# QuickSpecs

Overview

**HP Z440 Workstation**



1.  Integrated Front Handle
2.  Dedicated 9.5mm Optical Drive Bay
3.  Power Button

4.  HDD Activity LED
5.  Front I/O: 4 USB 3.0 with Charging Port (topmost port),
    1 Microphone, 1 Headset

## Overview



6. 2 External 5.25" Bays
7. 2 Internal 3.5" Bays
8. Fan and Front Card Guide Kit (optional)
9. 6 6Gb/s SATA Ports
10. Rear Grip

11. 525W, 85% Efficient Power Supply or
    700W, 90% Efficient Power Supply

12. Rear I/O: Rear Power Button, 4 USB 3.0, 2 USB 2.0,
    PS/2 Ports, 1 RJ-45 to Integrated GbE, 1 Audio Line In,
    1 Audio Line Out

13. 8 DIMM Slots for DDR4 ECC Registered Memory

14. Intel Xeon Processors: E5-1600 v3/v4 family (4C/6C/8C),
    E5-2600 v3 family (8C)

15. 2 PCIe x16 Gen 3 Slots

16. 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2,
    1 PCI Slot

Overview

# Overview

**Form Factor**    Minitower

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

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

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

**Available Processors**

| Name | Cores | Clock Speed (GHz) | Cache (MB) | Memory Speed (MT/s) | Hyper-Threading | Featuring Intel® vPro™ Technology | Intel® Turbo Boost Technology[1] | TDP (W) |
|---|---|---|---|---|---|---|---|---|
| Intel® Xeon® 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 E5-2630 v3 processor | 8 | 2.4 | 20 | 1866 | YES | YES | 2, 8 | 85 |
| Intel Xeon E5-1650 v3 processor | 6 | 3.5 | 15 | 2133 | YES | YES | 1, 3 | 140 |
| Intel Xeon E5-1630 v3 processor | 4 | 3.7 | 10 | 2133 | YES | YES | 1, 1 | 140 |

## Overview

| Processor | Cores | Speed (GHz) | Cache (MB) | Memory (MHz) | HT | Turbo | Turbo Steps[1] | Watts |
|---|---|---|---|---|---|---|---|---|
| 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 |
| Intel Xeon E5-2637 v4 processor | 4 | 3.5 | 15 | 2400 | YES | YES | 1, 2 | 135 |
| Intel Xeon E5-2623 v4 processor | 4 | 2.6 | 10 | 2133 | YES | YES | 2, 6 | 85 |
| | | | | | | | | |

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

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

**Available Processors Disclaimers**

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

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

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

**Color**

Jack Black

**Convertibility**

No

**Expansion Slots (see system board section for more details)**

**Slot 1** (top):
PCI Express Gen2 x1 with open-ended connector*
Full-height, Half-length

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

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

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

## 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 pre-installed)<br>2 external 5.25" bays<br>• 3rd and 4th 3.5" HDD each occupy one external bay<br>• 3rd and 4th 2.5" HDD/SSD occupy a single external bay within a 2:1 carrier)<br><br>1 dedicated 9.5mm slim optical disk drive bay |
| **Front I/O** | 4 USB 3.0, 1 Headset, 1 Microphone |
| **Internal I/O** | 2 USB 2.0 ports available with a single 2x5 header. The 2x5 header can be converted to a standard (Type-A) USB connector through the use one HP Internal USB Port Kit (EM165AA). This port kit uses one half of the 2x5 header. The 2x5 header also supports up to one 15-in-1 Media Card Reader.<br>1 USB 3.0 port available by a 2x10 header. |
| **Rear I/O** | 4 USB 3.0, 2 USB 2.0, 2 PS/2, 1 RJ-45 (NIC), 1 Audio Line-In, 1 Audio Line-Out.<br>Serial supported with optional connector on PCI bracket cabled to system board connector. |
| **Interfaces Supported** | 15-in-1 Media Card Reader (optional)<br>6-channel SATA interface (6 @ 6.0 Gb/s). 6 channels are eSATA configurable for use with eSATA CTO/AMO Kit (No hot plug / hot swap supported).<br>USB 2.0, USB 3.0 |
| **On-board RAID Support** | RAID 0, 1, 10 (Factory integrated)<br>RAID 5 (NOT Factory integrated)<br><br>Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, and 10) |
| **Chassis Dimensions (H x W x D)** | **Footprint Dimensions:**<br><br>H: 17.0" [431.8mm]<br>W: 6.65" [168.91mm]<br>D: 17.5" [444.7mm] (measured to the rear of service panel)<br><br><br>**Maximum Dimensions:**<br><br>H: 17.0" [431.8mm]<br>W: 6.65" [168.91mm]<br>D: 17.9" [455.7mm] (measured to the rear padlock loop) |
| **Rack Dimensions** | 4U |
| **Weight** | Exact weights depend upon configuration.<br>Minimum: 11.0 kg (24.3 lbs.)<br>Standard: 13.5 kg (29.8 lbs.) |

## Overview

|  |  |
|---|---|
|  | Maximum: 17.5 kg (38.5 lbs.) |
| **Temperature** | Operating: 5° to 35°C (40° to 95°F) |
|  | Non-operating: -40° to 60°C (-40° to 140°F) |
| **Humidity** | Operating: 8% to 85% relative humidity, non-condensing |
|  | Non-operating: 8% to 90% relative humidity, non-condensing |
| **Maximum Altitude (non-pressurized)** | Operating: 3,048m (10,000ft) |
|  | Non-operating: 9,144m (30,000ft) |

**Power Supply**

**ENTRY**

525 watts wide-ranging, active Power Factor Correction, 85% Efficient, with no 6-pin graphics power cable

The Z440 525W power supply efficiency report can be found at this link:
http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_753084-001_525W_ECOS%203914_Report.pdf

**HIGH-END**

700 watts wide-ranging, active Power Factor Correction, 90% Efficient, with two graphics power cables 700w PSU will support up to 225w of graphics

The Z440 700W power supply efficiency report can be found at this link:
http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_719795-001_700W_ECOS%203915_Report.pdf

**Workstation ISV Certifications**

See the latest list of certifications at
http://www.hp.com/united-states/campaigns/workstations/partnerships.html

## Supported Components

### Processors

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| **Intel® Xeon® E5-1600 v4 Series CPU** | | | | |
| Intel® Xeon® E5-1603 v4 2.8 2133 4C CPU | Y | N | | |
| Intel® Xeon® E5-1607 v4 3.1 2133 4C CPU | Y | N | | |
| Intel® Xeon® E5-1620 v4 3.5 2400 4C CPU | Y | N | | |
| Intel® Xeon® E5-1630 v4 3.7 2400 4C CPU | Y | N | | |
| Intel® Xeon® E5-1650 v4 3.6 2400 6C CPU | Y | N | | |
| Intel® Xeon® E5-1660 v4 3.2 2400 8C CPU | Y | N | | |
| Intel® Xeon® E5-1680 v4 3.4 2400 8C CPU | Y | N | | |
| **Intel® Xeon® E5-1600 v3 Series CPU** | | | | |
| Intel® Xeon® E5-1680 v3 3.2 2133 8C CPU | Y | N | | |
| Intel® Xeon® E5-1660 v3 3.0 2133 8C CPU | Y | N | | |
| Intel® Xeon® E5-1650 v3 3.5 2133 6C CPU | Y | N | | |
| Intel® Xeon® E5-1630 v3 3.7 2133 4C CPU | Y | N | | |
| Intel® Xeon® E5-1620 v3 3.5 2133 4C CPU | Y | N | | |
| Intel® Xeon® E5-1607 v3 3.1 1866 4C CPU | Y | N | | |
| Intel® Xeon® E5-1603 v3 2.8 1866 4C CPU | Y | N | | |
| **Intel® Xeon® E5-2600 v3 Series CPU** | | | | |
| Intel® Xeon® E5-2630 v3 2.4 1866 8C CPU | Y | N | | |

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

### Monitors / Displays

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

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

### Storage / Hard Drives

## Supported Components

**SAS Hard Drives**

| SAS Hard Drives for HP Workstations | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| 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**

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

**NOTES:**

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

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

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

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

Removable Boot Drive option

## Supported Components

**SATA Solid State Drives**

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| **HP Solid State Drives (SSDs) for Workstations** | | | | |
| HP 128GB* SATA 6Gb/s SSD | Y | Y | A3D25AA | |
| HP 256GB* SATA 6Gb/s SSD | Y | Y | A3D26AA | |
| HP 512GB* SATA 6Gb/s SSD | Y | Y | D8F30AA | |
| HP 1TB SATA* 6Gb/s SSD | Y | Y | F3C96AA | |
| HP 256GB SATA* 6Gb/s SED SSD | Y | N | | |
| HP 256GB SATA 6Gb/s SED Opal 2 SSD | Y | Y | G7U67AA | |
| HP 512GB SATA SED SSD | Y | Y | N8T26AA | |
| HP Enterprise Class 240GB SATA SSD | Y | Y | T3U07AA | |
| HP Enterprise Class 480GB SATA SSD | Y | Y | T3U08AA | |

**NOTES:**

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

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

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

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

**PCIe Solid State Drives**

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| **PCIe SSDs for HP Workstations** | | | | |
| HP Z Turbo Drive 512GB SSD | Y | Y | G3G89AA | |
| HP Z Turbo Drive 256GB SSD | Y | Y | G3G88AA | |
| HP Z Turbo Drive G2 512GB SSD | Y | Y | M1F74AA | |
| HP Z Turbo Drive G2 256GB SSD | Y | Y | M1F73AA | |
| HP Z Turbo Drive G2 1TB SSD | Y | Y | T9H98AA | |
| **HP Z Turbo Drive Quad Pro** | | | | |
| 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 2x256GB PCIe SSD | Y | Y | N2M98AA | Note 2 |
| HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD | Y | Y | N2M99AA | Note 2 |
| HP Z Turbo Drive Quad Pro 256GB SSD module | N | Y | N2N00AA | Note 1 |
| HP Z Turbo Drive Quad Pro 512GB SSD module | N | Y | N2N01AA | Note 1 |

**NOTES:**

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

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

## Supported Components

> **NOTE:** PCIe SSDs are not available with SAS controller or SAS HDDs. All PCIe SSD configurations require the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).
>
> **NOTE 1:** M.2 SSD module only
> **NOTE 2:** Dual M.2 SSD modules plus carrier

### Hard Drive Controllers

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| **Integrated SATA 6.0 Gb/s Controller** | | | | |
| Integrated SATA 6.0 Gb/s Controller | Y | N | | Six Ports |
| **Factory integrated RAID on motherboard for SATA drives** | | | | |
| RAID 0 Configuration – Striped Array | Y | N | | Note 1 |
| RAID 0 Data Configuration -- Boot/OS Drive + 2 Drive Striped Array | Y | N | | Note 1 |
| RAID 1 Configuration – Mirrored Array | Y | N | | Note 1 |
| RAID 10 Configuration - Striped/Mirrored Array | Y | N | | Note 1 |
| **LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card** | | | | |
| LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card | Y | Y | E0X20AA | Note 2 |
| **LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit** | | | | |
| LSI 9270-8i SAS 6Gb/s ROC RAID Card | N | Y | E0X21AA | Note 2 |
| LSI iBBU09 Battery Backup Unit | N | Y | E0X19AA | |
| **Integrated RAID for PCIe SSDs** | | | | |
| RAID 0 Data Configuration | Y | N | | Note 3 |

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

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

**NOTE 2:** Specific user-configured hardware SAS RAID configurations are supported on this Linux system.
IS: Striping of 2 or more HDDs into a single logical volume
IM: Mirroring of 2 HDDs into a single logical volume
IME: Mirroring of 3 or more HDDs into a single logical volume.
For details, please visit http://www.hp.com/support/linux_hardware_matrix

