | 9,144m (30,000ft) |
| <b>Power Supply</b>                       | Tool-free 925W 90% Efficient wide-ranging, active Power Factor Correction, with two graphics power cables                                                                                                                                                                                                                   |                   |
|                                           | The Power Supply Efficiency Report for this product may be found at this link:<br><a href="http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf">http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf</a> |                   |
| <b>Interfaces Supported</b>               | 15-in-1 Media Card Reader (optional)<br>6-channel SATA interfaces (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported).<br>USB 2.0, USB 3.0<br>Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, 5, and 10)                          |                   |
| <b>Workstation ISV Certifications</b>     | 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>                                                                                                                 |                   |

### Supported Components

#### Processors

|                                                | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|------------------------------------------------|--------------------|------------|------------------------|---------------|
| <b>Intel® Xeon® E5-1600 v4 Series CPU</b>      |                    |            |                        |               |
| Intel® Xeon® E5-1680 v4 3.4 2400 8C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1660 v4 3.2 2400 8C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1650 v4 3.6 2400 6C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1630 v4 3.7 2400 4C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1620 v4 3.5 2400 4C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1607 v4 3.1 2133 4C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1603 v4 2.8 2133 4C CPU        | Y                  | N          |                        |               |
| <b>Intel® Xeon® E5-1600 v3 Series CPU</b>      |                    |            |                        |               |
| Intel® Xeon® E5-1630 v3 3.7 2133 4C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1620 v3 3.5 2133 4C CPU        | Y                  | N          |                        |               |
| Intel® Xeon® E5-1603 v3 2.8 1866 4C CPU        | Y                  | N          |                        |               |
| <b>Z640 Intel® Xeon® E5-2600 v3 Series CPU</b> |                    |            |                        |               |
| Intel® Xeon® E5-2630 v3 2.4 1866 8C CPU        | Y                  | Y          | J9P98AA                |               |
| Intel® Xeon® E5-2643 v3 3.4 2133 6C CPU        | Y                  | Y          | J9P93AA                |               |
| Intel® Xeon® E5-2620 v3 2.4 1866 6C CPU        | Y                  | Y          | J9Q00AA                |               |
| <b>Intel® Xeon® E5-2600 v4 Series CPU</b>      |                    |            |                        |               |
| Intel® Xeon® E5-2699 v4 2.2 2400 22C 2ndCPU    | Y                  | Y          | T9U26AA                |               |
| Intel® Xeon® E5-2697 v4 2.3 2400 18C 2ndCPU    | Y                  | Y          | T9U25AA                |               |
| Intel® Xeon® E5-2695 v4 2.1 2400 18C 2ndCPU    | Y                  | Y          | T9U24AA                |               |
| Intel® Xeon® E5-2690 v4 2.6 2400 14C 2ndCPU    | Y                  | Y          | T9U23AA                |               |
| Intel® Xeon® E5-2683 v4 2.1 2400 16C 2ndCPU    | Y                  | Y          | T9U22AA                |               |
| Intel® Xeon® E5-2680 v4 2.4 2400 14C 2ndCPU    | Y                  | Y          | T9U21AA                |               |
| Intel® Xeon® E5-2667 v4 3.2 2400 8C 2ndCPU     | Y                  | Y          | T9U20AA                |               |
| Intel® Xeon® E5-2660 v4 2.0 2400 14C 2ndCPU    | Y                  | Y          | T9U19AA                |               |
| Intel® Xeon® E5-2650 v4 2.2 2400 12C 2ndCPU    | Y                  | Y          | T9U18AA                |               |
| Intel® Xeon® E5-2643 v4 3.4 2400 6C 2ndCPU     | Y                  | Y          | T9U17AA                |               |
| Intel® Xeon® E5-2640 v4 2.4 2133 10C 2ndCPU    | Y                  | Y          | T9U16AA                |               |
| Intel® Xeon® E5-2637 v4 3.5 2400 4C 2ndCPU     | Y                  | Y          | T9U15AA                |               |
| Intel® Xeon® E5-2630 v4 2.2 2133 10C 2ndCPU    | Y                  | Y          | T9U14AA                |               |
| Intel® Xeon® E5-2623 v4 2.6 2133 4C 2ndCPU     | Y                  | Y          | T9U13AA                |               |
| Intel® Xeon® E5-2620 v4 2.1 2133 8C 2ndCPU     | Y                  | Y          | T9U12AA                |               |
| Intel® Xeon® E5-2609 v4 1.7 1866 8C 2ndCPU     | Y                  | Y          | T9U11AA                |               |
| Intel® Xeon® E5-2603 v4 1.7 1866 6C 2ndCPU     | Y                  | Y          | T9U10AA                |               |

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### Supported Components

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

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

Z640 processor AMO kits include:

- 2nd CPU/Memory Module (riser)
- processor
- heatsink

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

### Monitors / Displays

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

### Supported Components

#### Storage/Hard Drives

##### SAS Hard Drives

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

##### NOTES:

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

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

**NOTE:** SAS controller add-in card required

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

Removable Boot Drive option

##### SATA Hard Drives

|                                                     |   |   |         |  |
|-----------------------------------------------------|---|---|---------|--|
| <b>SATA 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 |  |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class) | Y | Y | W0R10AA |  |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class) | Y | Y | W0R10AA |  |
| 2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD                  | Y | Y | QB576AA |  |
| 3.0TB SATA 7200 rpm 6Gb/s 3.5" HDD                  | Y | Y | QF298AA |  |
| 4TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class) | Y | Y | K4T76AA |  |
| 500GB SATA 7.2K SED SFF HDD                         | Y | Y | D8N29AA |  |
| 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)            | Y | Y | M7S54AA |  |

##### NOTES:

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

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

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

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

### Supported Components

#### Removable Boot Drive option

#### SATA Solid State Drives (SSDs)

#### HP Solid State Drives (SSDs) for Workstations

|                                    |   |   |         |
|------------------------------------|---|---|---------|
| HP 128GB SATA 6Gb/s SSD            | Y | Y | A3D25AA |
| HP 256GB SATA 6Gb/s SSD            | Y | Y | A3D26AA |
| HP 512GB SATA 6Gb/s SSD            | Y | Y | D8F30AA |
| HP 1TB SATA 6Gb/s SSD              | Y | Y | F3C96AA |
| HP 2TB SATA 6Gb/s SSD              | Y | Y | Y6P08AA |
| HP 256GB SATA 6Gb/s SED Opal 2 SSD |   |   | G7U67AA |
| HP 512GB SATA SED SSD              | Y | Y | N8T26AA |
| HP Enterprise Class 240GB SATA SSD | Y | Y | T3U07AA |
| HP Enterprise Class 480GB SATA SSD | Y | Y | T3U08AA |

#### NOTES:

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

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

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

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

#### PCIe SSDs

#### PCIe SSDs for HP Workstations

|                                   |   |   |         |
|-----------------------------------|---|---|---------|
| HP Z Turbo Drive 512GB SSD        | Y | Y | G3G89AA |
| HP Z Turbo Drive 256GB SSD        | Y | Y | G3G88AA |
| HP Z Turbo Drive G2 512GB SSD     | Y | Y | M1F74AA |
| HP Z Turbo Drive G2 256GB SSD     | Y | Y | M1F73AA |
| HP Z Turbo Drive G2 1TB SSD       | Y | Y | T9H98AA |
| HP Z Turbo Drive G2 256GB TLC SSD | Y | Y | Y1T46AA |
| HP Z Turbo Drive G2 512GB TLC SSD | Y | Y | Y1T49AA |
| HP Z Turbo Drive G2 1TB TLC SSD   | Y | Y | Y1T52AA |
| HP Z Turbo Drive G2 256GB SED SSD | Y | Y | Y1T55AA |
| HP Z Turbo Drive G2 512GB SED SSD | Y | Y | Y1T58AA |

#### HP Z Turbo Drive Quad Pro

|                                            |   |   |         |
|--------------------------------------------|---|---|---------|
| HP Z Turbo Drive G2 1TB TLC SSD            | Y | Y | Y1T52AA |
| HP Z Turbo Drive G2 512GB TLC SSD          | Y | Y | Y1T49AA |
| HP Z Turbo Drive G2 256GB TLC SSD          | Y | Y | Y1T46AA |
| HP Z Turbo Drive Quad Pro 256GB SSD module | N | Y | N2N00AA |
| HP Z Turbo Drive Quad Pro 512GB SSD module | N | Y | N2N01AA |
| HP Z Turbo Drive Quad Pro 1TB SSD module   | Y | Y | T9J00AA |
| HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD | Y | Y | N2M98AA |
| HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD   | Y | Y | T9H99AA |

Note 1

Note 1

Note 1

### Supported Components

#### Intel® 750 Series AIC PCIe SSD

|                                      |   |   |         |
|--------------------------------------|---|---|---------|
| Intel® 750 Series AIC 400GB PCIe SSD | Y | Y | Y4A61AV |
| Intel® 750 Series AIC 800GB PCIe SSD | Y | Y | Y4A62AV |
| Intel® 750 Series AIC 1.2TB PCIe SSD | Y | Y | Y4A63AV |

#### NOTES:

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

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

PCIe SSDs are not available with SAS controller or SAS HDDs

**NOTE 1:** M.2 SSD module only

**NOTE 2:** Dual M.2 SSD modules plus carrier

#### NOTES

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

### Hard Drive Controllers

|                                                                          | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|--------------------------------------------------------------------------|--------------------|------------|------------------------|---------------|
| <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 1 Configuration – Mirrored Array                                    | Y                  | N          |                        | Note 1        |
| RAID 10 Configuration – Striped/Mirrored Array                           | Y                  | N          |                        | Note 1        |
| RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array       | Y                  | N          |                        | Note 1        |
| <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                |               |
| <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                                      | Y                  | Y          | E0X21AA                |               |
| LSI iBBU09 Battery Backup Unit                                           | N                  | Y          | E0X19AA                |               |
| <b>Integrated RAID for PCIe SSDs</b>                                     |                    |            |                        |               |
| RAID 0 Data Configuration                                                | Y                  | N          |                        | Note 3        |

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

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

All drives must be identical in type and capacity.

RAID arrays greater than 2 TB are fully supported.

**NOTE 1:** Requires hard drives with identical speed, capacity, and interface.

**NOTE 2:** Specific user-configured hardware SAS RAID configurations are supported on this Linux system. IS: Striping of 2 or more HDDs into a single logical volume

IM: Mirroring of 2 HDDs into a single logical volume

### Supported Components

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)

**NOTE 3:** PCIe SSDs NOT available for Boot RAID Configuration

---

### Supported Components

#### Graphics

|                                         | Factory<br>Configured | Option Kit | Option Kit Part<br>Number | Support Notes | Supported<br># of cards | Mixed? |
|-----------------------------------------|-----------------------|------------|---------------------------|---------------|-------------------------|--------|
| <b>Professional 2D</b>                  |                       |            |                           |               |                         |        |
| NVIDIA NVS 310 1GB Graphics             | Y                     | Y          | M6V51AA                   | Note 1        | 3                       |        |
| NVIDIA NVS 315 1GB Graphics             | Y                     | Y          | E1U66AA                   | Note 2        | 4                       | -      |
| NVIDIA NVS 510 2GB Graphics             | Y                     | Y          | C2J98AA                   | Note 1        | 2                       | -      |
| <b>Entry 3D</b>                         |                       |            |                           |               |                         |        |
| NVIDIA® Quadro® K620 2GB Graphics       | Y                     | Y          | J3G87AA                   |               | 2                       | Yes    |
| NVIDIA® Quadro® K420 2GB Graphics       | Y                     | Y          | N1T07AA                   |               | 2                       | Yes    |
| NVIDIA® Quadro® P600 2GB Graphics       | Y                     | Y          | 1ME42AA                   |               | 2                       |        |
| AMD FirePro W2100 2GB Graphics          | Y                     | Y          | J3G91AA                   |               | 2                       | Yes    |
| <b>Mid-range 3D</b>                     |                       |            |                           |               |                         |        |
| NVIDIA® Quadro® K1200 4GB Graphics      | Y                     | Y          | L4D16AA                   |               | 2                       | Yes    |
| NVIDIA® Quadro® K2200 4GB Graphics      | Y                     | Y          | J3G88AA                   |               | 2                       | Yes    |
| NVIDIA® Quadro® M2000 4GB Graphics      | Y                     | Y          | T7T60AA                   |               | 2                       |        |
| NVIDIA® Quadro® P2000 5GB Graphics      | Y                     | Y          | 1ME41AA                   |               | 2                       |        |
| AMD FirePro W4300 4GB Graphics          | Y                     | Y          | T7T58AA                   |               | 2                       | Yes    |
| AMD FirePro W5100 4GB Graphics          | Y                     | Y          | J3G92AA                   |               | 2                       | Yes    |
| Radeon Pro™ WX4100 4GB 1st GFX Graphics | Y                     | Y          | Z0B15AA                   |               | 1                       |        |
| <b>High End 3D</b>                      |                       |            |                           |               |                         |        |
| NVIDIA® Quadro® P4000 8GB Graphics      | Y                     | Y          | 1ME40AA                   |               | 2                       |        |
| NVIDIA® Quadro® M4000 8GB Graphics      | Y                     | Y          | M6V52AA                   |               | 2                       | Yes    |
| NVIDIA® Quadro® M5000 8GB Graphics      | Y                     | Y          | M6V53AA                   |               | 1                       | Yes    |
| NVIDIA® Quadro® M6000 24GB Graphics     | Y                     | Y          | T7T61AA                   |               | 1                       | Yes    |
| NVIDIA® Quadro® P5000 16GB Graphics     | Y                     | Y          | Z0B13AA                   |               | 2                       |        |
| AMD FirePro™ W7100 8GB Graphics         | Y                     | Y          | J3G93AA                   |               | 2                       | Yes    |
| Radeon Pro™ WX7100 8GB Graphics*        | Y                     | Y          | Z0B14AA                   |               | 2                       | No     |
| <b>Ultra 3D</b>                         |                       |            |                           |               |                         |        |
| NVIDIA® Quadro® P6000 24GB Graphics     | Y                     | Y          | Z0B12AA                   |               | 2                       | Yes    |
| NVIDIA® Quadro® Sync II                 | Y                     | Y          | 1WT20AA                   |               |                         |        |

**NOTE 1:** If 1st card is NVS 510, 2nd card must be NVS 510 or NVS 310.

**NOTE 2:** 4th NVS 310 or NVS 315 supported as AMO-only

### Supported Components

#### Graphics Cable Adapters

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

#### Memory

##### CTO

##### DDR4-2133 ECC Registered DIMMs

|                                   |
|-----------------------------------|
| 8GB DDR4-2133 ECC Registered RAM  |
| 16GB DDR4-2133 ECC Registered RAM |

##### Option Kit Part Number

|         |
|---------|
| J9P82AA |
| J9P83AA |

##### Support Notes

|     |
|-----|
| 1,2 |
| 1,2 |

##### DDR4-2400 ECC Registered DIMMs

|                                        |
|----------------------------------------|
| HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM   |
| HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM   |
| HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM |
| HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM |

|         |
|---------|
| T9V38AA |
| T9V39AA |
| T9V40AA |
| T9V41AA |

##### NOTES:

For details on the supported memory configurations on the HP Z640 Workstation, please refer to the System Technical Specifications - System Board section of this document.

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

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

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

ONLY registered and load reduced DDR4 DIMMs are supported.

DDR3 DIMMs ARE NOT SUPPORTED.

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

#### Multimedia and Audio Devices

### Supported Components

#### Multimedia and Audio Devices

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

#### Optical and Removable Storage

|                                           | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-------------------------------------------|--------------------|------------|------------------------|---------------|
| <b>HP SlimTray Optical Drives</b>         |                    |            |                        |               |
| HP 9.5mm Slim DVD Writer                  | Y                  | Y          | K3R64AA                |               |
| HP 9.5mm Slim DVD-ROM Drive               | Y                  | Y          | K3R63AA                | Note 1        |
| HP 9.5mm Slim BDXL Blu-Ray Writer         | Y                  | Y          | K3R65AA                | Note 2        |
| <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                | Note 4        |
| <b>HP 15-in-1 Media Card Reader</b>       |                    |            |                        |               |
| HP 15-in-1 Media Card Reader              | Y                  | Y          | G1S79AA                |               |

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

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

**NOTE 1:** Not supported as a 2nd Optical Drive.

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

**NOTE 3:** Only one DX115 device can be installed into Z640. This device can only be installed into the top optical (5.25") bay.

