

### Overview



- |                              |  |
|------------------------------|--|
| 1. Power Button              | 5. USB 3.0 (2 ports, upper charging, lower standard) |
| 2. System Activity LED       | 6. Headphone port                                    |
| 3. Thunderbolt™ 2* (2 ports) | 7. Microphone port                                   |
| 4. SD 4.0 Media Card Reader  |  |

\*Thunderbolt is new technology. Thunderbolt cable and Thunderbolt device (sold separately) must be compatible with Windows. To determine whether your device is Thunderbolt Certified for Windows, see <https://thunderbolttechnology.net/products>. Thunderbolt™ 2.0 is planned to be available via an optional add-in card in early 2014.

<b>Form Factor</b>	All in One
<b>Operating Systems</b>	Windows 8.1 Pro 64-bit Genuine Windows® 7 Professional 64-Bit(1) Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit Windows 8.1 Pro MSNA 64 Downgrade to Windows 7 Professional 64-bit HP Linux Installer Kit(2) SUSE Linux Enterprise Desktop 11 (90 day license) (4)

### Overview

Red Hat Enterprise Linux Desktop/Workstation (3,4)

**NOTE 1:** Systems may require upgraded and/or separately purchased hardware and/or DVD drive to install the Windows 7 software and take full advantage of Windows 7 functionality. See <http://www.microsoft.com/windows/windows-7/> for details.

**NOTE 2:** HP Linux Installer Kit Includes drivers for 32-bit and 64-bit OS versions of Red Hat Enterprise Linux (RHEL) 5 Workstation, RHEL 6 Workstation, and 64-bit SUSE Linux Enterprise Desktop (SLED) 11. See <http://www.hp.com/go/linux> for details.

**NOTE 3:** RHEL Desktop is not available as a preinstall from HP. RHEL Desktop is only available as a one-year paper license drop-in-the-box.

**NOTE 4:** For detailed OS/hardware support information for Linux, see: [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix).

### Available Processors

Name	Cores	Clock Speed (GHz)	Intel® Turbo Boost Technology <sup>1</sup>	Cache (MB)	Memory Speed (MHz)	Hyper-Threading	Featuring Intel® vPro™ Technology	Intel® HD Graphics	TDP (W)
Intel® Xeon® processor E3-1280v3	4	3.6	4.0	8	1600	Y	Y	N/A	82W
Intel® Xeon® processor E3-1245v3	4	3.4	3.8	8	1600	Y	Y	Intel HD Graphics P4600	84W
Intel® Xeon® processor E3-1225v3	4	3.2	3.6	8	1600	N	Y	Intel HD Graphics P4600	84W
Intel® Core™ i5-4570 processor	4	3.2	3.6	6	1600	N	Y	Intel HD Graphics 4600	84W
Intel® Core™ i3-4130 processor	2	3.4	N/A	3	1600	Y	N	Intel HD Graphics 4400	54W

<sup>1</sup>The specifications shown in this column represent the maximum frequency (GHz) of one processor core when accelerated with Intel Turbo Boost Technology. Turbo boost stepping occurs in 100MHz increments. Processors that do not have turbo functionality are denoted as N/A.

### Available Processor Disclaimers

Intel Xeon E3 and Intel Core i3 processors can support either ECC or non-ECC memory. 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/](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.

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

### Integrated Display

See below for detailed information

Panel

### Overview

- Type: IPS (in-plane switching) LED Backlit LCD
- Viewable Image Area: 68.5 cm, (27 in.) widescreen; diagonally measured
- Screen Opening (W x H): 59.8 x 33.6 cm, (23.5 x 13.3 in.)
- Optimal Resolution: 2560 x 1440 @ 60 Hz; 3.7MP
- Aspect Ratio: 16:9 Widescreen
- Viewing Angle (typical): Up to 178° horizontal / 178° vertical
- Maximum Brightness (typical)\*: 380 nits cd/m<sup>2</sup>
- Minimum Brightness (typical)\*: 50 nits cd/m<sup>2</sup>
- Contrast Ratio (typical)\*: 1000:1
- Dynamic Contrast Ratio (typical)\*: N/A
- Response Time (typical)\*: 14 ms (gray to gray)
- Pixel Pitch: 0.2331 mm x 0.2331 mm
- Backlight LED Life Time: 30,000 hours minimum
- Color Gamut Area vs. NTSC: 77% (CIE 1931)
- Color Gamut Coverage of sRGB: 100% (CIE 1931)
- Color Support \*\*: Up to 16.7 Million colors

Notes: \*All performance specifications represent the typical specifications provided by HP's component manufacturers; actual performance may vary either higher or lower.