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

## Graphics

| | Support Notes | Supported |
|---|---|---|

## Supported Components

| | Factory Configured | Option Kit | Option Kit Part Number | | # of cards | Mixed? |
|---|:---:|:---:|:---:|:---:|:---:|:---:|
| **Professional 2D** | | | | | | |
| NVIDIA NVS 310 1GB Graphics | Y | Y | M6V51AA | Note 1 | 3 | |
| NVIDIA NVS 315 1GB Graphics | Y | Y | E1U66AA | Note 1 | 3 | |
| NVIDIA NVS 510 2GB Graphics | Y | Y | C2J98AA | Note 2 | 2 | |
| **Graphics Cable Adapters** | | | | | | |
| HP DisplayPort to Dual Link DVI Adapter | Y | Y | NR078AA | | 1 | |
| HP DisplayPort To DVI-D Adapter | Y | Y | FH973AA | | 1 | |
| HP DisplayPort To DVI-D Adapter (2-Pack) | Y | N | | | 1 | |
| HP DisplayPort To DVI-D Adapter (4-Pack) | Y | N | | | 1 | |
| HP DisplayPort To DVI-D Adapter (6-Pack) | Y | N | | | 1 | |
| HP DisplayPort To VGA Adapter | Y | Y | AS615AA | | 1 | |
| HP DisplayPort To VGA Adapter 2nd | Y | N | | | 1 | |
| **Entry 3D** | | | | | | |
| NVIDIA Quadro K620 2GB Graphics | Y | Y | J3G87AA | | 2 | |
| NVIDIA Quadro K420 2GB Graphics | Y | Y | N1T07AA | | 2 | |
| AMD FirePro W2100 2GB Graphics | Y | Y | J3G91AA | | 2 | Y |
| **Mid-range 3D** | | | | | | |
| NVIDIA Quadro K1200 4GB Graphics | Y | Y | L4D16AA | | 2 | Y |
| NVIDIA Quadro K2200 4GB Graphics | Y | Y | J3G88AA | Note 5, 6 | 2 | Y |
| NVIDIA Quadro M2000 4GB Graphics | Y | Y | T7T60AA | Note 5 | 2 | |
| AMD FirePro W4300 4GB Graphics | Y | Y | T7T58AA | | 2 | Y |
| AMD FirePro W5100 4GB Graphics | Y | Y | J3G92AA | Note 5, 6 | 2 | Y |
| **High End 3D** | | | | | | |
| NVIDIA Quadro M4000 8GB Graphics | Y | Y | M6V52AA | Notes 3, 4 | 2 | Y |
| NVIDIA Quadro M5000 8GB Graphics | Y | Y | M6V53AA | Notes 3, 4 | 1 | Y |
| AMD FirePro W7100 8GB Graphics | Y | Y | J3G93AA | Notes 3, 4 | 1 | Y |

**Note 1:** When configuring with a 3rd NVS 310 or 315--the configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).
**Note 2:** If 1st graphics card is NVS 510 then 2nd graphics card must be NVS 510 or NVS 310.
**Note 3:** Configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).
**Note 4:** Supported on 700W PSU chassis only.
**Note 5:** Dual graphics configuration supported on 700W PSU chassis only.
**Note 6:** Dual graphics configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

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

## Supported Components

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

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

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

**NOTE 3:** Supported on 700W PSU chassis only.

| Memory | CTO | Option Kit Part Number | Support Notes |
|---|---|---|---|
| | **DDR4-2133 ECC Registered DIMMs** | | |
| | 16GB DDR4-2133 ECC Registered RAM | J9P83AA | 1,2 |
| | 8GB DDR4-2133 ECC Registered RAM | J9P82AA | 1,2 |
| | 4GB DDR4-2133 ECC Registered RAM | J9P81AA | 1,2 |
| | HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM | T9V40AA | |
| | HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM | T9V39AA | |
| | HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM | T9V38AA | |

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

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

The CPUs determine the speed at which the memory is clocked. If an 2133MT/s capable CPU is used in the system, the maximum speed the memory will run at is 2133MT/s, regardless of the specified speed of the memory.

**NOTE 1:** ONLY registered DDR4 DIMMs are supported.
DDR3 DIMMs ARE NOT SUPPORTED.

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

# Multimedia and Audio Devices

## Supported Components

### Multimedia and Audio Devices

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

### Optical and Removable Storage

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

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

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

**NOTE 1:** Not supported as a 2nd drive option.
**NOTE 2:** Cannot be ordered in combination with another Blu-ray Writer.
**NOTE 3**: Only one DX115 device can be installed into Z440. This device can only be installed into the top optical (5.25") bay.
**NOTE 4:** Carrier requires a Z440 to have the DX115 frame installed. This part number is for the carrier only.

### Controller Cards

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

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

### Networking and Communications

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|

## Supported Components

| | | | | |
|---|---|---|---|---|
| Integrated Intel I218LM PCIe GbE Controller | Y | N | | |
| Intel Ethernet I210-T1 PCIe NIC | Y | Y | E0X95AA | |
| HP X520 10GbE Dual Port Adapter | Y | Y | C3N52AA | |
| HP 10GbE SFP+ SR Transceiver | Y | Y | C3N53AA | |
| HP 361T PCIe Dual Port Gigabit NIC | N | Y | C3N37AA | Note 1 |
| Intel Ethernet I350-T2 2-Port 1Gb NIC | Y | Y | V4A91AA | |
| Intel 7260 802.11 a/b/g/n PCIe WLAN NIC | N | Y | F2P07AA | |
| Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC | N | Y | N0S95AA | |

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

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

## Racking and Physical Security

## Supported Components

### Racking and Physical Security

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| HP Solenoid Hood Lock & Hood Sensor | Y | N | | |
| HP Business PC Security Lock Kit | N | Y | PV606AA | |
| HP xw4/Z2/Z4 Depth Adjustable Fixed Rail Rack Kit | N | Y | WH340AA | |
| HP Keyed Cable Lock 10mm | N | Y | T1A62AA | |

### Input Devices

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

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

### Other Hardware

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

# QuickSpecs

## Supported Components

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

**Note 2**: Fan and Front Card Guide required for any configuration that includes any of the following components:
- 3 x NVIDIA NVS 310/315
- 1 x NVIDIA Quadro M4000
- 1 x NVIDIA Quadro M5000
- 1 x NVIDIA Quadro K4200
- 1 x NVIDIA Quadro K5200
- 2 x AMD FirePro W5100
- 1 x AMD FirePro W7100
- 1 x NVIDIA Tesla K40
- 1 x HP Z Turbo Drive 256GB
- 1 x HP Z Turbo Drive 512GB
- 1 x HP Z Turbo Drive G2 256GB
- 1 x HP Z Turbo Drive G2 512GB
- Any HP Z Turbo Quad Pro configuration

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

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

## Software

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|---|---|---|---|
| HP Performance Advisor | Y | Y | | Note 1 |
| HP Remote Graphics Software (RGS) 7.1 | Y | Y | | Note 2 |
| MS Office Home & Business 2016 | Y | Y | | Note 3 |
| Cyberlink PowerDVD and Power2Go | Y | N | | |
| Foxit PhantomPDF Express | Y | N | | |

**NOTE 1:** Available as a free download here: www.hp.com/go/performanceadvisor
**NOTE 2:** Supported operating systems:
 • Windows 7 Professional 32/64
 • Windows 8.1 Professional 32/64
 • RHEL v6.6, 7
 • SLED 11 SP3

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

## Operating Systems

| | Support Notes |
|---|---|
| Windows 10 Pro 64 | |
| Windows 10 Pro downgrade to Windows 7 Professional 64 | |
| Windows 10 Home 64 | High end |
| Windows 8.1 Pro 64-bit | |
| Windows® 7 Professional 64-bit | (National Academic) |
| HP Linux Installer Kit | |
| Red Hat Enterprise Linux (RHEL) Workstation - Paper License (1yr) | Note 1 |

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

## Supported Components

## System Technical Specifications

### System Board

| | |
|---|---|
| **System Board Form Factor** | Main System Board: 24 x 31 cm 9.6 x 12.2 inches |
| **Processor Socket** | Single LGA2011 R3 |
| **Chipset** | Intel® C612 Chipset |
| **Super I/O Controller** | Nuvoton NPCD379H (SIO-12) |
| **Memory Expansion Slots** | 8 DDR4 memory slots |
| **Memory Type Supported** | DDR4, RDIMM (Registered), ECC: 4GB, 8GB and 16GB |
| **Memory Modes** | Channel Interleaved |
| **Memory Speed Supported** | 1600MT/s, 1866MT/s, 2133MT/s, and 2400MT/s |
| **Memory Protection Memory** | ECC available on data, parity on address and command |
| **Memory Configuration Table** | Please refer to the table below for details on how supported memory configurations are installed in your system. |

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

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

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

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

## System Technical Specifications

**Memory Load Order**
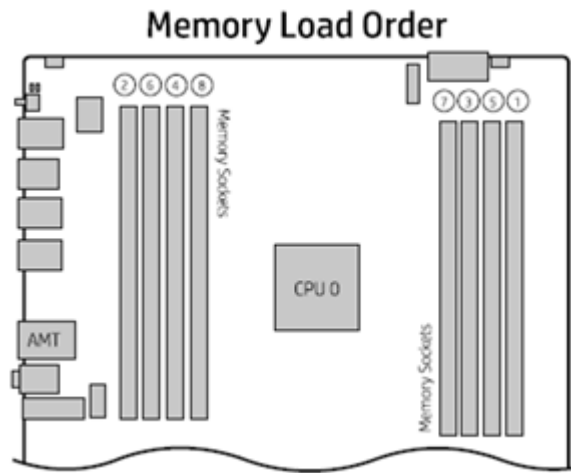


| | |
|---|---|
| **Maximum Memory** | Supports up to 128GB |
| **Memory Configuration (Supported)** | Only ECC DIMMs are supported. |
| **Note on Maximum Memory** | Maximum memory capacities assume 64-bit operating systems such as Windows 8.1 64-bit, Windows 7 Ultimate 64-bit, or Windows 7 Professional 64-bit. Windows 7 Professional 32-bit supports up to 4GB. Linux 32-bit supports up to 8GB. |
| **PCI Express Connectors** | Slot 1 (top):<br>PCI Express Gen2 x1<br>Full-height, Half-length<br>Slot 2:<br>PCI Express Gen3 x16<br>Full-height, Full-length (with extender)<br>Slot 3:<br>PCI Express Gen2 x4 with open-ended connector**<br>Full-height, Full-length (with extender)<br>Slot 4:<br>PCI Express Gen3 x8 with open-ended connector**<br>Full-height, Full-length (with extender)<br>Slot 5:<br>PCI Express Gen3 x16<br>Full-height, Full-length (with extender)<br>** 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:<br>PCI 32bit/33MHz<br>Full-height, Full-length (with extender) |

## System Technical Specifications

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

## System Technical Specifications

1 USB 3.0 port available by a 2x10 header.

| | |
|---|---|
| **HD Integrated Audio** | Realtek ALC221 |
| **Flash ROM** | Yes |
| **CPU Fan Header** | Yes |
| **Chassis Fan Header** | 1 Rear System Chassis Fan Header |
| **Front PCI Fan Header** | Yes |
| **Front Control Panel/Speaker Header** | Yes |
| **CMOS Battery Holder - Lithium** | Yes |
| **Integrated Trusted Platform Module** | Infineon TPM 1.2 Certified |
| **Power Supply Headers** | Yes |
| **Power Switch, Power LED & Hard Drive LED Header** | Yes |
| **Clear Password Jumper** | Yes |
| **Serial Port** | 1 internal header |
| **Parallel Port** | No |
| **Keyboard/Mouse** | USB or PS/2 |

**Power Supply**

| | | | | |
|---|---|---|---|---|
| **Power Supply** | 700W 90% Efficient, Custom PSU (Wide-Ranging, Active PFC) | | 525W 85% Efficient, Custom PSU (Wide-Ranging, Active PFC) | |
| **Operating Voltage Range** | 90–269 VAC | | 90–269 VAC | |
| **Rated Voltage Range** | 100-240 VAC | 118 VAC | 100-240 VAC | 118 VAC |
| **Rated Line Frequency** | 50–60 Hz | 400 Hz | 50–60 Hz | 400 Hz |
| **Operating Line Frequency Range** | 47–66 Hz | 393–407 Hz | 47–66 Hz | 393–407 Hz |
| **Rated Input Current** | 100-240V @ 9.5A | 118V @ 9.5A | 100-240V @ 7A | 118V @ 7A |
| **Heat Dissipation (Configuration and software dependent)** | Typical = 1648 btu/hr (415 kg-cal/hr) Max = 2746 btu/hr (692 kg-cal/hr) | | Typical = 1311 btu/hr (330 kg-cal/hr) Max = 2185 btu/hr (551 kg-cal/hr) | |
| **Power Supply Fan** | 92x25 mm variable speed | | 92x25 mm variable speed | |
| **ENERGY STAR Qualified (Configuration dependent)** | Yes | | Yes | |
| **80 PLUS® Compliant** | Yes, 90% Efficient<br><br>The Z440 700W power supply efficiency report can be found at this link:<br>http://www.plugloadsolutions.com/psu_reports/ HEWLETT%20PACKARD_719795-001_700W_ ECOS%203915_Report.pdf | | Yes, 85% Efficient<br><br>The Z440 525W power supply efficiency report can be found at this link:<br>http://www.plugloadsolutions.com/psu_reports/ HEWLETT%20PACKARD_753084-001_525W _ECOS%203914_Report.pdf | |
| **FEMP Standby Power Compliant @115V (<2W in S5 – Power Off)** | Yes | | Yes | |
| **EuP Compliant @ 230V (<0.5 W in S5 – Power Off)** | Yes | | Yes | |
| **CECP Compliant @ 220V (<4W in S3 – Suspend to RAM)** | Yes; Configuration dependent | | Yes; Configuration dependent | |
| **Power Consumption in sleep mode** | <15w | | <15w | |