**NOTE 4:** Carrier requires a Z640 to have the DX115 frame installed. This part number is for the carrier only.

### Supported Components

#### Controller Cards

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

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

### Networking and Communications

|                                                           | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-----------------------------------------------------------|--------------------|------------|------------------------|---------------|
| Integrated Intel® I218LM PCIe GbE Controller              | Y                  | N          |                        |               |
| Intel® Ethernet I210-T1 PCIe NIC                          | Y                  | Y          | E0X95AA                |               |
| HP X520 10GbE Dual Port Adapter                           | Y                  | Y          | C3N52AA                |               |
| HP 10GbE SFP+ SR Transceiver                              | Y                  | Y          | C3N53AA                |               |
| HP 10GbE SFP+ SR Transceiver                              | Y                  | Y          | C3N53AA                |               |
| HP 361T PCIe Dual Port Gigabit NIC                        | N                  | Y          | C3N37AA                | Note 1        |
| Intel® Ethernet I350-T4 4-port 1Gb NIC                    | N                  | Y          | W8X25AA                | Note 1        |
| Intel® 7260 802.11 a/b/g/n PCIe WLAN NIC*                 | N                  | Y          | F2P07AA                |               |
| Intel® 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC | N                  | Y          | N0S95AA                |               |

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

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

### Racking and Physical Security

|                                               | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-----------------------------------------------|--------------------|------------|------------------------|---------------|
| HP Solenoid Hood Lock & Hood Sensor           | Y                  | N          |                        |               |
| HP Business PC Security Lock Kit              | N                  | Y          | PV606AA                |               |
| HP Z6/8 Adjustable Rail Rack Kit, Flush Mount | N                  | Y          | B8S55AA                |               |
| HP Keyed Cable Lock 10mm                      | N                  | Y          | T1A62AA                |               |

### Supported Components

#### 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          | Y                  | Y          | ET424AA                |               |
| HP USB Hardened Mouse                           | Y                  | Y          | P1N77AA                |               |
| HP SpaceMouse Pro USB 3D Input Device           | N                  | Y          | B4A20AA                |               |
| HP SpacePilot Pro 3D USB Intelligent Controller | N                  | Y          | WH343AA                |               |
| 3Dconnexion CADMouse                            | Y                  | Y          | M5C35AA                |               |
| HP PS/2 Business Slim Keyboard                  | Y                  | Y          | N3R86AA                |               |
| HP USB Business Slim Keyboard                   | Y                  | Y          | N3R87AA                |               |
| HP Wireless Business Slim Keyboard              | Y                  | Y          | N3R88AA                | Note 1        |

**NOTE 1:** Combo kit includes wireless mouse

#### Other Hardware

|                                         | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|-----------------------------------------|--------------------|------------|------------------------|---------------|
| HP Internal USB Port Kit                | N                  | Y          | EM165AA                | Note 1        |
| HP eSATA PCI Cable Kit                  | N                  | Y          | GM110AA                | Note 2        |
| HP Serial Port Adapter                  | Y                  | Y          | PA716A                 |               |
| HP Optical Bay HDD Mounting Bracket     | N                  | Y          | NQ099AA                | Note 3        |
| HP 2.5in HDD/SSD 2-in-1 ODD Bay Bracket | N                  | Y          | K4T74AA                | Note 4        |
| HP Power Cord Kit                       | N                  | Y          | DM293A                 |               |
| HP Workstation Mouse Pad                | Y                  | N          |                        | Japan only    |
| HP ENERGY STAR® Enabled Configuration   | Y                  | N          |                        |               |

**Note 1:** The HP Internal USB Port kit has a single USB 2.0 type A connector.

**Note 2:** No hot plug / hot swap supported

**Note 3:** NQ099AA used to install 3rd/4th 3.5" HDDs in Z640 in the factory or when purchasing Aftermarket Option (AMO) drives

**Note 4:** K4T74AA used to install 3rd/4th 2.5" HDD/SSDs in Z640 in the factory or when purchasing Aftermarket Option (AMO) drives

#### Software

|                                       | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---------------------------------------|--------------------|------------|------------------------|---------------|
| HP Performance Advisor                | Y                  | Y          |                        | Note 1        |
| HP Remote Graphics Software (RGS) 7.1 | Y                  | Y          |                        | Note 2        |
| MS Office Home & Business 2016        | Y                  | Y          |                        | Note 3        |

### Supported Components

|                                  |   |   |
|----------------------------------|---|---|
| Cyberlink Media Suite & PowerDVD | Y | N |
| Foxit PhantomPDF Express         | Y | N |

**NOTE 1:** Available as a free download here: <http://www.hp.com/go/performanceadvisor>

**NOTE 2:** Supported operating systems:

- Windows 7 Professional 32/64
- Windows 8.1 Professional 32/64
- RHEL v6.3, 7
- SLED 11 SP3

For more information, go to: <http://www.hp.com/go/rgs>

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

### Operating Systems

### Support Notes

|                                                                                                |        |
|------------------------------------------------------------------------------------------------|--------|
| Windows 10 Pro 64                                                                              |        |
| Windows 10 Pro downgrade to Windows 7 Professional 64                                          |        |
| Windows 10 Home 64                                                                             | Note 1 |
| HP Linux Installer Kit                                                                         |        |
| Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr)                              | Note 2 |
| <b>NOTE 1:</b> Windows 10 Home High-End, not supported with dual-processor configurations      |        |
| <b>NOTE 2:</b> 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                                      |
|                                 | 2nd CPU/Memory Board (optional):<br>14.9 x 29.2 cm<br>5.85 x 11.50 inches                  |
|                                 |                                                                                            |
| <b>Processor Socket</b>         | LGA2011R3<br>1st CPU on system board<br>2nd CPU on optional 2nd CPU/Memory Module          |
| <b>CPU Bus Speed</b>            | QPI: Up to 9.6GT/second, depending on processor                                            |
| <b>Chipset</b>                  | Intel® C612 Chipset                                                                        |
| <b>Super I/O Controller</b>     | Nuvoton NPCD379H (SIO-12)                                                                  |
| <b>Memory Expansion Slots</b>   | 4 on system board(CPU0) + 4 on optional 2nd CPU/Memory Module(CPU1)                        |
| <b>Memory Type Supported</b>    | DDR4, RDIMM (Registered), ECC: 4GB, 8GB and 16GB<br>DDR4, LRDIMM (Load Reduced), ECC: 32GB |
| <b>Memory Modes</b>             | NUMA (Non-Uniform Memory Architecture), Memory Node Interleave                             |
| <b>Memory Speed Supported</b>   | 1600MT/s, 1866MHz and 2133MT/s                                                             |

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### System Technical Specifications

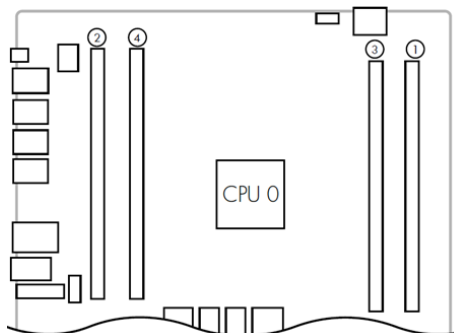
| Single Processor |       |                |       |            |                |              |
|------------------|-------|----------------|-------|------------|----------------|--------------|
| CPU 0            |       |                |       |            |                |              |
|  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

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

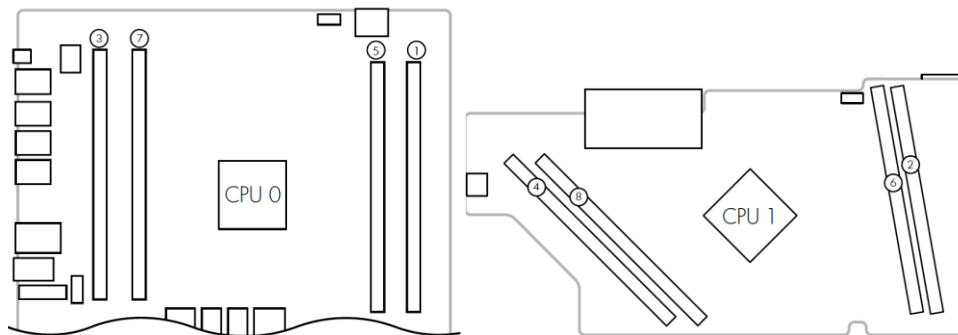
### System Technical Specifications

#### Memory Loading Order:

##### Load Order for Single Processor Configuration



##### Load Order for Dual Processor Configuration



#### Maximum Memory

Supports up to 256GB with two processors.

Please refer to the table above for details on how supported memory configurations are installed in your system.

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

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

#### Memory Configuration (Supported)

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

#### PCI Express Connectors

##### Slot 1 (top):

PCI Express Gen2 x1 with open-ended connector\*

Full-height, Half-length

(not available when 2nd CPU/Memory Module is installed)

##### Slot 2:

PCI Express Gen3 x16

Full-height, Full-length (with extender)

##### Slot 3:

### System Technical Specifications

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

#### Slot 4:

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

#### Slot 5:

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

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

#### PCI Connectors (5.0V)

#### Slot 6:

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

#### Supported Drive Interfaces

#### SATA

2 SATA @6Gb/s, supports RAID 0, 1 and NCQ.  
4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ.  
Factory integrated RAID is Microsoft Windows only.

#### Serial Attached SCSI

Requires Optional PCIe card

#### Integrated RAID

SATA: RAID 0, 1  
SSATA: RAID 0, 1, 10  
RAID 0 configuration - striped array  
(supported and configure to order)  
RAID 1 configuration - mirrored array  
(supported and configure to order)  
RAID 5 parity striping (supported but  
not configure to order)  
RAID 10 striped and mirrored array.

\*HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead

#### Integrated Graphics

No

#### Network Controller

Integrated Intel® I-218 Gbit LAN  
Memory Integrated 3KB receive buffer  
and 3KB transmit buffer  
Data rates supported 10/100/1000  
Mb/s  
Compliance IEEE 802.1as, 802.1p,  
802.1Q, 802.3, 802.3ab, 802.3az, 802.3i  
802.3u, 802.3x, 802.3z  
Bus architecture PCIe 1.0 x1 and SMBus  
Power requirement 0.5 watts  
Boot ROM support  
Network transfer rates:  
10BASE-T (half-duplex) 10 Mb/s  
10BASE-T (full-duplex) 20 Mb/s

### System Technical Specifications

100BASE-TX (half-duplex) 100 Mb/s  
 1000BASE-T (full-duplex) 2000 Mb/s  
 100BASE-TX (full-duplex) 200 Mb/s

Management capabilities: WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostics. AMT 9.1 support, vPro compliant

**SATA Connectors** Supported on all SATA and sSATA ports configurable with optional eSATA\* After-Market Option cable kit)  
 \* hot plug / hot swap not supported with eSATA

|                               |                 |                                                                                                                                                                                                                                                              |
|-------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IEEE 1394 Connector(s)</b> | <b>Front</b>    | None                                                                                                                                                                                                                                                         |
|                               | <b>Rear</b>     | 2 IEEE 1394b (requires optional PCIe card)                                                                                                                                                                                                                   |
|                               | <b>Internal</b> | None                                                                                                                                                                                                                                                         |
| <b>USB Connector(s)</b>       | <b>Front</b>    | 4 - USB 3.0                                                                                                                                                                                                                                                  |
|                               | <b>Rear</b>     | 4 - USB 3.0<br>2 - USB 2.0                                                                                                                                                                                                                                   |
|                               | <b>Internal</b> | One 2x5 header with two USB 2.0 ports. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header.<br>One 2x10 header with one USB 3.0 port. |
|                               |                 |                                                                                                                                                                                                                                                              |

**HD Integrated Audio** Realtek ALC221

**Flash ROM** Yes

**CPU Fan Header** One for each CPU socket

**Chassis Fan Header** Rear System Chassis Fan Header  
 Front System Chassis Fan Header

**CMOS Battery Holder – Lithium** Yes

**Power Supply Headers** Yes

**Power Switch, Power LED & Hard Drive LED Header** Yes (includes speaker and intrusion sensor signals)

**Clear Password Jumper** Yes

**Serial Port** One internal header

**Parallel Port** No

**Keyboard/Mouse** PS/2

### System Technical Specifications

#### Z640 Required Power Supply Info

|                                               |                                                              |                |
|-----------------------------------------------|--------------------------------------------------------------|----------------|
| <b>Power Supply</b>                           | 925W 90% Efficient, Custom PSU<br>(Wide Ranging, Active PFC) |                |
| <b>Operating Voltage Range</b>                | 90–269 VAC                                                   |                |
| <b>Rated Voltage Range</b>                    | 100–240 V                                                    | 118 V          |
| <b>Rated Line Frequency</b>                   | 50–60 Hz                                                     | 400 Hz         |
| <b>Operating Line Frequency Range</b>         | 47–66 Hz                                                     | 393–407 Hz     |
| <b>Rated Input Current</b>                    | 11.3 A @ 100–240 V                                           | 11.3 A @ 400 V |
| <b>Heat Dissipation</b>                       | Typical = 2105 btu/hr (530 kcal/hr)                          |                |
| <b>(Configuration and software dependent)</b> | Maximum = 3629 btu/hr (914 kcal/hr)                          |                |
| <b>Power Supply Fan</b>                       | 92x25 mm variable speed                                      |                |
| <b>ENERGY STAR Qualified</b>                  | Yes                                                          |                |
| <b>(Configuration dependent)</b>              | Yes, 90% Efficient                                           |                |

#### 80 PLUS® Compliant

The Z640 925W power supply efficiency report can be found at this link:  
[http://www.pluginloadsolutions.com/psu\\_reports/HEWLETT%20PACKARD\\_D12-925P1A\\_925W\\_ECOS%203892\\_Report%20\(2\).pdf](http://www.pluginloadsolutions.com/psu_reports/HEWLETT%20PACKARD_D12-925P1A_925W_ECOS%203892_Report%20(2).pdf)

|                                                                                                                         |                              |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>FEMP Standby Power Compliant @115V</b><br>(<2W in S5 - Power Off)                                                    | Yes                          |
| <b>EuP Compliant @ 230V</b><br>(<0.5 W in S5 - Power Off)                                                               | Yes                          |
| <b>CECP Compliant @ 220V</b><br>(<4W in S3 - Suspend to RAM)                                                            | Yes; Configuration dependent |
| <b>Power Consumption in sleep mode</b><br>(as defined by ENERGY STAR) - Suspend to RAM (S3)<br>(Instantly Available PC) | <20W                         |
| <b>Built-in Self-Test LED</b>                                                                                           | Yes                          |
| <b>Surge Tolerant Full Ranging Power Supply</b><br>(withstands power surges up to 2000V)                                | Yes                          |

|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Access Panel Solenoid Lock Header</b>   | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Access Panel Intrusion</b>              | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Sensor Header</b>                       | Integrated in Front User Interface (Power Switch, Power LED, HDD LED, Speaker) Cable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Multibay Header</b>                     | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Integrated Gigabit Ethernet</b>         | Integrated Intel® I-218 Gbit LAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Wake on LAN</b>                         | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>ASF 1.0/2.0</b> (Alert Standard Format) | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>TPM</b>                                 | Trusted Platform Module (TPM) 1.2 (Infineon SLB 9660). Common Criteria EAL4+ Certified. Upgradable to TPM 2.0 through Firmware v5.51 upgrade (Infineon SLB9665)*<br>Convertible to FIPS 140-2 Certified mode. When the SLB 9660 is converted (via Firmware v5.51) to TPM 2.0 mode then it is renamed as SLB 9665. Once converted to TPM2.0 the SLB9665 is CC EAL4+ certified. CG TPM Certified products list:<br><a href="http://www.trustedcomputinggroup.org/certification/tpmcertifiedproducts/">http://www.trustedcomputinggroup.org/certification/tpmcertifiedproducts/</a> |

**NOTE:** TPM 2.0 is not available for Win 7 32-bit

|                              |     |
|------------------------------|-----|
| <b>Password Clear Header</b> | Yes |
| <b>AUX IN</b> (audio)        | No  |

### System Technical Specifications

Clear CMOS Button  
Memory Fan Header

Yes  
CPU0 Memory Fan Header; CPU1 Memory Fan Header

### SYSTEM CONFIGURATION

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

|                                      |                       |                                            |              |             |              |             |              |
|--------------------------------------|-----------------------|--------------------------------------------|--------------|-------------|--------------|-------------|--------------|
| <b>Example Z640 Configuration #2</b> | Processor             | 2x Intel® Xeon® E5-2643 v3 (Dual Six-core) |              |             |              |             |              |
|                                      | Memory                | 8x 8GB DDR4-2133 (Registered DIMM)         |              |             |              |             |              |
|                                      | Graphics              | 1x NVIDIA® Quadro® K5200                   |              |             |              |             |              |
|                                      | Disks/Optical         | 4x 2TB SATA 7200 ; 1x Slim DVDRW SATA      |              |             |              |             |              |
|                                      | Power Supply          | 925W 90% 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)     | 82.62 W                                    |              | 82.36 W     |              | 83.10 W     |              |
|                                      | Windows Busy Typ (S0) | 399.09 W                                   |              | 397.52 W    |              | 399.46 W    |              |
|                                      | Windows Busy Max (S0) | 497.57 W                                   |              | 495.56 W    |              | 492.48 W    |              |
|                                      | Sleep (S3)            | 4.718 W                                    | 4.612 W      | 4.864 W     | 4.759 W      | 4.699 W     | 4.581 W      |
|                                      | Off (S5)              | 0.992 W                                    | 0.813 W      | 1.042 W     | 0.988 W      | 0.823 W     | 0.793 W      |
|                                      | Zero Power Mode (ErP) | 0.204 W                                    |              | 0.384 W     |              | 0.202 W     |              |
| <b>Heat Dissipation**</b>            |                       | 115 VAC                                    |              | 230 VAC     |              | 100 VAC     |              |
|                                      |                       | LAN Enabled                                | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled |

### System Technical Specifications

|  |                       |                 |                 |                 |                 |                 |                 |
|--|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|  | Windows Idle (S0)     | 281.90 btu/hr   |                 | 281.01 btu/hr   |                 | 283.54 btu/hr   |                 |
|  | Windows Busy Typ (S0) | 1361.70 btu/hr  |                 | 1356.34 btu/hr  |                 | 1362.95 btu/hr  |                 |
|  | Windows Busy Max (S0) | 1697.71 btu/hr  |                 | 1690.85 btu/hr  |                 | 1680.34 btu/hr  |                 |
|  | Sleep (S3)            | 16.09<br>btu/hr | 15.74<br>btu/hr | 16.60<br>btu/hr | 16.24<br>btu/hr | 16.03<br>btu/hr | 15.63<br>btu/hr |
|  | Off (S5)              | 3.15 btu/hr     | 2.77 btu/hr     | 3.56 btu/hr     | 3.37 btu/hr     | 2.81 btu/hr     | 2.71 btu/hr     |
|  | Zero Power Mode (ErP) | 0.694 btu/hr    |                 | 1.311 btu/hr    |                 | 0.689 btu/hr    |                 |

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

### DECLARED NOISE EMISSIONS

|                                              |                             |                                            |
|----------------------------------------------|-----------------------------|--------------------------------------------|
| <b>System Configuration</b><br>(Entry level) | <b>Processor Info</b>       | 1x Intel® Xeon® E5-2650 v3 2.30 GHz        |
|                                              | <b>Memory Info</b>          | 2x 8 GB DDR4-2133 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> (LWAd, bels) | <b>Deskside Sound Pressure</b><br>(LpAm, decibels) |
|-------------------------------------------------------------------------------|------------------------------------------------|---------------------------------|----------------------------------------------------|
|                                                                               | <b>Idle</b>                                    | 3.3                             | 16                                                 |
|                                                                               | <b>Hard drive Operating</b><br>(random reads)  | 3.5                             | 17                                                 |
|                                                                               | <b>DVD-ROM Operating</b><br>(sequential reads) | 4.5                             | 31                                                 |

### ENVIRONMENTAL DATA

|                                   |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmental Requirements</b> | <b>Temperature</b>      | Operating: 5°C to 35°C (40°F to 95°F)<br>Non-operating: -40°C to 60°C (-40°F 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: 3,048 m (10,000 ft)<br>Non-operating: 9,144 m (30,000 ft)                                                                                                                                                                                                                                                                                                                                                                                   |
|                                   | <b>Dynamic (new)</b>    | Shock<br>Operating: ½-sine: 40 g, 2-3ms (~62 cm/sec)<br>Non-operating:<br>½-sine: 160 cm/s, 2-3ms (~105 g)<br>square: 20 g, 422 cm/s<br><b>NOTE:</b> Values represent individual shock events and do not indicate repetitive shock events.<br>Vibration<br>Operating random: 0.5 g (rms), 5-300 Hz, up to 0.0025 g²/Hz<br>Non-operating random: 2.0 g (rms), 5-500 Hz, up to 0.0150 g²/Hz<br><b>NOTE:</b> Values do not indicate continuous vibration. |
|                                   | <b>Cooling</b>          | Above 1524m (5,000 ft.) altitude, maximum operating temperature is de-rated by 1°C (1.8°F) per 305m (1,000 ft.) elevation increase                                                                                                                                                                                                                                                                                                                     |