Notes: Color Support \*\*: Up to 16.7 Million colors

#### Signal Interface/Performance

- Horizontal Frequency: 90 kHz
- Vertical Frequency: 60 H
- Native Resolution: 2560 x 1440 @ 60 Hz; 3.7MP
- Preset VESA Graphic Modes (non-interlaced): 2560 x 1440 @ 60 Hz
- Maximum Pixel Clock Speed: 250 MHz
- User Programmable Modes: None
- Default Color Temperature: 6500 K
- Touch: 10 finger touch as CTO option (no pen ability)
- Z1 G2 Touch Technology:
  - Sensor Panel: 27"Glass on Glass
  - Multi-Touch: 10 points
  - Technology: Projected Capacitive Touch
  - Input: Finger or Capacitive Stylus
  - Resolution: 25 pixels-per-inch minimum (Win8)
  - Accuracy: 1 mm to each target & 10% jitter limit on moving (Win 8)
- Anti-glare: No glass, anti-glare as CTO option

<b>Convertibility</b>	The Z1 can either be placed on the desktop in the traditional display method or mounted on a wall with the industry standard VESA mount. The VESA mount on the Z1 uses a 100x100 VESA mount pattern.
<b>Expansion Slots</b> (see system board section for more details)	<ul style="list-style-type: none"> <li>• 1 MXM 3.1 (dedicated for graphics)</li> <li>• 2 miniPCIe/mSATA full-length</li> </ul>
<b>Expansion Bays</b> (see storage section for more details)	<ul style="list-style-type: none"> <li>• 1 internal 3.5" bay, or</li> <li>• 2 internal 2.5" bays</li> </ul>
<b>Side I/O</b>	1 USB 3.0, 1 USB 3.0 Charging Data Port, 2 Thunderbolt™ 2 ports (Optional), 1 SD 4.0 Media Card Reader, 1 Headphone, 1 Microphone
<b>Internal I/O</b>	1 USB 2.0 Type A on Rear IO board, 2 internal on 9-pin header (not available on touch capable option)

### Overview

<b>Rear I/O</b>	1 DisplayPort v1.1, 4 USB 2.0, 1 RJ45 LAN, 1 Subwoofer Output, 1 optical S/PDIF Output, 1 Audio Line-in, and 1 Audio Line-out	
<b>Chassis Dimensions</b> (HxWxD)	Vertical display orientation WITH stand: 530.0mm x 660.4mm x 419.1mm (20.8in. x 26in. x 16.5in.); Standard display orientation WITHOUT stand: 457.2mm x 660.4mm x 81.28mm (18in. x 26in. x 3.2in.) Service/Shipping orientation: 116mm x 660mm x 510mm	
<b>Weight</b>	Exact weights depend upon configuration; Max system weight WITH stand: 21.32 kg (47 lbs); Stand weight 5.9 kg (13 lbs)	
<b>Temperature</b>	Operating:	40° to 95°F (5° to 35°C)
	Non-operating	-40° to 140°F (-40° to 60°C)
<b>Humidity</b>	Operating:	8% to 85%
	Non-operating	8% to 90%
<b>Maximum Altitude</b> (non-pressurized)	Operating:	3,000 m (10,000 ft)
	Non-operating	9,100 m (30,000 ft).
<b>Power Supply</b>	400 watts wide-ranging, active Power Factor Correction, 90% Efficient  The Power Supply Efficiency Report for this product may be found at these links: <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_650503-001_ECOS%202720.1_400W_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_650503-001_ECOS%202720.1_400W_Report.pdf</a>	
<b>Chipset</b>	Intel® C226 chipset	
<b>Memory</b>	4 DIMM slots, supporting up to 32GB ECC or 16GB non-ECC Unbuffered DDR3 1866 MHz Components. Actual Memory speed is determined by the processor.	
<b>Memory Disclaimers</b>	The CPU determines the speed at which the memory is clocked. If a 1600MHz capable CPU is used in the system, the maximum speed the memory will run at is 1600MHz regardless of the specified speed of the memory.	
<b>Workstation ISV Certifications</b>	See the latest list of certifications at: <a href="http://www.hp.com/united-states/campaigns/workstations/partnerships.html">http://www.hp.com/united-states/campaigns/workstations/partnerships.html</a>	

### Supported Components

#### Processors

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Intel® Xeon® processor E3-1200 v3 family (Z230/Z1G2)</b>				
Intel® Xeon® processor E3-1280v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology	Y	N		Note 1
Intel® Xeon® processor E3-1245v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology	Y	N		Note 1, 2
Intel® Xeon® processor E3-1225v3, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology	Y	N		Note 1, 2
<b>4th generation Intel® Core™ processor family</b>				
Intel® Core™ i3-4130 processor, Dual-Core, 4 MB cache, 3.4 GHz	Y	N		Note 1
Intel® Core™ i5-4570 processor, Quad-Core, 6 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology	Y	N		Note 3

**NOTE 1:** These processors support either ECC or non-ECC memory

**NOTE 2:** Intel HD Graphics P4600 provides improved desktop performance and supports workstation-specific graphics drivers for improved compatibility and performance on select professional applications compared to Intel HD Graphics 4600 or Intel HD Graphics 4400.

