

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



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|-----|--|-----|---|
| 6. | 2 External 5.25" Bays | 12. | Rear I/O: Rear Power Button, 4 USB 3.0, 2 USB 2.0, PS/2 Ports, 1 RJ-45 to Integrated GbE, 1 Audio Line In, 1 Audio Line Out |
| 7. | 2 Internal 3.5" Bays | 13. | 8 DIMM Slots for DDR4 ECC Registered Memory |
| 8. | Fan and Front Card Guide Kit (optional) | 14. | Intel Xeon Processors: E5-1600 v3/v4 family (4C/6C/8C), E5-2600 v3 family (8C) |
| 9. | 6 6Gb/s SATA Ports | 15. | 2 PCIe x16 Gen 3 Slots |
| 10. | Rear Grip | 16. | 1 PCIe x8 Gen 3, 1 PCIe x1 Gen 2, 1 PCIe x4 Gen 2, 1 PCI Slot |
| 11. | 525W, 85% Efficient Power Supply or 700W, 90% Efficient Power Supply | | |

Overview

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Form Factor Operating Systems

Minitower

Preinstalled:

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

Supported:

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

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

Available Processors

| Name | Cores | Clock Speed (GHz) | Cache (MB) | Memory Speed (MT/s) | 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 |
| 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 |

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|--|---|-----|----|------|-----|-----|------|-----|
| 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 |
| <p>¹The 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.</p> <p>NOTE: Although the Intel Xeon E5-2600 processor family supports dual processors, the HP Z440 Workstation does not support dual processor configurations.</p> | | | | | | | | |

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)

Slot 5:
PCI Express Gen3 x16
Full-height, Full-length (with extender)

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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)
 2 external 5.25" bays

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

1 dedicated 9.5mm slim optical disk drive bay

Front I/O 4 USB 3.0, 1 Headset, 1 Microphone

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.
 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.
 Serial supported with optional connector on PCI bracket cabled to system board connector.

Interfaces Supported 15-in-1 Media Card Reader (optional)
 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).
 USB 2.0, USB 3.0

On-board RAID Support RAID 0, 1, 10 (Factory integrated)
 RAID 5 (NOT Factory integrated)

Factory integrated RAID available for SATA/SAS drives (RAID 0, 0 Data, 1, and 10)

**Chassis Dimensions (H x W) Footprint Dimensions:
 x D)**

H: 17.0" [431.8mm]
 W: 6.65" [168.91mm]
 D: 17.5" [444.7mm] (measured to the rear of service panel)

Maximum Dimensions:

H: 17.0" [431.8mm]
 W: 6.65" [168.91mm]
 D: 17.9" [455.7mm] (measured to the rear padlock loop)

Rack Dimensions 4U

Weight Exact weights depend upon configuration.
 Minimum: 11.0 kg (24.3 lbs.)
 Standard: 13.5 kg (29.8 lbs.)
 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)

Overview

| | |
|---|---|
| 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® E5-1600 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® E5-1603 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 | | |

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

Monitors / Displays

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

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

Storage / Hard Drives

SAS Hard Drives

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

Supported Components

| | | | |
|-----------------------|---|---|---------|
| 600GB SAS 15K SFF HDD | Y | Y | L5B75AA |
| 300GB SAS 15K SFF HDD | Y | Y | L5B74AA |

NOTES:

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

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

NOTE: SAS controller add-in card required

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

Removable Boot Drive option

SATA Hard Drives

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|--|--------------------|------------|------------------------|---------------|
| SATA (Serial ATA) Hard Drives for HP Workstations | | | | |
| 500GB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | LQ036AA | |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD | Y | Y | LQ037AA | |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class) | Y | Y | WOR10AA | |
| 1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class) | Y | Y | WOR10AA | |
| 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, available as AMO (NQ099AA). 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 2TB SATA 6Gb/s SSD | Y | Y | Y6P08AA | |
| 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, available as AMO (K4T74AA). 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 G2 256GB TLC SSD | Y | Y | Y1T46AA | |
| HP Z Turbo Drive G2 512GB TLC SSD | Y | Y | Y1T49AA | |
| HP Z Turbo Drive G2 1TB TLC SSD | Y | Y | Y1T52AA | |
| HP Z Turbo Drive G2 256GB SED SSD | Y | Y | Y1T55AA | |
| HP Z Turbo Drive G2 512GB SED SSD | Y | Y | Y1T58AA | |
| HP Z Turbo Drive Quad Pro | | | | |
| HP Z Turbo Drive 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 2x1TB PCIe SSD | Y | Y | T9H99AA | Note 2 |
| HP Z Turbo Drive G2 1TB TLC SSD | Y | Y | Y1T52AA | |
| HP Z Turbo Drive G2 256GB TLC SSD | Y | Y | Y1T46AA | |

Supported Components

| | | | | |
|--|---|---|---------|--------|
| HP Z Turbo Drive G2 512GB TLC SSD | Y | Y | Y1T49AA | |
| HP Z Turbo Drive Quad Pro 256GB SSD module | N | Y | N2N00AA | Note 1 |
| HP Z Turbo Drive Quad Pro 512GB SSD module | N | Y | N2N01AA | Note 1 |
| HP Z Turbo Drive Quad Pro 1TB SSD module | N | Y | T9J00AA | Note 1 |
| HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD | Y | Y | N2M98AA | |
| HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD | Y | Y | N2M99AA | |
| HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD | Y | Y | T9H99AA | |
| Intel 750 Series AIC PCIe SSD | | | | |
| Intel 750 Series AIC 400GB PCIe SSD | Y | Y | Y4A61AV | |
| Intel 750 Series AIC 800GB PCIe SSD | Y | Y | Y4A62AV | |
| Intel 750 Series AIC 1.2TB PCIe SSD | Y | Y | Y4A63AV | |

NOTES:

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

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

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

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, 4 |
| 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, 4 |
| LSI iBBU9 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.

Supported Components

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

Note 4: Configuration requires the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA).

Graphics

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes | Supported # of cards |
|--|--------------------|------------|------------------------|---------------|----------------------|
| 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 |
| NVIDIA® Quadro® P400 2GB Graphics | Y | Y | 1ME43AA | | 2 |
| NVIDIA® Quadro® P600 2GB Graphics | Y | Y | 1ME42AA | | 2 |
| AMD FirePro W2100 2GB Graphics | Y | Y | J3G91AA | | 2 |
| Mid-range 3D | | | | | |
| NVIDIA® Quadro® K1200 4GB Graphics | Y | Y | L4D16AA | | 2 |
| NVIDIA® Quadro® K2200 4GB Graphics | Y | Y | J3G88AA | Note 5 | 2 |
| NVIDIA® Quadro® M2000 4GB Graphics | Y | Y | T7T60AA | Note 5, 6 | 2 |
| NVIDIA® Quadro® P1000 4GB Graphics | Y | Y | 1ME01AA | | 2 |
| NVIDIA® Quadro® P2000 5GB Graphics | Y | Y | 1ME41AA | Note 5 | 2 |
| Radeon Pro™ WX4100 4GB Graphics | Y | Y | Z0B15AA | Note 5, 6 | 2 |

Supported Components

| | | | | | |
|-------------------------------------|---|---|---------|------------|---|
| AMD FirePro W4300 4GB Graphics | Y | Y | T7T58AA | Note 5, 6 | 2 |
| AMD FirePro W5100 4GB Graphics | Y | Y | J3G92AA | Note 5, 6 | 2 |
| High End 3D | | | | | |
| NVIDIA® Quadro® M4000 8GB Graphics | Y | Y | M6V52AA | Notes 3, 4 | 2 |
| NVIDIA® Quadro® M5000 8GB Graphics | Y | Y | M6V53AA | Notes 3, 4 | 1 |
| NVIDIA® Quadro® P4000 8GB Graphics | Y | Y | 1ME40AA | Notes 3, 4 | 1 |
| NVIDIA® Quadro® P5000 16GB Graphics | Y | Y | Z0B13AA | Notes 3, 4 | 1 |
| AMD FirePro™ W7100 8GB Graphics | Y | Y | J3G93AA | Notes 3, 4 | 1 |
| Radeon Pro™ WX7100 8GB Graphics | Y | Y | Z0B14AA | Notes 3, 4 | 2 |
| Ultra 3D | | | | | |
| NVIDIA® Quadro® P6000 24GB Graphics | Y | Y | Z0B12AA | Notes 3, 4 | 1 |
| NVIDIA® Quadro® Sync II | N | Y | 1WT20AA | | |

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).

| 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 |
| | HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM | T9V41AA | 1,2 |
| | HP 16GB (1x16GB) DDR4-2400 ECC Reg RAM | T9V40AA | 1,2 |
| | HP 8GB (1x8GB) DDR4-2400 ECC Reg RAM | T9V39AA | 1,2 |
| | HP 4GB (1x4GB) DDR4-2400 ECC Reg RAM | T9V38AA | 1,2 |

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 or that include 32GB DIMMs require the HP Z440 Memory Cooling Solution, which is available both CTO (J2R51AV) and AMO (J2R52AA).

Supported Components

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

Multimedia and Audio Devices

Supported Components

Multimedia and Audio Devices

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

Optical and Removable Storage

| | Factory Configured | Option Kit | Option Kit Part Number | Support Notes |
|---|--------------------|------------|------------------------|---------------|
| HP SlimTray Optical Drives | | | | |
| HP 9.5mm Slim DVD Writer | Y | Y | K3R64AA | |
| HP 9.5mm Slim DVD-ROM Drive | Y | Y | K3R63AA | Note 1 |
| HP 9.5mm Slim BDXL Blu-Ray Writer | Y | Y | K3R65AA | Note 2 |
| 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® Ethernet I350-T4 4-port 1Gb NIC | N | Y | W8X25AA | Note 1 |
| Intel® 7260 802.11 a/b/g/n PCIe WLAN NIC | N | Y | F2P07AA | |
| Intel® 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC | N | Y | N0S95AA | |

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

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

Racking and Physical Security

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 Z240/Z440 Depth Adjust 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 | | |

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 any memory configuration using more than 4x DIMMs or that uses 32GB DIMMs.

Note 2: Fan and Front Card Guide required for any configuration that includes any of the following components:

- 1 x LSI 9217 SAS Controller
- 1 x NVIDIA® Quadro® P5000
- 1 x AMD Radeon Pro WX 7100
- 2 x AMD FirePro W4300
- 2 x NVIDIA® Quadro® M2000
- 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 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.

Supported Components

Operating Systems

Support Notes

Windows 10 Pro 64

Windows 10 Pro downgrade to Windows 7 Professional 64

Windows 10 Home 64

HP Linux Installer Kit

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

High end

Note 1

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

System Technical Specifications

System Board

| | |
|-----------------------------------|--|
| System Board Form Factor | Main System Board: 24 x 31 cm 9.6 x 12.2 inches |
| 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, 16GB and 32GB |
| Memory Modes | Channel Interleaved |
| Memory Speed Supported | 1600MT/s, 1866MT/s, 2133MT/s, and 2400MT/s |
| Memory Protection | 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. |

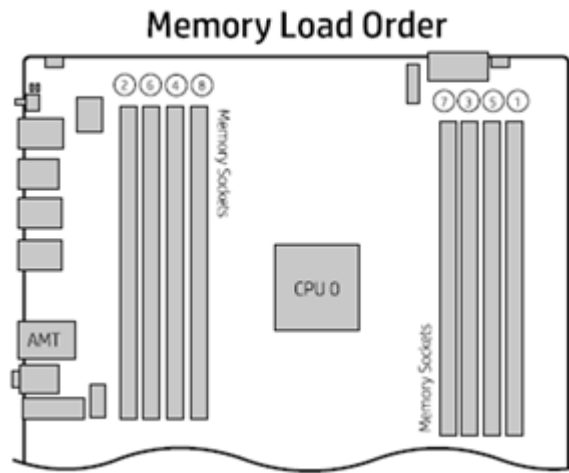
* For 32 bit operating systems, there is a memory limit of 4GB.