### System Technical Specifications

#### Physical Security and Serviceability

|                                                         |                                                                                                                                           |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Access Panel</b>                                     | Tool-less<br>Includes system board and memory information                                                                                 |
| <b>Optical Drive</b>                                    | Tool-less, no carrier or rails required                                                                                                   |
| <b>Hard Drives</b>                                      | Tool-less<br><br>Integrated blind-mate drive carriers<br><br>Optional 5.25" external bay carriers                                         |
| <b>Expansion Cards</b>                                  | Tool-less                                                                                                                                 |
| <b>Processor Socket</b>                                 | 1st socket on main system board. 2nd socket on optional 2nd CPU/Memory Module.                                                            |
| <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>                                     | Tool-less<br>2nd CPU/Memory Module: Tool-less                                                                                             |
| <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>                               | Yes, restores the computer to its original factory shipping image - Can be obtained via HP Support.                                       |
| <b>Dual Function Front Power Switch</b>                 | Yes, also acts as a reset switch when held for 4 seconds.                                                                                 |
| <b>Padlock Support</b>                                  | No                                                                                                                                        |
| <b>Cable Lock Support</b>                               | Yes, Kensington Cable Lock (optional): Prevents entire system theft only. 3mm x 7mm slot at rear of system                                |
| <b>Universal Chassis Clamp Lock Support</b>             | No                                                                                                                                        |
| <b>Solenoid Lock and Hood Sensor</b>                    | Access Panel Solenoid Lock: Yes (optional). Activated remotely to prevent system entry.<br>Access Panel Intrusion Sensor: Yes (optional). |

### System Technical Specifications

|                                                  |                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rear Port Control Cover</b>                   | No                                                                                                                                                                                                                                                                                                              |
| <b>Removable Media Write/Boot Control</b>        | Yes, user can prevent the workstation from writing to or booting from removable media.                                                                                                                                                                                                                          |
| <b>Power-On Password</b>                         | Yes, prevents an unauthorized person from booting up the computer.                                                                                                                                                                                                                                              |
| <b>Setup Password</b>                            | Yes, prevents an unauthorized person from changing the system 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>                        | CPU heatsink removal requires a T-15 Torx or flat blade screwdriver. CPU removal is tool-less.                                                                                                                                                                                                                  |
| <b>Power Supply Diagnostic LED</b>               | Yes                                                                                                                                                                                                                                                                                                             |
| <b>Front Power Button</b>                        | Yes                                                                                                                                                                                                                                                                                                             |
| <b>Rear Power Button</b>                         | Yes                                                                                                                                                                                                                                                                                                             |
| <b>Front Power LED</b>                           | Yes, white (normal), red (fault)                                                                                                                                                                                                                                                                                |
| <b>Front Hard Drive Activity LED</b>             | Yes, green                                                                                                                                                                                                                                                                                                      |
| <b>Front ODD Activity LED</b>                    | Yes                                                                                                                                                                                                                                                                                                             |
| <b>Internal Speaker</b>                          | Yes                                                                                                                                                                                                                                                                                                             |
| <b>System/Emergency ROM</b>                      | Recovers corrupted system BIOS                                                                                                                                                                                                                                                                                  |
| <b>Flash Recovery</b>                            |                                                                                                                                                                                                                                                                                                                 |
| <b>Cooling Solutions</b>                         | Air cooled forced convection                                                                                                                                                                                                                                                                                    |
| <b>Power Supply Fans</b>                         | 1 - 92mm                                                                                                                                                                                                                                                                                                        |
| <b>CPU Heatsink Fan</b>                          | 1st CPU: 1 - 92mm<br>Optional 2nd CPU: 1 - 92mm                                                                                                                                                                                                                                                                 |
| <b>Memory Heatsink Fan</b>                       | Optional 2nd CPU/Memory Module: rear bank: 1 - 80mm.                                                                                                                                                                                                                                                            |
| <b>HP Vision Diagnostics Offline Edition</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> </ul> |

### System Technical Specifications

- View the hardware configuration of the system

#### Key features and benefits

HP Vision Diagnostics simplifies the process of effectively identifying, diagnosing, and isolating the hardware issues. In addition to robust management tools, service tools can be invaluable in quickly resolving system problems. To streamline the service process and resolve problems quickly, it is necessary to have the right information available at the time that a service call is placed. The primary information requirement, which is also the one that provides the greatest Vision into potential system issues, is the configuration of the system. Vision diagnostics helps provide higher system availability. Typical uses of the Vision Diagnostics are:

- Testing and diagnosing apparent hardware failures
- Documenting system configurations for upgrade planning, standardization, inventory tracking, disaster recovery, and maintenance
- Sending configuration information to another location for more in-depth analysis

Entered using F2

**Access Panel Key Lock** Yes, prevents removal of the access panel and all internal components including devices installed in the external 5.25" bays.

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

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

**Trusted Platform Module Chip** Yes, Infineon TPM 1.2 Certified

**Integrated Chassis Handles** Yes

**Power Supply** Tool-less.  
Includes integrated handle.

**PCI Card Retention** Yes, tool-less  
Rear (all)  
Middle (full-height cards)  
Front (full-length cards with extender)

**Flash ROM** SPI ROM

**Diagnostic Power Switch LED on board** Yes

**Clear Password Jumper** Yes

**Clear CMOS Button** Yes

### System Technical Specifications

**CMOS Battery Holder** Yes

**DIMM Connectors** Yes

### BIOS

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

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

**ATAPI** ATAPI Removable Media Device BIOS Specification Version 1.0

**BBS** BIOS Boot Specification v1.01

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

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

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

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

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

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

**SMBIOS** System Management BIOS 2.7 for system management information

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

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

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

- **NORMAL** - normal temperature ranges.
- **ALERTED** - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.
- **SHUTDOWN** - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs.

### System Technical Specifications

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 hardware installed</b>                                 | System automatically detects the addition of new hardware                                                                                                                                                                                                                                                                                                                                                  |
| <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>                                                              | Allows 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>                                                       | Fan control parameters are set according to detected hardware configuration for optimal acoustics                                                                                                                                                                                                                                                                                                          |
| <b>Pre-boot Diagnostics</b>                                                   | Early (pre-video) critical errors are reported via beeps and blinks on the power LED                                                                                                                                                                                                                                                                                                                       |
| <b>Industry Standard Specification Support</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                            |

### System Technical Specifications

|                                    |                                                                                                                                                                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>UEFI Specification Revision</b> | 2.3.1                                                                                                                                                                                                                           |
| <b>Industry Standard</b>           | Revision Supported by the BIOS                                                                                                                                                                                                  |
| <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>                         | <ul style="list-style-type: none"> <li>Enhanced Disk Drive Specification Version 1.1</li> <li>BIOS Enhanced Disk Drive Specification Version 3.0</li> </ul>                                                                     |
| <b>EHCI</b>                        | Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0                                                                                                                                                       |
| <b>PCI</b>                         | <ul style="list-style-type: none"> <li>PCI Local Bus Specification, Revision 2.3</li> <li>PCI Power Management Specification, Revision 1.1</li> <li>PCI Firmware Specification, Revision 3.0, Draft 0.7</li> </ul>              |
| <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>                        | <ul style="list-style-type: none"> <li>Serial ATA Specification, Revision 1.0a</li> <li>Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5</li> <li>Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0</li> </ul> |
| <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                                                                                                                                                                     |

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

### Social and Environmental Responsibility

**Eco-Label Certifications & Declarations** This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:



### System Technical Specifications

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

#### Batteries

The battery in this product complies with EU Directive 2006/66/EC

Battery size: CR2032 (coin cell)

Battery type: Lithium Metal

The battery in this product does not contain:

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

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

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

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

#### HP Inc. Corporate Environmental Information

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

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

Eco-label certifications:

<http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html>

ISO 14001 certificates:

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

#### Additional Information

- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- <http://www.hp.com/hpinfo/globalcitizenship/environment/productdata/disassemblyworkstationio.html>
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- EPEAT Gold registered in the United States. See <http://www.epeat.net> for registration status in your country. EPEAT® registered where applicable. EPEAT registration varies by country.

### System Technical Specifications

See <http://www.epeat.net> for registration status by country. Search keyword *generator* on HP's 3<sup>rd</sup> party option store for solar energy accessory at [www.hp.com/go/options](http://www.hp.com/go/options)

#### Packaging

HP Workstation product packaging meets the HP General Specification for the Environment at [http://www.hp.com/hpinfo/globalcitizenship/society/gen\\_specifications.html](http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html)

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

#### Packaging Materials

##### Internal

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

##### External

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

#### Manageability

##### Industry Standard Specifications

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

- DASH 1.1 required functionalities via Intel® LAN on motherboard

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

Intel® Active Management Technology (AMT) 9.1

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

- Power Management (on, off, reset, graceful shutdown, sleep and hibernate)
- Support in Max Power Savings (Shutdown and Hibernate Modes)
- Hardware Inventory (includes BIOS and firmware revisions)
- Hardware Alerting
- Agent Presence
- System Defense Filters
- Serial Over LAN (SOL)
- IDE Redirect
- ME Wake-on-LAN (WOL)
- DASH 1.1 compliance
- IPv6 Support
- Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection

### System Technical Specifications

- Remote Scheduled Maintenance - pre-schedule when the system connects to the IT or service provider console for maintenance.
- Remote Alerts - automatically alert IT or service provider if issues arise
- Access Monitor - Provides oversight into Intel® AMT actions to support security requirements
- PC Alarm Clock
- Microsoft NAP Support
- Host Base set-up and configuration
- Management Engine (ME) firmware roll back
- Local Time Sync to UTC
- Remote Memory Dump Command - Creates memory dump for debug

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

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

**Remote Manageability Software Solutions** The HP Z640 Workstation is supported on the following remote manageability software consoles:

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

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

**System Software Manager** For questions or support for SSM, please visit: <http://www.hp.com/go/ssm>

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

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

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

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

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

**Product Change Notification**

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

## System Technical Specifications

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

### Stable & Consistent Offerings

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

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

#### Processors

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

#### Hard Drives

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

#### Graphics

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

#### Memory\*

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

Stable & Consistent Offerings

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

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

### Technical Specifications - Processors

Intel® Xeon® E5-1603 v4 2.8 2133 4C CPU  
 Intel® Xeon® E5-1607 v4 3.1 2133 4C CPU  
 Intel® Xeon® E5-1620 v4 3.5 2400 4C CPU  
 Intel® Xeon® E5-1630 v4 3.7 2400 4C CPU  
 Intel® Xeon® E5-1650 v4 3.6 2400 6C CPU  
 Intel® Xeon® E5-1660 v4 3.2 2400 8C CPU  
 Intel® Xeon® E5-1680 v4 3.4 2400 8C CPU

Intel® Xeon® E5-1630 v3 3.7 2133 4C CPU  
 Intel® Xeon® E5-1620 v3 3.5 2133 4C CPU  
 Intel® Xeon® E5-1603 v3 2.8 1866 4C CPU

Intel® Xeon® E5-2603 v3 1.6 1600 6C CPU  
 Intel® Xeon® E5-2609 v3 1.9 1600 6C CPU  
 Intel® Xeon® E5-2620 v3 2.4 1866 6C CPU  
 Intel® Xeon® E5-2623 v3 3.0 1866 4C CPU  
 Intel® Xeon® E5-2630 v3 2.4 1866 8C CPU  
 Intel® Xeon® E5-2640 v3 2.6 1866 8C CPU  
 Intel® Xeon® E5-2637 v3 3.5 2133 4C CPU  
 Intel® Xeon® E5-2650 v3 2.3 2133 10C CPU  
 Intel® Xeon® E5-2660 v3 2.6 2133 10C CPU  
 Intel® Xeon® E5-2643 v3 3.4 2133 6C CPU  
 Intel® Xeon® E5-2670 v3 2.3 2133 12C CPU  
 Intel® Xeon® E5-2680 v3 2.5 2133 12C CPU  
 Intel® Xeon® E5-2683 v3 2.0 2133 14C CPU  
 Intel® Xeon® E5-2667 v3 3.2 2133 8C CPU  
 Intel® Xeon® E5-2690 v3 2.6 2133 12C CPU  
 Intel® Xeon® E5-2695 v3 2.3 2133 14C CPU  
 Intel® Xeon® E5-2697 v3 2.6 2133 14C CPU  
 Intel® Xeon® E5-2699 v3 2.3 2133 18C CPU

J9Q02AA  
 J9Q01AA  
 J9Q00AA  
 J9P99AA  
 J9P98AA  
 J9P97AA  
 J9P96AA  
 J9P95AA  
 J9P94AA  
 J9P93AA  
 J9P92AA  
 J9P91AA  
 J9P90AA  
 J9P89AA  
 J9P88AA  
 J9P87AA  
 J9P86AA  
 J9P85AA

Z640 Intel® Xeon® E5-2643 v4 3.4 2400 6C 2ndCPU  
 Z640 Intel® Xeon® E5-2640 v4 2.4 2133 10C 2ndCPU  
 Z640 Intel® Xeon® E5-2637 v4 3.5 2400 4C 2ndCPU  
 Z640 Intel® Xeon® E5-2630 v4 2.2 2133 10C 2ndCPU  
 Z640 Intel® Xeon® E5-2623 v4 2.6 2133 4C 2ndCPU  
 Z640 Intel® Xeon® E5-2620 v4 2.1 2133 8C 2ndCPU  
 Z640 Intel® Xeon® E5-2609 v4 1.7 1866 8C 2ndCPU  
 Z640 Intel® Xeon® E5-2603 v4 1.7 1866 6C 2ndCPU

T9U16AA  
 T9U15AA  
 T9U14AA  
 T9U13AA  
 T9U12AA  
 T9U11AA  
 T9U10AA

### Technical Specifications – Storage / Hard Drives & SSDs

#### STORAGE/HARD DRIVES

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

### Technical Specifications – Storage / Hard Drives & SSDs

|                                             |                                                                                    |                                                                                       |                                                                                        |
|---------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
|                                             |                                                                                    | <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)<br><b>Average</b> 3.6 ms<br><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)                                                            |
| <b>HP 1.2TB SAS 10K SFF HDD</b>             | <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>Cache</b>                                                                       | multi-segmentable cache buffer                                                        |                                                                                        |
|                                             | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 0.18ms (max)<br><b>Average</b> 3.5ms<br><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)                                                           |                                                                                        |
| <b>SATA Hard Drives for HP Workstations</b> | <b>500GB SATA 7200 rpm 6Gb/s 3.5" HDD</b>                                          | <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<br><b>Average</b> 11 ms<br><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)                                                            |
|                                             | <b>1TB SATA 7200 rpm 6Gb/s 3.5" HDD</b>                                            | <b>Capacity</b>                                                                       | 1 Terabyte (1000 GB)                                                                   |
|                                             |                                                                                    | <b>Height</b>                                                                         | 1 in; 2.54 cm                                                                          |
|                                             |                                                                                    | <b>Width</b>                                                                          | <b>Media Diameter</b> 3.5 in; 8.9 cm                                                   |

|                                           |                                                                                    |                                    |                      |                |
|-------------------------------------------|------------------------------------------------------------------------------------|------------------------------------|----------------------|----------------|
| <b>2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD</b> | <b>Interface</b>                                                                   | Serial ATA (6.0Gb/s), NCQ enabled  | <b>Physical Size</b> | 4 in; 10.17 cm |
|                                           | <b>Synchronous Transfer Rate</b> (Maximum)                                         | Up to 600 MB/s                     |                      |                |
|                                           | <b>Interface</b>                                                                   | Serial ATA (6.0Gb/s), NCQ enabled  |                      |                |
|                                           | <b>Synchronous Transfer Rate</b> (Maximum)                                         | Up to 600 MB/s                     |                      |                |
|                                           | <b>Buffer</b>                                                                      | 64MB                               |                      |                |
|                                           | <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>                                                              | 1,953,525,168                      |                      |                |
| <b>Operating Temperature</b>              | 41° to 131° F (5° to 55° C)                                                        |                                    |                      |                |
| <b>2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD</b> | <b>Capacity</b>                                                                    | 2TB                                |                      |                |
|                                           | <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</b> (Maximum)                                         | Up to 600MB/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 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</b> (Maximum)                                         | 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>                   | 7200 rpm                                                                           |                                    |                      |                |
| <b>Operating Temperature</b>              | 41° to 140° F (5° to 60° C)                                                        |                                    |                      |                |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                                                |                                                                                    |                                                                                  |
|----------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>1TB SATA 7200 rpm 6Gb/s<br/>3.5" HDD (Enterprise Class)</b> | <b>Capacity</b>                                                                    | 1TB                                                                              |
|                                                                | <b>Protocol</b>                                                                    | SATA                                                                             |
|                                                                | <b>Form Factor</b>                                                                 | 3.5"                                                                             |
|                                                                | <b>Controller</b>                                                                  | AHCI                                                                             |
|                                                                | <b>Reliability (MTBF)</b>                                                          | 2.0M hours                                                                       |
|                                                                | <b>Rated Power On Hours</b>                                                        | 8760/yr                                                                          |
|                                                                | <b>Annualized Failure Rate</b> (based on Rated POH)                                | <0.62%                                                                           |
|                                                                | <b>Rated for 24/7/365 operation</b>                                                | YES                                                                              |
|                                                                | <b>Physical Size</b> (Height)                                                      | 1 in; 2.54 cm                                                                    |
|                                                                | <b>Physical Size</b> (Width)                                                       | 4 in; 10.17 cm                                                                   |
|                                                                | <b>Media Diameter</b>                                                              | 3.5 in; 8.9 cm                                                                   |
|                                                                | <b>Interface</b>                                                                   | Serial ATA (6Gb/s), NCQ enabled                                                  |
|                                                                | <b>Synchronous Transfer Rate</b> (Maximum)                                         | Up to 600MB/s                                                                    |
|                                                                | <b>Buffer</b>                                                                      | 128MB                                                                            |
|                                                                | <b>Seek Time</b> (typical reads, includes controller overhead, including settling) | <b>Single Track</b> 0.32ms<br><b>Average</b> 7.45ms<br><b>Full Stroke</b> 14.2ms |
|                                                                | <b>Operating Temperature</b>                                                       | 41° to 140° F (5° to 60° C)                                                      |
|                                                                | <b>Performance</b>                                                                 | <b>Sequential Read</b> up to 226MB/s<br><b>Sequential Write</b> up to 226MB/s    |
|                                                                | <b>Enterprise Class Features</b>                                                   | High Reliability                                                                 |
| <b>4TB SATA 7200 rpm 6Gb/s<br/>3.5" HDD (Enterprise Class)</b> | <b>Capacity</b>                                                                    | 4TB                                                                              |
|                                                                | <b>Height</b>                                                                      | 1 in; 2.54 cm                                                                    |
|                                                                | <b>Width</b>                                                                       | <b>Media Diameter</b> 3.5 in; 8.9 cm<br><b>Physical Size</b> 4 in; 10.17 cm      |
|                                                                | <b>Interface</b>                                                                   | Serial ATA (6Gb/s), NCQ enabled                                                  |
|                                                                | <b>Synchronous Transfer Rate</b> (Maximum)                                         | 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<br><b>Average</b> 8.5ms<br><b>Full Stroke</b> 15.7ms   |
|                                                                | <b>Rotational Speed</b>                                                            | 7,200 rpm                                                                        |
|                                                                | <b>Operating Temperature</b>                                                       | 5° to 60° F (-15° to 15.56° C)                                                   |
|                                                                |                                                                                    |                                                                                  |
| <b>500GB SATA 7.2K SED SFF<br/>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<br><b>Physical Size</b> 2.75 in; 6.99 cm   |
|                                                                | <b>Interface</b>                                                                   | Serial ATA (6Gb/s)                                                               |
|                                                                | <b>Synchronous Transfer Rate</b> (Maximum)                                         | Up to 600MB/s                                                                    |
|                                                                | <b>Buffer</b>                                                                      | 32MB                                                                             |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                                 |                                                                                    |                       |                                |
|-------------------------------------------------|------------------------------------------------------------------------------------|-----------------------|--------------------------------|
| <b>1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)</b> | <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>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>                                                                   |                       | 6Gb/s SATA                     |
|                                                 | <b>Synchronous Transfer Rate</b> (Maximum)                                         |                       | Up to 600MB/s                  |
|                                                 | <b>Buffer</b>                                                                      |                       | 64MB standard HDD cache buffer |
|                                                 | <b>Cache</b>                                                                       |                       | 8GB NAND flash                 |
|                                                 | <b>Rotational Speed</b>                                                            |                       | 7200 rpm                       |
|                                                 | <b>Operating Temperature</b>                                                       |                       | 32° to 140° F (0° to 60° C)    |
|                                                 |                                                                                    |                       |                                |