## System Technical Specifications

| | | |
|---|---|---|
| **(as defined by ENERGY STAR) – Suspend to RAM (S3) (Instantly Available PC)** | | |
| **Built-in Self Test LED** | Yes | Yes |
| **Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)** | Yes | Yes |
| **Hood Lock Header** | Yes | |
| **Hood Sensor Header** | Yes | |
| **Memory Fan** | 1 Memory Fan Header | |

## System Technical Specifications

## System Configuration

| Example Configuration #1 ENERGY STAR QUALIFIED | Processor | 1x Intel Xeon E5-1603 v3 (Quad-Core) |
|---|---|---|
| | Memory | 1x 4GB DDR4–2133  Registered RAM |
| | Graphics | 1x NVIDIA NVS 310 |
| | Disks / Optical | 1x 500GB SATA 7200 / 1x Slim DVD-ROM SATA |
| | Power Supply | 525W 85% Custom PSU |
| | Other | N/A |

| Energy Consumption | | 115 VAC | | 230 VAC | | 100 VAC | |
|---|---|---|---|---|---|---|---|
| | | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled |
| | Windows Idle (S0) | 51.01 W | | 51.29 W | | 53.01 W | |
| | Windows Busy Typ(S0) | 112.95 W | | 110.62 W | | 113.96 W | |
| | Windows Busy Max (S0) | 117.16 W | | 112.45 W | | 114.67 W | |
| | Sleep (S3) | 2.34 W | 2.19 W | 2.54 W | 2.41 W | 2.33 W | 2.19W |
| | Off (S5) | 0.825 W | 0.784 W | 1.024 W | 0.985 W | 0.851 W | 0.772 W |
| | Zero Power Mode (ErP) | 0.190 W | | 0.382 W | | 0.178 W | |

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

| Example Configuration #2 ENERGY STAR QUALIFIED | Processor | 1x Intel Xeon E5-1630 v3 (Quad-Core) |
|---|---|---|
| | Memory | 2x 4GB DDR4–2133 Registered RAM |
| | Graphics | 1x NVIDIA Quadro K620 |
| | Disks / Optical | 1x 500GB SATA 7200 / 1xSlim DVD-ROM SATA |
| | Power Supply | 700W 90% Custom PSU |
| | Other | N/A |

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

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

## System Technical Specifications

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

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

**Energy Consumption (Watts)**

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

**Heat Dissipation (Btu/hr)**

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

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

**Energy Consumption (Watts)**

| | 115 VAC | | 230 VAC | | 100 VAC | |
|---|---|---|---|---|---|---|
| | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled | LAN Enabled | LAN Disabled |
| Windows Idle (S0) | 61.88 W | | 61.39 W | | 62.35 W | |
| Windows Busy Typ(S0) | 296.64 W | | 290.88 W | | 303.03 W | |
| Windows Busy Max (S0) | 338.63 W | | 334.85 W | | 333.11 W | |
| Sleep (S3) | 3.99 W | 3.91 W | 4.02 W | 4.04 W | 3.99 W | 3.91 W |

## System Technical Specifications

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

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

## DECLARED NOISE EMISSIONS

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

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

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

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

## System Technical Specifications

| | | |
|---|---|---|
| **DVD-ROM Operating** (sequential reads) | 4.6 | 31 |

## ENVIRONMENTAL DATA

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

## Physical Security and Serviceability

| | |
|---|---|
| **Access Panel** | Tool-less<br>Includes system board and memory information. |
| **Optical Drive** | Tool-less |
| **Hard Drives** | Tool-less |
| **Expansion Cards** | Tool-less |
| **Processor Socket** | Tool-less |
| **Green User Touch Points** | Yes, on primary serviceable components. |
| **Color-coordinated Cables and Connectors** | Yes |
| **Memory** | Tool-less |
| **System Board** | Screw-In |
| **Dual Color Power and HD LED on Front of Computer** | Yes |
| **Configuration Record SW** | Yes |
| **Over-Temp Warning on Screen** | Yes, at POST screen on reboot |
| **Restore CD/DVD Set** | Restores the computer to its original factory shipping image; can be obtained via HP Support. |
| **Dual Function Front Power Switch** | Yes, causes a fail-safe power off when held for 4 seconds |

## System Technical Specifications

| | |
|---|---|
| **Padlock Support** | Yes (optional): Locks side cover and secures chassis from theft<br>7.0 mm (0.2756 in) diameter padlock loop at rear of system |
| **Cable Lock Support** | Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft<br>3 mm x 7 mm slot at rear of system |
| **Universal Chassis Clamp Lock Support** | Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable<br>Threaded feature at rear of system |
| **Solenoid Lock and Hood Sensor** | Yes (optional)<br>The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed |
| **Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control** | Yes, enables or disables serial, USB, audio, and network ports |
| **Removable Media Write/Boot Control** | Yes, prevents ability to boot from removable media on supported devices (and can disable writes to media) |
| **Power-On Password** | Yes, prevents an unauthorized person from booting up the workstation |
| **Setup Password** | Yes, prevents an unauthorized person from changing the workstation configuration |
| **3.3V Aux Power LED on System PCA** | Yes |
| **NIC LEDs (integrated) (Green & Amber)** | Yes |
| **CPUs and Heatsinks** | A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less |
| **Power Supply Diagnostic LED** | Yes |
| **Front Power Button** | Yes, ACPI multi-function |
| **Rear Power Button** | Yes |
| **Front Power LED** | Yes, white (normal), red (fault) |
| **Front Hard Drive Activity LED** | Yes, white |
| **Front ODD Activity LED** | Yes, on device |
| **Internal Speaker** | Yes |
| **System/Emergency ROM Flash Recovery** | Recovers corrupted system BIOS. |
| **Cooling Solutions** | Air cooled forced convection heatsinks |
| **Power Supply Fans** | 92 mm x 92 mm x 25 mm (non-serviceable) |
| **CPU Heatsink Fan** | 92 mm x 25 mm, 6-wire, PWM |
| **Chassis Fan** | Front:<br>(Optional) 92 mm x 92mm x 25 mm, 4-wire, PWM<br><br>Rear:<br>92 mm x 92mm x 25 mm, 4-wire, PWM |
| **Memory Heatsink Fan** | Dual 60 mm x 60 mm x 25 mm, 6-wire, PWM, Blindmate |
| **HP PC Hardware Diagnostics UEFI** | HP Vision Diagnostics Offline Edition |

## System Technical Specifications

The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to:

- Run diagnostics
- View the hardware configuration of the system

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

Typical uses of the Vision Diagnostics are:

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

| | |
|---|---|
| **Access Panel Key Lock** | No |
| **ACPI-Ready Hardware** | Advanced Configuration and Power Management Interface (ACPI). |

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

| | |
|---|---|
| **Trusted Platform Module Chip** | Infineon TPM 1.2 Certified |
| **Integrated Chassis Handles** | Yes, Front handle and dedicated rear recess |
| **Power Supply** | Requires T15 Torx or flat blade screwdriver |
| **PCIe Card Retention** | Yes, rear (all), middle (all), front (full-length cards with extender, using HP Z4 Fan and Front Card Guide Kit) |
| **Flash ROM** | Yes |
| **Diagnostic Power Switch LED on board** | Yes |
| **Clear Password Jumper** | Yes |
| **Clear CMOS Button** | Yes |
| **CMOS Battery Holder** | Yes |
| **DIMM Connectors** | Yes |

## BIOS

| | |
|---|---|
| **BIOS 32-bit Services** | Standard BIOS 32-bit Service Directory Proposal v0.4 |
| **PCI 3.0 Support** | Full BIOS support for PCI Express through industry standard interfaces. |
| **ATAPI** | ATAPI Removable Media Device BIOS Specification Version 1.0. |
| **BBS** | BIOS Boot Specification v1.01. |

## System Technical Specifications

| | |
|---|---|
| **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:<br>• NORMAL - normal temperature ranges.<br>• ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.<br>• SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer without warning before hardware component damage occurs. |
| **Remote ROM Flash** | Provides secure, fail-safe ROM image management from a central network console. |
| **ACPI (Advanced Configuration and Power Management Interface)** | Allows the system to enter and resume from low power modes (sleep states).<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. |
| **Ownership Tag** | A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen. |
| **Remote Wakeup/Remote Shutdown** | System administrators can power on, restart, and power off a client computer from a remote location. |
| **Instantly Available PC (Suspend to RAM - ACPI sleep state S3)** | Allows for very low power consumption with quick resume time. |
| **Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)** | Allows a new or existing system to boot over the network and download software, including the operating system. |
| **ROM revision levels** | Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information. |
| **System board revision level** | Allows management SW to read revision level of the system board.<br>Revision level is digitally encoded into the HW and cannot be modified. |
| **Start-up Diagnostics (Power-on Self-Test)** | Assesses system health at boot time with selectable levels of testing. |
| **Auto Setup when new hardware installed** | System automatically detects addition of new hardware. |
| **Keyboard-less Operation** | The system can be booted without a keyboard. |
| **Localized ROM Setup** | Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings. |
| **Asset Tag** | The user or MIS to set a unique tag string in non-volatile memory. |
| **Per-slot Control** | Allows I/O slot parameters (option ROM enable/disable, bus latency) to be configured individually. |
| **Adaptive Cooling** | Control parameters are set according to detected hardware configuration for optimal acoustics. |

## System Technical Specifications

| | |
|---|---|
| **Pre-boot Diagnostics** | (Pre-video) critical errors are reported via beeps and blinks on the power LED. |
| **Industry Standard Specification Support** | |
| **Industry Standard** | Revision Supported by the BIOS |
| **UEFI Specification Revision** | 2.3.1 |
| **ACPI** | Advanced Configuration and Power Management Interface, Version 4.0 |
| **ATA (IDE)** | AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b |
| **CD Boot** | "El Torito" Bootable CD-ROM Format Specification Version 1.0 |
| **EDD** | - Enhanced Disk Drive Specification Version 1.1<br>- BIOS Enhanced Disk Drive Specification Version 3.0 |
| **EHCI** | Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0 |
| **PCI** | PCI Local Bus Specification, Revision 2.3<br>PCI Power Management Specification, Revision 1.1<br>PCI Firmware Specification, Revision 3.0, Draft .7 |
| **PCI Express** | PCI Express Base Specification, Revision 2.0<br>PCI Express Base Specification, Revision 3.0 |
| **PMM** | POST Memory Manager Specification, Version 1.01 |
| **SATA** | Serial ATA Specification, Revision 1.0a<br>Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5<br>Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0 |
| **SPD** | PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B |
| **TPM** | Trusted Computing Group TPM Specification Version 1.2 |
| **UHCI** | Universal Host Controller Interface Design Guide, Revision 1.1 |
| **USB** | Universal Serial Bus Revision 1.1 Specification |
| | Universal Serial Bus Revision 2.0 Specification |
| | Universal Serial Bus Revision 3.0 Specification |
| **SMBIOS** | System Management BIOS Reference Specification, Version 2.7 |
| | External BIOS simulator found at: http://h20464.www2.hp.com/index.html |

## Social and Environmental Responsibility

| | |
|---|---|
| **Eco-Label Certifications & Declarations** | This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:<br><br>• ENERGY STAR® (energy-saving features available on selected configurations-Windows only)<br>• US Federal Energy Management Program (FEMP)<br>• China Energy Conservation Program<br>• The ECO declaration (TED) |
| **Batteries** | The battery in this product complies with EU Directive 2006/66/EC<br>Battery size: CR2032 (coin cell)<br>Battery type: Lithium Metal<br><br>The battery in this product does not contain:<br><br>• Mercury greater than 5ppm by weight |

## System Technical Specifications

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

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

Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.