**NOTE 3:** These processors support only non-ECC memory

#### Monitors / Displays

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP DreamColor LP2480zx Professional Display				
HP Z Display Z30i 30-inch IPS LED Backlit Monitor				
HP Z Display Z27i 27-inch IPS LED Backlit Monitor				
HP Z Display Z24i 24-inch IPS LED Backlit Monitor				
HP Z Display Z23i 23-inch IPS LED Backlit Monitor				
HP Z Display Z22i 21.5-inch IPS LED Backlit Monitor				

**NOTES:**

Supported by all Operating Systems available from HP

Screen Size Diagonally Measured

### Supported Components

#### Storage / Hard Drives

##### SATA Hard Drives

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>SATA Hard Drives for HP Workstations</b>				
500GB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ036AA	
1TB SATA 7200 rpm 6Gb/s 3.5" HDD	Y	Y	LQ037AA	
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	
500GB SATA 10K rpm SFF HDD	Y	Y	B8X19AA	
1TB SATA 10K rpm SFF HDD	Y	Y	B8X20AA	

##### SATA SSDs

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>HP Solid State Drive for Workstations</b>				
HP 256GB SATA 6Gb/s SSD	Y	Y	A3D26AA	
HP 512GB SATA 6Gb/s SSD	Y	Y	D8F30AA	
Seagate 600 Pro 480GB SATA SSD	Y	Y	E9Q52AA	
Seagate 600 Pro 120GB SATA SSD	Y	Y	E9Q50AA	
Seagate 600 Pro 240GB SATA SSD	Y	Y	E9Q51AA	
HP 256GB mSATA 6Gb/s SSD	Y	Y	E5Z78AA	

#### Hard Drive Controllers

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
<b>Factory integrated RAID on motherboard for SATA drives</b>				
RAID 0 Configuration - Striped Array	Y	N		
RAID 1 Configuration - Mirrored Array	Y	N		

SATA hardware RAID is not supported on Linux systems. The Linux kernel, with built-in software RAID, provides excellent functionality and performance. It is a good alternative to hardware-based RAID. Please visit <http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00060684/c00060684.pdf> for RAID capabilities with Linux.

All drives must be identical in type and capacity

All RAID arrays must be less than 2 TB

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

### Supported Components

#### Graphics

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes	Supported Multi Mixed
<b>Integrated Intel HD Graphics (Z230/Z1G2)</b>					
Intel HD Graphics P4600	Y	N		<b>NOTE 1.</b> Supported on Intel Xeon E3-12x5v3 processors only.	1
Intel HD Graphics 4600	Y	N		<b>NOTE 1.</b> Supported on Intel Core i5-4xxx and Core i7-4xxx processors only.	1
Intel HD Graphics 4400	Y	N		<b>NOTE 1.</b> Supported on Intel Core i3-4xxx processors only	1
<b>Entry 3D</b>					
NVIDIA Quadro K610M 1GB Graphics	Y	Y	E5Z74AA		1
<b>Mid-range 3D</b>					
NVIDIA Quadro K2100M 2GB Graphics	Y	Y	E5Z75AA		1
<b>High End 3D</b>					
NVIDIA Quadro K3100M 4GB Graphics	Y	Y	E5Z76AA		1
NVIDIA Quadro K4100M 4GB Graphics	Y	Y	E5Z77AA		1

**NOTE 1:**

If a discrete graphics card is installed, Intel integrated graphics is disabled.

### Supported Components

Memory	CTO	Option Kit Part Number	Support Notes
	<b>DDR3-1866 ECC Unbuffered DIMMs - CTO</b>		
	HP 32GB (4x8GB) DDR3-1866 ECC RAM		
	HP 16GB (2x8GB) DDR3-1866 ECC RAM		
	HP 16GB (4x4GB) DDR3-1866 ECC RAM		
	HP 8GB (2x4GB) DDR3-1866 ECC RAM		
	HP 8GB (4x2GB) DDR3-1866 ECC RAM		
	HP 4GB (2x2GB) DDR3-1866 ECC RAM		
	HP 4GB (1x4GB) DDR3 1866 ECC RAM		
	<b>DDR3-1866 nECC Unbuffered DIMMs CTO</b>		
	HP 16GB (4x4GB) DDR3-1866 nECC RAM		
	HP 8GB (2x4GB) DDR3-1866 nECC RAM		
	HP 4GB (1x4GB) DDR3-1866 nECC RAM		
	<b>Sub-Section Description/Notes</b>		
	Intel® Xeon E3 and Intel Core i3 processors can support either ECC or non-ECC memory; Intel® Core i5/i7 processors only support non-ECC memory.		
	Two channels of DDR3 memory are supported. To realize full performance at least one DIMM must be inserted into each channel.		
	The CPU determines the speed at which the memory is clocked. If a 1333MHz capable CPU is used in the system, the maximum speed the memory will run at is 1333MHz regardless of the specified speed of the memory.		
	Only unbuffered DDR3 DIMMs are supported.		
	<b>AMO</b>		
	<b>DDR3-1866 ECC Unbuffered DIMMs - AMO</b>		
	HP 8GB (1x8GB) DDR3-1866 ECC RAM	E2Q93AA	
	HP 4GB (1x4GB) DDR3-1866 ECC RAM	E2Q91AA	
	HP 2GB (1x2GB) DDR3-1866 ECC RAM	E2Q90AA	
	<b>DDR3-1866 nECC Unbuffered DIMMs AMO</b>		
	HP 4GB (1x4GB) DDR3-1866 nECC RAM	E5Z83AA	
	<b>Sub-Section Description/Notes</b>		
	The CPU determines the speed at which the memory is clocked. If a 1600MHz capable CPU is used in the system, the maximum speed the memory will run at is 1600MHz regardless of the specified speed of the memory.		
	The CPU determines the speed at which the memory is clocked. If a 1600MHz capable CPU is used in the system, the maximum speed the memory will run at is 1600MHz regardless of the specified speed of the memory.		