|                                      |                                |                                            |                                 |
|--------------------------------------|--------------------------------|--------------------------------------------|---------------------------------|
| <b>SATA SSDs for HP Workstations</b> | <b>HP 128GB SATA 6Gb/s SSD</b> | <b>Capacity</b>                            | 128GB                           |
|                                      |                                | <b>Protocol</b>                            | SATA                            |
|                                      |                                | <b>Form Factor</b>                         | 2.5"                            |
|                                      |                                | <b>Controller</b>                          | AHCI                            |
|                                      |                                | <b>NAND Type</b>                           | MLC                             |
|                                      |                                | <b>Endurance</b>                           | 100TBW (TB Written)             |
|                                      |                                | <b>Reliability</b> (MTTF)                  | 1.5M hours                      |
|                                      |                                | <b>Physical Size</b> (Height)              | 0.28 in; 0.7 cm                 |
|                                      |                                | <b>Physical Size</b> (Width)               | 2.5 in; 6.36 cm                 |
|                                      |                                | <b>Interface</b>                           | SATA 6Gb/s                      |
|                                      |                                | <b>Synchronous Transfer Rate</b> (Maximum) | Up to 550MB/s (Sequential Read) |
|                                      |                                | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)     |
|                                      |                                | <b>Performance</b>                         |                                 |
|                                      |                                | <b>Sequential Read</b>                     | 560 MB/s                        |
|                                      |                                | <b>Sequential Write</b>                    | 400 MB/s                        |
|                                      |                                | <b>Random Read</b>                         | 90K IOPS                        |
|                                      |                                | <b>Random Write</b>                        | 88K IOPS                        |
|                                      | <b>HP 256GB SATA 6Gb/s SSD</b> | <b>Capacity</b>                            | 256GB                           |
|                                      |                                | <b>Protocol</b>                            | SATA                            |
|                                      |                                | <b>Form Factor</b>                         | 2.5"                            |
|                                      |                                | <b>Controller</b>                          | AHCI                            |
|                                      |                                | <b>NAND Type</b>                           | MLC                             |
|                                      |                                | <b>Endurance</b>                           | 200TBW (TB Written)             |
|                                      |                                | <b>Reliability</b> (MTTF)                  | 1.5M hours                      |
|                                      |                                | <b>Physical Size</b> (Height)              | 0.28 in; 0.7 cm                 |
|                                      |                                | <b>Physical Size</b> (Width)               | 2.5 in; 6.36 cm                 |

### Technical Specifications – Storage / Hard Drives & SSDs

|  |                                            |                                                                                                                                                           |
|--|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Interface</b>                           | SATA 6Gb/s                                                                                                                                                |
|  | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 600MB/s                                                                                                                                             |
|  | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)                                                                                                                               |
|  | <b>Performance</b>                         | <b>Sequential Read</b> 560MB/s (max)<br><b>Sequential Write</b> 510MB/s (max)<br><b>Random Read</b> 100K IOPS (max)<br><b>Random Write</b> 88K IOPS (max) |
|  | <b>HP 256GB SATA 6Gb/s SED Opal 2 SSD</b>  |                                                                                                                                                           |
|  | <b>Capacity</b>                            | 256GB                                                                                                                                                     |
|  | <b>Protocol</b>                            | SATA                                                                                                                                                      |
|  | <b>Form Factor</b>                         | 2.5"                                                                                                                                                      |
|  | <b>Controller</b>                          | AHCI                                                                                                                                                      |
|  | <b>NAND Type</b>                           | MLC                                                                                                                                                       |
|  | <b>Endurance</b>                           | 200TBW (TB Written)                                                                                                                                       |
|  | <b>Reliability (MTTF)</b>                  | 1.5M hours                                                                                                                                                |
|  | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                                                                                                                                           |
|  | <b>Physical Size (Width)</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>Performance</b>                         | <b>Sequential Read</b> 560MB/s<br><b>Sequential Write</b> 510 MB/s<br><b>Random Read</b> 100K IOPS<br><b>Random Write</b> 88K IOPS                        |
|  | <b>Self-Encrypting Drive Support</b>       | OPAL 2                                                                                                                                                    |
|  | <b>HP 512GB SATA 6Gb/s SSD</b>             |                                                                                                                                                           |
|  | <b>Capacity</b>                            | 512GB                                                                                                                                                     |
|  | <b>Protocol</b>                            | SATA                                                                                                                                                      |
|  | <b>Form Factor</b>                         | 2.5"                                                                                                                                                      |
|  | <b>Controller</b>                          | AHCI                                                                                                                                                      |
|  | <b>NAND Type</b>                           | MLC                                                                                                                                                       |
|  | <b>Endurance</b>                           | 300TBW (TB Written)                                                                                                                                       |
|  | <b>Reliability (MTTF)</b>                  | 1.5M hours                                                                                                                                                |
|  | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                                                                                                                                           |
|  | <b>Physical Size (Width)</b>               | 2.5 in; 6.36 cm                                                                                                                                           |
|  | <b>Interface</b>                           | SATA 6Gb/s                                                                                                                                                |
|  | <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>Performance</b>                         | <b>Sequential Read</b> 560 MB/s<br><b>Sequential Write</b> 510 MB/s<br><b>Random Read</b> 100K IOPS<br><b>Random Write</b> 88K IOPS                       |

### Technical Specifications – Storage / Hard Drives & SSDs

|                              |                                            |                                  |
|------------------------------|--------------------------------------------|----------------------------------|
| <b>HP 512GB SATA SED SSD</b> | <b>Capacity</b>                            | 512GB                            |
|                              | <b>Protocol</b>                            | SATA                             |
|                              | <b>Form Factor</b>                         | 2.5"                             |
|                              | <b>Controller</b>                          | AHCI                             |
|                              | <b>NAND Type</b>                           | MLC                              |
|                              | <b>Endurance</b>                           | 300TBW (TB Written)              |
|                              | <b>Reliability (MTTF)</b>                  | 1.5M hours                       |
|                              | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                  |
|                              | <b>Physical Size (Width)</b>               | 2.5 in; 6.36 cm                  |
|                              | <b>Interface</b>                           | SATA 6Gb/s                       |
|                              | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 600MB/s                    |
|                              | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)      |
|                              | <b>Performance</b>                         | <b>Sequential Read</b> 560 MB/s  |
|                              |                                            | <b>Sequential Write</b> 510 MB/s |
|                              |                                            | <b>Random Read</b> 100K IOPS     |
|                              |                                            | <b>Random Write</b> 88K IOPS     |
|                              | <b>Self-Encrypting Drive Support</b>       | OPAL 1 and 2                     |
| <b>HP 1TB SATA 6Gb/s SSD</b> | <b>Capacity</b>                            | 1TB                              |
|                              | <b>Protocol</b>                            | SATA                             |
|                              | <b>Form Factor</b>                         | 2.5"                             |
|                              | <b>Controller</b>                          | AHCI                             |
|                              | <b>NAND Type</b>                           | MLC                              |
|                              | <b>Endurance</b>                           | 400TBW (TB Written)              |
|                              | <b>Reliability (MTTF)</b>                  | 1.5M hours                       |
|                              | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                  |
|                              | <b>Physical Size (Width)</b>               | 2.5 in; 6.36 cm                  |
|                              | <b>Interface</b>                           | SATA 6Gb/s                       |
|                              | <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>Performance</b>                         | <b>Sequential Read</b> 560 MB/s  |
|                              |                                            | <b>Sequential Write</b> 510 MB/s |
|                              |                                            | <b>Random Read</b> 100K IOPS     |
|                              |                                            | <b>Random Write</b> 88K IOPS     |
| <b>HP 2TB SATA 6Gb/s SSD</b> | <b>Capacity</b>                            | 2TB                              |
|                              | <b>Protocol</b>                            | SATA                             |
|                              | <b>Form Factor</b>                         | 2.5"                             |
|                              | <b>Controller</b>                          | AHCI                             |
|                              | <b>NAND Type</b>                           | 3D TLC                           |
|                              | <b>Endurance</b>                           | 400TBW (TB Written)              |
|                              | <b>Reliability (MTTF)</b>                  | 1.5M hours                       |
|                              | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                  |
|                              |                                            |                                  |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                               |                                            |                                  |
|-----------------------------------------------|--------------------------------------------|----------------------------------|
| <b>HP Enterprise Class<br/>240GB SATA SSD</b> | <b>Physical Size (Width)</b>               | 2.5 in; 6.36 cm                  |
|                                               | <b>Interface</b>                           | SATA 6Gb/s                       |
|                                               | <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>Performance</b>                         | <b>Sequential Read</b> 530 MB/s  |
|                                               |                                            | <b>Sequential Write</b> 500 MB/s |
|                                               |                                            | <b>Random Read</b> 92K IOPS      |
|                                               |                                            | <b>Random Write</b> 83K IOPS     |
|                                               | <b>Capacity</b>                            | 240GB                            |
|                                               | <b>Protocol</b>                            | SATA                             |
|                                               | <b>Form Factor</b>                         | 2.5"                             |
|                                               | <b>Controller</b>                          | AHCI                             |
|                                               | <b>NAND Type</b>                           | MLC                              |
|                                               | <b>Endurance</b>                           | 920TBW (TB Written)              |
|                                               | <b>Reliability (MTTF)</b>                  | 2.0M hours                       |
| <b>HP Enterprise Class<br/>480GB SATA SSD</b> | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                  |
|                                               | <b>Physical Size (Width)</b>               | 2.5 in; 6.36 cm                  |
|                                               | <b>Interface</b>                           | 6Gb/s SATA                       |
|                                               | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 600MB/s                    |
|                                               | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)      |
|                                               | <b>Performance</b>                         | <b>Sequential Read</b> 420 MB/s  |
|                                               |                                            | <b>Sequential Write</b> 290 MB/s |
|                                               |                                            | <b>Random Read</b> 63K IOPS      |
|                                               |                                            | <b>Random Write</b> 18K IOPS     |
|                                               | <b>Enterprise Class Features</b>           | High Endurance NAND              |
|                                               |                                            | Power Loss Protection            |
|                                               |                                            | End-to-End Data Protection       |
|                                               |                                            |                                  |
|                                               | <b>Capacity</b>                            | 480GB                            |
|                                               | <b>Protocol</b>                            | SATA                             |
|                                               | <b>Form Factor</b>                         | 2.5"                             |
|                                               | <b>Controller</b>                          | AHCI                             |
|                                               | <b>NAND Type</b>                           | MLC                              |
|                                               | <b>Endurance</b>                           | 1850TBW (TB Written)             |
|                                               | <b>Reliability (MTTF)</b>                  | 2.0M hours                       |
|                                               | <b>Physical Size (Height)</b>              | 0.28 in; 0.7 cm                  |
|                                               | <b>Physical Size (Width)</b>               | 2.5 in; 6.36 cm                  |
|                                               | <b>Interface</b>                           | 6Gb/s SATA                       |
|                                               | <b>Synchronous Transfer Rate (Maximum)</b> | Up to 600MB/s                    |
|                                               | <b>Operating Temperature</b>               | 32° to 158° F (0° to 70° C)      |