~ 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 |
| 128 GB | | 32 GB | | 32 GB | | | 32 GB | | 32 GB | Best |
| 256 GB | | 32 GB | 32 GB | 32 GB | 32 GB | 32 GB | 32 GB | 32 GB | 32 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



Maximum Memory Supports up to 256GB

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):
PCI Express Gen2 x1
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)
- Slot 5:
PCI Express Gen3 x16
Full-height, Full-length (with extender)

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

PCI Connectors (5.0V)

- Slot 6:
PCI 32bit/33MHz
Full-height, Full-length (with extender)

System Technical Specifications

| | | |
|-----------------------------------|------------------------------|--|
| Supported Drive Interfaces | SATA | 2 SATA @6Gb/s, supports RAID 0,1 and NCQ. 4 sSATA @6Gb/s, Supports RAID 0,1,10 and NCQ. Factory integrated RAID is Microsoft Windows only. Requires Optional PCIe card |
| | Serial Attached SCSI | Requires Optional PCIe card |
| | Integrated RAID | SATA: RAID 0, 1 SSATA: RAID 0, 1, 10 <ul style="list-style-type: none"> • RAID 0 configuration - striped array (supported and configure to order) • RAID 1 configuration - mirrored array (supported and configure to order) • RAID 5 parity striping (supported but not configure to order) • RAID 10 striped and mirrored array *HW RAID functionality not supported by Linux. Use SW RAID functionality provided in the Red Hat Operating system instead. |
| | Integrated Graphics | No |
| | Network Controller | Integrated Intel I-218 Gbit LAN 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 * hot plug / hot swap not supported with eSATA |
| | IDE connector | No |
| | Floppy connector | No |
| | Serial | 1 internal header |
| | 2nd Serial | No |
| IEEE 1394 Connector(s) | Parallel | No |
| | AUX IN (audio) | No |
| | Front | None |
| | Rear | 2 IEEE 1394b (requires optional PCIe card) |
| USB Connector(s) | Internal | None |
| | Front | 4 USB 3.0 |
| | Rear | 4 USB 3.0 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. 1 USB 3.0 port available by a 2x10 header. |

System Technical Specifications

| | | | | |
|--|--|-------------|--|------------|
| 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 | Trusted Platform Module (TPM) 1.2 (Infineon SLB 9660). Common Criteria EAL4+ Certified. Upgradable to TPM 2.0 through Firmware v5.51 upgrade (Infineon SLB9665). Convertible to FIPS 140-2 Certified mode. (TPM 2.0 is not available for Win 7 32-bit.). When the SLB 9660 is converted (via Firmware v5.51) to TPM 2.0 mode then it is renamed as SLB 9665. Once converted to TPM2.0 the SLB9665 is CC EAL4+ certified. CG TPM Certified products list: http://www.trustedcomputinggroup.org/certification/tpmcertifiedproducts/ | | | |
| 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 | 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 | |
| | Yes, 90% Efficient | | Yes, 85% Efficient | |
| 80 PLUS® Compliant | 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 | | 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 | |
| FEMP Standby Power Compliant @115V (<2W in S5 – Power Off) | Yes | | Yes | |
| EuP Compliant @ 230V (<0.5 W in S5 – Power Off) | Yes | | Yes | |

System Technical Specifications

| | | |
|---|------------------------------|------------------------------|
| CECP Compliant @ 220V (<4W in S3 – Suspend to RAM) | Yes; Configuration dependent | Yes; Configuration dependent |
| Power Consumption in sleep mode (as defined by ENERGY STAR) – Suspend to RAM (S3) (Instantly Available PC) | <15w | <15w |
| 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 | 2.19 W |
| | Off (S5) | 0.825 W | 0.784 W | 1.024 W | 0.985 W | 0.851 W | 0.772 W |
| | Zero Power Mode (ErP) | 0.190 W | | 0.382 W | | 0.178 W | |

| | | | | | | | |
|----------------------------------|-----------------------|---------------|--------------|---------------|-------------|---------------|-------------|
| 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 / 1x Slim 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 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 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

| | | | | | | | |
|-------------------------------------|-----------------------|----------------|--------------|----------------|-------------|----------------|-------------|
| | 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 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 |
| Hard drive Operating (random reads) | | 3.3 | 15 |
| DVD-ROM Operating (sequential reads) | | 4.3 | 30 |

ENVIRONMENTAL DATA

| | | |
|-----------------------------------|-------------------------|--|
| Environmental Requirements | 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% RH, non-condensing Non-operating: 8% to 90% RH, non-condensing |
| | Maximum Altitude | Operating: 3,000 m (10,000 feet) Non-operating: 9,100 m (30,000 feet) |
| | Dynamic (new) | Shock Operating: ½-sine: 40g, 2-3ms (~62 cm/sec) |

System Technical Specifications

Non-operating:

½-sine: 160 cm/s, 2-3ms (~105g)

square: 422 cm/s, 20g

NOTE: Values represent individual shock events and do not indicate repetitive shock events.

Vibration

Operating random: 0.5g (rms), 5-300 Hz, up to 0.0025g²/Hz

Non-operating random: 2.0g (rms), 5-500 Hz, up to 0.0150 g²/Hz

NOTE: Values do not indicate continuous vibration.

Cooling

Above 1524 m (5,000 ft.) altitude, maximum operating temperature is derated by 1° C (1.8° F) per 305 m (1,000 ft.) elevation increase

Physical Security and Serviceability

| | |
|---|---|
| Access Panel | Tool-less Includes system board and memory information. |
| Optical Drive | Tool-less |
| Hard Drives | Tool-less |
| Expansion Cards | Tool-less |
| Processor Socket | Tool-less |
| Green User Touch Points | Yes, on 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 |
| Padlock Support | Yes (optional): Locks side cover and secures chassis from theft 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 3 mm x 7 mm slot at rear of system |
| Universal Chassis Clamp Lock Support | Yes (optional): Locks side cover and locks cables to chassis. Secures chassis from theft and allows multiple units to be chained together when used with optional cable Threaded feature at rear of system |
| Solenoid Lock and Hood Sensor | Yes (optional) The Solenoid Hood Lock eliminates the need for a physical key by making the chassis lockable through software and a password. You can also lock and unlock the chassis remotely over the network. The Sensor Kit detects when the access panel has been removed |
| Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control | Yes, enables or disables serial, USB, audio, and network ports |

System Technical Specifications

| | |
|--|--|
| 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: (Optional) 92 mm x 92mm x 25 mm, 4-wire, PWM Rear: 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 | <p>HP Vision Diagnostics Offline Edition</p> <p>The diagnostics utility enables you to perform testing and to view critical computer hardware and software configuration information from various sources. This utility enables you to:</p> <ul style="list-style-type: none"> • 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

System Technical Specifications

- 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.

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

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

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

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

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

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

SMBIOS System Management BIOS 2.7, for system management information.

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

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

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

- NORMAL - normal temperature ranges.

System Technical Specifications

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

| | |
|---|--|
| Remote ROM Flash | Provides secure, fail-safe ROM image management from a central network console. |
| ACPI (Advanced Configuration and Power Management Interface) | Allows the system to enter and resume from low power modes (sleep states). Enables an operating system to control system power consumption based on the dynamic workload. Makes it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system. Supports ACPI 4.0 for full compatibility with 64-bit operating systems. |
| Ownership Tag | A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen. |
| Remote Wakeup/Remote Shutdown | System administrators can power on, restart, and power off a client computer from a remote location. |
| Instantly Available PC (Suspend to RAM - ACPI sleep state S3) | Allows for very low power consumption with quick resume time. |
| Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server) | Allows a new or existing system to boot over the network and download software, including the operating system. |
| ROM revision levels | Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information. |
| System board revision level | Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified. |
| Start-up Diagnostics (Power-on Self-Test) | Assesses system health at boot time with selectable levels of testing. |
| Auto Setup when new hardware installed | System automatically detects 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. |
| Pre-boot Diagnostics | (Pre-video) critical errors are reported via beeps and blinks on the power LED. |
| Industry Standard Specification Support | |
| Industry Standard UEFI Specification Revision | Revision Supported by the BIOS 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 - BIOS Enhanced Disk Drive Specification Version 3.0 |
| EHCI | Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0 |
| PCI | PCI Local Bus Specification, Revision 2.3 PCI Power Management Specification, Revision 1.1 PCI Firmware Specification, Revision 3.0, Draft .7 |
| PCI Express | PCI Express Base Specification, Revision 2.0 PCI Express Base Specification, Revision 3.0 |

System Technical Specifications

| | |
|---------------|--|
| PMM | POST Memory Manager Specification, Version 1.01 |
| SATA | Serial ATA Specification, Revision 1.0a Serial ATA 3 Gb/s: Serial ATA Specification, Revision 2.5 Serial ATA 6 Gb/s: Serial ATA Specification, Revision 3.0 |
| SPD | PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B |
| TPM | Trusted Computing Group TPM Specification Version 1.2 |
| UHCI | Universal Host Controller Interface Design Guide, Revision 1.1 |
| USB | Universal Serial Bus Revision 1.1 Specification Universal Serial Bus Revision 2.0 Specification Universal Serial Bus Revision 3.0 Specification |
| SMBIOS | System Management BIOS Reference Specification, Version 2.7 External BIOS simulator found at: http://h20464.www2.hp.com/index.html |

Social and Environmental Responsibility

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

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

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

The battery in this product does not contain:

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

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

Low Halogen Statement HP Inc. is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis. 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 HP Inc. offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <http://www.hp.com/recycle> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.

System Technical Specifications

HP Inc. Corporate Environmental Information

For more information about HP's commitment to the environment:
Global Citizenship Report <http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html>

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

Additional Information

ISO 14001 certificates:

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

- 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 registered in the United States. See <http://www.epeat.net> for registration status in your country. EPEAT® registered where applicable. EPEAT registration varies by country. See <http://www.epeat.net> for registration status by country. Search keyword *generator* on HP's 3rd party option store for solar energy accessory at <http://www.hp.com/go/options>

Packaging

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

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

Packaging Materials

Internal

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

External

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

Manageability

Industry Standard Specifications

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

- DASH 1.1 (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

System Technical Specifications

- 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 Service, Support, and Warranty

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>

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

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

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

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

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

Product Change Notification

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

System Technical Specifications

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

Stable & Consistent Offerings

As part of its commitment to hardware, software, and solution innovation, HP is proud to introduce this breakthrough platform configuration stability to HP Workstation customers. HP Stable & Consistent Offerings are built on the foundation of a carefully chosen set of 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 |

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

Technical Specifications - Processors

Intel Xeon E5-1680 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) |

1TB SATA 7200 rpm 6Gb/s 3.5" HDD (Enterprise Class)

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

Technical Specifications - Hard Drives

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 |
| 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) |

Technical Specifications - Hard Drives

SATA SSDs for HP Workstations

HP 128GB SATA 6Gb/s SSD

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

HP 256GB SATA 6Gb/s SSD

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

HP 256GB SATA 6Gb/s SED Opal 2 SSD

| | |
|-------------------------------|---------------------|
| Capacity | 256GB |
| Protocol | SATA |
| Form Factor | 2.5" |
| Controller | AHCI |
| NAND Type | MLC |
| Endurance | 200TBW (TB Written) |
| Reliability (MTTF) | 1.5M hours |
| Physical Size (Height) | 0.28 in; 0.7 cm |
| Physical Size (Width) | 2.5 in; 6.36 cm |
| Interface | 6Gb/s SATA |

Technical Specifications - Hard Drives

| | | | | | | | | | | |
|--------------------------------|--|--|------------------------|----------|-------------------------|----------|--------------------|-----------|---------------------|----------|
| | Synchronous Transfer Rate (Maximum) | Up to 550MB/s (Sequential Read) | | | | | | | | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | | | | | | | | |
| | Performance | <table border="0"> <tr> <td>Sequential Read</td> <td>560MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>510 MB/s</td> </tr> <tr> <td>Random Read</td> <td>100K IOPS</td> </tr> <tr> <td>Random Write</td> <td>88K IOPS</td> </tr> </table> | Sequential Read | 560MB/s | Sequential Write | 510 MB/s | Random Read | 100K IOPS | Random Write | 88K IOPS |
| 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 | <table border="0"> <tr> <td>Sequential Read</td> <td>560 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>510 MB/s</td> </tr> <tr> <td>Random Read</td> <td>100K IOPS</td> </tr> <tr> <td>Random Write</td> <td>88K IOPS</td> </tr> </table> | Sequential Read | 560 MB/s | Sequential Write | 510 MB/s | Random Read | 100K IOPS | Random Write | 88K IOPS |
| 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) | | | | | | | | |
| | 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 | <table border="0"> <tr> <td>Sequential Read</td> <td>560 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>510 MB/s</td> </tr> <tr> <td>Random Read</td> <td>100K IOPS</td> </tr> <tr> <td>Random Write</td> <td>88K IOPS</td> </tr> </table> | Sequential Read | 560 MB/s | Sequential Write | 510 MB/s | Random Read | 100K IOPS | Random Write | 88K IOPS |
| 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 | | | | | | | | |