### Supported Components

#### Multimedia and Audio Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP HD 2MP 1080p Webcam	Y	N		
Integrated HP Digital Mic Array	Y	N		

#### Optical and Removable Storage

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Slim DVD-ROM Drive	Y	Y	E5Z82AA	
HP Slim SuperMulti DVDRW SATA Drive	Y	Y	E5Z80AA	
HP Slim Blu-ray Writer	Y	Y	E5Z81AA	

Actual speeds may vary. Does not permit copying of commercially available DVD movies or other copyright protected materials. Intended for creation and storage of your original material and other lawful uses. Double Layer discs can store more data than single layer discs. However, double-layer discs burned with this drive may not be compatible with many existing single-layer DVD drives and players. As Blu-ray is a new format containing new technologies, certain disc, digital connection, compatibility and/or performance issues may arise, and do not constitute defects in the product. Flawless playback on all systems is not guaranteed. In order for some Blu-ray titles to play, they may require a DVI or HDMI digital connection and your display may require HDCP support. HD-DVD movies cannot be played on this workstation.

#### Controller Cards

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Thunderbolt 2-port AiO Module	Y	Y	E5Z73AA	

#### Networking and Communications

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
Integrated Intel I217LM PCIe GbE Controller (Intel vPro with Intel AMT 9.0)	Y	N		
Integrated Intel Dual Band Wireless-AC 7260, Dual Band with dual antenna TX/RX streams at 867Mbps 802.11ac Wireless LAN & Bluetooth®4 Combo Card	Y	N		

**NOTE 1:** Card is factory installed into miniPCIe slot 1.

### Supported Components

#### Racking and Physical Security

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Chassis Intrusion Sensor	Y	N		
HP Keyed Cable Lock Kit	N	Y	BV411AA	

#### Input Devices

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP USB CCID SmartCard Keyboard	Y	Y	E6D77AA	
HP USB Keyboard	Y	Y	QY776AA	
HP Wireless Keyboard and Mouse	Y	Y	QY449AA	
HP USB Laser Mouse	Y	Y	GW405AA	

#### Other Hardware

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Power Cord Kit	Y	N		
HP ENERGY STAR Qualified Configuration	Y	N		

#### Software

	Factory Configured	Option Kit	Option Kit Part Number	Support Notes
HP Performance Advisor	Y	N		See note 1
HP Remote Graphics Software (RGS) 6.0	Y	N		See note 2
PDF Complete - Corporate Edition	Y	N		
MS Office Home & Business 2013	Y	N		See note 3

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

**NOTE 2:** Supports both 32 and 64 bit versions of Windows 7 Professional and Enterprise, Windows XP Professional and Enterprise, and RHEL V6

**NOTE 3:** Available CTO as a "Drop in the Box" addition.

### Supported Components

#### Operating Systems

Genuine Windows® 7 Professional 64-bit

HP Linux Installer Kit

SUSE Linux Enterprise Desktop 11

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

Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit

Windows 8.1 Pro 64-bit

Windows 8.1 Pro Downgrade to Windows 7 Professional 64-bit (National Academic)

**NOTE 1:** See <http://www.microsoft.com/windows/windows-7/> for support details.

**NOTE 2:** For detailed OS/hardware support information for Linux, see: [http://www.hp.com/support/linux\\_hardware\\_matrix](http://www.hp.com/support/linux_hardware_matrix).

**NOTE 3:** This second OS must be ordered with the HP Linux Installer Kit as the first OS.

#### Support Notes

See note 1

See note 2

See note 2

See note 3

### System Technical Specifications

<b>System Board</b>		
<b>System Board Form Factor</b>	Custom Motherboard, Custom Rear IO board, Custom Side IO board	
<b>Processor Socket</b>	Single LGA 1150	
<b>CPU Bus Speed</b>	DMI Gen2	
<b>Chipset</b>	Intel® PCH C226	
<b>Super I/O Controller</b>	Nuvoton NPCD379H	
<b>Memory Expansion Slots</b>	4 DDR3 memory slots	
<b>Memory Type Supported</b>	DDR3, UDIMM (Unbuffered), ECC & non-ECC	
<b>Memory Modes</b>	Non-interleaved for single channel. Interleaved when both channels are populated.	
<b>Memory Speed Supported</b>	Up to 1600MHz DDR3	
<b>Maximum Memory</b>	32GB ECC or 16GB non-ECC	
<b>Memory Configuration (Supported)</b>	4GB non-ECC/ 2GB, 4GB and 8GB ECC unbuffered DIMMs are supported. ECC and non-ECC memory DIMMs cannot be mixed on the same system.  <b>NOTES:</b> * Maximum memory capacities assume 64-bit operating systems, such as genuine Windows® 7 Professional 64-Bit or Red Hat Linux 64-bit. 32-bit Windows Operating Systems support up to 4 GB.	
<b>PCI Express Connectors</b>	1 MXM 3.1 slot (PCIe Gen2 x16, DP x 2) for graphics 2 miniPCIe/mSATA slots (PCIe Gen2 x1 or SATA 6Gbps x1, USB 2.0), full length  <b>NOTE:</b> the Z1 G2 ships with an Intel WLAN/BT card installed in slot 1.	
<b>Supported Drive Interfaces</b>	<b>SATA</b>	Integrated Serial ATA interfaces: 2 x 6Gb/s SATA, 1 x 6Gb/s SATA for ODD 2 x mSATA/miniPCIe slots  <b>NOTE:</b> the Z1 supports a maximum of two SATA SFF/SSD drives only. RAID 0 and 1 supported. (Factory integrated RAID is Microsoft Windows only). <b>NOTE:</b> the Z1 G2 ships with an Intel WLAN/BT card installed in slot 1.
	<b>Integrated RAID</b>	<b>NOTE:</b> Requires identical hard drives (speeds, capacity, interface)
	<b>Integrated Graphics</b>	Intel HD Graphics P4600 (on Intel Xeon E3-12x5v3 processors) Intel HD Graphics 4600 (on Core i5-4570 processor) Intel HD Graphics 4400 (on Core i3-4130 processor) Unified Memory Architecture (UMA)- A region of system memory is reserved and dedicated to the graphics display.  DirectX 11.1 compliant and OpenGL 4.0.  Integrated Graphics can support up to 3 displays: embedded display, external display via Rear IO and external display via optional add-in TBT module.