### Technical Specifications – Storage / Hard Drives & SSDs

|                               |                               |                                  |                                                                                                                                      |
|-------------------------------|-------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
|                               |                               | <b>Performance</b>               | <b>Sequential Read</b> 420 MB/s<br><b>Sequential Write</b> 380 MB/s<br><b>Random Read</b> 63K IOPS<br><b>Random Write</b> 23K IOPS   |
|                               |                               | <b>Enterprise Class Features</b> | High Endurance NAND<br>Power Loss Protection<br>End-to-End Data Protection                                                           |
| PCIe SSDs for HP Workstations | HP Z Turbo Drive 256GB SSD    | <b>Capacity</b>                  | 256GB                                                                                                                                |
|                               |                               | <b>Protocol</b>                  | PCIe                                                                                                                                 |
|                               |                               | <b>Form Factor</b>               | Half-height, half-length                                                                                                             |
|                               |                               | <b>Controller</b>                | AHCI                                                                                                                                 |
|                               |                               | <b>NAND Type</b>                 | MLC                                                                                                                                  |
|                               |                               | <b>Endurance</b>                 | 146TB                                                                                                                                |
|                               |                               | <b>Interface</b>                 | PCI Express 2.0 x4 electrical x4 physical                                                                                            |
|                               |                               | <b>Operating Temperature</b>     | 32° to 158° F (0° to 70° C)                                                                                                          |
|                               |                               | <b>Performance</b>               | <b>Sequential Read</b> 1080 MB/s<br><b>Sequential Write</b> 800 MB/s<br><b>Random Read</b> 120K IOPS<br><b>Random Write</b> 60K IOPS |
|                               |                               |                                  |                                                                                                                                      |
|                               | HP Z Turbo Drive 512GB SSD    | <b>Capacity</b>                  | 512GB                                                                                                                                |
|                               |                               | <b>Protocol</b>                  | PCIe                                                                                                                                 |
|                               |                               | <b>Form Factor</b>               | Half-height, half-length                                                                                                             |
|                               |                               | <b>Controller</b>                | AHCI                                                                                                                                 |
|                               |                               | <b>NAND Type</b>                 | MLC                                                                                                                                  |
|                               |                               | <b>Endurance</b>                 | 292TB                                                                                                                                |
|                               |                               | <b>Interface</b>                 | PCI Express 2.0 x4 electrical x4 physical                                                                                            |
|                               |                               | <b>Operating Temperature</b>     | 32° to 158° F (0° to 70° C)                                                                                                          |
|                               |                               | <b>Performance</b>               | <b>Sequential Read</b> 1170 MB/s<br><b>Sequential Write</b> 950 MB/s<br><b>Random Read</b> 122K IOPS<br><b>Random Write</b> 72K IOPS |
|                               |                               |                                  |                                                                                                                                      |
|                               | HP Z Turbo Drive G2 256GB SSD | <b>Capacity</b>                  | 256GB                                                                                                                                |
|                               |                               | <b>Protocol</b>                  | PCIe                                                                                                                                 |
|                               |                               | <b>Form Factor</b>               | Half-height, half-length                                                                                                             |
|                               |                               | <b>Controller</b>                | NVMe                                                                                                                                 |
|                               |                               | <b>NAND Type</b>                 | MLC                                                                                                                                  |
|                               |                               | <b>Endurance</b>                 | 146TB                                                                                                                                |
|                               |                               | <b>Reliability (MTBF)</b>        | 1.5M hours                                                                                                                           |
|                               |                               | <b>Interface</b>                 | PCI Express 3.0 x4 electrical x4 physical                                                                                            |
|                               |                               | <b>Operating Temperature</b>     | 32° to 158° F (0° to 70° C)                                                                                                          |
|                               |                               | <b>Performance</b>               | <b>Sequential Read</b> 2150 MB/s                                                                                                     |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                              |                              |                                           |                                |
|----------------------------------------------|------------------------------|-------------------------------------------|--------------------------------|
|                                              |                              | <b>Sequential Write</b>                   | 1260 MB/s                      |
|                                              |                              | <b>Random Read</b>                        | 300K IOPS                      |
|                                              |                              | <b>Random Write</b>                       | 100K IOPS                      |
| <b>HP Z Turbo Drive G2<br/>512GB SSD</b>     | <b>Capacity</b>              | 512GB                                     |                                |
|                                              | <b>Protocol</b>              | PCIe                                      |                                |
|                                              | <b>Form Factor</b>           | Half-height, half-length                  |                                |
|                                              | <b>Controller</b>            | NVMe                                      |                                |
|                                              | <b>NAND Type</b>             | MLC                                       |                                |
|                                              | <b>Endurance</b>             | 292TB                                     |                                |
|                                              | <b>Reliability (MTBF)</b>    | 1.5M hours                                |                                |
|                                              | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                |
|                                              | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                |
|                                              | <b>Performance</b>           | <b>Sequential Read</b>                    | 2150 MB/s                      |
|                                              |                              | <b>Sequential Write</b>                   | 1550 MB/s                      |
|                                              |                              | <b>Random Read</b>                        | 300K IOPS                      |
|                                              |                              | <b>Random Write</b>                       | 100K IOPS                      |
|                                              |                              |                                           |                                |
| <b>HP Z Turbo Drive G2 1TB<br/>SSD</b>       | <b>Capacity</b>              | 1TB                                       |                                |
|                                              | <b>Protocol</b>              | PCIe                                      |                                |
|                                              | <b>Form Factor</b>           | Half-height, half-length                  |                                |
|                                              | <b>Controller</b>            | NVMe                                      |                                |
|                                              | <b>NAND Type</b>             | MLC                                       |                                |
|                                              | <b>Endurance</b>             | 600TB                                     |                                |
|                                              | <b>Reliability (MTTF)</b>    | 1.5M hours                                |                                |
|                                              | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                |
|                                              | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                |
|                                              | <b>Performance</b>           | <b>Sequential Read</b>                    | 2500 MB/s                      |
|                                              |                              | <b>Sequential Write</b>                   | 1550 MB/s                      |
|                                              |                              | <b>Random Read</b>                        | 210K IOPS                      |
|                                              |                              | <b>Random Write</b>                       | 130K IOPS                      |
|                                              |                              |                                           |                                |
| <b>HP Z Turbo Drive G2<br/>256GB TLC SSD</b> | <b>Capacity</b>              | 256GB                                     |                                |
|                                              | <b>Protocol</b>              | PCIe                                      |                                |
|                                              | <b>Form Factor</b>           | M.2 in Half-height, half-length card      |                                |
|                                              | <b>Controller</b>            | NVMe                                      |                                |
|                                              | <b>NAND Type</b>             | 3D TLC                                    |                                |
|                                              | <b>Endurance</b>             | 75TBW (TB Written)                        |                                |
|                                              | <b>Reliability (MTBF)</b>    | 1.5M hours                                |                                |
|                                              | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                |
|                                              | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                |
|                                              | <b>Performance</b>           | <b>Sequential Read</b>                    | 2800 MB/s                      |
|                                              |                              | <b>Sequential Write</b>                   | 320 MB/s (1100 MB/s max/Turbo) |
|                                              |                              |                                           |                                |
|                                              |                              |                                           |                                |
|                                              |                              |                                           |                                |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                                       |                              |                                           |                                 |           |
|-------------------------------------------------------|------------------------------|-------------------------------------------|---------------------------------|-----------|
| <b>HP Z Turbo Drive G2<br/>512GB TLC SSD</b>          | <b>Capacity</b>              | 512GB                                     | <b>Random Read</b>              | 250K IOPS |
|                                                       | <b>Protocol</b>              | PCIe                                      | <b>Random Write</b>             | 180K IOPS |
|                                                       | <b>Form Factor</b>           | M.2 in Half-height, half-length card      |                                 |           |
|                                                       | <b>Controller</b>            | NVMe                                      |                                 |           |
|                                                       | <b>NAND Type</b>             | 3D TLC                                    |                                 |           |
|                                                       | <b>Endurance</b>             | 150TBW (TB Written)                       |                                 |           |
|                                                       | <b>Reliability (MTBF)</b>    | 1.5M hours                                |                                 |           |
|                                                       | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                 |           |
|                                                       | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                 |           |
|                                                       | <b>Performance</b>           | <b>Sequential Read</b>                    | 2800 MB/s                       |           |
| <b>HP Z Turbo Drive G2 1TB<br/>SSD</b>                |                              | <b>Sequential Write</b>                   | 660 MB/s (1600 MB/s max/Turbo)  |           |
|                                                       |                              | <b>Random Read</b>                        | 260K IOPS                       |           |
|                                                       |                              | <b>Random Write</b>                       | 260K IOPS                       |           |
|                                                       | <b>Capacity</b>              | 1TB                                       |                                 |           |
|                                                       | <b>Protocol</b>              | PCIe                                      |                                 |           |
|                                                       | <b>Form Factor</b>           | M.2 in Half-height, half-length card      |                                 |           |
|                                                       | <b>Controller</b>            | NVMe                                      |                                 |           |
|                                                       | <b>NAND Type</b>             | 3D TLC                                    |                                 |           |
|                                                       | <b>Endurance</b>             | 300TBW (TB Written)                       |                                 |           |
|                                                       | <b>Reliability (MTTF)</b>    | 1.5M hours                                |                                 |           |
| <b>HP Z Turbo Drive Quad<br/>Pro 2x256GB PCIe SSD</b> | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                 |           |
|                                                       | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                 |           |
|                                                       | <b>Performance</b>           | <b>Sequential Read</b>                    | 3000 MB/s                       |           |
|                                                       |                              | <b>Sequential Write</b>                   | 1150 MB/s (1700 MB/s max/Turbo) |           |
|                                                       |                              | <b>Random Read</b>                        | 360K IOPS                       |           |
|                                                       |                              | <b>Random Write</b>                       | 330K IOPS                       |           |
|                                                       | <b>Capacity</b>              | 512GB                                     |                                 |           |
|                                                       | <b>Protocol</b>              | PCIe                                      |                                 |           |
|                                                       | <b>Form Factor</b>           | PCIe Card, Full Height PCIe Slot          |                                 |           |
|                                                       | <b>Controller</b>            | NVMe                                      |                                 |           |
| <b>HP Z Turbo Drive Quad<br/>Pro 2x256GB PCIe SSD</b> | <b>NAND Type</b>             | MLC                                       |                                 |           |
|                                                       | <b>Endurance</b>             | 146TB                                     |                                 |           |
|                                                       | <b>Reliability (MTTF)</b>    | 1.5M hours                                |                                 |           |
|                                                       | <b>Interface</b>             | PCIe Gen3 x4 architecture                 |                                 |           |
|                                                       | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                 |           |
|                                                       | <b>Performance</b>           | <b>Sequential Read</b>                    | 2150 MB/s                       |           |
|                                                       |                              | <b>Sequential Write</b>                   | 1260 MB/s                       |           |
|                                                       |                              |                                           |                                 |           |
|                                                       |                              |                                           |                                 |           |
|                                                       |                              |                                           |                                 |           |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                                   |                              |                                           |                                |
|---------------------------------------------------|------------------------------|-------------------------------------------|--------------------------------|
|                                                   |                              | <b>Random Read</b>                        | 300K IOPS                      |
|                                                   |                              | <b>Random Write</b>                       | 100K IOPS                      |
| <b>HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD</b> | <b>Capacity</b>              | 1TB                                       |                                |
|                                                   | <b>Protocol</b>              | PCIe                                      |                                |
|                                                   | <b>Form Factor</b>           | PCIe Card, Full Height PCIe Slot          |                                |
|                                                   | <b>Controller</b>            | NVMe                                      |                                |
|                                                   | <b>NAND Type</b>             | MLC                                       |                                |
|                                                   | <b>Endurance</b>             | 292TB                                     |                                |
|                                                   | <b>Reliability (MTTF)</b>    | 1.5M hours                                |                                |
|                                                   | <b>Interface</b>             | PCIe Gen3 x4 architecture                 |                                |
|                                                   | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                |
|                                                   | <b>Performance</b>           | <b>Sequential Read</b>                    | 2150 MB/s                      |
|                                                   |                              | <b>Sequential Write</b>                   | 1550 MB/s                      |
|                                                   |                              | <b>Random Read</b>                        | 300K IOPS                      |
|                                                   |                              | <b>Random Write</b>                       | 100K IOPS                      |
| <b>HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD</b>   | <b>Capacity</b>              | 2TB                                       |                                |
|                                                   | <b>Protocol</b>              | PCIe                                      |                                |
|                                                   | <b>Form Factor</b>           | PCIe Card, Full Height PCIe Slot          |                                |
|                                                   | <b>Controller</b>            | NVMe                                      |                                |
|                                                   | <b>NAND Type</b>             | MLC                                       |                                |
|                                                   | <b>Endurance</b>             | 600TB                                     |                                |
|                                                   | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                |
|                                                   | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                |
|                                                   | <b>Performance</b>           | <b>Sequential Read</b>                    | 3200 MB/s                      |
|                                                   |                              | <b>Sequential Write</b>                   | 1800 MB/s                      |
|                                                   |                              | <b>Random Read</b>                        | 430K IOPS                      |
|                                                   |                              | <b>Random Write</b>                       | 320K IOPS                      |
| <b>HP Z Turbo Drive G2 256GB TLC SSD</b>          | <b>Capacity</b>              | 256GB                                     |                                |
|                                                   | <b>Protocol</b>              | PCIe                                      |                                |
|                                                   | <b>Form Factor</b>           | M.2 in Half-height, half-length card      |                                |
|                                                   | <b>Controller</b>            | NVMe                                      |                                |
|                                                   | <b>NAND Type</b>             | 3D TLC                                    |                                |
|                                                   | <b>Endurance</b>             | 75TBW (TB Written)                        |                                |
|                                                   | <b>Reliability (MTBF)</b>    | 1.5M hours                                |                                |
|                                                   | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical |                                |
|                                                   | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)               |                                |
|                                                   | <b>Performance</b>           | <b>Sequential Read</b>                    | 2800 MB/s                      |
|                                                   |                              | <b>Sequential Write</b>                   | 320 MB/s (1100 MB/s max/Turbo) |
|                                                   |                              | <b>Random Read</b>                        | 250K IOPS                      |
|                                                   |                              | <b>Random Write</b>                       | 180K IOPS                      |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                              |                              |                                                         |
|----------------------------------------------|------------------------------|---------------------------------------------------------|
| <b>HP Z Turbo Drive G2<br/>512GB TLC SSD</b> | <b>Capacity</b>              | 512GB                                                   |
|                                              | <b>Protocol</b>              | PCIe                                                    |
|                                              | <b>Form Factor</b>           | M.2 in Half-height, half-length card                    |
|                                              | <b>Controller</b>            | NVMe                                                    |
|                                              | <b>NAND Type</b>             | 3D TLC                                                  |
|                                              | <b>Endurance</b>             | 150TBW (TB Written)                                     |
|                                              | <b>Reliability (MTBF)</b>    | 1.5M hours                                              |
|                                              | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical               |
|                                              | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)                             |
|                                              | <b>Performance</b>           | <b>Sequential Read</b> 2800 MB/s                        |
|                                              |                              | <b>Sequential Write</b> 660 MB/s (1600 MB/s max/Turbo)  |
|                                              |                              | <b>Random Read</b> 260K IOPS                            |
|                                              |                              | <b>Random Write</b> 260K IOPS                           |
| <b>HP Z Turbo Drive G2 1TB<br/>TLC SSD</b>   | <b>Capacity</b>              | 1TB                                                     |
|                                              | <b>Protocol</b>              | PCIe                                                    |
|                                              | <b>Form Factor</b>           | M.2 in Half-height, half-length card                    |
|                                              | <b>Controller</b>            | NVMe                                                    |
|                                              | <b>NAND Type</b>             | 3D TLC                                                  |
|                                              | <b>Endurance</b>             | 300TBW (TB Written)                                     |
|                                              | <b>Reliability (MTBF)</b>    | 1.5M hours                                              |
|                                              | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical               |
|                                              | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)                             |
|                                              | <b>Performance</b>           | <b>Sequential Read</b> 3000 MB/s                        |
|                                              |                              | <b>Sequential Write</b> 1150 MB/s (1700 MB/s max/Turbo) |
|                                              |                              | <b>Random Read</b> 360K IOPS                            |
|                                              |                              | <b>Random Write</b> 330K IOPS                           |
| <b>HP Z Turbo Drive G2<br/>256GB SED SSD</b> | <b>Capacity</b>              | 256GB                                                   |
|                                              | <b>Protocol</b>              | PCIe                                                    |
|                                              | <b>Form Factor</b>           | Half-height, half-length                                |
|                                              | <b>Controller</b>            | NVMe                                                    |
|                                              | <b>NAND Type</b>             | MLC                                                     |
|                                              | <b>Endurance</b>             | 150TBW (TB Written)                                     |
|                                              | <b>Reliability (MTTF)</b>    | 1.5M hours                                              |
|                                              | <b>Interface</b>             | PCI Express 3.0 x4 electrical x4 physical               |
|                                              | <b>Operating Temperature</b> | 32° to 158° F (0° to 70° C)                             |
|                                              | <b>Performance</b>           | <b>Sequential Read</b> 3100 MB/s                        |
|                                              |                              | <b>Sequential Write</b> 1400 MB/s                       |
|                                              |                              | <b>Random Read</b> 330K IOPS                            |
|                                              |                              | <b>Random Write</b> 280K IOPS                           |

### Technical Specifications – Storage / Hard Drives & SSDs

|                                                   |                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | <b>Self-Encrypting Drive Support</b>                                                                                                                                                                                         | OPAL 2                                                                                                                                                                                                                                                                                                              |
| <b>HP Z Turbo Drive G2 512GB SED SSD</b>          | <b>Capacity</b><br><b>Protocol</b><br><b>Form Factor</b><br><b>Controller</b><br><b>NAND Type</b><br><b>Endurance</b><br><b>Reliability (MTBF)</b><br><b>Interface</b><br><b>Operating Temperature</b><br><b>Performance</b> | 512GB<br>PCIe<br>Half-height, half-length<br>NVMe<br>MLC<br>300TBW (TB Written)<br>1.5M hours<br>PCI Express 3.0 x4 electrical x4 physical<br>32° to 158° F (0° to 70° C)<br><b>Sequential Read</b> 3200 MB/s<br><b>Sequential Write</b> 1700 MB/s<br><b>Random Read</b> 330K IOPS<br><b>Random Write</b> 300K IOPS |
|                                                   | <b>Self-Encrypting Drive Support</b>                                                                                                                                                                                         | OPAL 2                                                                                                                                                                                                                                                                                                              |
| <b>HP Z Turbo Drive Quad Pro 256GB SSD module</b> | <b>Capacity</b><br><b>Interface</b><br><b>Operating Temperature</b>                                                                                                                                                          | 256GB (one M.2 PCIe NVMe module)<br>PCI Express 3.0 x4 electrical x4 physical<br>32° to 158° F (0° to 70° C)                                                                                                                                                                                                        |
| <b>HP Z Turbo Drive Quad Pro 512GB SSD module</b> | <b>Capacity</b><br><b>Interface</b><br><b>Operating Temperature</b>                                                                                                                                                          | 512GB (one M.2 PCIe NVMe module)<br>PCI Express 3.0 x4 electrical x4 physical<br>32° to 158° F (0° to 70° C)                                                                                                                                                                                                        |
| <b>HP Z Turbo Drive Quad Pro 1TB SSD module</b>   | <b>Capacity</b><br><b>Interface</b><br><b>Operating Temperature</b>                                                                                                                                                          | 1TB (one M.2 PCIe NVMe module)<br>PCI Express 3.0 x4 electrical x4 physical<br>32° to 158° F (0° to 70° C)                                                                                                                                                                                                          |

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

### Technical Specifications – Storage / Hard Drives & SSDs

|                                                 |                              |                                   |
|-------------------------------------------------|------------------------------|-----------------------------------|
| <b>Intel® 750 Series AIC<br/>800GB PCIe SSD</b> | <b>Capacity</b>              | 800GB                             |
|                                                 | <b>Protocol</b>              | PCIe                              |
|                                                 | <b>Form Factor</b>           | PCIe Card, Half Height            |
|                                                 | <b>Controller</b>            | NVMe                              |
|                                                 | <b>NAND Type</b>             | MLC                               |
|                                                 | <b>Endurance</b>             | 127TBW (TB Written)               |
|                                                 | <b>Reliability (MTBF)</b>    | 1.2M hours                        |
|                                                 | <b>Operating Temperature</b> | 32° to 131° F (0° to 55° C)       |
|                                                 | <b>Performance</b>           | <b>Sequential Read</b> 2100 MB/s  |
|                                                 |                              | <b>Sequential Write</b> 800 MB/s  |
|                                                 |                              | <b>Random Read</b> 420K IOPS      |
|                                                 |                              | <b>Random Write</b> 210K IOPS     |
|                                                 |                              |                                   |
| <b>Intel® 750 Series AIC<br/>1.2TB PCIe SSD</b> | <b>Capacity</b>              | 1.2TB                             |
|                                                 | <b>Protocol</b>              | PCIe                              |
|                                                 | <b>Form Factor</b>           | PCIe Card, Half Height            |
|                                                 | <b>Controller</b>            | NVMe                              |
|                                                 | <b>NAND Type</b>             | MLC                               |
|                                                 | <b>Endurance</b>             | 127TBW (TB Written)               |
|                                                 | <b>Reliability (MTBF)</b>    | 1.2M hours                        |
|                                                 | <b>Operating Temperature</b> | 1.2TB                             |
|                                                 | <b>Performance</b>           | <b>Sequential Read</b> 2500 MB/s  |
|                                                 |                              | <b>Sequential Write</b> 1200 MB/s |
|                                                 |                              | <b>Random Read</b> 460K IOPS      |
|                                                 |                              | <b>Random Write</b> 290K IOPS     |
|                                                 |                              |                                   |

### HARD DRIVE CONTROLLERS

|                                                     |                                           |                                          |
|-----------------------------------------------------|-------------------------------------------|------------------------------------------|
| <b>LSI 9217-4i4e 8-port SAS<br/>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<br/>Devices</b> | 256 Non-RAID SAS/SATA devices            |
|                                                     | <b>LED Indicators</b>                     | N/A                                      |
|                                                     |                                           |                                          |
|                                                     | <b>PCI Bus</b>                            | x8 lane PCIe 3.0 compliant               |

Technical Specifications – Storage / Hard Drives & SSDs

|                                                                                  |                                       |                                                                                                                          |
|----------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>LSI 9270-8i SAS 6Gb/s<br/>ROC RAID Card and iBBU9<br/>Battery Backup Unit</b> | <b>RAID Levels</b>                    | RAID 0, 1, 5, and 6<br>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>Certification Level</b>            | PCI-Express 3.0                                                                                                          |
|                                                                                  | <b>IO Bus</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<br><b>NOTE:</b> HP Workstations do not support this many internal drives. |
|                                                                                  | <b>LED Indicators</b>                 | Heartbeat LED on card                                                                                                    |

### Technical Specifications - Graphics

#### GRAPHICS

##### NVIDIA NVS 310 512MB Graphics

##### Form Factor

Low Profile:  
2.713 inches in height × 6.150 inches in length  
Weight: ~142 grams

##### Graphics Controller

NVIDIA NVS 310  
GPU: GF119-825

##### Bus Type

PCI Express x16, 2.0 compliant

##### Memory

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

##### Connectors

2 x DisplayPort

##### Maximum Resolution

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

##### Image Quality Features

The following video formats are supported:

- MPEG2
- MPEG4 Part 2 Advanced Simple Profile
- H.264 SVC codec support
- Support for 3D Blu Ray
- VC1
- DivX version 3.11 and later
- MVC

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

##### Display Output

Up to 2 displays in the following configurations:

##### DisplayPort output:

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

##### DVI-D output:

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

##### HDMI output:

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

##### VGA display output:

### Technical Specifications - Graphics

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

|                                   |                                                                                                                                                                                                                    |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                   |
| <b>Supported Graphics APIs</b>    | DX11, OpenGL 4.1                                                                                                                                                                                                   |
| <b>Available Graphics Drivers</b> | Windows 8<br>Genuine Windows 7 Professional (64-bit and 32-bit)<br>Microsoft Windows XP Professional (64-bit and 32-bit)<br>Red Hat Enterprise Linux(RHEL)<br>SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) |

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

#### Note

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

#### NVIDIA NVS 310 1GB Graphics

|                               |                                                                                                                                                                                                             |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Form Factor</b>            | Low Profile:<br>2.713 inches in height × 6.150 inches in length<br>Weight: ~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: 1GBB DDR3<br>Clock: 875Mhz<br>Memory Bandwidth: 14GB/                                                                                                                                                 |
| <b>Connectors</b>             | 2x DisplayPort 1.2                                                                                                                                                                                          |
| <b>Maximum Resolution</b>     | Up to 2560 x 1600 (digital display) per display.                                                                                                                                                            |
| <b>Image Quality Features</b> | The following video formats are supported:<br>- MPEG2<br>- MPEG4 Part 2 Advanced Simple Profile<br>- H.264 SVC codec support<br>- Support for 3D Blu Ray<br>- VC1<br>- DivX version 3.11 and later<br>- MVC |

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 310 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

|                       |                                                   |
|-----------------------|---------------------------------------------------|
| <b>Display Output</b> | Up to 2 displays in the following configurations: |
|-----------------------|---------------------------------------------------|

### Technical Specifications - Graphics

#### DisplayPort output:

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

#### DVI-D output:

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

#### HDMI output:

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

#### VGA display output:

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

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

DX11, OpenGL 4.1

#### Available Graphics Drivers

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

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

#### Notes

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

#### NVIDIA NVS 315 1GB Graphics (for HP Workstations)

#### Form Factor

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

#### Graphics Controller

NVIDIA NVS 315 (using GF119-825 GPU)  
Number of Cores: 48 CUDA cores

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                              |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | Max. Power: 19.3W<br>Cooling Solution: Active fan heatsink                                                                                                                                                                                                                                   |
| <b>Bus Type</b>                   | PCI Express x16, 2.0 compliant                                                                                                                                                                                                                                                               |
| <b>Memory</b>                     | Size: 1GB DDR3<br>Clock: 875Mhz<br>Memory Bandwidth: 14GB/s                                                                                                                                                                                                                                  |
| <b>Connectors</b>                 | DMS-59 output<br>Cables included:<br>- For CTO: DMS-59 to DVI cable<br>- For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable                                                                                                                                                                |
| <b>Maximum Resolution</b>         | Maximum number of displays supported: 2                                                                                                                                                                                                                                                      |
|                                   | Maximum Resolution Support:<br>- DMS-59 to VGA: 2048 x 1536 @ 85Hz<br>- DMS-59 to DVI: 1980 x 1200 @ 60Hz<br>- DMS-59 to DP: 2560 x 1600 @ 60Hz                                                                                                                                              |
| <b>Image Quality Features</b>     | See Display Output section.                                                                                                                                                                                                                                                                  |
|                                   | The following video formats are supported:<br>- MPEG2<br>- MPEG4 Part 2 Advanced Simple Profile<br>- H.264 SVC codec support<br>- Support for 3D Blu Ray<br>- VC1<br>- DivX version 3.11 or later                                                                                            |
|                                   | A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode. |
| <b>Display Output</b>             | Up to 2 displays using one of the following DMS-59 cables:<br>DMS-59 to DVI<br>DMS-59 to VGA<br>DMS-59 to DP                                                                                                                                                                                 |
|                                   | DisplayPort output:<br>- Drives two DisplayPort enabled digital displays at resolutions up to 2560 x 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter.                                                                                                       |
|                                   | DVI-D output:<br>- Drives two digital displays at resolutions up to 1920 x 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor                                                                                                                               |
|                                   | VGA display output:<br>- Drives two analog displays at resolutions up to 2048 x 1536 at 85 Hz using DMS-59 to VGA cable adaptor.                                                                                                                                                             |
| <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                                                                                             |
| <b>Supported Graphics APIs</b>    | DX11, OpenGL 4.3                                                                                                                                                                                                                                                                             |
| <b>Available Graphics Drivers</b> | Windows 8<br>Microsoft Windows 7 Professional (64-bit and 32-bit)<br>Microsoft Windows XP Professional (64-bit and 32-bit)<br>Red Hat Enterprise Linux(RHEL)                                                                                                                                 |

### Technical Specifications - Graphics

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

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

#### Notes

1. The thermal solution used on this card is an active fan heatsink.
2. Factory configured graphics card includes DMS-59 to DVI cable.
3. Option kit graphics card includes DMS-59 to DVI and DMS-59 to VGA cables (one each).