Technical Specifications - Hard Drives

| | | | |
|---|--|---------------------------------|-----------|
| 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 2TB SATA 6Gb/s SSD | Capacity | 2TB | |
| | Protocol | SATA | |
| | Form Factor | 2.5" | |
| | Controller | AHCI | |
| | NAND Type | 3D TLC | |
| | 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 | 530 MB/s |
| | | Sequential Write | 500 MB/s |
| | | Random Read | 92K IOPS |
| | | Random Write | 83K 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 | |

Technical Specifications - Hard Drives

| | | |
|--|--|----------|
| Synchronous Transfer Rate (Maximum) | Up to 600MB/s | |
| Operating Temperature | 32° to 158° F (0° to 70° C) | |
| Performance | Sequential Read | 420 MB/s |
| | Sequential Write | 290 MB/s |
| | Random Read | 63K IOPS |
| | Random Write | 18K IOPS |
| Enterprise Class Features | High Endurance NAND Power Loss Protection End-to-End Data Protection | |

HP Enterprise Class 480GB SATA SSD

| | | |
|--|--|----------|
| Capacity | 480GB | |
| Protocol | SATA | |
| Form Factor | 2.5" | |
| Controller | AHCI | |
| NAND Type | MLC | |
| Endurance | 1850TBW (TB Written) | |
| Reliability (MTTF) | 2.0M hours | |
| Physical Size (Height) | 0.28 in; 0.7 cm | |
| Physical Size (Width) | 2.5 in; 6.36 cm | |
| Interface | 6Gb/s SATA | |
| Synchronous Transfer Rate (Maximum) | Up to 600MB/s | |
| Operating Temperature | 32° to 158° F (0° to 70° C) | |
| Performance | Sequential Read | 420 MB/s |
| | Sequential Write | 380 MB/s |
| | Random Read | 63K IOPS |
| | Random Write | 23K IOPS |
| Enterprise Class Features | High Endurance NAND Power Loss Protection End-to-End Data Protection | |

PCIe SSDs for HP Workstations

HP Z Turbo Drive 256GB SSD

| | | |
|------------------------------|---|-----------|
| Capacity | 256GB | |
| Protocol | PCIe | |
| Form Factor | Half-height, half-length | |
| Controller | AHCI | |
| NAND Type | MLC | |
| Endurance | 146TB | |
| Interface | PCI Express 2.0 x4 electrical x4 physical | |
| Operating Temperature | 32° to 158° F (0° to 70° C) | |
| Performance | Sequential Read | 1080 MB/s |
| | Sequential Write | 800 MB/s |
| | Random Read | 120K IOPS |
| | Random Write | 60K IOPS |

| | |
|-----------------|-------|
| Capacity | 512GB |
|-----------------|-------|

Technical Specifications - Hard Drives

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

Technical Specifications - Hard Drives

| | | |
|------------------------------|---|-----------|
| 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 |
| Self-Encrypting Drive Support | OPAL 2 | | |

Technical Specifications - Hard Drives

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 | <table> <tr> <td>Sequential Read</td> <td>3200 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1700 MB/s</td> </tr> <tr> <td>Random Read</td> <td>330K IOPS</td> </tr> <tr> <td>Random Write</td> <td>300K IOPS</td> </tr> </table> | Sequential Read | 3200 MB/s | Sequential Write | 1700 MB/s | Random Read | 330K IOPS | Random Write | 300K IOPS |
| 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 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 | <table> <tr> <td>Sequential Read</td> <td>2150 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1260 MB/s</td> </tr> <tr> <td>Random Read</td> <td>300K IOPS</td> </tr> <tr> <td>Random Write</td> <td>100K IOPS</td> </tr> </table> | Sequential Read | 2150 MB/s | Sequential Write | 1260 MB/s | Random Read | 300K IOPS | Random Write | 100K IOPS |
| 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 | <table> <tr> <td>Sequential Read</td> <td>2150 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1550 MB/s</td> </tr> <tr> <td>Random Read</td> <td>300K IOPS</td> </tr> <tr> <td>Random Write</td> <td>100K IOPS</td> </tr> </table> | Sequential Read | 2150 MB/s | Sequential Write | 1550 MB/s | Random Read | 300K IOPS | Random Write | 100K IOPS |
| Sequential Read | 2150 MB/s | | | | | | | | |
| Sequential Write | 1550 MB/s | | | | | | | | |
| Random Read | 300K IOPS | | | | | | | | |
| Random Write | 100K IOPS | | | | | | | | |

HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD

| | |
|-----------------|------|
| Capacity | 2TB |
| Protocol | PCIe |

Technical Specifications - Hard Drives

| | | | | | | | | | | |
|--|--------------------------------|--|------------------------|-----------|-------------------------|--------------------------------|--------------------|-----------|---------------------|-----------|
| | Form Factor | PCIe Card, Full Height PCIe Slot | | | | | | | | |
| | Controller | NVMe | | | | | | | | |
| | NAND Type | MLC | | | | | | | | |
| | Endurance | 600TB | | | | | | | | |
| | Interface | PCI Express 3.0 x4 electrical x4 physical | | | | | | | | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | | | | | | | | |
| | Performance | <table border="0"> <tr> <td>Sequential Read</td> <td>3200 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1800 MB/s</td> </tr> <tr> <td>Random Read</td> <td>430K IOPS</td> </tr> <tr> <td>Random Write</td> <td>320K IOPS</td> </tr> </table> | Sequential Read | 3200 MB/s | Sequential Write | 1800 MB/s | Random Read | 430K IOPS | Random Write | 320K IOPS |
| Sequential Read | 3200 MB/s | | | | | | | | | |
| Sequential Write | 1800 MB/s | | | | | | | | | |
| Random Read | 430K IOPS | | | | | | | | | |
| Random Write | 320K IOPS | | | | | | | | | |
| HP Z Turbo Drive G2 256GB TLC SSD | Capacity | 256GB | | | | | | | | |
| | Protocol | PCIe | | | | | | | | |
| | Form Factor | M.2 in Half-height, half-length card | | | | | | | | |
| | Controller | NVMe | | | | | | | | |
| | NAND Type | 3D TLC | | | | | | | | |
| | Endurance | 75TBW (TB Written) | | | | | | | | |
| | Reliability (MTBF) | 1.5M hours | | | | | | | | |
| | Interface | PCI Express 3.0 x4 electrical x4 physical | | | | | | | | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | | | | | | | | |
| | Performance | <table border="0"> <tr> <td>Sequential Read</td> <td>2800 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>320 MB/s (1100 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>250K IOPS</td> </tr> <tr> <td>Random Write</td> <td>180K IOPS</td> </tr> </table> | Sequential Read | 2800 MB/s | Sequential Write | 320 MB/s (1100 MB/s max/Turbo) | Random Read | 250K IOPS | Random Write | 180K IOPS |
| Sequential Read | 2800 MB/s | | | | | | | | | |
| Sequential Write | 320 MB/s (1100 MB/s max/Turbo) | | | | | | | | | |
| Random Read | 250K IOPS | | | | | | | | | |
| Random Write | 180K IOPS | | | | | | | | | |
| HP Z Turbo Drive G2 512GB TLC SSD | Capacity | 512GB | | | | | | | | |
| | Protocol | PCIe | | | | | | | | |
| | Form Factor | M.2 in Half-height, half-length card | | | | | | | | |
| | Controller | NVMe | | | | | | | | |
| | NAND Type | 3D TLC | | | | | | | | |
| | Endurance | 150TBW (TB Written) | | | | | | | | |
| | Reliability (MTBF) | 1.5M hours | | | | | | | | |
| | Interface | PCI Express 3.0 x4 electrical x4 physical | | | | | | | | |
| | Operating Temperature | 32° to 158° F (0° to 70° C) | | | | | | | | |
| | Performance | <table border="0"> <tr> <td>Sequential Read</td> <td>2800 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>660 MB/s (1600 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>260K IOPS</td> </tr> <tr> <td>Random Write</td> <td>260K IOPS</td> </tr> </table> | Sequential Read | 2800 MB/s | Sequential Write | 660 MB/s (1600 MB/s max/Turbo) | Random Read | 260K IOPS | Random Write | 260K IOPS |
| Sequential Read | 2800 MB/s | | | | | | | | | |
| Sequential Write | 660 MB/s (1600 MB/s max/Turbo) | | | | | | | | | |
| Random Read | 260K IOPS | | | | | | | | | |
| Random Write | 260K IOPS | | | | | | | | | |
| HP Z Turbo Drive G2 1TB TLC SSD | Capacity | 1TB | | | | | | | | |
| | Protocol | PCIe | | | | | | | | |
| | Form Factor | M.2 in Half-height, half-length card | | | | | | | | |
| | Controller | NVMe | | | | | | | | |
| | NAND Type | 3D TLC | | | | | | | | |
| | Endurance | 300TBW (TB Written) | | | | | | | | |

Technical Specifications - Hard Drives

| | | |
|--|------------------------------|---|
| | Reliability (MTBF) | 1.5M hours |
| | Interface | PCI Express 3.0 x4 electrical x4 physical |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |
| | Performance | Sequential Read 3000 MB/s |
| | | Sequential Write 1150 MB/s (1700 MB/s max/Turbo) |
| | | Random Read 360K IOPS |
| | | Random Write 330K IOPS |
| HP Z Turbo Drive G2 256GB TLC SSD | Capacity | 256GB |
| | Protocol | PCIe |
| | Form Factor | M.2 in Half-height, half-length card |
| | Controller | NVMe |
| | NAND Type | 3D TLC |
| | Endurance | 75TBW (TB Written) |
| | Reliability (MTBF) | 1.5M hours |
| | Interface | PCI Express 3.0 x4 electrical x4 physical |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |
| | Performance | Sequential Read 2800 MB/s |
| | | Sequential Write 320 MB/s (1100 MB/s max/Turbo) |
| | | Random Read 250K IOPS |
| | | Random Write 180K IOPS |
| HP Z Turbo Drive G2 512GB TLC SSD | Capacity | 512GB |
| | Protocol | PCIe |
| | Form Factor | M.2 in Half-height, half-length card |
| | Controller | NVMe |
| | NAND Type | 3D TLC |
| | Endurance | 150TBW (TB Written) |
| | Reliability (MTBF) | 1.5M hours |
| | Interface | PCI Express 3.0 x4 electrical x4 physical |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |
| | Performance | Sequential Read 2800 MB/s |
| | | Sequential Write 660 MB/s (1600 MB/s max/Turbo) |
| | | Random Read 260K IOPS |
| | | Random Write 260K IOPS |
| HP Z Turbo Drive G2 1TB SSD | Capacity | 1TB |
| | Protocol | PCIe |
| | Form Factor | M.2 in Half-height, half-length card |
| | Controller | NVMe |
| | NAND Type | 3D TLC |
| | Endurance | 300TBW (TB Written) |