### System Technical Specifications

	<b>Network Controller</b>	Integrated Ethernet PHY Connection I217LM. Management capabilities: WOL, PXE 2.1 and AMT 9
<b>USB Connector(s)</b>	<b>Front</b>	Side (not Front): 1 USB 3.0, 1 USB 3.0 Charging Data Port
	<b>Rear</b>	4 USB 2.0
	<b>Internal</b>	1 USB 2.0 Type A, 2 USB 2.0 across one 9-pin header (9-pin header is not available when the touch display option is selected)
<b>HD Integrated Audio</b>	Intel HD / IDT 92HD68 codec	
<b>Flash ROM</b>	Yes	
<b>CPU Fan Header</b>	Yes	
<b>Front Control Panel/Speaker Header</b>	Yes	
<b>CMOS Battery Holder - Lithium</b>	Yes	
<b>Integrated Trusted Platform Module</b>	Integrated TPM 1.2.  TPM module disabled where restricted by law.	
<b>Power Supply Headers</b>	Yes	
<b>Power Switch, Power LED &amp; Hard Drive LED Header</b>	Yes	
<b>Clear Password Jumper</b>	Yes	
<b>Keyboard/Mouse</b>	USB or Wireless	

### Power Supply

<b>Power Supply</b>	<b>400W 90% Efficient, Custom PSU (Wide Ranging, Active PFC)</b>	
<b>Operating Voltage Range</b>	<b>90-264 VAC</b>	
<b>Rated Voltage Range</b>	<b>100-240 VAC</b>	<b>118 VAC</b>
<b>Rated Line Frequency</b>	<b>50-60 Hz</b>	<b>400 Hz</b>
<b>Operating Line Frequency Range</b>	<b>47-63 Hz</b>	<b>393-407 Hz</b>
<b>Rated Input Current</b>	<b>5A @ 100-240 VAC</b>	<b>4.5A @ 118 VAC</b>
<b>Heat Dissipation (Configuration and software dependent)</b>	<b>Typical: 570 btu/hr (144 kg-cal/hr) Maximum: 1365 btu/hr (344 kg-cal/hr)</b>	
<b>Power Supply Fan</b>	<b>(2) 40x20 mm variable speed</b>	
<b>ENERGY STAR Qualified (Configuration dependent)</b>	<b>Yes</b>	
<b>80 PLUS® Compliant</b>	<b>Yes, 90% Efficient</b>	
	<p>The Z1 400W power supply efficiency report can be found at this link:  <a href="http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_650503-001_ECOS%202720.1_400W_Report.pdf">http://www.plugloadsolutions.com/psu_reports/HEWLETT%20PACKARD_650503-001_ECOS%202720.1_400W_Report.pdf</a></p>	

### System Technical Specifications

<b>FEMP Standby Power Compliant @115V</b>	<b>Yes</b>
<b>ErP LOT6 Compliant @ 230V (&lt;0.5 W in S5 - Power Off)</b>	<b>Yes</b>
<b>CECP Compliant @ 220V (&lt;4W in S3 - Suspend to RAM)</b>	<b>NA</b>
<b>Power Consumption in sleep mode (as defined by ENERGY STAR) - Suspend to RAM (S3) (Instantly Available PC)</b>	<b>&lt;4W</b>
<b>Built-in Self Test LED</b>	<b>Yes</b>
<b>Surge Tolerant Full Ranging Power Supply (withstands power surges up to 2000V)</b>	<b>Yes</b>