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

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

**Hewlett-Packard Corporate Environmental Information** — For more information about HP's commitment to the environment:
Global Citizenship Report http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html

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

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

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

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

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

**Packaging Materials**
**Internal** — Cushions and plastic bags made of low density polyethylene (LDPE).
**External** — Outer carton, accessories carton, and insert made of corrugated paper board.

## System Technical Specifications

### Manageability

**Industry Standard Specifications**

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

- DASH 1.1 (via Intel® LAN on motherboard)

**Intel Active Management Technology (AMT)**

Intel® Active Management Technology (AMT) 9.1

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

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

**Intel® vPro™ Technology**

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

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

**Remote Manageability Software Solutions**

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

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

**System Software Manager**

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

**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)

## System Technical Specifications

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

## Stable & Consistent Offerings

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

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

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

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

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

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

## Stable & Consistent Offerings

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

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

## Technical Specifications - Processors

Intel Xeon E5-1680 v3 3.2 2133 8C CPU
Intel Xeon E5-1660 v3 3.0 2133 8C CPU
Intel Xeon E5-1650 v3 3.5 2133 6C CPU
Intel Xeon E5-1630 v3 3.7 2133 4C CPU
Intel Xeon E5-1620 v3 3.5 2133 4C CPU
Intel Xeon E5-1607 v3 3.1 1866 4C CPU
Intel Xeon E5-1603 v3 2.8 1866 4C CPU

Intel Xeon E5-2630 v3 2.4 1866 8C CPU
Intel Xeon E5-2637 v4 3.5 2400 4C CPU
Intel Xeon E5-2623 v4 2.6 2133 4C CPU

Technical Specifications - Hard Drives

## STORAGE/HARD DRIVES

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

## Technical Specifications - Hard Drives

| **HP 600GB SAS 10K SFF HDD** | **Capacity** | 600GB | |
| --- | --- | --- | --- |
| | **Height** | 0.6 in; 1.53 cm | |
| | **Width** | **Media Diameter** | 2.5 in; 6.36 cm |
| | | **Physical Size** | 2.75 in; 6.99 cm |
| | **Interface** | SAS 6Gb/s | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | **Buffer** | 64MB | |
| | **Cache** | multi-segmentable cache buffer | |
| | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 0.4 ms (max) |
| | | **Average** | 3.6 ms |
| | | **Full Stroke** | 7.3 ms |
| | **Rotational Speed** | 10,000 rpm | |
| | **Logical Blocks** | 1,172,123,568 | |
| | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |
| **HP 1.2TB SAS 10K SFF HDD** | **Capacity** | 1.2TB | |
| | **Height** | 0.6 in; 1.53 cm | |
| | **Width** | **Media Diameter** | 2.5 in; 6.36 cm |
| | | **Physical Size** | 2.75 in; 6.99 cm |
| | **Interface** | SAS 6Gb/s | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | **Buffer** | 64MB | |
| | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 0.18ms (max) |
| | | **Average** | 3.5ms |
| | | **Full Stroke** | 7.17ms |
| | **Rotational Speed** | 10,000 rpm | |
| | **Logical Blocks** | 2,344,225,968 | |
| | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |

## Technical Specifications - Hard Drives

| **SATA (Serial ATA) Hard Drives for HP Workstations** | **500GB SATA 7200 rpm 6Gb/s 3.5" HDD** | **Capacity** | 500GB | |
|---|---|---|---|---|
| | | **Height** | 1 in; 2.54 cm | |
| | | **Width** | **Media Diameter** | 3.5 in; 8.9 cm |
| | | | **Physical Size** | 4 in; 10.17 cm |
| | | **Interface** | Serial ATA (6.0Gb/s), NCQ enabled | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | | **Buffer** | 16MB | |
| | | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 2 ms |
| | | | **Average** | 11 ms |
| | | | **Full Stroke** | 21 ms |
| | | **Rotational Speed** | 7,200 rpm | |
| | | **Logical Blocks** | 976,773,168 | |
| | | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |
| | **1TB SATA 7200 rpm 6Gb/s 3.5" HDD** | **Capacity** | 1TB | |
| | | **Height** | 1 in; 2.54 cm | |
| | | **Width** | **Media Diameter** | 3.5 in; 8.9 cm |
| | | | **Physical Size** | 4 in; 10.17 cm |
| | | **Interface** | Serial ATA (6.0Gb/s), NCQ enabled | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 600 MB/s | |
| | | **Buffer** | 64MB | |
| | | **Cache** | Adaptive | |
| | | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 2 ms |
| | | | **Average** | 11 ms |
| | | | **Full Stroke** | 21 ms |
| | | **Rotational Speed** | 7,200 rpm | |
| | | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |
| | **2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD** | **Capacity** | 2.0TB | |
| | | **Height** | 1 in; 2.54 cm | |
| | | **Width** | **Media Diameter** | 3.5 in; 8.9 cm |
| | | | **Physical Size** | 4 in; 10.17 cm |
| | | **Interface** | Serial ATA (6.0 Gb/s), NCQ Enabled | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 600 MB/s | |
| | | **Buffer** | 64MB | |
| | | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 1.0 ms |
| | | | **Average** | 11 ms |
| | | | **Full Stroke** | 18 ms |
| | | **Rotational Speed** | 7,200 rpm | |
| | | **Logical Blocks** | 3,907,029,168 | |
| | | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |

## Technical Specifications - Hard Drives

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

---

| **500GB SATA 7.2K SED SFF HDD** | **Capacity** | 500GB | |
|---|---|---|---|
| | **Height** | 0.275 in; 0.7 cm | |
| | **Width** | **Media Diameter** | 2.5 in; 6.36 cm |
| | | **Physical Size** | 2.75 in; 6.99 cm |
| | **Interface** | Serial ATA (6Gb/s) | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | Buffer | 32MB | |
| | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 1ms |
| | | **Average** | 4.2ms |
| | | **Full Stroke** | 25ms (typical) |
| | Rotational Speed | 7,200 rpm | |
| | Operating Temperature | 32° to 140° F (0° to 60° C) | |
| **1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid)** | **Capacity** | 1TB | |
| | **Height** | 1 in; 2.54 cm | |

## Technical Specifications - Hard Drives

| | | | | |
|---|---|---|---|---|
| | | **Width** | **Media Diameter** | 3.5 in; 8.9 cm |
| | | | **Physical Size** | 4 in; 10.17 cm |
| | | **Interface** | 6Gb/s SATA | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | | **Buffer** | 64MB standard HDD cache buffer | |
| | | **Cache** | 8GB NAND flash | |
| | | **Rotational Speed** | 7200 rpm | |
| | | **Operating Temperature** | 32° to 140° F (0° to 60° C) | |
| **SATA SSDs for HP Workstations** | **HP 128GB SATA 6Gb/s SSD** | **Capacity** | 128GB | |
| | | **Protocol** | SATA | |
| | | **Form Factor** | 2.5" | |
| | | **Controller** | AHCI | |
| | | **NAND Type** | MLC | |
| | | **Endurance** | 100TBW (TB Written) | |
| | | **Reliability** (MTTF) | 1.5M hours | |
| | | **Physical Size** (Height) | 0.28 in; 0.7 cm | |
| | | **Physical Size** (Width) | 2.5 in; 6.36 cm | |
| | | **Interface** | SATA 6Gb/s | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 550MB/s (Sequential Read) | |
| | | **Operating Temperature** | 32° to 158° F (0° to 70° C) | |
| | | **Performance** | **Sequential Read** | 560 MB/s |
| | | | **Sequential Write** | 400 MB/s |
| | | | **Random Read** | 90K IOPS |
| | | | **Random Write** | 88K IOPS |
| | **HP 256GB SATA 6Gb/s SSD** | **Capacity** | 256GB | |
| | | **Protocol** | SATA | |
| | | **Form Factor** | 2.5" | |
| | | **Controller** | AHCI | |
| | | **NAND Type** | MLC | |
| | | **Endurance** | 200TBW (TB Written) | |
| | | **Reliability** (MTTF) | 1.5M hours | |
| | | **Physical Size** (Height) | 0.28 in; 0.7 cm | |
| | | **Physical Size** (Width) | 2.5 in; 6.36 cm | |
| | | **Interface** | SATA 6Gb/s | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | | **Operating Temperature** | 32° to 158° F (0° to 70° C) | |
| | | **Performance** | **Sequential Read** | 560MB/s (max) |
| | | | **Sequential Write** | 510MB/s (max) |
| | | | **Random Read** | 100K IOPS (max) |
| | | | **Random Write** | 88K IOPS (max) |

## Technical Specifications - Hard Drives

| | | | |
|---|---|---|---|
| **HP 256GB SATA 6Gb/s SED Opal 2 SSD** | **Capacity** | 256GB | |
| | **Protocol** | SATA | |
| | **Form Factor** | 2.5" | |
| | **Controller** | AHCI | |
| | **NAND Type** | MLC | |
| | **Endurance** | 200TBW (TB Written) | |
| | **Reliability** (MTTF) | 1.5M hours | |
| | **Physical Size** (Height) | 0.28 in; 0.7 cm | |
| | **Physical Size** (Width) | 2.5 in; 6.36 cm | |
| | **Interface** | 6Gb/s SATA | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 550MB/s (Sequential Read) | |
| | **Operating Temperature** | 32° to 158° F (0° to 70° C) | |
| | **Performance** | **Sequential Read** | 560MB/s |
| | | **Sequential Write** | 510 MB/s |
| | | **Random Read** | 100K IOPS |
| | | **Random Write** | 88K IOPS |
| | **Self-Encrypting Drive Support** | OPAL 2 | |
| | | | |
| **HP 512GB SATA 6Gb/s SSD** | **Capacity** | 512GB | |
| | **Protocol** | SATA | |
| | **Form Factor** | 2.5" | |
| | **Controller** | AHCI | |
| | **NAND Type** | MLC | |
| | **Endurance** | 300TBW (TB Written) | |
| | **Reliability** (MTTF) | 1.5M hours | |
| | **Physical Size** (Height) | 0.28 in; 0.7 cm | |
| | **Physical Size** (Width) | 2.5 in; 6.36 cm | |
| | **Interface** | SATA 6Gb/s | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 550MB/s (Sequential Read) | |
| | **Operating Temperature** | 32° to 158° F (0° to 70° C) | |
| | **Performance** | **Sequential Read** | 560 MB/s |
| | | **Sequential Write** | 510 MB/s |
| | | **Random Read** | 100K IOPS |
| | | **Random Write** | 88K IOPS |
| | | | |
| **HP 512GB SATA SED SSD** | **Capacity** | 512GB | |
| | **Protocol** | SATA | |
| | **Form Factor** | 2.5" | |
| | **Controller** | AHCI | |
| | **NAND Type** | MLC | |
| | **Endurance** | 300TBW (TB Written) | |

## Technical Specifications - Hard Drives

|  |  |  |  |
|---|---|---|---|
|  | **Reliability** (MTTF) | 1.5M hours |  |
|  | **Physical Size** (Height) | 0.28 in; 0.7 cm |  |
|  | **Physical Size** (Width) | 2.5 in; 6.36 cm |  |
|  | **Interface** | SATA 6Gb/s |  |
|  | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s |  |
|  | **Operating Temperature** | 32° to 158° F (0° to 70° C) |  |
|  | **Performance** | **Sequential Read** | 560 MB/s |
|  |  | **Sequential Write** | 510 MB/s |
|  |  | **Random Read** | 100K IOPS |
|  |  | **Random Write** | 88K IOPS |
|  | **Self-Encrypting Drive Support** | OPAL 1 and 2 |  |
|  |  |  |  |
| **HP 1TB SATA 6Gb/s SSD** | **Capacity** | 1TB |  |
|  | **Protocol** | SATA |  |
|  | **Form Factor** | 2.5" |  |
|  | **Controller** | AHCI |  |
|  | **NAND Type** | MLC |  |
|  | **Endurance** | 400TBW (TB Written) |  |
|  | **Reliability** (MTTF) | 1.5M hours |  |
|  | **Physical Size** (Height) | 0.28 in; 0.7 cm |  |
|  | **Physical Size** (Width) | 2.5 in; 6.36 cm |  |
|  | **Interface** | SATA 6Gb/s |  |
|  | **Synchronous Transfer Rate** (Maximum) | Up to 550MB/s (Sequential Read) |  |
|  | **Operating Temperature** | 32° to 158° F (0° to 70° C) |  |
|  | **Performance** | **Sequential Read** | 560 MB/s |
|  |  | **Sequential Write** | 510 MB/s |
|  |  | **Random Read** | 100K IOPS |
|  |  | **Random Write** | 88K IOPS |
|  |  |  |  |
| **HP Enterprise Class 240GB SATA SSD** | **Capacity** | 240GB |  |
|  | **Protocol** | SATA |  |
|  | **Form Factor** | 2.5" |  |
|  | **Controller** | AHCI |  |
|  | **NAND Type** | MLC |  |
|  | **Endurance** | 920TBW (TB Written) |  |
|  | **Reliability** (MTTF) | 2.0M hours |  |
|  | **Physical Size** (Height) | 0.28 in; 0.7 cm |  |
|  | **Physical Size** (Width) | 2.5 in; 6.36 cm |  |
|  | **Interface** | 6Gb/s SATA |  |
|  | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s |  |
|  | **Operating Temperature** | 32° to 158° F (0° to 70° C) |  |