Technical Specifications - Hard Drives

| | | | | | | | | | | | |
|--|---|--------------------------------------|---|------------------------|-----------|-------------------------|---------------------------------|--------------------|-----------|---------------------|-----------|
| | | 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 | <table border="0"> <tr> <td>Sequential Read</td> <td>3000 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1150 MB/s (1700 MB/s max/Turbo)</td> </tr> <tr> <td>Random Read</td> <td>360K IOPS</td> </tr> <tr> <td>Random Write</td> <td>330K IOPS</td> </tr> </table> | Sequential Read | 3000 MB/s | Sequential Write | 1150 MB/s (1700 MB/s max/Turbo) | Random Read | 360K IOPS | Random Write | 330K IOPS |
| Sequential Read | 3000 MB/s | | | | | | | | | | |
| Sequential Write | 1150 MB/s (1700 MB/s max/Turbo) | | | | | | | | | | |
| Random Read | 360K IOPS | | | | | | | | | | |
| Random Write | 330K IOPS | | | | | | | | | | |
| HP Z Turbo Drive G2 256GB SED SSD | | Capacity | 256GB | | | | | | | | |
| | | Protocol | PCIe | | | | | | | | |
| | | Form Factor | M.2 in Half-height, half-length card | | | | | | | | |
| | | Controller | NVMe | | | | | | | | |
| | | NAND Type | 3D 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 | <table border="0"> <tr> <td>Sequential Read</td> <td>3100 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1400 MB/s</td> </tr> <tr> <td>Random Read</td> <td>330K IOPS</td> </tr> <tr> <td>Random Write</td> <td>280K IOPS</td> </tr> </table> | Sequential Read | 3100 MB/s | Sequential Write | 1400 MB/s | Random Read | 330K IOPS | Random Write | 280K IOPS |
| Sequential Read | 3100 MB/s | | | | | | | | | | |
| Sequential Write | 1400 MB/s | | | | | | | | | | |
| Random Read | 330K IOPS | | | | | | | | | | |
| Random Write | 280K IOPS | | | | | | | | | | |
| | | Self-Encrypting Drive Support | OPAL 2 | | | | | | | | |
| HP Z Turbo Drive G2 512GB SED SSD | | Capacity | 512GB | | | | | | | | |
| | | Protocol | PCIe | | | | | | | | |
| | | Form Factor | M.2 in Half-height, half-length card | | | | | | | | |
| | | Controller | NVMe | | | | | | | | |
| | | NAND Type | 3D 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 | <table border="0"> <tr> <td>Sequential Read</td> <td>3200 MB/s</td> </tr> <tr> <td>Sequential Write</td> <td>1700 MB/s</td> </tr> <tr> <td>Random Read</td> <td>330K IOPS</td> </tr> <tr> <td>Random Write</td> <td>300K IOPS</td> </tr> </table> | Sequential Read | 3200 MB/s | Sequential Write | 1700 MB/s | Random Read | 330K IOPS | Random Write | 300K IOPS |
| 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 2x256GB PCIe SSD | Capacity | 2x256GB (two M.2 PCIe NVMe modules) | | | | | | | | |
| | | Interface | PCI Express Gen3 x16 | | | | | | | | |
| | | Operating Temperature | 32° to 158° F (0° to 70° C) | | | | | | | | |
| | HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD | Capacity | 2x512GB (two M.2 PCIe NVMe modules) | | | | | | | | |
| | | Interface | PCI Express Gen3 x16 | | | | | | | | |
| | | Operating Temperature | 32° to 158° F (0° to 70° C) | | | | | | | | |

Technical Specifications - Hard Drives

| | | |
|---|------------------------------|---|
| HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD | Capacity | 2x1TB (two M.2 PCIe NVMe modules) |
| | Interface | PCI Express Gen3 x16 |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |
| HP Z Turbo Drive Quad Pro 256GB SSD module | Capacity | 256GB (one M.2 PCIe NVMe module) |
| | Interface | PCI Express 3.0 x4 electrical x4 physical |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |
| HP Z Turbo Drive Quad Pro 512GB SSD module | Capacity | 512GB (one M.2 PCIe NVMe module) |
| | Interface | PCI Express 3.0 x4 electrical x4 physical |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |
| HP Z Turbo Drive Quad Pro 1TB SSD module | Capacity | 1TB (one M.2 PCIe NVMe module) |
| | Interface | PCI Express 3.0 x4 electrical x4 physical |
| | Operating Temperature | 32° to 158° F (0° to 70° C) |

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

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

| | | |
|--|--------------------|------------------------|
| Intel 750 Series AIC 1.2TB PCIe SSD | Capacity | 1.2TB |
| | Protocol | PCIe |
| | Form Factor | PCIe Card, Half Height |
| | Controller | NVMe |
| | NAND Type | MLC |
| | Endurance | 127TBW (TB Written) |

Technical Specifications - Hard Drives

| | | |
|------------------------------|-------------------------|-----------|
| Reliability (MTBF) | 1.2M hours | |
| Operating Temperature | 1.2TB | |
| Performance | Sequential Read | 2500 MB/s |
| | Sequential Write | 1200 MB/s |
| | Random Read | 460K IOPS |
| | Random Write | 290K IOPS |

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: 2.713 inches in height × 6.150 inches in length Weight: ~142 grams |
| | Graphics Controller | NVIDIA NVS 310 GPU: GF119-825 |
| | Bus Type | PCI Express x16, 2.0 compliant |
| | Memory | Size: 1GBB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/ |
| | Connectors | 2x DisplayPort 1.2 |
| | Maximum Resolution | Up to 2560 × 1600 (digital display) per display. |
| | Image Quality Features | The following video formats are supported: - MPEG2 - MPEG4 Part 2 Advanced Simple Profile - H.264 SVC codec support - Support for 3D Blu Ray - VC1 - DivX version 3.11 and later - MVC |
| | Display Output | <p>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.</p> <p>Up to 2 displays in the following configurations:</p> <p>DisplayPort output:</p> <ul style="list-style-type: none"> • Drives two DisplayPort enabled digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected natively using the 2 DisplayPort connectors on the NVS 310 graphics card • Supports 2 monitors up to resolution of 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort 1.2 multi stream topology technology. <p>DVI-D output:</p> <ul style="list-style-type: none"> • Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors • Drives two digital display at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors <p>HDMI output:</p> <ul style="list-style-type: none"> • 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 |

Technical Specifications - Graphics

VGA display output:

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

| | |
|-----------------------------------|--|
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | DX11, OpenGL 4.1 |
| Available Graphics Drivers | Windows 8.1 Windows 8 Genuine Windows 7 Professional (64-bit and 32-bit) Red Hat Enterprise Linux(RHEL) SUSE Linux Enterprise Desktop 11 (64-bit and 32-bit) |

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

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

SUSE Linux Enterprise drivers may also be obtained from:

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

Notes

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

NVIDIA NVS 315 1 GB Graphics

| | |
|----------------------------|--|
| Form Factor | Low Profile: 2.713 inches in height × 5.7 inches in length Weight: ~142 grams |
| Graphics Controller | NVIDIA NVS 315 (using GF119-825 GPU) Number of Cores: 48 CUDA cores Max. Power: 19.3W Cooling Solution: Active fan heatsink |
| Bus Type | PCI Express x16, 2.0 compliant |
| Memory | Size: 1GB DDR3 Clock: 875Mhz Memory Bandwidth: 14GB/s |
| Connectors | DMS-59 output Cables included: - For CTO: DMS-59 to DVI cable - For AMO: DMS-59 to DVI cable and DMS-59 to VGA cable |
| Maximum Resolution | Maximum number of displays supported: 2 Maximum Resolution Support: - DMS-59 to VGA: 2048 x 1536 @ 85Hz - DMS-59 to DVI: 1980 x 1200 @ 60Hz - DMS-59 to DP: 2560 x 1600 @ 60Hz |

Technical Specifications - Graphics

| | |
|-----------------------------------|--|
| Image Quality Features | <p>See Display Output section.</p> <p>The following video formats are supported:</p> <ul style="list-style-type: none">- MPEG2- MPEG4 Part 2 Advanced Simple Profile- H.264 SVC codec support- Support for 3D Blu Ray- VC1- DivX version 3.11 or later <p>A full range of video resolutions are supported including 1080p, 1080i, 720p, 480p and 480i. The NVS 315 GPU provides hardware acceleration for the computationally intensive parts of video processing, as well as provides improved video playback speeds via faster decode and transcode.</p> |
| Display Output | <p>Up to 2 displays using one of the following DMS-59 cables:</p> <ul style="list-style-type: none">- DMS-59 to DVI- DMS-59 to VGA- DMS-59 to DP <p>DisplayPort output:</p> <ul style="list-style-type: none">• Drives two DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking, when connected via the DMS-59 to DP adapter. <p>DVI-D output:</p> <ul style="list-style-type: none">• Drives two digital display at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DMS-59 to DVI-D single-link cable adaptor <p>VGA display output:</p> <ul style="list-style-type: none">• 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 | <p>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)</p> <p>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</p> <p>SUSE Linux Enterprise drivers may also be obtained from: ftp://download.nvidia.com/novell or http://www.nvidia.com</p> |
| Notes | <ol style="list-style-type: none">1. The thermal solution used on this card is an active fan heatsink. |

Technical Specifications - Graphics

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 Core Clock: 797 MHz Memory Clock: 891 MHz CUDA Cores: 192 |
| | Bus Type | PCI Express x16, Generation 2.0 |
| | Memory | 2GB DDR3 |
| | Connectors | Four mini-DisplayPort. Four mini-DisplayPort-to-DisplayPort adapters included. (DisplayPort to DVI-D, DisplayPort to VGA, DisplayPort to HDMI, and DisplayPort to Dual-Link DVI adapters available as separate accessories) |
| | Maximum Resolution | Mini-DisplayPort connectors support ultra-high-resolution panels (up to 3840 × 2160 @ 60Hz) |
| | 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 |
| | DVI-D Output | <ul style="list-style-type: none"> • Drives four digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking using DisplayPort to DVI-D single-link cable adaptors. • Drives four digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking using DisplayPort to DVI-D dual-link cable adaptors. |
| | HDMI Output | <ul style="list-style-type: none"> • 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. |

Technical Specifications - Graphics

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
Full OpenGL 4.3 support

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

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

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

Notes [Heatsink cooler design is active.](#)

NVIDIA® Quadro® K620 2GB Graphics

| | |
|-------------------------------|---|
| Form Factor | 2.713" H x 6.3" L Single Slot, Low Profile Full Height Profile bracket installed Low Profile bracket included Weight: 133 grams |
| Graphics Controller | NVIDIA® Quadro® K620 Graphics Card GM107 GPU 384 CUDA cores Max Power: 45 Watts |
| Bus Type | PCI Express 2.0 x16 |
| Memory | 2 GB GDDR3, 900 MHz 128-bit memory I/O path 29 GB/s memory bandwidth |
| Connectors | 1 DL-DVI(I) output, 1 DisplayPort output Factory Configured: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card |
| Maximum Resolution | Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. DisplayPort 1.2: - up to 4096x2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) Dual Link DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz |
| Image Quality Features | 10-bit internal display processing pipeline 10-bit scan-out support |
| Display Output | 1 Dual-link DVI-I connector |

Technical Specifications - Graphics

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

NVIDIA® Quadro® K420 2GB Graphics

| | |
|----------------------------|--|
| Form Factor | Low Profile: 2.713 inches × 6.3 inches Cooling: Active |
| Graphics Controller | NVIDIA® Quadro® K420 GPU: GK107 with 192 CUDA cores Power: 41W |
| Bus Type | PCI Express x16, 2.0 compliant |
| Memory | Size: 2GB DDR3 Clock: 891MHz Memory Bandwidth: 29GB/s Memory Width: 128 bit |
| Connectors | One dual-link DVI-I connector One DisplayPort connector Factory Configured: No video cable adapter included After market option kit: One DP-to-DVI adapter included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
| Maximum Resolution | VGA (via adapter cable): - 2048 × 1536 × 32 bpp at 85 Hz Dual-link DVI - 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) Single-link DVI - 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) DisplayPort 1.2 - 3840 × 2160 × 30 bpp at 60 Hz |

Technical Specifications - Graphics

| | |
|-----------------------------------|--|
| Image Quality Features | <p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p> <p>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo</p> |
| Display Output | <p>Maximum number of displays:</p> <ul style="list-style-type: none"> - 2 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors <p>Maximum number of DisplayPort displays possible (may require MST and/or HBR2):</p> <ul style="list-style-type: none"> - 4 1920x1200 - 2 2560x1600 - 1 3840x2160 <p>Maximum number of monitors across all available Quadro K420 outputs is 4.</p> |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | <p>DX11, OpenGL 4.4</p> <p>Programming support for CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Python, and Fortran</p> |
| Available Graphics Drivers | <p>Microsoft Windows 8.1</p> <p>Microsoft Windows 8</p> <p>Microsoft Windows 7</p> <p>Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> |
| Notes | <ol style="list-style-type: none"> 1. Factory configured Quadro K420 does not include any video adapters. Adapters must be ordered separately. 2. Option kit Quadro K420 includes one DP to DVI-D adapter. 3. Full Height Profile bracket installed. Low Profile bracket included in after market kit. |