#### NVIDIA NVS 510 2GB Graphics

#### Form Factor Graphics Controller

Low Profile, 2.713 inches × 6.3 inches, single slot

NVS 510 GPU  
Core Clock: 797 MHz  
Memory Clock: 891 MHz  
CUDA Cores: 192

#### Bus Type

PCI Express x16, Generation 2.0

#### Memory

2GB DDR3

#### Connectors

Four mini-DisplayPort.  
Four mini-DisplayPort to DisplayPort adapters included.  
(DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories)

#### Maximum Resolution

Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 × 2160 @ 60Hz)

**NOTE:** This card supports up to four displays. For Windows XP, only 2 active displays are supported.

#### Image Quality Features

10-bit internal display processing, including hardware support for 10-bit scan-out

#### Display Output

DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2) support.

Digital Display Support

#### 1. DisplayPort Output

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

#### 2. DVI-D Output

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

### Technical Specifications - Graphics

#### 3. HDMI Output

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

#### Analog Display Support

#### 1. VGA display output

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

#### Supported Graphics APIs

Full Microsoft DirectX 11, Shader Model 5.0 support  
Full OpenGL 4.3 support

#### Available Graphics Drivers

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

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

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

#### Power Consumption Note

33.4 Watts

Heatsink cooler design is active.

#### Graphics Cable Adapters Note

Graphics Cable Adapter option choice is available starting Feb 1 2013 for the following graphics cards:

NVS 310, Quadro 410, Quadro K5000, FirePro V3900, FirePro W7000

New Graphics Cards introduced after Feb 1 2013 will be eligible for choosing Graphics Cable Adapters, unless otherwise specified.

No cable choice for NVS 300, NVS 510.

Maximum number of cables allowed is 8.

#### NVIDIA® Quadro® K420 1GB Graphics

##### Form Factor

Low Profile:  
2.713 inches × 6.3 inches, single slot

##### Graphics Controller

NVIDIA® Quadro® K420  
GPU: GK107

##### Bus Type

PCI Express x16, 2.0 compliant

##### Memory

Size: 1GB DDR3  
Clock: 891MHz  
Memory Bandwidth: 29GB/s

##### Connectors

One dual-link DVI-I connector

##### Maximum Resolution

One DisplayPort connector

VGA (via adapter cable):

- 2048 × 1536 × 32 bpp at 85 Hz

Dual-link DVI

- 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Single-link DVI

### Technical Specifications - Graphics

- 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

DisplayPort 1.2

- 3840 × 2160 × 30 bpp at 60 Hz

#### RAMDAC

400 MHz integrated RAMDAC

#### Display Output

Maximum number of displays supported: 2

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

DX11, OpenGL 4.4

#### Available Graphics Drivers

Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran

Microsoft Windows 8.1

Microsoft Windows 8

Microsoft Windows 7

Linux

#### Notes

1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.

2. Option kit Quadro K420 includes one DP to DVI-D adapter.

#### NVIDIA® Quadro® K420 2GB Graphics

#### Form Factor

Low Profile:  
2.713 inches × 6.3 inches  
Cooling: Active

#### Graphics Controller

NVIDIA® Quadro® K420  
GPU: GK107 with 192 CUDA cores  
Power: 41W

#### Bus Type

PCI Express x16, 2.0 compliant

#### Memory

Size: 2GB DDR3  
Clock: 891MHz  
Memory Bandwidth: 29GB/s  
Memory Width: 128 bit

#### Connectors

One dual-link DVI-I connector  
One DisplayPort connector

Factory Configured: No video cable adapter included  
After market option kit: One DP-to-DVI adapter included with card

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

#### Maximum Resolution

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

Dual-link DVI  
- 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Single-link DVI  
- 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | DisplayPort 1.2<br>- 3840 × 2160 × 30 bpp at 60 Hz<br>•                                                                                                                                                                                                                                                                                                                                 |
| <b>Image Quality Features</b>     | 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)<br><br>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo                                                                                                                                         |
| <b>Display Output</b>             | Maximum number of displays:<br>- 2 direct attached monitors<br>- 4 using DP 1.2a with MST and HBR2 enabled monitors<br><br>Maximum number of DisplayPort displays possible (may require MST and/or HBR2):<br>- 4 1920x1200<br>- 2 2560x1600<br>- 1 3840x2160<br><br>Maximum number of monitors across all available Quadro K420 outputs is 4.                                           |
| <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 - Full OpenGL implementation, complete with NVIDIA and ARB extensions                                                                                                                                                                                                                                      |
| <b>Notes</b>                      | <ol style="list-style-type: none"> <li>1. <a href="#">Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.</a></li> <li>2. <a href="#">Option kit Quadro K420 includes one DP to DVI-D adapter.</a></li> <li>3. <a href="#">Full Height Profile bracket installed. Low Profile bracket included in after market kit.</a></li> </ol> |

#### NVIDIA® Quadro® K620 2GB Graphics

|                            |                                                                                                                                             |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Form Factor</b>         | 2.713" H x 6.3" L<br>Single Slot, Low Profile<br>Full Height Profile bracket installed<br>Low Profile bracket included<br>Weight: 133 grams |
| <b>Graphics Controller</b> | NVIDIA® Quadro® K620 Graphics Card<br>GM107 GPU<br>384 CUDA cores<br>Max Power: 45 Watts                                                    |
| <b>Bus Type</b>            | PCI Express 2.0 x16                                                                                                                         |
| <b>Memory</b>              | 2 GB GDDR3, 900 MHz<br>128-bit memory I/O path<br>29 GB/s memory bandwidth                                                                  |

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Connectors</b>                 | 1 DL-DVI(I) output, 1 DisplayPort output<br>Factory Configured: No video cable adapter included<br>Option Kit: 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 Factory Configuration or Option Kit accessories<br>DisplayPort 1.2:<br>- up to 4096x2160 x 30 bpp @ 60Hz<br>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)<br><br>Dual Link DVI(I) output:<br>- up to 2560 x 1600 x 32 bpp @ 60Hz<br><br>Single Link-DVI(I) output:<br><br>- up to 1920 x 1200 x 32 bpp @ 60Hz                                                                                                                                                      |
| <b>Image Quality Features</b>     | 10-bit internal display processing pipeline<br>10-bit scan-out support                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Display Output</b>             | 1 Dual-link DVI-I connector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Shading Architecture</b>       | 1 Display Port connector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Supported Graphics APIs</b>    | Full Microsoft DirectX 11.1 Shader Model 5.0<br>OpenGL 4.4<br>DirectX 11.1<br>API support includes:                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Available Graphics Drivers</b> | CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran<br>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><br><br>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> |
| <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>                                                                                                                                                                                                                                                     |

#### NVIDIA® Quadro® P600 2GB Graphics

#### Form Factor

Dimensions: 2.713" H x 5.7" L  
Single Slot, Low Profile  
Cooling: Active  
Weight: 129 grams

#### Graphics Controller

NVIDIA® Quadro® P600 Graphics Card

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | GP107-850 GPU<br>384 CUDA cores<br>Max Power: 40 Watts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Bus Type</b>                   | PCI Express 3.0 x16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Memory</b>                     | Size: 2 GB GDDR5, 2000 MHz<br>Memory Interface: 128-bit<br>Memory Bandwidth: 64 GB/s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Connectors</b>                 | 4mDP Outputs*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Maximum Resolution</b>         | DisplayPort 1.4:<br>- up to 4x 5120 x 2880 x 24 bpp @ 60Hz<br>- supports Multi-Stream Transport (MST)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Image Quality Features</b>     | 10-bit internal display processing pipeline<br>10-bit scan-out support                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Display Output</b>             | 4 mDP Connectors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Shading Architecture</b>       | Full Microsoft DirectX 12 Shader Model 5.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Supported Graphics APIs</b>    | OpenGL 4.5<br>DirectX 12<br>Vulkan 1.0<br>API support includes:<br>CUDA C, CUDA C++, DirectCompute , OpenCL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Available Graphics Drivers</b> | Microsoft Windows 10<br>Microsoft Windows 8.1<br>Microsoft Windows 7<br>Linux                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Notes</b>                      | <p>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></p> <p>*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports.<br/> <b>Note 1:</b> Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles.<br/> <b>Note 2:</b> AMO kits for P400, P600, P1000 and Adapters will ship in July 2017.</p> <ul style="list-style-type: none"> <li>Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits.</li> <li>If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> <li>2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables</li> <li>2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables</li> </ul> </li> </ul> |

### NVIDIA® Quadro® K1200 4GB Graphics Form Factor

|                            |                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------|
|                            | Dimensions: 2.71" H x 6.875" L<br>Single Slot, Low Profile<br>Cooling: Active<br>Weight: ~175 grams |
| <b>Graphics Controller</b> | NVIDIA® Quadro® K1200 Graphics Card<br>GPU: GM107 with 512 CUDA cores<br>Power: 46 Watts            |
| <b>Bus Type</b>            | PCI Express 2.0 x16                                                                                 |

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Memory</b>                     | Size: 4GB GDDR5<br>Memory Bandwidth: 80 GB/s<br>Memory Width: 128-bit                                                                                                                                                                                                                                                                 |
| <b>Connectors</b>                 | 4 mini-DisplayPort 1.2a<br><br>Factory Configured Option: 4 mini-DP-to-DP adapters included with card<br>Option Kit: 4 mini-DP-to-DP adapters included with card<br><br>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories                                                                     |
| <b>Maximum Resolution</b>         | DisplayPort:<br>- up to 4096 x 2160 x 30 bpp @ 60Hz<br>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)<br><br>DL-DVI(I) output:<br>- up to 2560 x 1600 x 32 bpp @ 60Hz<br><br>Single Link-DVI(I) output:<br>- up to 1920 x 1200 x 32 bpp @ 60Hz<br><br>VGA (via adapter cable):<br>- 2048 x 1536 x 32 bpp at 85 Hz |
| <b>Image Quality Features</b>     | 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)                                                                                                                                                                                                               |
| <b>Display Output</b>             | Maximum number of displays<br>- 4 direct attached monitors<br><br>Maximum number of DisplayPort displays possible:<br>- 4 1920x1200<br>- 4 2560x1600<br>- 4 4096x2160<br><br>Maximum number of monitors across all available Quadro K1200 outputs is 4.                                                                               |
| <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                                                                                                                                      |
| <b>Supported Graphics APIs</b>    | OpenGL 4.4<br>DirectX 11.1<br><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 - Full OpenGL implementation, complete with NVIDIA and ARB extensions                                                                                                                                                                                    |

### Technical Specifications - Graphics

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

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

#### Notes

1. Quadro K1200 offered as Factory Configured Option includes 4 miniDP to DP video cable adapters. Other video cable adapters must be ordered separately.
2. Quadro K1200 offered as an Option Kit includes 4 mini-DP to DP adapters. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).

### Technical Specifications - Graphics

|                                               |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NVIDIA® Quadro® K2200<br/>4GB Graphics</b> | <b>Form Factor</b>                | 4.38" H x 7.97" L<br>Single Slot, Full Height<br>Weight: 240 grams                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                               | <b>Graphics Controller</b>        | NVIDIA® Quadro® K2200 Graphics Card<br>GM107 GPU<br>640 CUDA cores<br>Max Power: 67.7 Watts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                               | <b>Bus Type</b>                   | PCI Express 2.0 x16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                               | <b>Memory</b>                     | 4 GB GDDR5, 2500 MHz<br>128-bit memory I/O path<br>80 GB/s memory bandwidth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                               | <b>Connectors</b>                 | 1 DL-DVI(I) output, 2 DisplayPort outputs<br>Factory Configured Option: No video cable adapter included<br>Option Kit: 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 4096 x 2160 x 30 bpp @ 60Hz<br>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                               | <b>Display Output</b>             | DL-DVI(I) output:<br>- up to 2560 x 1600 x 32 bpp @ 60Hz<br>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: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution)</li> <li>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</li> </ul> Maximum number of monitors across all available Quadro K2200 outputs is 4. |
|                                               | <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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

### Technical Specifications - Graphics

Microsoft Windows 7  
Linux

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

#### Note

1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays or a DisplayPort 1.2 hub device.
4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output.

#### NVIDIA® Quadro® M2000 4GB Graphics

##### Form Factor

Dimensions: 4.376" H x 6.6" L  
Single Slot, Full Height  
Cooling: Active  
Weight: 239 grams

##### Graphics Controller

NVIDIA® Quadro® M2000 Graphics Card  
GPU: GM206 with 768 CUDA cores  
Power: 75 Watts

##### Bus Type

PCI Express 3.0 x16

##### Memory

Size: 4GB GDDR5  
Memory Bandwidth: 105.7 GB/s  
Memory Width: 128-bit

##### Connectors

4x DisplayPort 1.2a

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

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

##### Maximum Resolution

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

Using two DP outputs, the M2000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.

##### Image Quality Features

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

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

### Technical Specifications - Graphics

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

#### NVIDIA Quadro P2000 5GB Graphics

|                            |                                                                                                                                                                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Form Factor</b>         | <p>Dimensions: 4.4"Hx7.9"L<br/>Single Slot<br/>Cooling: Active<br/>Weight: 260 grams</p>                                                                                                                                                                                                        |
| <b>Graphics Controller</b> | <p>NVIDIA Quadro P2000 Graphics Card<br/>Power: 75 Watts</p>                                                                                                                                                                                                                                    |
| <b>Bus Type</b>            | PCI Express 3.0 x16                                                                                                                                                                                                                                                                             |
| <b>Memory</b>              | <p>Size: 5GB GDDR5<br/>Memory Bandwidth: 140 GB/s<br/>Memory Width: 160-bit</p>                                                                                                                                                                                                                 |
| <b>Connectors</b>          | <p>4x DisplayPort 1.4</p> <p>Factory Configured Option: No adapter included with card<br/>After Market Option: No video cable adapter included</p> <p>Additional DVI to VGA, DisplayPort™ to VGA, DisplayPort™ to DVI, and DisplayPort™ to Dual-Link DVI adapters available as accessories.</p> |

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum Resolution</b>         | <p>DisplayPort:</p> <ul style="list-style-type: none"> <li>- up to 5120 x 2880 x 24 bpp @ 60Hz</li> <li>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DP 1.3 &amp; 1.4 ready.</li> </ul> <p>DL-DVI(I) output:</p> <ul style="list-style-type: none"> <li>- up to 2560 x 1600 x 32 bpp @ 60 Hz</li> </ul> <p>Single Link-DVI(I) output:</p> <ul style="list-style-type: none"> <li>- up to 1920 x 1200 x 32 bpp @ 60Hz</li> </ul> <p>HDMI 2.0 (requires DP to HDMI adapter):</p> <p>5120 x 2880 x 24 bpp @ 60Hz</p> |
| <b>Image Quality Features</b>     | <p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p> <p>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, NVIDIA® Mosaic and nView.</p>                                                                                                                                                                                                                                                                                                |
| <b>Display Output</b>             | <p>Maximum number of displays</p> <ul style="list-style-type: none"> <li>- 4 direct attached monitors</li> </ul> <p>Maximum number of monitors across all available Quadro P2000 outputs is 4.</p>                                                                                                                                                                                                                                                                                                                                      |
| <b>Shading Architecture</b>       | Shader Model 5.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Supported Graphics APIs</b>    | <p>OpenGL® 4.5</p> <p>DirectX® 12</p> <p>API support includes:</p> <p>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran software</p>                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Available Graphics Drivers</b> | <p>Microsoft Windows 10</p> <p>Microsoft Windows 7 Professional 64bit</p> <p>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site:</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. Quadro P2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.</li> <li>2. Quadro P2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.</li> </ol>                                                                                                                                                                                              |

#### AMD FirePro W2100 2GB Graphics

#### Form Factor Graphics Controller

Low Profile, half length (full-height bracket included)

AMD FirePro™ W2100 professional graphics

Power: <50W

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | 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<br>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:<br>- up to 4096x2160 x 30 bpp @ 60Hz<br><br>Dual Link DVI(I) (requires adapter cable):<br>- up to 2560 x 1600 x 32 bpp @ 60Hz<br><br>Single Link-DVI(I)(requires adapter):<br>- up to 1920 x 1200 x 32 bpp @ 60Hz<br><br>VGA(requires adapter):<br><br>- up to 1920 x 1200 x 32 bpp @ 60Hz |
| <b>Display Output</b>             | 2 x DisplayPort® 1.2                                                                                                                                                                                                                                                                                        |
| <b>Shading Architecture</b>       | Shader Model 5.0                                                                                                                                                                                                                                                                                            |
| <b>Supported Graphics APIs</b>    | OpenCL™ 1.2, DirectX® 11 and OpenGL 4.4                                                                                                                                                                                                                                                                     |
| <b>Available Graphics Drivers</b> | Windows 8.1 (64-bit and 32-bit)<br>Windows 7 (64-bit and 32-bit)<br>Red Hat Enterprise Linux (RHEL)<br>SUSE Linux Enterprise Desktop 11(64-bit and 32-bit)<br>Ubuntu                                                                                                                                        |