## Technical Specifications - Hard Drives

| | | | |
|---|---|---|---|
| | **Performance** | **Sequential Read** | 420 MB/s |
| | | **Sequential Write** | 290 MB/s |
| | | **Random Read** | 63K IOPS |
| | | **Random Write** | 18K IOPS |
| | **Enterprise Class Features** | High Endurance NAND<br>Power Loss Protection<br>End-to-End Data Protection | |
| **HP Enterprise Class 480GB SATA SSD** | **Capacity** | 480GB | |
| | **Protocol** | SATA | |
| | **Form Factor** | 2.5" | |
| | **Controller** | AHCI | |
| | **NAND Type** | MLC | |
| | **Endurance** | 1850TBW (TB Written) | |
| | **Reliability** (MTTF) | 2.0M hours | |
| | **Physical Size** (Height) | 0.28 in; 0.7 cm | |
| | **Physical Size** (Width) | 2.5 in; 6.36 cm | |
| | **Interface** | 6Gb/s SATA | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 600MB/s | |
| | **Operating Temperature** | 32° to 158° F (0° to 70° C) | |
| | **Performance** | **Sequential Read** | 420 MB/s |
| | | **Sequential Write** | 380 MB/s |
| | | **Random Read** | 63K IOPS |
| | | **Random Write** | 23K IOPS |
| | **Enterprise Class Features** | High Endurance NAND<br>Power Loss Protection<br>End-to-End Data Protection | |
| **PCIe SSDs for HP Workstations** | **HP Z Turbo Drive 256GB SSD** | **Capacity** | 256GB |
| | | **Protocol** | PCIe |
| | | **Form Factor** | Half-height, half-length |
| | | **Controller** | AHCI |
| | | **NAND Type** | MLC |
| | | **Endurance** | 146TB |
| | | **Interface** | PCI Express 2.0 x4 electrical  x4 physical |
| | | **Operating Temperature** | 32° to 158° F (0° to 70° C) |
| | | **Performance** | **Sequential Read** 1080 MB/s |
| | | | **Sequential Write** 800 MB/s |
| | | | **Random Read** 120K IOPS |
| | | | **Random Write** 60K IOPS |
| | **HP Z Turbo Drive 512GB SSD** | **Capacity** | 512GB |
| | | **Protocol** | PCIe |

## Technical Specifications - Hard Drives

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

## Technical Specifications - Hard Drives

| | |
|---|---|
| **Form Factor** | Half-height, half-length |
| **Controller** | NVMe |
| **NAND Type** | MLC |
| **Endurance** | 600TB |
| **Reliability** (MTTF) | 1.5M hours |
| **Interface** | PCI Express 3.0 x4 electrical  x4 physical |
| **Operating Temperature** | 32° to 158° F (0° to 70° C) |
| **Performance** | |

| | |
|---|---|
| **Sequential Read** | 2500 MB/s |
| **Sequential Write** | 1550 MB/s |
| **Random Read** | 210K IOPS |
| **Random Write** | 130K IOPS |

## Technical Specifications - Hard Drives

| HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD | Capacity | 512GB | |
|---|---|---|---|
| | Protocol | PCIe | |
| | Form Factor | PCIe Card, Full Height PCIe Slot | |
| | Controller | NVMe | |
| | NAND Type | MLC | |
| | Endurance | 146TB | |
| | Reliability (MTBF) | 1.5M hours | |
| | Interface | PCIe Gen3 x4 architecture | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | |
| | Performance | Sequential Read | 2150 MB/s |
| | | Sequential Write | 1260 MB/s |
| | | Random Read | 300K IOPS |
| | | Random Write | 100K IOPS |

| HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD | Capacity | 1TB | |
|---|---|---|---|
| | Protocol | PCIe | |
| | Form Factor | PCIe Card, Full Height PCIe Slot | |
| | Controller | NVMe | |
| | NAND Type | MLC | |
| | Endurance | 292TB | |
| | Reliability (MTBF) | 1.5M hours | |
| | Interface | PCIe Gen3 x4 architecture | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | |
| | Performance | Sequential Read | 2150 MB/s |
| | | Sequential Write | 1550 MB/s |
| | | Random Read | 300K IOPS |
| | | Random Write | 100K IOPS |

| HP Z Turbo Drive G2 256GB SED SSD | Capacity | 256GB | |
|---|---|---|---|
| | Protocol | PCIe | |
| | Form Factor | Half-height, half-length | |
| | Controller | NVMe | |
| | NAND Type | MLC | |
| | Endurance | 150TBW (TB Written) | |
| | Reliability (MTBF) | 1.5M hours | |
| | Interface | PCI Express 3.0 x4 electrical  x4 physical | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | |
| | Performance | Sequential Read | 3100 MB/s |
| | | Sequential Write | 1400 MB/s |
| | | Random Read | 330K IOPS |
| | | Random Write | 280K IOPS |

## Technical Specifications - Hard Drives

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

Technical Specifications - Hard Drive Controllers

## HARD DRIVE CONTROLLERS

| LSI 9217-4i4e 8-port SAS 6Gb/s RAID Card | | | |
|---|---|---|---|
| **PCI Bus** | 8 lanes, PCI Express 3.0 | | |
| **RAID Levels** | Offers Integrated RAID (0, 1, 1E and 10) | | |
| **PCI Data Burst Transfer Rate** | Half Duplex  x8, PCIe, 8000 MB/s | | |
| **SAS Bandwidth** | **Half Duplex** | | 600 MB/s per lane |
| **PCI Card Type** | 3.3V Add-in Card | | |
| **PCI Voltage** | 12 V ± 10% | | |
| **PCI Power** | 9.8W typical, Airflow min 200 LFM | | |
| **Bracket** | Full height and low profile | | |
| **Certification Level** | PCI Express 3.0 compliant | | |
| **SAS Processor** | LSI SAS2308/ Fusion MPT 2.0 | | |
| **Internal Connectors** | One x4  internal mini-SAS  (SFF8087) | | |
| **External Connectors** | One x4 external mini-SAS (SFF8088) | | |
| **Maximum Number of SCSI Devices** | 256 Non-RAID SAS/SATA devices | | |
| **LED Indicators** | N/A | | |

| LSI 9270-8i SAS 6Gb/s ROC RAID Card and iBBU9 Battery Backup Unit | |
|---|---|
| **PCI Bus** | x8 lane PCIe 3.0 compliant |
| **RAID Levels** | RAID 0, 1, 5, and 6 |
| **PCI Data Burst Transfer Rate** | RAID spans 10, 50 and 60 |
| **PCI Card Type** | Low profile, single PCIe slot design with full height bracket. |
| **PCI Voltage** | +3.3V Add-in Card |
| **PCI Power** | +3.3V, +12V |
| **Bracket** | PCI-Express 3.0 |
| **Certification Level** | Eight 6Gb/s and 3Gb/s compatible SAS/SATA ports |
| **SAS Processor** | LSISAS2208 Dual-Core RAID on Chip (ROC) |
| **Internal Connectors** | Two SAS SFF8087 x4 (Mini-SAS) |
| **External Connectors** | None |
| **Maximum Number of SCSI Devices** | Up to 128 SAS and/or SATA hard drives and SSDs |
| **LED Indicators** | **Heartbeat LED on card** |

Technical Specifications - Graphics

## GRAPHICS

| **NVIDIA NVS 310 1GB Graphics** | **Form Factor** | Low Profile:<br>2.713 inches in height × 6.150 inches in length<br>Weight: ~142 grams |
|---|---|---|
| | **Graphics Controller** | NVIDIA NVS 310<br>GPU: GF119-825 |
| | **Bus Type** | PCI Express x16, 2.0 compliant |
| | **Memory** | Size: 1GBB DDR3<br>Clock: 875Mhz<br>Memory Bandwidth: 14GB/ |
| | **Connectors** | 2x DisplayPort 1.2 |
| | **Maximum Resolution** | Up to 2560 x 1600 (digital display) per display. |
| | **Image Quality Features** | The following video formats are supported:<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<br><br>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:<br><br>DisplayPort output:<br>• 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<br>• Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology.<br><br>DVI-D output:<br>• 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<br>• 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<br><br>HDMI output: |

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- 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<br>Windows 8<br>Genuine Windows 7 Professional (64-bit and 32-bit)<br>Red Hat Enterprise Linux(RHEL)<br>SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)<br><br>HP qualified drivers may be preloaded or the latest HP qualified drivers are available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html<br><br>SUSE Linux Enterprise drivers may also be obtained from:<br>ftp://download.nvidia.com/novell or http://www.nvidia.com |
| **Notes** | 1. The thermal solution used on this card is an active fan heatsink.<br>2. Factory configured NVS 310 graphics card have no cable adpaters included. Adapters must be ordered separately.<br>3. Option kit NVS 310 includes 2 DP to DVI-D cable adapters.<br>4. Configurations of three NVS 310 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA). |

| | | |
|---|---|---|
| **NVIDIA NVS 315 1 GB Graphics** | **Form Factor** | Low Profile:<br>2.713 inches in height × 5.7 inches in length<br>Weight: ~142 grams |
| | **Graphics Controller** | NVIDIA NVS 315 (using GF119-825 GPU)<br>Number of Cores: 48 CUDA cores<br>Max. Power: 19.3W<br>Cooling Solution: Active fan heatsink |
| | **Bus Type** | PCI Express x16, 2.0 compliant |
| | **Memory** | Size: 1GB DDR3<br>Clock: 875Mhz<br>Memory Bandwidth: 14GB/s |
| | **Connectors** | 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 |
| | **Maximum Resolution** | Maximum number of displays supported: 2 |

## Technical Specifications - Graphics

Maximum Resolution Support:
 - DMS-59 to VGA: 2048 x 1536 @ 85Hz
 - DMS-59 to DVI: 1980 x 1200 @ 60Hz
 - DMS-59 to DP: 2560 x 1600 @ 60Hz

**Image Quality Features**
See Display Output section.

The following video formats are supported:
- MPEG2
- MPEG4 Part 2 Advanced Simple Profile
- H.264 SVC codec support
- Support for 3D Blu Ray
- VC1
- DivX version 3.11 or later

A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.

**Display Output**
Up to 2 displays using one of the following DMS-59 cables:
- DMS-59 to DVI
- DMS-59 to VGA
- DMS-59 to DP

DisplayPort output:
- Drives two DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter.

DVI-D output:
- Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor

VGA display output:
- Drives two analog displays at resolutions up to 2048 × 1536 at 85 Hz using DMS-59 to VGA cable adaptor.