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| NVIDIA® Quadro® P400 2GB Graphics | Form Factor | <p>Dimensions: 2.713" H x 5.7" L</p> <p>Single Slot, Low Profile</p> <p>Cooling: Active</p> <p>Weight: 129 grams</p> |
| | Graphics Controller | <p>NVIDIA® Quadro® P400 Graphics Card</p> <p>GP107-825 GPU</p> <p>256 CUDA cores</p> <p>Max Power: 30 Watts</p> |
| | Bus Type | PCI Express 3.0 x16 |
| | Memory | <p>Size: 2 GB GDDR5, 2000 MHz</p> <p>Memory Interface: 64-bit</p> <p>Memory Bandwidth: 32 GB/s</p> |
| | Connectors | 3mDP Outputs* |

Technical Specifications - Graphics

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|-----------------------------------|---|
| Maximum Resolution | DisplayPort 1.4: - up to 3x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST) |
| Image Quality Features | 10-bit internal display processing pipeline 10-bit scan-out support |
| Display Output | 3 mDP Connectors |
| Shading Architecture | Full Microsoft DirectX 12 Shader Model 5.1 |
| Supported Graphics APIs | OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL |
| Available Graphics Drivers | Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 7 Linux |
| | HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |

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| Notes | <p>*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports.</p> <p>Note 1: Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles.</p> <p>Note 2: AMO kits for P400, P600, P1000 and Adapters will ship in July 2017.</p> <ul style="list-style-type: none"> • Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits. • If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> - 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables - 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables |
|--------------|--|

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|--|-------------------------------|---|
| NVIDIA® Quadro® P600 2GB Graphics | Form Factor | Dimensions: 2.713" H x 5.7" L Single Slot, Low Profile Cooling: Active Weight: 129 grams |
| | Graphics Controller | NVIDIA® Quadro® P600 Graphics Card GP107-850 GPU 384 CUDA cores Max Power: 40 Watts |
| | Bus Type | PCI Express 3.0 x16 |
| | Memory | Size: 2 GB GDDR5, 2000 MHz Memory Interface: 128-bit Memory Bandwidth: 64 GB/s |
| | Connectors | 4mDP Outputs* |
| | Maximum Resolution | DisplayPort 1.4: - up to 4x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST) |
| | Image Quality Features | 10-bit internal display processing pipeline 10-bit scan-out support |

Technical Specifications - Graphics

| | |
|-----------------------------------|---|
| Display Output | 4 mDP Connectors |
| Shading Architecture | Full Microsoft DirectX 12 Shader Model 5.1 |
| Supported Graphics APIs | OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL |
| Available Graphics Drivers | Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 7 Linux |
| Notes | <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> <p>*P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports. Note 1: Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles. Note 2: AMO kits for P400, P600, P1000 and Adapters will ship in July 2017.</p> <ul style="list-style-type: none"> • Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits. • If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> - 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables - 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables |

| | | |
|---|----------------------------|---|
| NVIDIA® Quadro® K1200 4GB Graphics | Form Factor | Dimensions: 2.71" H x 6.875" L Single Slot, Low Profile Cooling: Active Weight: ~175 grams |
| | Graphics Controller | NVIDIA® Quadro® K1200 Graphics Card GPU: GM107 with 512 CUDA cores Power: 46 Watts |
| | Bus Type | PCI Express 2.0 x16 |
| | Memory | Size: 4GB GDDR5 Memory Bandwidth: 80 GB/s Memory Width: 128-bit |
| | Connectors | 4 mini-DisplayPort 1.2a Factory Configured Option: 4 mini-DP-to-DP adapters included with card Option Kit: 4 mini-DP-to-DP adapters included with card Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories |
| | Maximum Resolution | DisplayPort: |

Technical Specifications - Graphics

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

DL-DVI(I) output:

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

Single Link-DVI(I) output:

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

VGA (via adapter cable):

- 2048 x 1536 x 32 bpp at 85 Hz

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

Display Output Maximum number of displays
- 4 direct attached monitors

Maximum number of DisplayPort displays possible:

- 4 1920x1200
- 4 2560x1600
- 4 4096x2160

Maximum number of monitors across all available Quadro K1200 outputs is 4.

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.4
DirectX 11.1

API support includes:

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

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

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

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

Notes

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

Technical Specifications - Graphics

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| NVIDIA® Quadro® K2200 4 GB Graphics | Form Factor | 4.38" H x 7.97" L Single Slot, Full Height |
| | Weight: | 240 grams |
| | Graphics Controller | NVIDIA® Quadro® K2200 Graphics Card GM107 GPU 640 CUDA cores Max Power: 67.7 Watts |
| | Bus Type | PCI Express 2.0 x16 |
| | Memory | 4 GB GDDR5, 2500 Mhz 128-bit memory I/O path 80 GB/s memory bandwidth |
| | Connectors | 1 DL-DVI(I) output, 2 DisplayPort outputs Factory Configured Option: No video cable adapter included Option Kit: One DP-to-DVI adapter included with card |
| | Maximum Resolution | Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories DisplayPort: - up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) |
| | Image Quality Features | DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz 10-bit internal display processing pipeline 10-bit scan-out support |
| | Display Output | VGA: <ul style="list-style-type: none"> • requires use of DVI-to-VGA and/or DP-to-VGA video cable adapters • 400 MHz integrated RAMDAC • Max resolution: 2048 x 1536 x 32 bpp @ 85 Hz DL-DVI(I): <ul style="list-style-type: none"> • Max resolution: 2560 x 1600 x 32 bpp @ 60 Hz SL-DVI(I): <ul style="list-style-type: none"> • Max resolution: 1920 x 1200 x 32 bpp @ 60 Hz DisplayPort: <ul style="list-style-type: none"> • Supports HBR2 and MST • Max resolution: 4096 x 2160 x 30 bpp @ 60 Hz (only one monitor can be connected to a Quadro K2200 DisplayPort connector at this resolution) • Max number of DisplayPort daisy-chained monitors or hub connected monitors from a single Quadro K2200 DisplayPort connector: 4 with maximum resolution of 1920 x 1200 Maximum number of monitors across all available Quadro K2200 outputs is 4. |
| | Shading Architecture | Full Microsoft DirectX 11.1 Shader Model 5.0 |
| | Supported Graphics APIs | OpenGL 4.4 DirectX 11.1 |

Technical Specifications - Graphics

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

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| NVIDIA® Quadro® M2000 4GB Graphics | Form Factor | <p>Dimensions: 4.376" H x 6.6" L Single Slot, Full Height Cooling: Active Weight: 239 grams</p> |
| | Graphics Controller | <p>NVIDIA® Quadro® M2000 Graphics Card GPU: GM206 with 768 CUDA cores Power: 75 Watts</p> |
| | Bus Type | <p>PCI Express 3.0 x16</p> |
| | Memory | <p>Size: 4GB GDDR5 Memory Bandwidth: 105.7 GB/s Memory Width: 128-bit</p> |
| | Connectors | <p>4x DisplayPort 1.2a</p> <p>Factory Configured Option: No video cable adapter included After Market Option: No video cable adapter included</p> <p>Additional DisplayPort-to-VGA, DisplayPort-to-HDMI, or DisplayPort-to-DVI adapters are available as accessories</p> |
| | Maximum Resolution | <p>DisplayPort:</p> <ul style="list-style-type: none"> - up to 4096 x 2160 x 30 bpp @ 60Hz - up to 2560 x 1600 x 30 bpp @ 120 Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) |

Technical Specifications - Graphics

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

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| Image Quality Features | <p>12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection)</p> <p>Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, 3D DLP, Interleaved, and passive stereo</p> |
| Display Output | <p>Maximum number of displays - 4 direct attached monitors</p> <p>Maximum number of monitors across all available Quadro M2000 outputs is 4.</p> |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | <p>OpenGL 4.5 DirectX 12</p> <p>API support includes: CUDA C, CUDA C++, DirectCompute 5.0, and OpenCL software</p> |
| Available Graphics Drivers | <p>Microsoft Windows 10 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> |
| Notes | <ol style="list-style-type: none"> 1. Quadro M2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro M2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately. |

| | | |
|---|----------------------------|---|
| NVIDIA® Quadro® P1000 4GB Graphics | Form Factor | <p>Dimensions: 2.713" H x 5.7" L Single Slot, Low Profile Cooling: Active Weight: 129 grams</p> |
| | Graphics Controller | <p>NVIDIA® Quadro® P1000 Graphics Card GP107-860 GPU 640 CUDA cores Max Power: 47 Watts</p> |
| | Bus Type | PCI Express 3.0 x16 |
| | Memory | <p>Size: 4 GB GDDR5, 2500 MHz Memory Interface: 128-bit memory interface Memory Bandwidth: 80 GB/s memory bandwidth</p> |
| | Connectors | 4mDP Outputs* |
| | Maximum Resolution | DisplayPort 1.4: |

Technical Specifications - Graphics

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|-----------------------------------|---|
| | - up to 4x 5120 x 2880 x 24 bpp @ 60Hz - supports Multi-Stream Transport (MST) |
| Image Quality Features | 10-bit internal display processing pipeline 10-bit scan-out support |
| Display Output | 4 mDP Connectors |
| Shading Architecture | Full Microsoft DirectX 12 Shader Model 5.1 |
| Supported Graphics APIs | OpenGL 4.5 DirectX 12 Vulkan 1.0 API support includes: CUDA C, CUDA C++, DirectCompute , OpenCL |
| Available Graphics Drivers | Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 7 Linux |
| | HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |
| Notes | *P400, P600 and P1000 only have mini-DisplayPort (mDP) video ports. Note 1: Two mDP-to-DP adapters will ship with each P400, P600 or P1000 configured in HP Z Workstations Compatibles. Note 2: AMO kits for P400, P600, P1000 and Adapters will ship in July 2017. <ul style="list-style-type: none"> • Two mDP-to-DP Adapters are included in the P400, P600 and P1000 AMO kits. • If mDP-to-DP Adapters are needed, Adapters can be ordered separately: <ul style="list-style-type: none"> - 2KW86A6 - HP (Bulk 4) miniDP-to-DP Adapter Cables - 2KW87A6 - HP (Bulk 12) miniDP-to-DP Adapter Cables |

NVIDIA Quadro P2000 5GB Graphics

| | |
|----------------------------|--|
| Form Factor | Dimensions: 4.4"Hx7.9"L Single Slot Cooling: Active Weight: 260 grams |
| Graphics Controller | NVIDIA Quadro P2000 Graphics Card Power: 75 Watts |
| Bus Type | PCI Express 3.0 x16 |
| Memory | Size: 5GB GDDR5 Memory Bandwidth: 140 GB/s Memory Width: 160-bit |
| Connectors | 4x DisplayPort 1.4 Factory Configured Option: No adapter included with card After Market Option: No video cable adapter included |

Technical Specifications - Graphics

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

Maximum Resolution

DisplayPort:
- up to 5120 x 2880 x 24 bpp @ 60Hz
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DP 1.3 & 1.4 ready.

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

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

HDMI 2.0 (requires DP to HDMI adapter):
5120 x 2880 x 24 bpp @ 60Hz

Image Quality Features

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

Stereoscopic 3D display support including NVIDIA® 3D Vision™ technology, NVIDIA® Mosaic and nView.

Display Output

Maximum number of displays
- 4 direct attached monitors

Maximum number of monitors across all available Quadro P2000 outputs is 4.

Shading Architecture

Shader Model 5.1

Supported Graphics APIs

OpenGL® 4.5
DirectX® 12

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

Available Graphics Drivers

Microsoft Windows 10
Microsoft Windows 7 Professional 64bit
Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions

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

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

Notes

1. Quadro P2000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately.
2. Quadro P2000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately.