### System Configuration

<b>Example Configuration #1</b>	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1xIntel Core i3-4130 HP 8GB (2x4GB) DDR3 1866 ECC RAM 1xNVIDIA K610M Graphics 1x500GB SATA/1xDVD-ROM SATA 400W 90% Custom PSU -					
<b>Energy Consumption (Watts)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	70 W		70 W		71 W	
	Windows Busy Typ (S0)	108 W		110 W		110 W	
	Windows Busy Max (S0)	142 W		139 W		143 W	
	Sleep (S3)	0.82 W	0.82 W	0.97 W	0.82 W	0.82 W	0.97 W
	Off (S5)	0.74 W	0.74 W	0.89 W	0.74 W	0.74 W	0.89 W
Zero Power Mode (EuP)	0.20 W		0.35 W		0.19 W		
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	239 Btu/hr		239 Btu/hr		242 Btu/hr	
	Windows Busy Typ (S0)	369 Btu/hr		375 Btu/hr		375 Btu/hr	
	Windows Busy Max (S0)	485 Btu/hr		474 Btu/hr		488 Btu/hr	
	Sleep (S3)	2.80 Btu/hr	2.80 Btu/hr	3.31 Btu/hr	2.80 Btu/hr	2.80 Btu/hr	3.31 Btu/hr
	Off (S5)	2.52 Btu/hr	2.52 Btu/hr	3.04 Btu/hr	2.52 Btu/hr	2.52 Btu/hr	3.04 Btu/hr
Zero Power Mode (EuP)	0.68 Btu/hr		1.19 Btu/hr		0.65 Btu/hr		

### System Technical Specifications

<b>Example Configuration #2</b>	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1xIntel Xeon E3-1280v3 HP 8GB (2x4GB) DDR3 1866 ECC RAM 1xNVIDIA K3100M Graphics 1x1TB SATA/1xDVD+-RW SATA 400W 90% Custom PSU -					
<b>Energy Consumption (Watts)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	74 W		73 W		75 W	
	Windows Busy Typ (S0)	167 W		171 W		174 W	
	Windows Busy Max (S0)	244 W		237 W		242 W	
	Sleep (S3)	0.83 W	0.83 W	0.98 W	0.83 W	0.83 W	0.98 W
	Off (S5)	0.74 W	0.74 W	0.89 W	0.74 W	0.74 W	0.89 W
Zero Power Mode (EuP)	0.20 W		0.35 W		0.19 W		
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	253 Btu/hr		249 Btu/hr		256 Btu/hr	
	Windows Busy Typ (S0)	570 Btu/hr		584 Btu/hr		594 Btu/hr	
	Windows Busy Max (S0)	833 Btu/hr		809 Btu/hr		826 Btu/hr	
	Sleep (S3)	2.83 Btu/hr	2.83Btu/hr	3.34 Btu/hr	2.83 Btu/hr	2.83Btu/hr	3.34 Btu/hr
	Off (S5)	2.52 Btu/hr	2.52 Btu/hr	3.04 Btu/hr	2.52 Btu/hr	2.52 Btu/hr	3.04 Btu/hr
Zero Power Mode (EuP)	0.68 Btu/hr		1.19 Btu/hr		0.65 Btu/hr		

<b>Example Configuration #3</b>	Processor Info Memory Info Graphics Info Disks/Optical/Floppy Power Supply Other	1xIntel Xeon E5-1280v3 HP 16GB (4x4GB) DDR3 1866 ECC RAM 1xNVIDIA K4100M 2x1TB SATA 10K SFF/1xDVD+-RW SATA 400W 90% Custom PSU -					
<b>Energy Consumption (Watts)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	80 W		78 W		81 W	
	Windows Busy Typ (S0)	189 W		191 W		195 W	
	Windows Busy Max (S0)	275 W		263 W		274 W	
	Sleep (S3)	0.90 W	0.90 W	1.06 W	0.90 W	0.90 W	1.06 W
	Off (S5)	0.73 W	0.73 W	0.89 W	0.73 W	0.73 W	0.89 W
Zero Power Mode (EuP)	0.20 W		0.34 W		0.19 W		
<b>Heat Dissipation** (Btu/hr)</b>		115 VAC		230 VAC		100 VAC	
		LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled	LAN Enabled	LAN Disabled
	Windows Idle (S0)	273 Btu/hr		266 Btu/hr		276 Btu/hr	
	Windows Busy Typ (S0)	645 Btu/hr		652 Btu/hr		665 Btu/hr	
	938 Btu/hr	938 Btu/hr		897 Btu/hr		935 Btu/hr	
	Sleep (S3)	3.07 Btu/hr	3.07 Btu/hr	3.62 Btu/hr	3.07 Btu/hr	3.07 Btu/hr	3.62 Btu/hr
	Off (S5)	2.49 Btu/hr	2.49 Btu/hr	3.04 Btu/hr	2.49 Btu/hr	2.49 Btu/hr	3.04 Btu/hr
Zero Power Mode (EuP)	0.68 Btu/hr		1.16 Btu/hr		2.22 Btu/hr		

### System Technical Specifications

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

<b>System Configuration (Entry level)</b>	<b>Processor Info</b>	Intel Core i3-4130 2-core 3.4 GHz
	<b>Memory Info</b>	2 x 2 GB DDR3 1333 MHz
	<b>Graphics Info</b>	NVIDIA Quadro K610M
	<b>Disks/Optical</b>	1 x 2TB 7200 RPM SATA / Slim SuperMulti DVDRW SATA

<b>Declared Noise Emissions</b> (in accordance with ISO 7779 and ISO 9296)		<b>Sound Power (LWAd, bels)</b>	<b>Desktop Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	3.0 Bels	20 dB
	<b>Hard drive Operating (random reads)</b>	3.2 Bels	23 dB
	<b>DVD-ROM Operating (sequential reads)</b>	4.3 Bels	32 dB