**Shading Architecture**
Shader Model 5.0

**Supported Graphics APIs**
DX11, OpenGL 4.3

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

| | | |
|---|---|---|
| **NVIDIA NVS 510 2GB Graphics** | **Form Factor** | Low Profile, 2.713 inches × 6.3 inches, single slot |
| | **Graphics Controller** | NVS 510 GPU<br>Core Clock: 797 MHz<br>Memory Clock: 891 MHz<br>CUDA Cores: 192 |
| | **Bus Type** | PCI Express x16, Generation 2.0 |
| | **Memory** | 2GB DDR3 |
| | **Connectors** | Four mini-DisplayPort.<br>Four mini-DisplayPort-to-DisplayPort adapters included.<br>(DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories) |
| | **Maximum Resolution** | Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 x 2160 @ 60Hz)<br><br>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**

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

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

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**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**

**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<br>Full OpenGL 4.3 support |
| **Available Graphics Drivers** | 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) 6 Desktop/Workstation<br>SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit)<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html |
| **Notes** | Heatsink cooler design is active. |

| **NVIDIA Quadro K620 2GB Graphics** | | |
|---|---|---|
| | **Form Factor** | 2.713" H x 6.3" L<br>Single Slot, Low Profile<br>Full Height Profile bracket installed<br>Low Profile bracket included<br>Weight: 133 grams |
| | **Graphics Controller** | NVIDIA Quadro K620 Graphics Card<br>GM107 GPU<br>384 CUDA cores<br>Max Power: 45 Watts |
| | **Bus Type** | PCI Express 2.0 x16 |
| | **Memory** | 2 GB GDDR3, 900 MHz<br>128-bit memory I/O path<br>29 GB/s memory bandwidth |
| | **Connectors** | 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<br><br>Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
| | **Maximum Resolution** | DisplayPort 1.2:<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>- up to 1920 x 1200 x 32 bpp @ 60Hz |

## Technical Specifications - Graphics

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|---|---|
| **Image Quality Features** | 10-bit internal display processing pipeline<br>10-bit scan-out support |
| **Display Output** | 1 Dual-link DVI-I connector<br>1 Display Port connector |
| **Shading Architecture** | Full Microsoft DirectX 11.1 Shader Model 5.0 |
| **Supported Graphics APIs** | OpenGL 4.4<br>DirectX 11.1<br>API support includes:<br>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran |
| **Available Graphics Drivers** | 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>http://welcome.hp.com/country/us/en/support.html |
| **Notes** | 1. Factory configured Quadro K620 does not include a video cable adapter. Video cable adapters must be ordered separately.<br>2. Quadro K620 offered as an Option Kit (AMO) includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately. |

| **NVIDIA Quadro K420 2GB Graphics** | | |
|---|---|---|
| | **Form Factor** | Low Profile:<br>2.713 inches × 6.3 inches<br>Cooling: Active |
| | **Graphics Controller** | NVIDIA Quadro K420<br>GPU: GK107 with 192 CUDA cores<br>Power: 41W |
| | **Bus Type** | PCI Express x16, 2.0 compliant |
| | **Memory** | Size: 2GB DDR3<br>Clock: 891MHz<br>Memory Bandwidth: 29GB/s<br>Memory Width: 128 bit |
| | **Connectors** | One dual-link DVI-I connector<br>One DisplayPort connector<br><br>Factory Configured: No video cable adapter included<br>After market option kit: One DP-to-DVI adapter included with card<br><br>Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
| | **Maximum Resolution** | VGA (via adapter cable):<br>- 2048 × 1536 × 32 bpp at 85 Hz<br><br>Dual-link DVI<br>- 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking)<br><br>Single-link DVI<br>- 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) |

## Technical Specifications - Graphics

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|---|---|---|
|  |  | DisplayPort 1.2<br>- 3840 × 2160 × 30 bpp at 60 Hz |
|  | **Image Quality Features** | 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)<br><br>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo |
|  | **Display Output** | 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. |
|  | **Shading Architecture** | Shader Model 5.0 |
|  | **Supported Graphics APIs** | DX11, OpenGL 4.4<br>Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran |
|  | **Available Graphics Drivers** | Microsoft Windows 8.1<br>Microsoft Windows 8<br>Microsoft Windows 7<br>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions |
|  | **Notes** | 1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately.<br>2. Option kit Quadro K420 includes one DP to DVI-D adapter.<br>3. Full Height Profile bracket installed. Low Profile bracket included in after market kit. |
| **NVIDIA Quadro K1200 4GB Graphics**<br>**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 |
|  | **Graphics Controller** | NVIDIA Quadro K1200 Graphics Card<br>GPU: GM107 with 512 CUDA cores<br>Power: 46 Watts |
|  | **Bus Type** | PCI Express 2.0 x16 |
|  | **Memory** | Size: 4GB GDDR5 |

## Technical Specifications - Graphics

|  |  |
|---|---|
|  | Memory Bandwidth: 80 GB/s<br>Memory Width: 128-bit |
| **Connectors** | 4 mini-DisplayPort 1.2a |
|  | Factory Configured Option: 4 mini-DP-to-DP adapters included with card<br>Option Kit: 4 mini-DP-to-DP adapters included with card |
|  | Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories |
| **Maximum Resolution** | DisplayPort:<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 × 1536 × 32 bpp at 85 Hz |
| **Image Quality Features** | 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection) |
| **Display Output** | Maximum number of displays<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. |
| **Shading Architecture** | Shader Model 5.0 |
| **Supported Graphics APIs** | 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 |
| **Available Graphics Drivers** | Microsoft Windows 8.1<br>Microsoft Windows 8<br>Microsoft Windows 7<br>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions<br><br>HP qualified drivers may be preloaded or available from the HP support Web site: |

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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). |

| **NVIDIA Quadro K2200 4 GB Graphics** | | |
|---|---|---|
| | **Form Factor** | 4.38" H x 7.97" L<br>Single Slot, Full Height |
| | **Weight:** | 240 grams |
| | **Graphics Controller** | NVIDIA Quadro K2200 Graphics Card<br>GM107 GPU<br>640 CUDA cores<br>Max Power: 67.7 Watts |
| | **Bus Type** | PCI Express 2.0 x16 |
| | **Memory** | 4 GB GDDR5, 2500 Mhz<br>128-bit memory I/O path<br>80 GB/s memory bandwidth |
| | **Connectors** | 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<br><br>Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories |
| | **Maximum Resolution** | 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 |
| | **Image Quality Features** | 10-bit internal display processing pipeline<br>10-bit scan-out support |
| | **Display Output** | VGA:<br>• requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters<br>• 400 MHz integrated RAMDAC<br>• Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz<br><br>DL-DVI(I):<br>• Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz<br><br>SL-DVI(I):<br>• Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz<br><br>DisplayPort:<br>• Supports HBR2 and MST |

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

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

| | |
|--|--|
| **Shading Architecture** | Full Microsoft DirectX 11.1 Shader Model 5.0 |
| **Supported Graphics APIs** | OpenGL 4.4<br>DirectX 11.1<br>API support includes:<br>CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran |
| **Available Graphics Drivers** | 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>http://welcome.hp.com/country/us/en/support.html |
| **Notes** | 1. Quadro K2200 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.<br>2. Quadro K2200 offered as an Option Kit includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.<br>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.<br>4. A DisplayPort hub device may be used to connect multiple DisplayPort monitors to a single Quadro K2200 DisplayPort output. |

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| **NVIDIA Quadro M2000 4GB Graphics** | **Form Factor** | Dimensions: 4.376" H x 6.6" L<br>Single Slot, Full Height<br>Cooling: Active<br>Weight: 239 grams |
| | **Graphics Controller** | NVIDIA Quadro M2000 Graphics Card<br>GPU: GM206 with 768 CUDA cores<br>Power: 75 Watts |
| | **Bus Type** | PCI Express 3.0 x16 |
| | **Memory** | Size: 4GB GDDR5<br>Memory Bandwidth: 105.7 GB/s<br>Memory Width: 128-bit |
| | **Connectors** | 4x DisplayPort 1.2a |

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<table>
<tr>
<td></td>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td><strong>Maximum Resolution</strong></td>
<td>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 M2000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution.</td>
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<td><strong>Image Quality Features</strong></td>
<td>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</td>
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<td><strong>Display Output</strong></td>
<td>Maximum number of displays<br>- 4 direct attached monitors<br><br>Maximum number of monitors across all available Quadro M2000 outputs is 4.</td>
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<tr>
<td></td>
<td><strong>Shading Architecture</strong></td>
<td>Shader Model 5.0</td>
</tr>
<tr>
<td></td>
<td><strong>Supported Graphics APIs</strong></td>
<td>OpenGL 4.5<br>DirectX 12<br><br>API support includes:<br>CUDA C, CUDA C++, DirectCompute 5.0, and OpenCL software</td>
</tr>
<tr>
<td></td>
<td><strong>Available Graphics Drivers</strong></td>
<td>Microsoft Windows 10<br>Microsoft Windows 7<br>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html</td>
</tr>
<tr>
<td></td>
<td><strong>Notes</strong></td>
<td>1. Quadro M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.<br>2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.</td>
</tr>
<tr>
<td><strong>AMD FirePro W2100 2GB Graphics</strong></td>
<td><strong>Form Factor</strong></td>
<td>Low Profile, half length (full-height bracket included)</td>
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<td></td>
<td><strong>Graphics Controller</strong></td>
<td>AMD FirePro™ W2100 professional graphics<br><br>Power: &lt;50W</td>
</tr>
</table>

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

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| AMD FirePro W4300 4GB Graphics | Form Factor | Low Profile, single slot (6.6" x 3.118")<br>Full Height, single slot (6.6" x 4.725") |
|---|---|---|
| | Graphics Controller | 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 |
| | Bus Type | PCI Express® x16, Generation 3.0 |
| | Memory | 4GB GDDR5 memory<br>Memory Bandwidth: up to 96 GB/s<br>Memory Width: 128 bit |
| | Connectors | 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. |
| | Maximum Resolution | DisplayPort:<br>- 4096x2160 @24bpp (3 x 4K @ 60Hz, 4 x 4K @ 30Hz) |
| | Image Quality Features | Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.<br>High bandwidth scaler for high quality up and downscaling<br>Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows<br>GPU control of display refresh rates for tear-free and jitter-free image quality<br>when rotating models or viewing video content.(Requires FreeSync compliant displays) |
| | Display Output | 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<br><br>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):<br>• one 4096x2160 display<br>• two 2560x1600 displays<br>• four 1920x1200 displays |
| | Shading Architecture | Shader Model 5.0 |
| | Supported Graphics APIs | OpenGL 4.4<br>OpenCL 2.0<br>DirectX 12.0 |
| | Available Graphics Drivers | Windows 10  (64-bit and 32-bit)<br>Windows® 7  (64-bit and 32-bit)<br>Linux |

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|---|---|---|
|  | **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. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details. |
|  |  | 2. Configurations of two FirePro W4300 graphics cards in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA). |

| **AMD FirePro W5100 4GB Graphics** | **Form Factor** | Full height, single slot (6.75" X 4.376") |
|---|---|---|
|  | **Graphics Controller** | AMD FirePro W5100 graphics<br>GPU Frequency: 930Mhz<br>GPU: 768 Stream Processors organized into 12 Compute Units<br>Power: <75 Watts<br>Cooling: Active |
|  | **Bus Type** | PCI Express® x16, Generation 3.0 |
|  | **Memory** | 4GB GDDR5 memory<br>Memory Bandwidth: up to 96 GB/s<br>Memory Width: 128 bit |
|  | **Connectors** | 4x 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 or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
|  | **Maximum Resolution** | 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) |
|  | **Image Quality Features** | Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.<br>High bandwidth scaler for high quality up and downscaling |

## Technical Specifications - Graphics

| | | |
|---|---|---|
| | **Display Output** | 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<br><br>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):<br>- one 4096x2160 display<br>- two 2560x1600 displays<br>- four 1920x1200 displays |
| | **Shading Architecture** | Shader Model 5.0 |
| | **Supported Graphics APIs** | OpenGL 4.4<br>OpenCL 1.2 and 2.0<br>DirectX 11.2 / 12<br>AMD Mantle |
| | **Available Graphics Drivers** | Windows 8.1 / 8 (64-bit and 32-bit)<br>Windows® 7 (64-bit and 32-bit)<br>Linux<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html |
| | **Notes** | 1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required.  A maximum of two active adapters is recommended for consumer systems. See www.amd.com/eyefinityfaq for full details. |
| | **Form Factor** | Full height, single slot (6.75" X 4.376") |
| **NVIDIA Quadro M4000 8GB Graphics** | **Form Factor** | Dimensions: 4.4" H x 9.5" L<br>Single Slot, Full Height<br>Cooling: Active<br>Weight: 475 grams (without extender) |
| | **Graphics Controller** | NVIDIA Quadro M4000<br>GPU: GM204 with 1664 CUDA cores<br>Power: 120 Watts |
| | **Bus Type** | PCI Express 3.0 x16 |
| | **Memory** | Size: 8GB GDDR5<br>Memory Bandwidth: 192 GB/s<br>Memory Width: 256-bit |
| | **Connectors** | 4 DisplayPort 1.2a |

## Technical Specifications - Graphics

Factory configured Option: No video cable adapter included
After market option kit: No video cable adapter included