Technical Specifications - Graphics

| | | |
|---|-----------------------------------|--|
| Radeon™ Pro WX 4100 4GB Graphics | Form Factor | Low-Profile Single Slot (6.6" Length) |
| | Graphics Controller | Polaris 11 Baffin GL XT GPU: 1024 Stream Processors organized into 16 Compute Units Power: 50 Watts Cooling: Active |
| | Memory | 4GB GDDR5 memory Memory Bandwidth: 6 Gbps / 96 GB/s Memory Width: 128 bit |
| | Connectors | 4x Mini DisplayPort 1.4 – HDR ready connectors with HBR3 and MST support. Factory Configured: Four mDP-to-DP cable adapters included After market option kit: Four mDP-to-DP cable adapters included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
| | Maximum Resolution | 5K support @ 60Hz <ul style="list-style-type: none"> • 1x single-cable 5K monitor, or 2x dual-cable 5K monitors 4x 4K support @ 60Hz |
| | Image Quality Features | Advanced support for 8-bit and 10-bit per RGB color component. High bandwidth scaler for high quality up and downscaling |
| | Display Output | 4 full physical DP1.3 HBR3 / DP1.4 HDR outputs FreeSync support |
| | GPU Architecture | GCN 4th Generation |
| | Supported Graphics APIs | DirectX® 12 OpenGL® 4.5 OpenCL™ 2.0 Vulkan™ 1.0 |
| | Available Graphics Drivers | Windows 10 64-bit Windows® 7 64-bit Linux 64-bit (selected Enterprise distributions) |
| | | HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |
| | Notes | <ol style="list-style-type: none"> 1. HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support. 2. AMD PowerTune and AMD ZeroCore Power are technologies offered by certain FirePro™ and Radeon™ Pro products, which are designed to intelligently manage GPU power consumption in response to certain GPU load conditions. 3. As of September 2016, certified for DisplayPort™ 1.4 HBR3 and ready for DisplayPort™ 1.4 HDR based on independent verification by DisplayPort™ testing authority. HDR content requires that the system be configured with a fully HDR- |

Technical Specifications - Graphics

ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support.

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

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

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

| | |
|---------------------------|--|
| Maximum Resolution | DisplayPort 1.2: <ul style="list-style-type: none"> • up to 4096x2160 x 30 bpp @ 60Hz Dual Link DVI(I) (requires adapter cable): <ul style="list-style-type: none"> • up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I)(requires adapter): <ul style="list-style-type: none"> • up to 1920 x 1200 x 32 bpp @ 60Hz VGA(requires adapter): <ul style="list-style-type: none"> • 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) |

Technical Specifications - Graphics

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

AMD FirePro W4300 4GB Graphics

Form Factor

Low Profile, single slot (6.6" x 3.118")
Full Height, single slot (6.6" x 4.725")

Graphics Controller

AMD FirePro W4300 graphics
GPU Frequency: 930Mhz
Memory Clock Speed: 1500Mhz
GPU: 768 Stream Processors organized into 12 Compute Units
Power: <50 Watts
Cooling: Active

Bus Type

PCI Express® x16, Generation 3.0

Memory

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

Connectors

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

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

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

Maximum Resolution

DisplayPort:
- 4096x2160 @24bpp (3 x 4K @ 60Hz, 4 x 4K @ 30Hz)

Image Quality Features

Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component.
High bandwidth scaler for high quality up and downscaling
Incorporated Adaptive-Sync enables FreeSync™ technology from AMD that allows GPU control of display refresh rates for tear-free and jitter-free image quality when rotating models or viewing video content.(Requires FreeSync compliant displays)

Display Output

Max number of monitors supported using DisplayPort 1.2a:

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

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

- one 4096x2160 display

Technical Specifications - Graphics

- two 2560x1600 displays
- four 1920x1200 displays

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.4
OpenCL 2.0
DirectX 12.0

Available Graphics Drivers Windows 10 (64-bit and 32-bit)
Windows® 7 (64-bit and 32-bit)
Linux

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

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

Notes

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

AMD FirePro W5100 4GB Graphics

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

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

Bus Type PCI Express® x16, Generation 3.0

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

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

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

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

Maximum Resolution DisplayPort:
- 4096x2160 @24bpp 60Hz

Technical Specifications - Graphics

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

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

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

| | |
|-----------------------------------|--|
| Image Quality Features | Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling |
| Display Output | Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors |
| Shading Architecture | Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays Shader Model 5.0 |
| Supported Graphics APIs | OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle |
| Available Graphics Drivers | Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux |
| 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. |
| Form Factor | Full height, single slot (6.75" X 4.376") |

| | | |
|---|--------------------|--|
| NVIDIA® Quadro® M4000 8GB Graphics | Form Factor | Dimensions: 4.4" H x 9.5" L Single Slot, Full Height Cooling: Active Weight: 475 grams (without extender) |
|---|--------------------|--|

Graphics Controller NVIDIA® Quadro® M4000

Technical Specifications - Graphics

GPU: GM204 with 1664 CUDA cores
Power: 120 Watts

| | |
|-------------------------------|--|
| Bus Type | PCI Express 3.0 x16 |
| Memory | Size: 8GB GDDR5 Memory Bandwidth: 192 GB/s Memory Width: 256-bit |
| Connectors | 4 DisplayPort 1.2a Factory configured Option: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories |
| Maximum Resolution | DisplayPort: - single DisplayPort up to 4096 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz VGA (via adapter cable): - 2048 x 1536 x 32 bpp at 85 Hz |
| Image Quality Features | 12-bit internal display pipeline (hardware support for 12-bit scanout on supported panels, applications and connection) 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. |

Technical Specifications - Graphics

| | |
|-----------------------------------|--|
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | OpenGL 4.5 DirectX 12 |
| | API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran |
| Available Graphics Drivers | Microsoft Windows 10 Microsoft Windows 8.1 Microsoft Windows 8 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions |
| | HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |
| Notes | 1. Configurations using the Quadro M4000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA). |

NVIDIA® Quadro® M5000 8GB Graphics

| | |
|----------------------------|---|
| Form Factor | Dimensions: 4.4" H x 10.5" L Dual Slot, Full Height Cooling: Active Weight: 525 grams (without extender) |
| Graphics Controller | NVIDIA® Quadro® M5000 GPU: GM204 with 2048 CUDA cores Power: 150 Watts |
| Bus Type | PCI Express 3.0 x16 |
| Memory | Size: 8GB GDDR5 ECC capable Memory bandwidth: 211GB/s Memory Width: 256-bit |
| Connectors | 1 Dual Link DVI-I 4 DisplayPort 1.2a |
| | Factory configured option: No adapter included with card. After market option kit: No adaptor included with card. |
| | Additional DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories |
| Maximum Resolution | DisplayPort: |

Technical Specifications - Graphics

- up to four 4096 x 2160 x 30 bpp @ 60Hz displays
- up to two 5120 x 2880 @ 60Hz displays
- supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST)

DL-DVI(I) output:

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

Single Link-DVI(I) output:

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

VGA (via adapter cable):

- 2048 x 1536 x 32 bpp at 85 Hz

Image Quality Features

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

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

Full OpenGL quad buffered stereo support.

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

Display Output

Maximum number of displays

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

Maximum number of DisplayPort displays possible (may require MST and/or HBR2):

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

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

Shading Architecture

Shader Model 5.0

Supported Graphics APIs

OpenGL 4.5
DirectX 12

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

Available Graphics Drivers

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

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. Factory configured Quadro M5000 does not include a video cable adapter. Video cable adapters must be ordered separately.
2. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).
3. Configurations of a single Quadro M5000 graphics card in HP Z440 Workstation require the HP Z440 Fan and Front Card Guide Kit, configurable from the factory (CTO PN: G8T99AV) or as an Aftermarket Option (AMO PN: J9P80AA).

NVIDIA® Quadro® P4000 8GB Graphics

Form Factor

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

Graphics Controller

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

Bus Type

PCI Express 3.0 x16

Memory

Size: 8GB GDDR5
Memory Bandwidth: 243 GB/s
Memory Width: 256-bit

Connectors

4 x DisplayPort 1.4
3-pin mini-DIN connector via optional bracket
1 x 6-pin auxiliary power connector
4-pin header for stereo signal
SYNC connector for Quadro® Sync II
2 x SLI connectors

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

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

Maximum Resolution

Dual-link internal TMDS (DVI 1.0):
- up to 2560 x 1600 x 32 bpp @ 60 Hz

Single-link internal TMDS (DVI 1.0):
- up to 1920 x 1200 x 32 bpp @ 60 Hz

HDMI™ 2.0b (requires DP to HDMI adapter):
- up to 5120 x 2880 x 24 bpp @ 60Hz

DisplayPort:

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

Technical Specifications - Graphics

| | |
|-----------------------------------|--|
| | Using two DP outputs, the P4000 can drive one dual DP input display with 5120 x 2880 x 30 bpp @ 60Hz resolution. |
| Image Quality Features | Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView |
| Display Output | Maximum number of displays - 4 direct attached monitors |
| | Maximum number of monitors across all available Quadro P4000 outputs is 4. |
| Shading Architecture | Shader Model 5.1 |
| Supported Graphics APIs | OpenGL 4.5 DirectX 12 Vulkan 1.0 |
| | API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran |
| Available Graphics Drivers | Microsoft Windows 10 Microsoft Windows 7 Linux - Full OpenGL implementation, complete with NVIDIA and ARB extensions |
| | HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |
| Notes | <ol style="list-style-type: none"> 1. Quadro P4000 offered as Factory Configured Option does not include a video cable adapter. Video cable adapters must be ordered separately. 2. Quadro P4000 offered as an After Market Option does not include video cables. Video cable adapters must be ordered separately. |

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

Technical Specifications - Graphics

| | |
|------------------------------------|---|
| Connectors | <p>DP (x4) with HDR support DL-DVI(D) 3-pin mini-DIN connector SLI connector Quadro Sync connector (compatible with Quadro II Sync) One 8-pin auxiliary power connector</p> <p>Factory configured option: No video cable adapter included with card. After market option Kit: No video cable adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p> |
| Maximum Resolution | <p>5K support @ 60Hz 1x single-cable 5K monitor, or 2x dual-cable 5K monitors</p> |
| Image Quality Features | <p>Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView Desktop Management</p> |
| Display Outputs¹ | <p>4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or up to 8K at 30Hz) 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1200 @ 120 Hz)</p> |
| GPU Architecture | NVIDIA Pascal™ |
| Supported Graphics APIs | <p>DirectX® 12 , OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0 Developer API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p> |
| Available Graphics Drivers | <p>Windows® 10 64-bit Windows® 7 64-bit Linux 64-bit</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> |
| Notes | <ol style="list-style-type: none"> 1- Supports up to a total of 4 displays 2- For HP Z440 Workstations, the 700W power supply option must be used. 3- For HP Z840 Workstation configurations, the 1125W power supply option must be used for multiple P5000 configurations. |

NVIDIA® Quadro® K4200 4GB Graphics Form Factor

Dimensions: 4.376" H x 9.5" L
Single Slot, Full Height
Cooling: Active

Technical Specifications - Graphics

| | |
|-------------------------------|---|
| Weight: | 461 grams (without extender) |
| Graphics Controller | NVIDIA® Quadro® K4200 GPU: GK104-850 GPU with 1344 CUDA cores Power: 108 Watts |
| Bus Type | PCI Express 2.0 x16 |
| Memory | Size: 4GB GDDR5 Memory Bandwidth: 173 GB/s Memory Width: 256-bit |
| Connectors | 1 DL-DVI(I) 2 DisplayPort 1.2a Factory Configured Option: No video cable adapter included After market option kit: One DP-to-DVI adapter included with card Additional DVI-to-VGA, DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as accessories |
| Maximum Resolution | DisplayPort: - up to 3840 x 2160 x 30 bpp @ 60Hz - supports High Bit Rate 2 (HBR2) and Multi-Stream Transport (MST) DL-DVI(I) output: - up to 2560 x 1600 x 32 bpp @ 60Hz Single Link-DVI(I) output: - up to 1920 x 1200 x 32 bpp @ 60Hz VGA (via adapter cable): - 2048 x 1536 x 32 bpp at 85 Hz |
| Image Quality Features | 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) 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 - 3 direct attached monitors - 4 using DP 1.2a with MST and HBR2 enabled monitors Maximum number of DisplayPort displays possible (may require MST and/or HBR2): - 4 1920x1200 |