<b>System Configuration (Entry level)</b>	<b>Processor Info</b>	Intel i3-4130 2-core 3.4 GHz
	<b>Memory Info</b>	2 x 2 GB DDR3 1333 MHz
	<b>Graphics Info</b>	Intel HD Graphics 4400
	<b>Disks/Optical</b>	2 x 480 GB SSD SATA / Slim SuperMulti DVDRW SATA

<b>Declared Noise Emissions</b> (in accordance with ISO 7779 and ISO 9296)		<b>Sound Power (LWAd, bels)</b>	<b>Desktop Sound Pressure (LpAm, decibels)</b>
	<b>Idle</b>	2.7 Bels	20 dB
	<b>Hard drive Operating (random reads)</b>	2.7 Bels	20 dB
	<b>DVD-ROM Operating (sequential reads)</b>	4.3 Bels	33 dB

<b>System Configuration (High-end)</b>	<b>Processor Info</b>	Intel Xeon E3-1280 V3 4-core 3.6 GHz
	<b>Memory Info</b>	4 x 8 GB DDR3 1333 MHz
	<b>Graphics Info</b>	NVIDIA Q4100M MXM
	<b>Disks/Optical</b>	2 x 500 GB 10K RPM SATA / Slim SuperMulti DVDRW SATA



### System Technical Specifications

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)		Sound Power (LWAd, bels)	Desktop Sound Pressure (LpAm, decibels)
	Idle	3.0 Bels	21 dB
	Hard drive Operating (random reads)	3.8 Bels	28 dB
	DVD-ROM Operating (sequential reads)	4.3 Bels	32 dB

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

### Physical Security and Serviceability

Access Panel	Tool-less Includes system board and memory information
Tool-less	Tool-less
Hard Drives	Tool-less
Expansion Cards	MXM graphics assembly is tool-less. MiniPCIe cards are screw-in.
Processor Socket	Tool-less, except for the processor heatsink.
Green User Touch Points	On tool-free internal chassis mechanisms
Color-coordinated Cables and Connectors	When appropriate
Memory	Tool-less
System Board	Screw-In for motherboard, Rear IO and Side IO boards.
Over-Temp Warning on Screen	Yes

### System Technical Specifications

<b>Restore CD/DVD Set</b>	Restores the computer to its original factory shipping operating system. Orderable with the workstation, or available from Support.
<b>Dual Function Side Power Switch</b>	Power on/off  Causes a fail-safe power off when held for 4 seconds
<b>Cable Lock Support</b>	Yes, Kensington Cable Lock (optional): Locks side cover and secures chassis from theft 3mm x 7mm slot at rear of system
<b>Solenoid Lock and Hood Sensor</b>	No Solenoid Lock  Hood Sensor - The Sensor Kit detects when the access panel has been opened.
<b>Serial, Parallel, USB, Audio, Network, Enable/Disable Port Control</b>	Enables or disables USB, audio, and network ports
<b>Power-On Password</b>	Yes, prevents an unauthorized person from booting up the workstation
<b>Setup Password</b>	Yes, prevents an unauthorized person from changing the workstation configuration
<b>3.3V Aux Power LED on System PCA</b>	No
<b>NIC LEDs (integrated) (Green &amp; Amber)</b>	Yes
<b>CPUs and Heatsinks</b>	A T-15 Torx or flat blade screwdriver is needed to remove the CPU heatsink before the CPU can be removed. CPU removal is tool-less
<b>Power Supply Diagnostic LED</b>	Yes
<b>Side Power Button</b>	ACPI multi-function
<b>Side Power LED</b>	Blue (normal), red (fault)
<b>Side Hard Drive Activity LED</b>	Green
<b>Side ODD Activity LED</b>	Present on an Optical Device
<b>Internal Stereo Speakers</b>	Two 4W speakers
<b>System/Emergency ROM Flash Recovery</b>	Recovers corrupted system BIOS.
<b>Cooling Solutions</b>	Air cooled forced convection
<b>Power Supply Fans</b>	Two 40 mm x 40 mm x 20 mm 4-wire PWM (not serviceable separately from the power supply)
<b>CPU Heatsink Fan</b>	Two 80 mm blowers
<b>MXM Heatsink Fan</b>	One 110 mm blower with MXM graphics assembly
<b>System Blower</b>	110 mm blower
<b>HP Advanced System Diagnostics Offline Edition</b>	HP Vision Diagnostics utility must be booted from USB or CD, and enables you to perform testing and to view critical computer hardware and software configuration information from various sources.
<b>Access Panel Key Lock</b>	No

### System Technical Specifications

<b>ACPI-Ready Hardware</b>	Advanced Configuration and Power Management Interface (ACPI). <ul style="list-style-type: none"> <li>Allows the system to wake from a low power mode.</li> <li>Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system</li> </ul>
<b>Trusted Platform Module Chip</b>	Yes
<b>Integrated Chassis Handles</b>	One on top-rear of system
<b>Power Supply</b>	Tool-less
<b>miniPCIe Card Retention</b>	2 × M2 screws
<b>Flash ROM</b>	Present
<b>Diagnostic Power Switch LED on board</b>	No
<b>Clear Password Jumper</b>	Present
<b>Clear CMOS Button</b>	Present
<b>CMOS Battery Holder</b>	Present
<b>DIMM Connectors</b>	Present - tool-less