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

**Maximum Resolution**

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

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

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

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

**Image Quality Features**

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

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

Full OpenGL quad buffered stereo support

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

**Display Output**

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

Maximum number of DisplayPort displays possible:
- 4 1920x1200
- 4 2560x1600
- 4 4096x2160
- 2 5120x2880 (requires dual DP input capable 5k displays)

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

**Shading Architecture**

Shader Model 5.0

**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

## Technical Specifications - Graphics

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

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

| | | |
|---|---|---|
| | **Notes** | 1. Configurations using the Quadro M4000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA). |
| **NVIDIA Quadro M5000 8GB Graphics** | **Form Factor** | Dimensions: 4.4" H x 10.5" L<br>Dual Slot, Full Height<br>Cooling: Active<br>Weight: 525 grams (without extender) |
| | **Graphics Controller** | NVIDIA Quadro M5000<br>GPU: GM204 with 2048 CUDA cores<br>Power: 150 Watts |
| | **Bus Type** | PCI Express 3.0 x16 |
| | **Memory** | Size: 8GB GDDR5 ECC capable<br>Memory bandwidth: 211GB/s<br>Memory Width: 256-bit |
| | **Connectors** | 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 |
| | **Maximum Resolution** | 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 × 1536 × 32 bpp at 85 Hz |

## Technical Specifications - Graphics

| | |
|---|---|
| **Image Quality Features** | 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. |
| **Display Output** | 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)<br><br>Maximum number of monitors across all available Quadro M5000 outputs is 4. |
| **Shading Architecture** | Shader Model 5.0 |
| **Supported Graphics APIs** | OpenGL 4.5<br>DirectX 12<br><br>API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, Fortran |
| **Available Graphics Drivers** | Microsoft Windows 10<br>Microsoft Windows 8.1<br>Microsoft Windows 8<br>Microsoft Windows 7<br>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html |
| **Notes** | 1. Factory configured Quadro M5000 does not include a video cable adapter. Video cable adapters must be ordered separately.<br>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).<br>3. Configurations of a single Quadro M5000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, |

## Technical Specifications - Graphics

configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

| NVIDIA Quadro K4200 4GB Graphics | | |
|---|---|---|
| | **Form Factor** | Dimensions: 4.376" H x 9.5" L<br>Single Slot, Full Height<br>Cooling: Active |
| | **Weight:** | 461 grams (without extender) |
| | **Graphics Controller** | NVIDIA Quadro K4200<br>GPU: GK104-850 GPU with 1344 CUDA cores<br>Power: 108 Watts |
| | **Bus Type** | PCI Express 2.0 x16 |
| | **Memory** | Size: 4GB GDDR5<br>Memory Bandwidth: 173 GB/s<br>Memory Width: 256-bit |
| | **Connectors** | 1 DL-DVI(I)<br>2 DisplayPort 1.2a<br><br>Factory Configured Option: No video cable adapter included<br>After market option kit: One DP-to-DVI adapter included with card<br><br>Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories |
| | **Maximum Resolution** | DisplayPort:<br>- up to 3840 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 × 1536 × 32 bpp at 85 Hz |
| | **Image Quality Features** | 10-bit internal display processing (hardware support for 10-bit scanout for both windowed desktop and full screen, only available on Windows with Aero disabled and Linux)<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 |

## Technical Specifications - Graphics

| | | |
|---|---|---|
| **Display Output** | Maximum number of displays<br>- 3 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>- 2 3840x2160<br><br>Maximum number of monitors across all available Quadro K4200 outputs is 4. | |
| **Shading Architecture** | Shader Model 5.0 | |
| **Supported Graphics APIs** | 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 | |
| **Available Graphics Drivers** | Microsoft Windows 8.1<br>Microsoft Windows 8<br>Microsoft Windows 7<br>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html | |
| **Notes** | 1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.<br>2. Quadro K4200 offered as After Market Kits includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.<br>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).<br>4. Configurations of a single Quadro K4200 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA). | |

| | | |
|---|---|---|
| **NVIDIA Quadro K5200 8GB Graphics** | **Form Factor** | 4.376" H x 10.5" L<br>Dual Slot |
| | **Weight:** | **~880 grams** |
| | **Graphics Controller** | NVIDIA Quadro K5200<br>GK 110 GPU |

## Technical Specifications - Graphics

|  |  |
|---|---|
|  | 2304 CUDA cores<br>Max Power: 150 Watts |
| **Bus Type** | PCI Express 3.0 x16 |
| **Memory** | 8GB GDDR5<br>256-bit memory I/O path<br>192 GB/s memory bandwidth |
| **Connectors** | DVI-I (1), DVI-D (1), DP (2),<br><br>Factory configured option: No adapter included with card.<br>Option Kit: No adaptor included with card.<br><br>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories. |

**Image Quality Features**

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

**Display Output**

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

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

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

DisplayPort with MST and HBR2.
- Maximum resolution: 4096 × 2160 × 30 bpp at 60Hz
- Maximum resolution:2560 x 1600 x 30bpp at 120Hz

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

**Shading Architecture**    Shader Model 5.0

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

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

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

| | | |
|---|---|---|
| **AMD FirePro W7100 8GB Graphics** | **Form Factor** | Full height, single slot (9.5" X 4.376") |
| | **Weight:** | AMD FirePro W7100 graphics<br>GPU: 1792 Stream Processors organized into 28 Compute Units<br>Power: <75 Watts<br>Cooling: Active |
| | **Graphics Controller** | PCI Express® x16, Generation 3.0 |
| | **Bus Type** | 8GB GDDR5 memory<br>Memory Bandwidth: up to 176 GB/s<br>Memory Width: 256 bit |
| | **Memory** | 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. |
| | **Connectors** | 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) |
| | **Image Quality Features** | Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.<br>High bandwidth scaler for high quality up and downscaling |
| | **Display Output** | 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):<br>- one 4096x2160 display<br>- two 2560x1600 displays<br>- four 1920x1200 displays |
| **Shading Architecture** | Shader Model 5.0 |
| **Supported Graphics APIs** | OpenGL 4.4<br>OpenCL 1.2 and 2.0<br>DirectX 11.2 / 12<br>AMD Mantle |
| **Available Graphics Drivers** | Windows 8.1 / 8 (64-bit and 32-bit)<br>Windows® 7 (64-bit and 32-bit)<br>Linux<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html |
| **Notes** | 1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required.  See www.amd.com/eyefinityfaq for full details.<br>2. OpenGL 4.4 support available with driver 14.301.xxx or later.<br>3. OpenCL 2.0 support planned in driver updates for early 2015.<br>4. For HP Z440 Workstation configurations, the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA), is required. |

Technical Specifications - Graphics

## HIGH PERFORMANCE GPU COMPUTING

| NVIDIA Tesla K40 Workstation Compute Processor | Form Factor | Size: 4.376 inches by 10.5 inches<br>Slots: Dual Slot<br>Power Connectors: One 6-pin and one 8-pin |
|---|---|---|
| | **Weight:** | ~826 grams |
| | **System Interface** | PCI Express Gen3 ×16 |
| | **Video Outputs** | None. |
| | **Memory** | 12GB GDDR5,<br>memory path: 384-bit<br>memory clock: 3Ghz |
| | **Peak Memory Bandwidth** | 288 GB/s |
| | **Supported APIs** | CUDA, OpenACC, OpenCL 1.2 API support includes:<br>C, C++, Java, Python, and Fortran |
| | **Supported Operating Systems** | Windows 8 (64-bit)<br>Genuine Windows 7 Professional (64-bit)<br>Red Hat Enterprise Linux (RHEL) 5, 6 Desktop/Workstation (64-bit)<br>SUSE Linux Enterprise Desktop 11 (64-bit)<br><br>HP qualified drivers may be preloaded or available from the HP support Web site:<br>http://welcome.hp.com/country/us/en/support.html<br><br>Novell SUSE Linux Enterprise drivers may also be obtained from:<br>ftp://download.nvidia.com/novell or http://www.nvidia.com |
| | **Processor Cores** | GK110B GPU<br>Base Clock: 745 MHz<br>Boost Clock: up to 875 MHz<br>2888 CUDA cores |
| | **Power Consumption** | ~235 Watts<br><br>**Note:** A 700W PSU is required for any K40 configuration on the Z440. |

## OPTICAL AND REMOVABLE STORAGE

# QuickSpecs

Technical Specifications – Optical and Removable Storage

## OPTICAL AND REMOVABLE STORAGE

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

## Technical Specifications – Optical and Removable Storage

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

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

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

## Technical Specifications – Optical and Removable Storage

|  |  |  |
|---|---|---|
|  | DVD-R<br>DVD-RW<br>CD-R<br>CD-RW |  |
| **Disc Capacity** | DVD-ROM | 8.5 GB DL or 4.7 GB standard |
|  | Blu-ray | 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 |
| **Maximum Data Transfer Rates** | 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-R      Up to 6X<br>BD-RE SL/DL  Up to 6X |
| **Power** | Source | SATA DC power receptacle |
|  | DC Power Requirements | 5 VDC ± 5%-100 mV ripple p-p |
|  | DC Current | 5 VDC -900 mA typical, 2000mA maximum |
| **Operating Environmental (all conditions non-condensing)** | Temperature | 41° to 122° F (5° to 50° C) |
|  | Relative Humidity | 10% to 80% |
|  | Maximum Wet Bulb Temperature | 84° F (29° C) |

## Technical Specifications – Optical and Removable Storage

| | | |
|---|---|---|
| | **Operating Systems Supported** | Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, <br> Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. <br> Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation <br> SUSE Linux Enterprise Desktop 10 & 11 <br><br> No driver is required for this device. Native support is provided by the operating system. |
| | **Kit Contents** | 9.5mm Slim BDXL Blu-Ray Writer, 5.25" ODD Bay adapter/carrier, slim SATA data/power cable, installation guide |
| | | As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation. |
| **HP DX115 Removable Drive Enclosure** | **Interface Type** | Compatible with SAS or SATA controllers.  Offers 6Gb/s performance when used with 6Gb/s HDDs. |
| | **Dimensions** (WxHxD) | 147.6mm W x 41.1mm H x 205mm D <br> (5.81" W x 1.62" H x 8.08" D) |
| | **Approvals** | Frame and Carrier: 1.73 kg (3.8 lbs.) <br> Carrier: 0.45 kg (1 lbs.) |
| **HP 15-in-1 Media Card Reader** | **Description** | Supports hardware ECC (Error Correction Code) function <br> Supports hardware CRC (Cyclic Redundancy Check) function <br> Supports MS 4-bit parallel transfer mode <br> Supports MS-PRO 4-bit parallel transfer mode <br> Supports MS PRO-HG Duo 4-bit parallel transfer mode <br> Supports SD 4-bit parallel transfer mode <br> Supports UHS-104 SD 4-bit card (version 3.0) <br> Supports CF v6.0 with PIO mode 6 and Ultra DMA 7 mode |
| | **Interface Type** | USB 3.0 High-speed interface <br> **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 <br> CompactFlash Type II <br> Microdrive <br> Secure Digital Card (SD) <br> Secure Digital High Capacity (SDHC) <br> SD Extended Capacity Memory Card (SDXC) <br> SD Ultra High Speed II(SD UHSII) <br> Memory Stick <br> Memory Stick Select <br> Memory Stick Duo (MS Duo) <br> Memory Stick PRO (MS PRO) <br> Memory Stick PRO Duo (MS PRO Duo) <br> Memory Stick PRO-HG Duo |

## Technical Specifications – Optical and Removable Storage

|  |  |
|---|---|
|  | MagicGate Memory Stick (MG) |
|  | MagicGate Memory Stick Duo |
|  |  |
|  | These additional media types are supported with a card adapter. |
|  | Memory Stick Micro (M2) |
|  | miniSD |
|  | miniSD High Capacity |
|  | Micro SD Memory Card (MicroSD) |
|  | Micro SD High Capacity Memory Card (MicroSDHC) |
|  |  |
|  | Test Parameters/Conditions - Power applied, unit operating on system ±5% |
| **Operating Systems Supported** | Windows 8 Pro (64-bit)* |
|  | Windows 8.1 (64-bit)* |
|  | Windows 8 (64-bit)* |
|  | Windows 7 Ultimate (32-bit)** |
|  | Windows 7 Ultimate (64-bit)** |
|  | Windows 7 Professional (32-bit)** |
|  | Windows 7 Professional (64-bit)** |
|  | Windows 7 Home Basic** |
|  | Windows 7 Home Premium (32-bit)** |
|  | Windows 7 Home Premium (64-bit)** |
|  | Windows Vista Business 64 |
|  | Windows Vista Business 32 |
|  | Windows Vista Home Basic 32 |
|  | Windows XP Professional |
|  | Windows XP Home 32 |
|  |  |
|  | No driver is required for this device. Native support is provided by the operating system. |
|  |  |
|  | Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See http://www.microsoft.com. |
|  | Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details. |
| **Kit Contents** | Media card reader, 5.25" bracket/rails/bezel, Install Guide, IO & Security Software and Documentation CD |
| **Approvals** | USB-IF, WHQL, Compliant with USB Mass Storage Class Bulk only Transport Specification Rev. 1.0, Compliant Intel Front Panel I/O Connectivity Design Guide V. 1.3, FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUVT |
|  |  |
| **Weight** | 0.35 lbs. (0.16 kg) |