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

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

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

### Technical Specifications - Graphics

|                                       |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AMD FirePro W4300 4GB Graphics</b> | <b>Form Factor</b>                | Low Profile, single slot (6.6" x 3.118")<br>Full Height, single slot (6.6" x 4.725")                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                       | <b>Graphics Controller</b>        | AMD FirePro W4300 graphics<br>GPU Frequency: 930Mhz<br>Memory Clock Speed: 1500Mhz<br>GPU: 768 Stream Processors organized into 12 Compute Units<br>Power: <50 Watts<br>Cooling: Active                                                                                                                                                                                                                                                                                                                                          |
|                                       | <b>Bus Type</b>                   | PCI Express® x16, Generation 3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                       | <b>Memory</b>                     | 4GB GDDR5 memory<br>Memory Bandwidth: up to 96 GB/s<br>Memory Width: 128 bit                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                       | <b>Connectors</b>                 | 4x Mini Display Port 1.2 connectors with HBR2 and MST support.<br><br>Factory Configured: No video cable adapter included<br>After market option kit: No video cable adapter included<br><br>Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories.                                                                                                                                                                                |
|                                       | <b>Maximum Resolution</b>         | DisplayPort:<br>- 4096x2160 @24bpp (3 x 4K @ 60Hz, 4 x 4K @ 30Hz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                       | <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<br>Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows GPU control of display refresh rates for tear-free and jitter-free image quality when rotating models or viewing video content.(Requires FreeSync compliant displays)                                                                                                                                       |
|                                       | <b>Display Output</b>             | Max number of monitors supported using DisplayPort 1.2a: <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> 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): <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 2.0<br>DirectX 12.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                       | <b>Available Graphics Drivers</b> | Windows 10 (64-bit and 32-bit)<br>Windows® 7 (64-bit and 32-bit)<br>Linux                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

### Technical Specifications - Graphics

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

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

#### Notes

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

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

### Technical Specifications - Graphics

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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>    | <p>OpenGL 4.4</p> <p>OpenCL 1.2 and 2.0</p> <p>DirectX 11.2 / 12</p> <p>AMD Mantle</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Available Graphics Drivers</b> | <p>Windows 8.1 / 8 (64-bit and 32-bit)</p> <p>Windows® 7 (64-bit and 32-bit)</p> <p>Linux</p> <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>                      | <p>1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See <a href="http://www.amd.com/eyefinityfaq">www.amd.com/eyefinityfaq</a> for full details.</p> |
| <b>Form Factor</b>                | Full height, single slot (6.75" X 4.376")                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

#### Radeon™ Pro WX 4100 4GB Graphics

|                            |                                                                                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Form Factor</b>         | Low-Profile Single Slot (6.6" Length)                                                                                                           |
| <b>Graphics Controller</b> | <p>Polaris 11 Baffin GL XT</p> <p>GPU: 1024 Stream Processors organized into 16 Compute Units</p> <p>Power: 50 Watts</p> <p>Cooling: Active</p> |
| <b>Memory</b>              | <p>4GB GDDR5 memory</p> <p>Memory Bandwidth: 6 Gbps / 96 GB/s</p> <p>Memory Width: 128 bit</p>                                                  |
| <b>Connectors</b>          | 4x Mini DisplayPort 1.4 – HDR ready connectors with HBR3 and MST support.                                                                       |

### Technical Specifications - Graphics

Factory Configured: Four mDP-to-DP cable adapters included  
After market option kit: Four mDP-to-DP cable adapters included

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

|                                   |                                                                                                                                                   |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Maximum Resolution</b>         | 5K support @ 60Hz <ul style="list-style-type: none"> <li>1x single-cable 5K monitor, or 2x dual-cable 5K monitors</li> </ul> 4x 4K support @ 60Hz |
| <b>Image Quality Features</b>     | Advanced support for 8-bit and 10-bit per RGB color component. High bandwidth scaler for high quality up and downscaling                          |
| <b>Display Output</b>             | 4 full physical DP1.3 HBR3 / DP1.4 HDR outputs<br>FreeSync support                                                                                |
| <b>GPU Architecture</b>           | GCN 4th Generation                                                                                                                                |
| <b>Supported Graphics APIs</b>    | DirectX®12<br>OpenGL® 4.5<br>OpenCL™ 2.0<br>Vulkan™ 1.0                                                                                           |
| <b>Available Graphics Drivers</b> | Windows 10 64-bit<br>Windows® 7 64-bit<br>Linux 64-bit (selected Enterprise distributions)                                                        |

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

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Notes</b> | <ol style="list-style-type: none"> <li>1. HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support.</li> <li>2. AMD PowerTune and AMD ZeroCore Power are technologies offered by certain FirePro™ and Radeon™ Pro products, which are designed to intelligently manage GPU power consumption in response to certain GPU load conditions.</li> <li>3. As of September 2016, certified for DisplayPort™ 1.4 HBR3 and ready for DisplayPort™ 1.4 HDR based on independent verification by DisplayPort™ testing authority. HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support.</li> </ol> |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**NVIDIA® Quadro® P4000 8GB Graphics**

**Form Factor**

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

**Graphics Controller**

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

### Technical Specifications - Graphics

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bus Type</b>                | PCI Express 3.0 x16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Memory</b>                  | Size: 8GB GDDR5<br>Memory Bandwidth: 243 GB/s<br>Memory Width: 256-bit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Connectors</b>              | 4 x DisplayPort 1.4<br>3-pin mini-DIN connector via optional bracket<br>1 x 6-pin auxiliary power connector<br>4-pin header for stereo signal<br>SYNC connector for Quadro® Sync II<br>2 x SLI connectors<br><br>Factory Configured Option: No video cable adapter included<br>After Market Option: No video cable adapter included<br><br>Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as accessories                                                                                               |
| <b>Maximum Resolution</b>      | Dual-link internal TMDS (DVI 1.0):<br>- up to 2560 x 1600 x 32 bpp @ 60 Hz<br><br>Single-link internal TMDS (DVI 1.0):<br>- up to 1920 x 1200 x 32 bpp @ 60 Hz<br><br>HDMI™ 2.0b (requires DP to HDMI adapter):<br>- up to 5120 x 2880 x 24 bpp @ 60Hz<br><br>DisplayPort:<br>- up to 4096 x 2160 x 30 bpp @ 60Hz<br>- up to 2560 x 1600 x 30 bpp @ 120 Hz<br>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)<br><br>Using two DP outputs, the P4000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution. |
| <b>Image Quality Features</b>  | Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component.<br>HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors<br>NVIDIA 3D Vision™ and other 3D stereo technologies<br>NVIDIA Mosaic and nView                                                                                                                                                                                                                                                                                                                                  |
| <b>Display Output</b>          | Maximum number of displays<br>- 4 direct attached monitors<br><br>Maximum number of monitors across all available Quadro P4000 outputs is 4.                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Shading Architecture</b>    | Shader Model 5.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Supported Graphics APIs</b> | OpenGL 4.5<br>DirectX 12<br>Vulkan 1.0<br><br>API support includes:<br>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran                                                                                                                                                                                                                                                                                                                                                                                                            |

### Technical Specifications - Graphics

#### Available Graphics Drivers

Microsoft Windows 10  
Microsoft Windows 7  
Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

#### Notes

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

1. Quadro P4000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro P4000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

#### NVIDIA® Quadro® M4000 8GB Graphics

#### Form Factor

Dimensions: 4.4" H x 9.5" L  
Single Slot, Full Height  
Cooling: Active  
Weight: 475 grams (without extender)

#### Graphics Controller

NVIDIA® Quadro® M4000  
GPU: GM204 with 1664 CUDA cores  
Power: 120 Watts

#### Bus Type

PCI Express 3.0 x16

#### Memory

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

#### Connectors

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

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

#### Maximum Resolution

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

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

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

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

#### Image Quality Features

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

### Technical Specifications - Graphics

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

Full OpenGL quad buffered stereo support

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

#### Display Output

Maximum number of displays

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

Maximum number of DisplayPort displays possible:

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

Maximum number of monitors across all available Quadro M4000 outputs is 4.

#### Shading Architecture

Shader Model 5.0

#### Supported Graphics APIs

OpenGL 4.5  
DirectX 12

API support includes:

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

#### Available Graphics Drivers

Microsoft Windows 10  
Microsoft Windows 8.1  
Microsoft Windows 8  
Microsoft Windows 7  
Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

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

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

#### NVIDIA® Quadro® M5000 8GB Graphics Form Factor

Dimensions: 4.4" H x 10.5" L  
Dual Slot, Full Height  
Cooling: Active  
Weight: 525 grams (without extender)

#### Graphics Controller

NVIDIA® Quadro® M5000  
GPU: GM204 with 2048 CUDA cores  
Power: 150 Watts

### Technical Specifications - Graphics

|                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bus Type</b>               | PCI Express 3.0 x16                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Memory</b>                 | Size: 8GB GDDR5 ECC capable<br>Memory bandwidth: 211GB/s<br>Memory Width: 256-bit                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Connectors</b>             | 1 Dual Link DVI-I<br>4 DisplayPort 1.2a<br><br>Factory configured option: No adapter included with card.<br>After market option kit: No adaptor included with card.<br><br>Additional DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories                                                                                                                                                |
| <b>Maximum Resolution</b>     | DisplayPort:<br>- up to four 4096 x 2160 x 30 bpp @ 60Hz displays<br>- up to two 5120 x 2880 @ 60Hz displays<br>- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)<br><br>DL-DVI(I) output:<br>- up to 2560 x 1600 x 32 bpp @ 60Hz<br><br>Single Link-DVI(I) output:<br>- up to 1920 x 1200 x 32 bpp @ 60Hz<br><br>VGA (via adapter cable):<br>- 2048 x 1536 x 32 bpp at 85 Hz                                                              |
| <b>Image Quality Features</b> | 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)<br><br>NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and other 3D stereo format support.<br><br>Full OpenGL quad buffered stereo support.<br><br>Support for large-scale, ultra-high resolution visualization using the NVIDIA® SVS platform which includes NVIDIA® Mosaic, NVIDIA® Sync and NVIDIA® Warp/Blend technologies. |
| <b>Display Output</b>         | Maximum number of displays<br>- 4 direct attached monitors<br>- 4 using DP 1.2a with MST and HBR2 enabled monitors<br><br>Maximum number of DisplayPort displays possible (may require MST and/or HBR2):<br>- 4 1920x1200<br>- 4 2560x1600<br>- 4 4096x2160<br>- 2 5120x2880 (requires dual DP input 5k displays)                                                                                                                                           |

### Technical Specifications - Graphics

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

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.5  
DirectX 12

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

Microsoft Windows 10  
Microsoft Windows 8.1  
Microsoft Windows 8  
Microsoft Windows 7  
Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

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

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

1. Factory configured Quadro M5000 does not include a video cable adapter. Video cable adapters must be ordered separately.
2. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).

### Technical Specifications - Graphics

#### NVIDIA® Quadro® M6000 Form Factor 24GB Graphics

4.4" H x 10.5" L  
Dual Slot  
Power: 250 Watts  
Weight: 1023 grams

#### Graphics Controller

NVIDIA® Quadro® M6000 Graphics Card based on the GM200 GPU  
Core Count: 3072  
Base Clock: 1026 MHz  
Boost Clock: 1152 MHz  
Idle Clock: 324 MHz

#### Bus Type

PCI Express 3.0 x16

#### Memory

24GB GDDR5  
384-bit memory I/O path  
317 GB/s memory bandwidth  
ECC Memory (disabled by default)

#### Connectors

DP (x4)  
Dual-Link DVI-I  
Optional Stereo  
SLI connector  
Quadro Sync connector  
One 8-pin auxiliary power connector

Factory configured option: No adapter included with card.  
Option Kit: No adaptor included with card.

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

#### Image Quality Features

- DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP 1.3 support
- NVIDIA 3D Vision™ technology
- NVIDIA Premium Mosaic and nView

#### Display Output

400 MHz integrated RAMDAC  
• Maximum resolution over VGA (requires DVI to VGA cable or DP to VGA adapter): 2048 × 1536 × 32 bpp at 85 Hz

Dual-link internal TMDS (DVI 1.0)  
• Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)

Single-link internal TMDS (DVI 1.0)  
• Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking)

DisplayPort 1.2a with MST and HBR2. Each DisplayPort connector has the following capabilities:

- Maximum pixel clock: 592 MPixel/s
- Maximum bandwidth: 17.2 Gbps

### Technical Specifications - Graphics

- Example maximum resolution: 4096 × 2160 × 30 bpp at 60Hz

#### HDMI

- Maximum resolution (requires DP to HDMI adapter): 4096 × 2160 × 8 bpp at 60Hz

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** Full OpenGL 4.4  
Full DirectX 12  
API support includes:  
CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran

**Available Graphics Drivers** Windows 10  
Windows 8.1  
Windows 8  
Windows 7 Professional  
Linux

HP qualified drivers may be preloaded or available from the HP support Web site:  
<http://www8.hp.com/us/en/drivers.html>

**Notes**

1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA® Quadro® M6000 to enable direct mapping of GPU to Virtual Machine.
2. No display output adapter included.
3. For HP Z840 Workstation configurations, the 1125W power supply option must be used.

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

### Technical Specifications - Graphics

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

### Technical Specifications - Graphics

|                                                |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NVIDIA® Quadro® P6000<br/>24GB Graphics</b> | <b>Form Factor</b>                 | Full-Height Dual Slot (4.4" Height x 10.5" Length)<br>Weight: 967 grams / 2.14 lbs                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                | <b>Graphics Controller</b>         | Quadro™ P6000 graphics<br>GPU: 3840 NVIDIA CUDA® Parallel Processing Cores<br>Power: 250 Watts<br>Cooling: Active                                                                                                                                                                                                                                                                                                                                                      |
|                                                | <b>Memory</b>                      | 24GB GDDR5X memory<br>Memory Bandwidth: Up to 432 GB/s<br>Memory Width: 384 bit<br>ECC Memory (disabled by default)                                                                                                                                                                                                                                                                                                                                                    |
|                                                | <b>Connectors</b>                  | DP (x4) with HDR support<br>DL-DVI(I)<br>3-pin mini-DIN connector<br>SLI connector<br>Quadro Sync connector (compatible with Quadro II Sync)<br>One 8-pin auxiliary power connector<br><br>Factory configured option: No video cable adapter included with card.<br>After market option Kit: No video cable 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>Maximum Resolution</b>          | 5K support @ 60Hz<br>1x single-cable 5K monitor, or 2x dual-cable 5K monitors                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                | <b>Image Quality Features</b>      | Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component.<br>HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors<br>NVIDIA 3D Vision™ and other 3D stereo technologies<br>NVIDIA Mosaic and nView                                                                                                                                                                                                                                                |
|                                                | <b>Display Outputs<sup>1</sup></b> | 4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or up to 8K at 30Hz)<br>1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1200 @ 120 Hz)                                                                                                                                                                                                                                                                                                        |
|                                                | <b>GPU Architecture</b>            | NVIDIA Pascal™                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                | <b>Supported Graphics APIs</b>     | DirectX®12 , OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0<br>Developer API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran                                                                                                                                                                                                                                                                                                           |
|                                                | <b>Available Graphics Drivers</b>  | Windows® 10 64-bit<br>Windows® 7 64-bit<br>Linux 64-bit                                                                                                                                                                                                                                                                                                                                                                                                                |

### Technical Specifications - Graphics

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

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

#### Notes

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

|                                       |                               |                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AMD FirePro W7100 8GB Graphics</b> | <b>Form Factor</b>            | Full height, single slot (9.5" X 4.376")                                                                                                                                                                                                                                                                                |
|                                       | <b>Graphics Controller</b>    | AMD FirePro W7100 graphics<br>GPU: 1792 Stream Processors organized into 28 Compute Units<br>Power: <75 Watts<br>Cooling: Active                                                                                                                                                                                        |
|                                       | <b>Bus Type</b>               | PCI Express® x16, Generation 3.0                                                                                                                                                                                                                                                                                        |
|                                       | <b>Memory</b>                 | 8GB GDDR5 memory<br>Memory Bandwidth: up to 176 GB/s<br>Memory Width: 256 bit                                                                                                                                                                                                                                           |
|                                       | <b>Connectors</b>             | 4x Display Port 1.2a connectors with HBR2 and MST support.<br><br>Factory Configured: No video cable adapter included<br>After market option kit: No video cable adapter included<br><br>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
|                                       | <b>Maximum Resolution</b>     | DisplayPort:<br>- 4096x2160 @24bpp 60Hz<br><br>Dual Link DVI:<br>- 2560x1600 (requires DP to DL-DVI adapter)<br><br>Single Link DVI:<br>- 1920x1200 (requires DP to DVI adapter)<br><br>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>         | Max number of monitors supported using DisplayPort 1.2a:<br>- 4 direct attached monitors<br>- 6 using DP 1.2a with MST and HBR2 enabled monitors                                                                                                                                                                        |

### Technical Specifications - Graphics

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

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

**Shading Architecture** Shader Model 5.0

**Supported Graphics APIs** OpenGL 4.4  
OpenCL 1.2 and 2.0  
DirectX 11.2 / 12  
AMD Mantle

**Available Graphics Drivers** Windows 8.1 / 8 (64-bit and 32-bit)  
Windows® 7 (64-bit and 32-bit)  
Linux

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

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

**Notes**

1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. See [www.amd.com/eyefinityfaq](http://www.amd.com/eyefinityfaq) for full details.
2. OpenGL 4.4 support available with driver 14.301.xxx or later.
3. OpenCL 2.0 support planned in driver updates for early 2015.