Technical Specifications - Graphics

- 4 2560x1600
- 2 3840x2160

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

Shading Architecture Shader Model 5.0

Supported Graphics APIs OpenGL 4.4
DirectX 11.1

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

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

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

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

- Notes**
1. Quadro K4200 offered as CTO does not include a video cable adapter. Video cable adapters must be ordered separately.
 2. Quadro K4200 offered as After Market Kits includes one DP-to-DVI video cable adapter. Additional cables must be ordered separately.
 3. A total maximum of 4 active monitors are supported across all display output types. This may be accomplished by using daisy chained DisplayPort 1.2 displays (displays must support MST and HBR2).
 4. 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 Dual Slot |
| | Weight: | ~880 grams |
| | Graphics Controller | NVIDIA® Quadro® K5200 GK 110 GPU 2304 CUDA cores Max Power: 150 Watts |
| | Bus Type | PCI Express 3.0 x16 |
| | Memory | 8GB GDDR5 256-bit memory I/O path 192 GB/s memory bandwidth |

Technical Specifications - Graphics

| | |
|-----------------------------------|--|
| Connectors | <p>DVI-I (1), DVI-D (1), DP (2),</p> <p>Factory configured option: No adapter included with card. Option Kit: No adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p> |
| Image Quality Features | <ul style="list-style-type: none"> • DisplayPort with Multi-Stream Technology (MST) and High Bit Rate 2 (HBR2), HDMI 1.4, and HDCP support • NVIDIA 3D Vision™ technology |
| Display Output | <p>400 MHz integrated RAMDAC</p> <ul style="list-style-type: none"> • Maximum resolution over VGA (through DVI to VGA cable): 2048 × 1536 × 32 bpp at 85 Hz <p>Dual-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> • Maximum resolution over digital port (single GPU and SLI mode): 2560 × 1600 × 32 bpp at 60 Hz (reduced blanking) <p>Single-link internal TMDS (DVI 1.0)</p> <ul style="list-style-type: none"> • Maximum resolution over digital port (single GPU and SLI mode): 1920 × 1200 × 32 bpp at 60 Hz (reduced blanking) <p>DisplayPort with MST and HBR2.</p> <ul style="list-style-type: none"> • Maximum resolution: 4096 × 2160 × 30 bpp at 60Hz • Maximum resolution: 2560 × 1600 × 30bpp at 120Hz <p>HDMI</p> <ul style="list-style-type: none"> • Maximum resolution: 1920 × 1080 × 32 bpp at 60Hz |
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | <p>OpenGL 4.4</p> <p>DirectX 11</p> <p>API support for NVIDIA's CUDA™ C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p> |
| Available Graphics Drivers | <p>Windows 8</p> <p>Windows 7 Professional (64-bit and 32-bit)</p> <p>Red Hat Enterprise Linux (RHEL) 6 Desktop/Workstation (64-bit)</p> <p>SUSE Linux Enterprise Desktop 11 SP3(64-bit and 32-bit)</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> |
| Notes | <ol style="list-style-type: none"> 1. NVIDIA GRID VGX Pass Through feature supported on NVIDIA® Quadro® K5200 to enable direct mapping of GPU to Virtual Machine. 2. No display output adapter included. |

Technical Specifications - Graphics

| | | |
|---------------------------------------|-------------------------------|---|
| AMD FirePro W7100 8GB Graphics | Form Factor | Full height, single slot (9.5" X 4.376") |
| | Weight: | AMD FirePro W7100 graphics GPU: 1792 Stream Processors organized into 28 Compute Units Power: <75 Watts Cooling: Active |
| | Graphics Controller | PCI Express® x16, Generation 3.0 |
| | Bus Type | 8GB GDDR5 memory Memory Bandwidth: up to 176 GB/s Memory Width: 256 bit |
| | Memory | 4x Display Port 1.2a connectors with HBR2 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
| | Connectors | DisplayPort: - 4096x2160 @24bpp 60Hz Dual Link DVI: - 2560x1600 (requires DP to DL-DVI adapter) Single Link DVI: - 1920x1200 (requires DP to DVI adapter) VGA: - 1920x1200 (requires DP to VGA adapter) |
| | Image Quality Features | Advanced support for 8-bit, 10-bit, and 16-bit per RGB color component. High bandwidth scaler for high quality up and downscaling |
| | Display Output | Max number of monitors supported using DisplayPort 1.2a: - 4 direct attached monitors - 6 using DP 1.2a with MST and HBR2 enabled monitors Monitor chaining from a single DisplayPort (subject to a max of 6 total monitors across all outputs, requires use of DisplayPort enabled monitors supporting MST and HBR2): - one 4096x2160 display - two 2560x1600 displays - four 1920x1200 displays |

Technical Specifications - Graphics

| | |
|-----------------------------------|--|
| Shading Architecture | Shader Model 5.0 |
| Supported Graphics APIs | OpenGL 4.4 OpenCL 1.2 and 2.0 DirectX 11.2 / 12 AMD Mantle |
| Available Graphics Drivers | Windows 8.1 / 8 (64-bit and 32-bit) Windows® 7 (64-bit and 32-bit) Linux HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html |
| Notes | <ol style="list-style-type: none"> 1. AMD Eyefinity technology supports up to six DisplayPort™ monitors on an enabled graphics card. Supported display quantity, type and resolution vary by model and board design; confirm specifications with manufacturer before purchase. To enable more than two displays, or multiple displays from a single output, additional hardware such as DisplayPort-ready monitors or DisplayPort 1.2 MST-enabled hubs may be required. See www.amd.com/eyefinityfaq for full details. 2. OpenGL 4.4 support available with driver 14.301.xxx or later. 3. OpenCL 2.0 support planned in driver updates for early 2015. 4. For HP Z440 Workstation configurations, the HP Z4 Fan and Front Card Guide Kit, which is available both CTO (G8T99AV) and AMO (J9P80AA), is required. |

| | | |
|---|----------------------------|--|
| Radeon™ Pro WX 7100 8GB Graphics | Form Factor | Full-Height Single Slot (9.5" Length) |
| | Graphics Controller | Radeon™ Pro WX 7100 graphics GPU: 2304 Stream Processors organized into 36 Compute Units Power: 130 Watts Cooling: Active |
| | Memory | 8GB GDDR5 memory Memory Bandwidth: 7 Gbps / 224 GB/s Memory Width: 256 bit |
| | Connectors | 4x Display Port 1.4 – HDR ready connectors with HBR3 and MST support. Factory Configured: No video cable adapter included After market option kit: No video cable adapter included Additional DisplayPort-to-VGA or DisplayPort-to-DVI adapters are available as Factory Configuration or Option Kit accessories. |
| | Maximum Resolution | 5K support @ 60Hz <ul style="list-style-type: none"> • 1x single-cable 5K monitor, or 2x dual-cable 5K monitors |

Technical Specifications - Graphics

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

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

GPU Architecture GCN 4th Generation

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

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

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

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

Notes

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

NVIDIA® Quadro® P6000 Form Factor
24GB Graphics

Full-Height Dual Slot (4.4" Height x 10.5" Length)
Weight: 967 grams / 2.14 lbs

Technical Specifications - Graphics

| | |
|------------------------------------|---|
| Graphics Controller | <p>Quadro™ P6000 graphics GPU: 3840 NVIDIA CUDA® Parallel Processing Cores Power: 250 Watts Cooling: Active</p> |
| Memory | <p>24GB GDDR5X memory Memory Bandwidth: Up to 432 GB/s Memory Width: 384 bit ECC Memory (disabled by default)</p> |
| Connectors | <p>DP (x4) with HDR support DL-DVI(I) 3-pin mini-DIN connector SLI connector Quadro Sync connector (compatible with Quadro II Sync) One 8-pin auxiliary power connector</p> <p>Factory configured option: No video cable adapter included with card. After market option Kit: No video cable adaptor included with card.</p> <p>DVI to VGA, DisplayPort to VGA, DisplayPort to DVI, and DisplayPort to Dual-Link DVI adapters available as accessories.</p> |
| Maximum Resolution | <p>5K support @ 60Hz 1x single-cable 5K monitor, or 2x dual-cable 5K monitors</p> |
| Image Quality Features | <p>Advanced support for 8-bit, 10-bit, and 12-bit per RGB color component. HDCP 2.2 support over DisplayPort, DVI, and HDMI connectors NVIDIA 3D Vision™ and other 3D stereo technologies NVIDIA Mosaic and nView</p> |
| Display Outputs¹ | <p>4x DP1.4 HDR outputs (up to 3840x2160 UHD @ 120Hz refresh, or up to 8K at 30Hz) 1x Dual-link DVI-D output (up to 2560 x 1600 @ 60 Hz and 1920x1200 @ 120 Hz)</p> |
| GPU Architecture | NVIDIA Pascal™ |
| Supported Graphics APIs | <p>DirectX®12 , OpenGL® 4.5, OpenCL™ 1.0, Vulkan™ 1.0 Developer API support includes: CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python, and Fortran</p> |
| Available Graphics Drivers | <p>Windows® 10 64-bit Windows® 7 64-bit Linux 64-bit</p> <p>HP qualified drivers may be preloaded or available from the HP support Web site: http://welcome.hp.com/country/us/en/support.html</p> |

Technical Specifications - Graphics

Notes

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

| | | |
|--------------------------------|--------------------------------------|--|
| NVIDIA® Quadro® Sync II | Part number | 1WT20AA |
| | Dimensions (HxD) | 6.0 inches × 4.2 inches |
| | Devices Supported | NVIDIA® Quadro® P4000 NVIDIA® Quadro® P5000 NVIDIA® Quadro® P6000 |
| | Bus Type | Requires one free mechanical PCIe bus slot. 6-pin PCI or SATA power connector |
| | PCI Form Factor | Full Height, half length, single slot |
| | Ports | 2 RJ45 connectors for carrying frame lock signals over CAT5 cables. BNC Connector for external house synchronization. |
| | Internal Connectors | 6 NVIDIA SLI® style edge fingers for connection to compatible GPUs <ul style="list-style-type: none"> • Included with the board are 4 12-Inch Short Sync Cables to connect to GPU's • Included with the board are 2 24-Inch Long Sync Cables to connect to GPU's |
| | System Requirements | Requires one free mechanical PCIe bus slot. 6-pin PCI or SATA power connector Must be used with NVIDIA Quadro P4000, P5000 or P6000 graphics cards. Requires Quadro driver version R375 or later. |
| | Temperature - Operating | 0° to 55° C |
| | Temperature - Storage | -40° to 60° C |
| | Relative Humidity - Operating | 10% to 80% |
| | Power Requirements | Board power dissipation: <15W |
| | Operating Systems Supported | Windows 10 64-bit Windows 7 64-bit Linux 64-bit |
| | Kit Contents | Contains: <ul style="list-style-type: none"> • Quadro Sync II Card • 4 x 12-Inch Short Sync Cables • 2 x 24-Inch Long Sync Cables (Two) • Quick Start Guide |

Technical Specifications – Optical and Removable Storage

OPTICAL AND REMOVABLE STORAGE

| | | | |
|---------------------------------|--|--|--|
| HP 9.5mm Slim 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+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW | |
| | Disc Capacity | DVD-ROM Full Stroke DVD Full Stroke CD | 8.5 GB DL or 4.7 GB standard < 200 ms (seek) < 200 ms (seek) |
| | Maximum Data Transfer Rates | CD ROM Read DVD ROM Read | CD-ROM, CD-R Up to 24X CD-RW Up to 24X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X |
| | Power | Source DC Power Requirements DC Current | SATA DC power receptacle 5 VDC ± 5%-100 mV ripple p-p 5 VDC -< 800 mA typical, <1600 mA maximum |
| | Operating Environmental (all conditions non-condensing) | Temperature Relative Humidity Maximum Wet Bulb Temperature | 41° to 122° F (5° to 50° C) 10% to 80% 84° F (29° C) |
| | Operating Systems Supported | Windows 10, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 | |
| Kit Contents | HP SATA DVD Writer drive, installation guide. | | |