Technical Specifications - Controller Cards

## CONTROLLER CARDS

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

## Technical Specifications - Networking and Communications

## NETWORKING AND COMMUNICATIONS

| | | |
|---|---|---|
| **Integrated Intel I218LM PCIe GbE Controller** | **Connector** | RJ-45 (motherboard integration) |
| | **Controller** | Intel I218LM GbE platform LAN connect networking controller |
| | **Memory** | 3 KB FIFO packet buffer memory (both Tx and Rx) |
| | **Data Rates Supported** | 10/100/1000 Mbps |
| | **Compliance** | 802.1as, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3x, 802.3z |
| | **Bus Architecture** | PCI Express 1.1 (x1) and SMBus |
| | **Data Transfer Mode** | PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state) |
| | **Power Requirement** | Requires 3.3V only (integrated regulators) |
| | **Boot ROM Support** | Yes |
| | **Network Transfer Mode** | Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver) |
| | **Network Transfer Rate** | 10BASE-T (half-duplex) 10 Mbps<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 |
| | **Management Capabilities** | WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostics<br>AMT 9.1 support, vPro compliant |
| **HP X520 10GbE Dual Port Adapter** | **Hardware Certifications** | FCC B, UL, CE, VCCI, BSMI, CTICK, KCC |
| **HP 10GbE SFP+ SR Transceiver** | **Operating Temperature** | 0°C to 45°C (32°F to 113°F) |
| | **Operating Humidity** | 0% to 85%, noncondensing |
| | **Dimensions** (H x W x D) | 0.47(h) x 0.54(w) x 2.19(d)inches<br>(1.19 x 1.38 x 5.57 cm) |
| **HP 361T PCIe Dual Port Gigabit NIC** | **Connector** | Two RJ-45 |
| | **Controller** | Intel® Ethernet I350 Controller |
| | **Data Rates Supported** | 10/100/1000 Mbps, Half- and full-duplex |
| | **Compliance** | 802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588<br>PCIe v2.0 standard<br>RoHS (6 of 6)<br>FCC (U.S. only) Class B<br>DOC (Canada) Class B<br>CE EN 55024, EN55022 Class B<br>VCCI Class II<br>UL 1950<br>CSA 950<br>EN 60950<br>CE<br>ACPI 1.1a<br>Microsoft WHQL (Windows Hardware Quality Labs) |

## Technical Specifications - Networking and Communications

| | |
|---|---|
| **Data Path Width** | Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots |
| **Power Requirement** | 4.1W idle without EEE link partner<br>3.2W idle with EEE link partner<br>4.2W maximum |
| **Network Transfer Rate** | 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 |
| **Operating Temperature** | 32° to 131°F (0° to 55° C) |
| **Operating Humidity** | 10% to 95% non-condensing |
| **Dimensions** (H x W x D) | 5.3 x 2.5 in (13.50 cm x 6.4 cm) (without brackets) |
| **Operating System Driver Support** | Windows 7 Professional 32-bit and 64-bit.<br>Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation<br>Novell SLED 10 & SLED 11 |
| **Kit Contents** | HP 361T PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in)<br>Product Warranty statement and the Quick Install Card (QIC). |

| | | |
|---|---|---|
| **Intel Ethernet I350-T2 2-Port 1Gb NIC** | **Connector** | Two RJ-45 |
| | **Controller** | Intel® Ethernet I350 Controller |
| | **Data Rates Supported** | 10/100/1000 Mbps, Half- and full-duplex |
| | **Compliance** | 802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588<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) |
| | **Data Path Width** | Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots |
| | **Power Requirement** | 4.1W idle without EEE link partner<br>3.2W idle with EEE link partner<br>4.2W maximum |
| | **Network Transfer Rate** | 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 |

## Technical Specifications - Networking and Communications

| | |
|---|---|
| **Operating Temperature** | 32° to 131° F (0° to 55° C ) |
| **Operating Humidity** | 10% to 95% non-condensing |
| **Dimensions** (H x W x D) | 5.3 x 2.5 in (13.50cm x 6.4 cm) (without brackets) |
| **Operating System Driver Support** | Windows 7 32-bit and 64-bit; Windows 10 32-bit and 64-bit; Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation<br>Novell SLED 10 & SLED 11 |
| **Kit Contents** | Intel I350-T2 PCIe Dual Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in)<br>Product Warranty statement and the Installation Guide. |

| | | |
|---|---|---|
| **Intel 7260 802.11 a/b/g/n PCIe WLAN NIC** | **Operating Humidity** | Operating      10% to 90% (non-condensing)<br>Non-operating   5% to 95% (non-condensing) |
| | **Dimensions** (H x W x D) | 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) |
| | **Kit Contents** | PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty. |
| | **Notes** | 1. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.<br>2. Check latest software/driver release for updates on supported security features.<br>3. Maximum output power may vary by country according to local regulations.<br>4. In Power Save Polling mode and on battery power.<br>5. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation). |

| | | |
|---|---|---|
| **Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC** | **Operating Temperature** | 0 to 80 C |
| | **Operating Humidity** | Non-operating   50% to 90% RH non-condensing (at temperatures of 25C to 35C) |
| | **Kit Contents** | WLAN module with PCIe x1 card, Dual band antenna, USB cable for internal Bluetooth connection, installation guide, warranty card |

## Summary of Changes

### SUMMARY OF CHANGES

| Date of change: | Version History: | | Description of change: |
|---|---|---|---|
| August 21 | V1 | Added | Style and technical specifications |
| October 1, 2014 | From v1 to v2 | Added | Rack dimensions, note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs |
| | | Changed | Turbo specs for E5-1660v3, Acoustics - only 1 ODD on the high-end config, not 2, Declared Noise Emissions section, Supported Components: Graphics, Optical and Removable Storage, Overview, Stable & Consistent, power supply configurations, Noise Emissions section, Updated Power Supply Configurations and table |
| | | Removed | Cyberlink MediaSuitt, TPM 2.0 references, HP Power Assistant and PDF Complete |
| December 3, 2014 | From v2 to v3 | Added | HP Z440 Memory Cooling Solution, power cable descriptor in Overview and System Technical Specifications sections |
| January 1, 2015 | From v3 to v4 | Added | OS under Overview, and Support Components, Memory support matrix and load order |
| February 1, 2015 | From v4 to v5 | Added | AMD W5100, W7100 GPU, DX115 Removable HDD Frame/Carrier, 256GB SATA 6Gb/s SED OPAL 2 SSD from Supported Components |
| | | Changed | Internal I/O USB, OS under overview, and Supported components. |
| March 1, 2015 | From v5 to v6 | Added | Operating Systems: Red Hat and SUSE Support, 600 and 300GB SAS SFF HDD, 4TB SATA HD, HD Controller |
| | | Changed | HP Installer Kit for Linux, RAID, SAS and SATA Hard Drives Notes, ACPI support under BIOS section |
| April 1, 2015 | From v6 to v7 | Changed | Hard Drives Notes and Memory Notes in Supported Components section. Memory Speed Supported in System Board. Memory Info from System Configuration. |
| | | Added | Chassis Dimensions |
| May 1, 2015 | From v7 to v8 | Added | Integrated RAID for PCIe SSDs and note in Hard Drive Controllers section |
| | | Changed | Notes in Hard Drive Controllers sections, High Performance GPU Computing, and Other Hardware |
| July 1, 2015 | From v8 to v9 | Added | 1TB SATA 7200 rpm 8GB 3.5" SSHD (hybrid), HP Z Turbo Drive G2 512GB SSD, HP Z Turbo Drive G2 256GB SSD, and notes for Supported Components and Technical Specifications; 3Dconnexion CADMouse to Input Devices. |
| | | Changed | Storage/Hard Drives section Descriptions/Notes |
| | | Removed | 600GB SAS 15K rpm 6Gb/s 3.5" HDD, 300GB SAS 15K rpm 6Gb/s 3.5" HDD |
| August 1, 2015 | From v9 to v10 | Added | Windows 10 64-bit, SUSE Linux Enterprise Desktop 11 SP3, 12 in OS, Overview; NVIDIA NVS 310 1GB Graphics in Professional 2D; NVIDIA Quadro K420 2GB Graphics in Entry 3D Graphics section; Intel Xeon E5-1630 v3 in Stable and consistent offerings in Stable and consistent offerings |
| | | Changed | HP Solenoid Hood Lock & Hood Sensor in Supported Components, Racking and Physical Security section; Intel Xeon E5-1603 v3 |
| | | Removed | Windows 8.1 64-bit, Windows 8.1 Emerging Market, SUSE Linux Enterprise Desktop 11 SP3 |
| September 1, 2015 | From v10 to v11 | Added | HP 512GB SATA SED SSD in Supported Components, Storage and Technical Specifications |
| | | Changed | Notes for SATA SSDs, and PCI Express in Supported Components, HP Solenoid Hood Lock & Hood Sensor in Racking and Physical Security, Notes for Memory Cooling Solution in Other Hardware |
| | | Removed | Intel Pro 1500 180GB SATA SSD |
| November 1, 2015 | From v11 to v12 | Added | Storage PCIe notes, HP Z Turbo Drive Quad Pro, 256GB, and 512GB SSD modules, NVIDIA Quadro M4000 8GB Graphics, NVIDIA Quadro M5000 8GB Graphics, Z440 HP Z Cooler and notes from Other Hardware section; |

## Summary of Changes

| | | | |
|---|---|---|---|
| | | Changed | Controller Cards section notes; HP Remote Graphics Software (RGS) 7.1, MS Office Home & Business 2016 from Software section; Windows 10 Pro 64 and Windows 10 Pro downgrade to Windows 7 Professional 64 from Operative Systems section. |
| January 1, 2016 | From v12 to v13 | Added | Updated Preinstalled OS in Overview section |
| February 1, 2016 | From v13 to v14 | Added | HP Enterprise Class 240GB SATA SSD and HP Enterprise Class 480GB SATA SSD, NVIDIA Quadro K1200 4GB Graphics, HP PS/2 Business Slim Keyboard, HP USB Business Slim Keyboard, HP Wireless Business Slim Keyboard |
| | | Changed | SATA SSDs notes |
| | | Removed | Samsung Enterprise 240GB SATA SSD, Samsung Enterprise 480GB SATA SSD, NVIDIA Quadro K5200 8GB Graphics, NVIDIA Quadro K6000 12GB Graphics. |
| March 1, 2016 | From v14 to v15 | Added | Windows 10 Home 64 High-end in Overview and Supported Components; AMD FirePro W4300 4GB Graphics in Mid-Ranga Category, Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC in Networking and Communications |
| | | Removed | Ubuntu 14.04, and Windows 8.1 64-bit from Overview OS; NVIDIA NVS 310 512MB Graphics, NVIDIA Quadro K420 1GB Graphics in Graphics |
| March 31, 2015 | From v15 to v16 | Added | Intel Xeon E5-2600 v3 Series CPUs, HP Z Turbo Drive G2 1TB SSD, Intel Ethernet I350-T2 2-Port 1Gb NIC |
| | | Changed | AMD FirePro W2100 2GB Graphics moved to Entry 3D; PCIe Drives and Memory notes; HP Solenoid Hood Lock & Hood Sensor option. |
| June 7, 2016 | From v16 to v17 | Added | Enterprise Class status for4TB SATA HDD, HP USB Hardened Mouse, Intel Xeon E5-1600 v4 Series CPU, Note 6 for NVIDIA Quadro M2000 |
| | | Removed | Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit |
| July 1, 2016 | From v17 to v18 | Added | HP Keyed Cable Lock 10mm |
| September 1, 2016 | From v18 to v19 | Added | Z Turbo SED, and notes for PCIe SSDs, Specs for SATA SSDs |