#### Radeon™ Pro WX 7100 8GB Graphics

#### Form Factor Graphics Controller

Full-Height Single Slot (9.5" Length )  
Radeon™ Pro WX 7100 graphics  
GPU: 2304 Stream Processors organized into 36 Compute Units  
Power: 130 Watts  
Cooling: Active

**Memory** 8GB GDDR5 memory  
Memory Bandwidth: 7 Gbps / 224 GB/s  
Memory Width: 256 bit

**Connectors** 4x Display Port 1.4 – HDR ready connectors with HBR3 and MST support.

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

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

**Maximum Resolution** 5K support @ 60Hz

### Technical Specifications - Graphics

- 1x single-cable 5K monitor, or 2x dual-cable 5K monitors

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

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

**GPU Architecture** GCN 4th Generation

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

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

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

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

#### Notes

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

### Technical Specifications - Graphics

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

### Technical Specifications - Optical and Removable Storage

#### OPTICAL AND REMOVABLE STORAGE

|                                 |                                                                |                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HP 9.5mm Slim 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+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+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 10, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*.<br>Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation<br>SUSE Linux Enterprise Desktop 10 & 11 |
|                                 |                                                                | <i>* No driver is required for this device. Native support is provided by the operating system.</i>                                                                                                                                                                                                                  |
|                                 | <b>Kit Contents</b>                                            | 9.5mm Slim DVD Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide                                                                                                                                                                                                                 |

### Technical Specifications - Optical and Removable Storage

|                                    |                                                                |                                                                                                                                                                                                                                                                                                                                                    |                                                          |
|------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| <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<br>BD-R<br>BD-RE<br>DVD-RAM<br>DVD+R<br>DVD+RW<br>DVD+R DL<br>DVD-R DL<br>DVD-R<br>DVD-RW |

### Technical Specifications - Optical and Removable Storage

|                                                                |                                                                                     |                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                | 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)<br>BD-ROM (SL/DL) 25S / 28S<br>BD-R (SL/DL) 25S / 28S<br>BD-RE (SL/DL) 25S / 28S<br>DVD-ROM (SL/DL) 18S / 18S<br>DVD-R (SL/DL) 25S / 25S<br>DVD-RW 25S<br>DVD+R (SL/DL) 25S / 25S<br>DVD+RW 25S<br>DVD-RAM 45S<br>CD-ROM 15S |
| <b>Maximum Data Transfer Rates</b>                             | CD ROM Read                                                                         | CD-ROM, CD-R Up to 24X<br>CD-RW Up to 24X                                                                                                                                                                                                                            |
|                                                                | 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                                                                                      |
|                                                                | Blu-ray                                                                             | BD-ROM Up to 6X<br>BD-ROM DL Up to 6X<br>BD-R Up to 6X<br>BD-R DL Up to 6X<br>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 Supported</b>                             | Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, |                                                                                                                                                                                                                                                                      |

### Technical Specifications - Optical and Removable Storage

Windows Vista Business 64\*, Windows Vista Business 32\*, Windows Vista Home Basic 32\*, Windows 2000, Windows XP Professional or Windows XP Home 32\*.

Red Hat Enterprise Linux(RHEL) WS4\*\*, 5, 6 Desktop/Workstation

SUSE Linux Enterprise Desktop 10 & 11

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

#### Kit Contents

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

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

#### HP DX115 Removable Drive Enclosure

##### Interface Type

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

##### Dimensions (WxHxD)

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

##### Approvals

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

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

##### Description

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

##### Interface Type

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

##### Dimensions (WxHxD)

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

##### Supported Media Types

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

#### Operating Systems Supported

Test Parameters/Conditions - Power applied, unit operating on system  $\pm 5\%$

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

Windows 8 Pro (64-bit)\*

Windows 8.1 (64-bit)\*

Windows 8 (64-bit)\*

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

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

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

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

Windows 7 Home Basic\*\*

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

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

Windows Vista Business 64

Windows Vista Business 32

Windows Vista Home Basic 32

Windows XP Professional

Windows XP Home 32

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

## Technical Specifications - Optical and Removable Storage

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

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

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

**Weight** 0.35 lbs. (0.16 kg)

### 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 bilingual 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                                                                                                                                           |
| <hr/>                                               |                                |                                                                                                                                                                                                                                                                |
| <b>HP X520 10GbE Dual Port Adapter</b>              | <b>Hardware Certifications</b> | FCC B, UL, CE, VCCI, BSMI, CTICK, KCC                                                                                                                                                                                                                          |
| <hr/>                                               |                                |                                                                                                                                                                                                                                                                |
| <b>HP 10GbE SFP+ SR Transceiver</b>                 | <b>Operating Temperature</b>   | 0C to 45C<br>(32F to 113F)                                                                                                                                                                                                                                     |
|                                                     | <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)                                                                                                                                                                                                   |
| <hr/>                                               |                                |                                                                                                                                                                                                                                                                |
| <b>HP 10GbE SFP+ SR Transceiver</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 |

### Technical Specifications - Networking and Communications

|                                        |                                                                                                                                                                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | 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                                                                                                                                                      |
| <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 (13.50cm 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® X540-T2 10GbE Dual Port Adapter

|                                        |                                                                                                                                                                                                         |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Temperature</b>           | 32° to 131° F (0° to 55° C)                                                                                                                                                                             |
| <b>Operating Humidity</b>              | 5% to 95% non-condensing                                                                                                                                                                                |
| <b>Dimensions (H x W x D)</b>          | Standard PCIe with full height bracket installed, half height bracket included.<br>0.7 x 2.7 x 6.0 in                                                                                                   |
| <b>Operating System Driver Support</b> | The HP driver drop is a unified package that includes the X540-T2 driver. It is the same driver as is used for the 561T. Currently, it includes drivers for Win7-32, Win7-x64, Win8-x64, and Win81-x64. |
| <b>Kit Contents</b>                    | Intel® X540 10Gb Ethernet Dual port adapter, Installation guide, Warranty card.                                                                                                                         |

#### NOTES

[Windows Server 2012 R2](#), [Windows Server 2012](#), [Windows 8](#), [Windows Server 2008 R2](#), [Windows 7](#), [Windows Server 2008 SP2](#), [Windows Vista SP2](#), [Windows Server 2003 R2](#), [Windows Server 2003 SP2](#), Linux Stable Kernel version 3.x, 2.6.x, Red Hat Enterprise Linux 5, 6, SUSE Linux Enterprise Server 10, 11, FreeBSD 9, VMware ESX/ESXi. Note: Not all OS's supported on all HP Z Workstations.

#### HP 361T PCIe Dual Port Gigabit NIC

|                             |                                                                                                                    |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|
| <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) |

### Technical Specifications - Networking and Communications

|                                              |                                        |                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              |                                        | 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                                                                                                                                                                                                                                                  |
|                                              | <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 (13.50cm 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).                                                                                             |
| <b>Intel Ethernet I350-T4 4-port 1Gb NIC</b> | <b>Connector</b>                       | Four 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 v2.1 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                                                                                                                                                                                                                                                  |

### Technical Specifications - Networking and Communications

|                                        |                                                                                                                                                                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power Requirement</b>               | 5.0W (typical)                                                                                                                                                                                                                    |
| <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 (13.50cm x 6.4 cm) (without brackets)                                                                                                                                                                                |
| <b>Operating System Driver Support</b> | Windows 7 32-bit and 64-bit; Windows 10 32-bit and 64-bit; Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation<br>Novell SLED 10 & SLED 11                                                                               |
| <b>Kit Contents</b>                    | Intel I350-T4 PCIe Quad Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in)<br>Product Warranty statement and the Installation Guide. |

#### 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. |

#### NOTES:

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

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

|                              |                                                                                                                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Temperature</b> | 0 to 80 C                                                                                                                        |
| <b>Operating Humidity</b>    | Non-operating 50% to 90% RH non-condensing (at temperatures of 25C to 35C)                                                       |
| <b>Kit Contents</b>          | WLAN module with PCIe x1 card, Dual band antenna, USB cable for internal Bluetooth connection, installation guide, warranty card |

| Date of change: | Version History: |       | Description of change:                                                                                                    |
|-----------------|------------------|-------|---------------------------------------------------------------------------------------------------------------------------|
| August 21       | V1               | Added | Style and technical specifications,                                                                                       |
| October 1, 2014 | From v1 to v2    | Added | Cyberlink Power2Go on supported components: software, Foxit PhantomPDF Express to supported components: software, note to |

### Technical Specifications - Networking and Communications

|                   |                 |         |                                                                                                                                                                                                                                                                                            |
|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                 |         | supported components: memory, Optical drives, DVD, BD-XL specs                                                                                                                                                                                                                             |
|                   |                 | Changed | Processor table with corrected turbo specs for E5-1660v3, Declared Noise Emissions section, stable & consistent offerings, system technical specifications: system board, supported components: optical and removable storage, supported components: graphics, Zero-ed out Noise Emissions |
|                   |                 | Removed | "Cyberlink MediaSuite" from supported components: software                                                                                                                                                                                                                                 |
| January 1, 2015   | From v2 to v3   | Added   | HP 256 GB SED Opal 2 SSD, AMD FirePro W7100 GPU, Intel® X540 and Ubuntu OS                                                                                                                                                                                                                 |
|                   |                 | Changed | OS Overview Section, Chassis Dimensions, Power Suply note and links                                                                                                                                                                                                                        |
| February 1, 2015  | From v3 to v4   | Added   | Windows 8.1 EM, AMD FirePro W5100 4GB specs, HP DX115 notes                                                                                                                                                                                                                                |
|                   |                 | Changed | Internal I/O USB from Overview and System Board sections                                                                                                                                                                                                                                   |
|                   |                 | Removed | NVIDIA Tesla K20c Compute Processor from High Performance GPU Computing                                                                                                                                                                                                                    |
| March 1, 2015     | From v4 to v5   | Added   | OS Support, RAID Interfaces Support, 600 and 300 GB SAS 15K SFF HDD, 4TB SATA HDD                                                                                                                                                                                                          |
|                   |                 | Changed | Linux Installer Kit, Hard Drives description notes, ACPI support from BIOS section                                                                                                                                                                                                         |
| April 1, 2015     | From v5 to v6   | Changed | Hard Drive and Memory Notes from Supported Components section. Memory Speed Supported and Memory Info from System Board section                                                                                                                                                            |
| May 1, 2015       | From v6 to v7   | Added   | Integrated RAID for PCIe SSDs and note to Supported Hard Drive Controllers section                                                                                                                                                                                                         |
|                   |                 | Changed | Note 1 from Hard Drive Controllers                                                                                                                                                                                                                                                         |
| July 1, 2015      | From v7 to v8   | Added   | 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), NVIDIA® Quadro® M6000 12GB Graphics, 3Dconnexion CADMouse, HP 2.5in HDD/SSD 2-in-1 ODD Bay Bracket, Notes for Other software                                                                                                                     |
|                   |                 | Changed | HP Optical Bay HDD Mounting Bracket, Notes for the Storage section                                                                                                                                                                                                                         |
|                   |                 | Removed | 600GB SAS 15K rpm 6Gb/s 3.5" HDD, 300GB SAS 15K rpm 6Gb/s 3.5" HDD,                                                                                                                                                                                                                        |
| August 1, 2015    | From v8 to v9   | Added   | Windows 10 64-bit, SUSE Linux Enterprise Desktop 11 SP3, 12 in OS, Overview; NVIDIA NVS 310 1GB Graphics in Professional 2D; NVIDIA® Quadro® K420 2GB Graphics in Entry 3D Graphics section.                                                                                               |
|                   |                 | Changed | Intel® Xeon® E5-1603 v3, Intel® Xeon® E5-1630 v3 to Stable & Consistent Offerings.                                                                                                                                                                                                         |
|                   |                 | Removed | Windows 8.1 64-bit, Windows 8.1 Emerging Market                                                                                                                                                                                                                                            |
| September 1, 2015 | From v9 to v10  | Added   | HP 512GB SATA SED SSD in storage, LSI iBBU09 Battery Backup Unit in hard drive controllers                                                                                                                                                                                                 |
|                   |                 | Changed | SATA SSDs notes                                                                                                                                                                                                                                                                            |
|                   |                 | Removed | Intel® Pro 1500 180GB SATA SSD in Storage and supported components                                                                                                                                                                                                                         |
| November 1, 2015  | From v10 to v11 | Added   | Storage PCIe notes, HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA® Quadro® M4000 8GB Graphics, NVIDIA® Quadro® M5000 8GB Graphics, notes from Other Hardware section;                                                                                                    |
|                   |                 | Changed | Controller Cards section notes; HP Remote Graphics Software (RGS) 7.1, MS Office Home & Business 2016 from Software section; Windows 8.1 Professional, Windows 10 Pro 64 and Windows 10 Pro downgrade to Windows 7 Professional 64, RHEL v6.6, 7 from Operative Systems                    |

### Technical Specifications - Networking and Communications

|                   |                 |         |                                                                                                                                                                                                                             |
|-------------------|-----------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                 |         | section.                                                                                                                                                                                                                    |
| February 1, 2016  | From v11 to v12 | Added   | HP Enterprise Class 240GB SATA SSD and HP Enterprise Class 480GB SATA SSD, NVIDIA® Quadro® K1200 4GB Graphics, HP PS/2 Business Slim Keyboard, HP USB Business Slim Keyboard, HP Wireless Business Slim Keyboard            |
|                   |                 | Changed | SATA SSDs notes                                                                                                                                                                                                             |
|                   |                 | Removed | Samsung Enterprise 240GB SATA SSD, Samsung Enterprise 480GB SATA SSD, NVIDIA® Quadro® K5200 8GB Graphics, NVIDIA® Quadro® K6000 12GB Graphics.                                                                              |
| March 1, 2016     | From v12 to v13 | Added   | Windows 10 Home 64 High-end and Note in Overview and Supported Components; AMD FirePro W4300 4GB Graphics in Mid-Ranga Category, Intel® 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC in Networking and Communications |
|                   |                 | Changed | Note 1 in Supported Components, Operative Systems                                                                                                                                                                           |
|                   |                 | Removed | Ubuntu 14.04 from Overview OS; NVIDIA NVS 310 512MB Graphics, NVIDIA® Quadro® K420 1GB Graphics in Graphics                                                                                                                 |
| March 31, 2016    | From v13 to v14 | Added   | Intel® Xeon® E5-2600 v4 Series CPU, HP Z Turbo Drive G2 1TB SSD, AMD FirePro W2100 2GB Graphics, DDR4-2400 ECC Registered DIMMs                                                                                             |
|                   |                 | Changed | Hard Drives, PCIe notes, Intel® Active Management Technology updated with E5-2600 v4 processors                                                                                                                             |
| May 1, 2016       | From v14 to v15 | Added   | M2000 and M6000 24GB graphics                                                                                                                                                                                               |
|                   |                 | Changed | AMD W2100 from "mid-range 3D" to "entry 3D" category,                                                                                                                                                                       |
|                   |                 | Removed | K4200 and K5200 graphics                                                                                                                                                                                                    |
| June 6, 2016      | From v15 to v16 | Added   | E5-1600 v4 CPUs to Overview and Supported Components sections, Enterprise Class status to 4TB SATA HDD                                                                                                                      |
|                   |                 | Removed | Win 8.1 to Win 7 downgrade offering from Overview and Operating Systems under Supported Components sections                                                                                                                 |
| July 1, 2016      | From v16 to v17 | Added   | Added HP USB Hardened Mouse and HP Keyed Cable Lock 10mm                                                                                                                                                                    |
| September 1, 2016 | From v17 to v18 | Added   | Z Turbo SED and notes for PCIe SSDs, Specs for SATA SSDs                                                                                                                                                                    |
|                   |                 | Removed | Windows 8.1, NVIDIA® Quadro® M6000 12GB Graphics                                                                                                                                                                            |
| October 1, 2016   | From v18 to v19 | Added   | PCIe TLC SSDs, 2) Added Intel® 750 Series PCIe SSDs, 3), 1TB Enterprise HDD                                                                                                                                                 |
|                   |                 | Removed | Intel® Xeon® E5 1600-2600 v3, HP Z Turbo Drive Quad Pro 2x256, 2x512, 4GB DDR4-2133 ECC Registered RAM, 32GB DDR4-2133 ECC Load Reduced (LR) RAM, Windows 8.1 Pro 64-bit, Windows 7 Professional 64-bit                     |
| November 1, 2016  | From v19 to v20 | Added   | 1TB SATA 7200 rpm HDD (Enterprise Class), HP Z Turbo Drive G2 TLC SSDs, HP Z Turbo Drive Quad Pro SSDs module, Intel® 750 Series AIC SSDs                                                                                   |
|                   |                 | Changed | Intel® Xeon E5-2600 Series CPU and notes                                                                                                                                                                                    |
|                   |                 | Removed | Intel® Xeon E5-2600 v3 Series CPU and notes, 4, 32, and 64GB DDR4-2133 RAM DIMMs                                                                                                                                            |
| January 1, 2016   | From v20 to v21 | Added   | Radeon Pro WX 7100 8GB graphics, HP Z Turbo Drive G2 256GB TLC, HP Z Turbo Drive G2 512GB TLC, HP Z Turbo Drive G2 1TB TLC, 2TB SATA SSD, 9.5mm Slim DVD-Writer.                                                            |
| February 1, 2017  | From v21 to v22 | Changed | HP 9.5mm Slim SuperMulti DVD Writer                                                                                                                                                                                         |
| March 1, 2017     | From v22 to v23 | Added   | NVIDIA Quadro P5000 16GB Graphics and NVIDIA Quadro P6000 24GB Graphics                                                                                                                                                     |

### Technical Specifications - Networking and Communications

|                   |                 |         |                                                                                                                                                                               |
|-------------------|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| April 1, 2017     | From v23 to v24 | Changed | System Board section TMP notes; Trusted Platform Module (TPM) 1.2 (Infineon SLB 9660). Upgradable to TPM 2.0 through Firmware v5.51 upgrade (Infineon SLB9665).               |
| April 14, 2017    | From v24 to v25 | Removed | The System Configuration (High-end) & Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296) subsections under The DECLARED NOISE EMISSIONS section was removed. |
| May 1, 2017       | From v25 to v26 | Added   | The NVIDIA® Quadro® P2000 5GB Graphics to Mid-range 3D Graphics                                                                                                               |
|                   |                 | Changed | Changed The HP 9.5mm Slim SuperMulti DVD Writer for The HP 9.5mm Slim DVD Writer.                                                                                             |
| May 1, 2017       | From v26 to v27 | Added   | The NVIDIA® Quadro® P4000 8GB Graphics to High End 3D Graphics                                                                                                                |
| June 5, 2017      | From v27 to v28 | Added   | The AMD Radeon Pro WX 4100 4 GB Graphics to Mid-range 3D Graphics, added NVIDIA Quadro P600 to Entry 3D Graphics section and added NVIDIA Quadro Sync II                      |
|                   |                 | Changed | HP 9.5mm Slim DVD Writer Option Kit Part Number under Optical and Removable Storage section                                                                                   |
|                   |                 | Removed | DVD-RAM as a supported format under the DVD writer section                                                                                                                    |
| July 6, 2017      | From v28 to v29 | Added   | Intel Ethernet I350-T4 4-port 1Gb NIC to Networking and Communications section                                                                                                |
|                   |                 | Changed | The Note 2 for NVIDIA Quadro P600 & the Operating Systems supported section for the NVIDIA Quadro Sync II                                                                     |
|                   |                 | Removed | The Tesla K40 as High Performance GPU Computing and removed Slim DVDRW SATA 1st & 2nd ODD from the Stable & Consistent Offerings section                                      |
| July 28, 2017     | From v29 to v30 | Removed | HP Z440 Fan and Front Card Guide Kit as an option                                                                                                                             |
| August 21, 2017   | From v30 to v31 | Changed | EPEAT statement                                                                                                                                                               |
| September 6, 2017 | From v31 to v32 | Added   | Memory footnotes                                                                                                                                                              |
|                   |                 | Changed | Displays section and changed the info for the NVIDIA Quadro P4000 8GB Graphics                                                                                                |
| November 1, 2017  | From v32 to v33 | Added   | “for workstations” added to Windows 10 Pro 64 on OS section                                                                                                                   |
|                   |                 | Changed | Multi-core disclaimer updated.                                                                                                                                                |
| August 9, 2018    | From v33 to v34 | Changed | Memory support                                                                                                                                                                |

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