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

Technical Specifications – Optical and Removable Storage

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

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

Technical Specifications – Optical and Removable Storage

| | | |
|--|--|---|
| Disc Capacity | DVD-ROM | 8.5 GB DL or 4.7 GB standard |
| | Blu-ray | 25 GB (single-layer) 50 GB (dual-layer) 100/128 GB (BDXL) |
| | Full Stroke DVD | < 230 ms (seek) |
| | Full Stroke CD | < 220 ms (seek) |
| | Blu-ray | < 230 ms (seek) (Full Stroke Blu-ray) |
| | Startup Time | (Time to drive ready from tray loading) |
| | | BD-ROM (SL/DL) 25S / 28S |
| | | BD-R (SL/DL) 25S / 28S |
| | | BD-RE (SL/DL) 25S / 28S |
| | | DVD-ROM (SL/DL) 18S / 18S |
| | | DVD-R (SL/DL) 25S / 25S |
| | | DVD-RW 25S |
| | | DVD+R (SL/DL) 25S / 25S |
| | | DVD+RW 25S |
| | | DVD-RAM 45S |
| | CD-ROM 15S | |
| Maximum Data Transfer Rates | CD ROM Read | CD-ROM, CD-R Up to 24X CD-RW Up to 24X |
| | DVD ROM Read | DVD-RAM Up to 8X DVD+RW Up to 8X DVD-RW Up to 8X DVD+R DL Up to 8X DVD-R DL Up to 8X DVD-ROM Up to 8X DVD-ROM DL Up to 8X DVD+R Up to 8X DVD-R Up to 8X |
| | Blu-ray | BD-ROM Up to 6X BD-ROM DL Up to 6X BD-R Up to 6X BD-R DL Up to 6X BD-R Up to 6X BD-RE SL/DL Up to 6X |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Power | Source | SATA DC power receptacle |
| | DC Power Requirements | 5 VDC ± 5%-100 mV ripple p-p |
| | DC Current | 5 VDC -900 mA typical, 2000mA maximum |
| Operating Environmental (all conditions non-condensing) | Temperature | 41° to 122° F (5° to 50° C) |
| | Relative Humidity | 10% to 80% |
| | Maximum Wet Bulb Temperature | 84° F (29° C) |
| Operating Systems Supported | Windows 8.1, Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation SUSE Linux Enterprise Desktop 10 & 11 | |

Technical Specifications – Optical and Removable Storage

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

Kit Contents

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

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

HP DX115 Removable Drive Enclosure

Interface Type

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

Dimensions (WxHxD)

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

Approvals

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

HP 15-in-1 Media Card Reader

Description

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

Interface Type

USB 3.0 High-speed interface

Note: If there is a USB2 connection, USB2 transfer speeds are supported.

Dimensions (WxHxD)

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

Supported Media Types

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

These additional media types are supported with a card adapter.

Memory Stick Micro (M2)
miniSD
miniSD High Capacity

Technical Specifications – Optical and Removable Storage

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) 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 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps |
| | Management Capabilities | WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostics AMT 9.1 support, vPro compliant |

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

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

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

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

| | | |
|--|--|---|
| Intel 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 PCIe v2.1 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs) |
| | Data Path Width | Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots |
| Power Requirement | 4.1W idle without EEE link partner 3.2W idle with EEE link partner 4.2W maximum | |
| Network Transfer Rate | 10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s | |

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 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) Product Warranty statement and the Installation Guide. |
|---------------------|---|

| | | |
|--|---|---|
| Intel Ethernet I350-T4 4-port 1Gb NIC | Connector | Four RJ-45 |
| | Controller | Intel® Ethernet I350 Controller |
| | Data Rates Supported | 10/100/1000 Mbps, Half- and full-duplex |
| | Compliance | 802.3, 802.3u, 802.3x, 802.3ab, 802.3ad, 802.1p, 802.1Q, 802.3az, IEEE 1588 PCIe v2.1 standard RoHS (6 of 6) FCC (U.S. only) Class B DOC (Canada) Class B CE EN 55024, EN55022 Class B VCCI Class II UL 1950 CSA 950 EN 60950 CE ACPI 1.1a Microsoft WHQL (Windows Hardware Quality Labs) |
| | Data Path Width | Four lane (x4) PCI Express compatible with x4, x8, and x16 PCI Express slots |
| | Power Requirement | 5.0W (typical) |
| | Network Transfer Rate | 10BASE-T (half-duplex) 10 Mb/s 10BASE-T (full-duplex) 20 Mb/s 100BASE-TX (half-duplex) 100 Mb/s 100BASE-TX (full-duplex) 200 Mb/s 1000BASE-T (full-duplex) 2000 Mb/s |
| | Operating Temperature | 32° to 131° F (0° to 55° C) |
| | Operating Humidity | 10% to 95% non-condensing |
| | Dimensions (H x W x D) | 5.3 x 2.5 in (13.50cm x 6.4 cm) (without brackets) |
| Operating System Driver Support | Windows 7 32-bit and 64-bit; Windows 10 32-bit and 64-bit; Red Hat Enterprise Linux(RHEL) WS4, 5, 6 Desktop/Workstation Novell SLED 10 & SLED 11 | |
| Kit Contents | Intel I350-T4 PCIe Quad Port Gigabit NIC PCA with a standard height bracket attached to it (the low profile bracket is included in the clamshell that the PCA ships in) Product Warranty statement and the Installation Guide. | |

Technical Specifications - Networking and Communications

| | | |
|--|-------------------------------|--|
| Intel 7260 802.11 a/b/g/n PCIe WLAN NIC | Operating Humidity | Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing) |
| | Dimensions (H x W x D) | Native HMC: 26.8 x 30.0 x 2.4 mm Carrier Card Assembly 3.3 x 4.7 in (84 x 119 mm) |
| | Kit Contents | PCIe x1 card with full height bracket, rf antenna, antenna cable, separate low profile bracket, software CD and warranty. |
| | Notes | <ol style="list-style-type: none"> 1. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista. 2. Check latest software/driver release for updates on supported security features. 3. Maximum output power may vary by country according to local regulations. 4. In Power Save Polling mode and on battery power. 5. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation). |

| | | |
|---|------------------------------|--|
| Intel 8260 802.11 a/b/g/n/ac with Bluetooth 4.2 PCIe NIC | 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, 2014 | V1 | Added | Style and technical specifications |
| October 1, 2014 | From v1 to v2 | Added | Rack dimensions, note to supported components: memory, Foxit PhantomPDF Express and Cyberlink Power2Go: software, Optical drives: DVD, BD-XL specs |
| | | Changed | Turbo specs for E5-1660v3, Acoustics - only 1 ODD on the high-end config, not 2, Declared Noise Emissions section, Supported Components: Graphics, Optical and Removable Storage, Overview, Stable & Consistent, power supply configurations, Noise Emissions section, Updated Power Supply Configurations and table |
| | | Removed | Cyberlink MediaSuite, TPM 2.0 references, HP Power Assistant and PDF Complete |
| December 3, 2014 | From v2 to v3 | Added | HP Z440 Memory Cooling Solution, power cable descriptor in Overview and System Technical Specifications sections |
| January 1, 2015 | From v3 to v4 | Added | OS under Overview, and Support Components, Memory support matrix and load order |
| February 1, 2015 | From v4 to v5 | Added | AMD W5100, W7100 GPU, DX115 Removable HDD Frame/Carrier, 256GB SATA 6Gb/s SED OPAL 2 SSD from Supported Components |
| | | Changed | Internal I/O USB, OS under overview, and Supported components. |
| March 1, 2015 | From v5 to v6 | Added | Operating Systems: Red Hat and SUSE Support, 600 and 300GB SAS SFF HDD, 4TB SATA HD, HD Controller |
| | | Changed | HP Installer Kit for Linux, RAID, SAS and SATA Hard Drives Notes, ACPI support under BIOS section |
| April 1, 2015 | From v6 to v7 | Changed | Hard Drives Notes and Memory Notes in Supported Components section. Memory Speed Supported in System Board. Memory Info from System Configuration. |
| | | Added | Chassis Dimensions |
| 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 |

Summary of Changes

| | | | |
|-------------------|-----------------|---------|--|
| 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; |
| | | 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-Range 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 for 4TB 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 |
| October 1, 2016 | From v19 to v20 | Added | Intel 750 Series PCIe SSDs, Added Z Turbo TLC SSDs, Added 1TB Enterprise HDD |
| | | Removed | OS options, Xeon v3 processors, 4GB 2133 DIMMs |
| November 1, 2016 | From v20 to v21 | Added | 1TB SATA 7200 rpm HDD (Enterprise Class), HP Z Turbo and Z Turbo Quad Pro SSD Drives |
| | | Changed | PCIe drives note |
| | | Removed | Intel Xeon v3 processors, 4GB DDR4-2133 RAM, Win 7, and 8.1 Pro 64-bit |
| January 1, 2017 | From v21 to v22 | Added | Radeon Pro WX 7100 8GB graphics, HP Z Turbo Drive G2 256GB TLC, HP Z Turbo Drive G2 512GB TLC, HP Z Turbo Drive G2 1TB TLC, 2TB SATA SSD, 9.5mm Slim DVD-Writer. |
| February 1, 2017 | From v22 to v23 | Changed | HP 9.5mm Slim SuperMulti DVD Writer specs and HP Inc. disclaimers |
| March 1, 2017 | From v23 to v24 | Added | NVIDIA Quadro P5000 |
| April 1, 2017 | From v24 to v25 | Added | Hard Drive Controllers section note 4, Fan and Front Card Guide Components, |
| | | Changed | SATA Hard Drives, HP Solid State Drives (SSDs) notes, Notes 5&6 to Mid-Range Quadro M2000, FirePro 4300Graphics and Radeon Pro WX7100, TPM content |
| April 14, 2017 | From v25 to v26 | Removed | The System Configuration (High-end) & Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296) subsections under The DECLARED NOISE EMISSIONS section was removed. |
| May 1, 2017 | From v26 to v27 | Added | The NVIDIA® Quadro® P2000 5GB Graphics to Mid-range 3D Graphics |

Summary of Changes

| | | | |
|--------------------|-----------------|---------|---|
| | | Changed | Changed The HP 9.5mm Slim SuperMulti DVD Writer for The HP 9.5mm Slim DVD Writer. |
| May 1, 2017 | From v27 to v28 | Added | In page 12 added notes 1 & 2 to all the memory parts, added HP 32GB (1x32GB) DDR4-2400 ECC Reg RAM to Memory section, added new configurations to DIMM slots for capacities of 128GB & 256GB in the System Board section. |
| | | Changed | Changed the Maximum Memory support from 128GB to 256GB, changed the Mixed support configuration in the Graphics section. |
| June 5, 2017 | From v28 to v29 | Added | NVIDIA Quadro P6000 24GB Graphics to Ultra 3D Graphics, NVIDIA Quadro P4000 to High-end 3D section, added NVIDIA Quadro P400 & P600 to Entry 3D Graphics section, added NVIDIA Quadro P1000 to Mid-range 3D section, Radeon Pro WX4100 4GB 1st GFX Graphics to Mid-range 3D section and added NVIDIA Quadro Sync II |
| | | Changed | HP 9.5mm Slim DVD Writer Option Kit Part Number under Optical and Removable Storage section |
| | | Removed | DVD-RAM as a supported format under the DVD writer section |
| July 6, 2017 | From v29 to v30 | Added | Intel Ethernet I350-T4 4-port 1Gb NIC to Networking and Communications section |
| | | Changed | The Note 1 in the Other Hardware section, changed The Note 2 in the Memory section, changed The Note 2 for NVIDIA Quadro P400, P600, P1000 and changed the Operating Systems supported section for the NVIDIA Quadro Sync II |
| | | Removed | The Tesla K40 as High Performance GPU Computing and removed Slim DVDRW SATA 1st & 2nd ODD from the Stable & Consistent Offerings section |
| August 21, 2017 | From v30 to v31 | Changed | EPEAT statement |
| September 6, 2017 | From v31 to v32 | Added | Memory footnotes |
| | | Changed | Displays section and changed the info for the NVIDIA Quadro P4000 8GB Graphics |
| September 25, 2017 | From v32 to v33 | Changed | Graphics section |
| November 1, 2017 | From v33 to v34 | Changed | “for workstations” added to Windows 10 Pro 64 on OS section / Multi-core disclaimer updated. |
| August 9, 2018 | From v34 to v35 | Changed | Memory support |
| July 8, 2019 | From v35 to v36 | Changed | Racking and Physical Security section |

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