<b>BIOS</b>	
<b>BIOS 32-bit Services</b>	Standard BIOS 32-bit Service Directory Proposal v0.4
<b>ATAPI</b>	ATAPI Removable Media Device BIOS Specification Version 1.0.
<b>BBS</b>	BIOS Boot Specification v1.01.
<b>WMI Support</b>	WMI is Microsoft's implementation of Web-Based Enterprise Management (WBEM) for Windows. WMI is fully compliant with the Distributed Management Task Force (DMTF) Common Information Model (CIM) and WBEM specifications.
<b>BIOS Boot Spec 1.01+</b>	Provides more control over how and from what devices the workstation will boot.
<b>BIOS Power On</b>	Users can define a specific date and time for the system to power on.
<b>ROM Based Computer Setup Utility (F10)</b>	Review and customize system configuration settings controlled by the BIOS.
<b>System/Emergency ROM Flash Recovery with Video</b>	Recovers system BIOS in corrupted Flash ROM.
<b>Replicated Setup</b>	Saves BIOS settings to USB flash device in human readable file. Repset.exe utility can then replicate these settings on machines being deployed without entering Computer Configuration Utility (F10 Setup).
<b>SMBIOS</b>	System Management BIOS 2.7.1, for system management information.
<b>Boot Control</b>	Disables the ability to boot from removable media on supported devices.
<b>Memory Change Alert</b>	Alerts management console if memory is removed or changed.
<b>Thermal Alert</b>	Monitors the temperature state within the chassis. Three modes: <ul style="list-style-type: none"> <li>NORMAL - normal temperature ranges.</li> <li>ALERTED - excessive temperatures are detected. Raises a flag so action can be taken to avoid shutdown or provide for a smoother system shutdown.</li> <li>SHUTDOWN - excessive temperatures are encountered. Automatically shuts down the computer</li> </ul>

### System Technical Specifications

	without warning before hardware component damage occurs.
<b>Remote ROM Flash</b>	Provides secure, fail-safe ROM image management from a central network console.
<b>ACPI (Advanced Configuration and Power Management Interface)</b>	Allows the system to enter and resume from low power modes (sleep states). 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.
<b>Ownership Tag</b>	A user-defined string stored in non-volatile memory that is displayed in the BIOS splash screen.
<b>Remote Wakeup/ Remote Shutdown</b>	System administrators can power on, restart, and power off a client computer from a remote location.
<b>Instantly Available PC (Suspend to RAM - ACPI sleep state S3)</b>	Allows for very low power consumption with quick resume time.
<b>Remote System Installation via F12 (PXE 2.1) (Remote Boot from Server)</b>	Allows a new or existing system to boot over the network and download software, including the operating system.
<b>ROM revision levels</b>	Reports the system BIOS revision level in Computer Configuration Utility (F10 Setup). Version is available through an industry standard interface (SMBIOS) so that management SW applications can use and report this information.
<b>System board revision level</b>	Allows management SW to read revision level of the system board. Revision level is digitally encoded into the HW and cannot be modified.
<b>Start-up Diagnostics (Power-on Self-Test)</b>	Assesses system health at boot time with selectable levels of testing.
<b>Auto Setup when new hardware installed</b>	System automatically detects addition of new hardware.
<b>Keyboard-less Operation</b>	The system can be booted without a keyboard.
<b>Localized ROM Setup</b>	Common BIOS image supports System Configuration Utility (F10 Setup) menus in 12 languages with local keyboard mappings.
<b>Asset Tag</b>	Enables the user or IT administrator to set a unique tag string in non-volatile memory.
<b>Per-slot Control</b>	Allows I/O slot parameters (option ROM, enable/disable, bus latency) to be configured individually.
<b>Adaptive Cooling</b>	Control parameters are set according to detected hardware configuration for optimal acoustics.
<b>Pre-boot Diagnostics</b>	(Pre-video) critical errors are reported via beeps and blinks on the power LED.
<b>Intel® Active Management Technology (AMT)</b>	AMT 7.0; Allows workstation status to be monitored on a remote console
<b>Digitally and Cryptographically Signed BIOS</b>	Helps to prevent the installation of unauthorized versions of a BIOS (a rogue BIOS) from a virus, malware, or other code that could lead to compromised system security, data access, physical service, or even system board replacement.
<b>Master Boot Record Protection</b>	A feature in the HP BIOS that prevents changes and/or infections to the Master Boot Record. Useful in protecting from viruses
<b>Boot Block Emergency Recovery Mode (BIOS Recovery)</b>	The HP BIOS offers a write-protected boot block ROM that provides recovery from a failed flashing of the computer BIOS. This special recovery mode prevents the system from becoming unusable or "bricked" when a BIOS update is interrupted.

### System Technical Specifications

<b>Industry Standard Specification Support</b>	
<b>Industry Standard</b>	Revision Supported by the BIOS
<b>UEFI Specification Revision</b>	2.3.1
<b>ACPI</b>	Advanced Configuration and Power Management Interface, Version 4.0
<b>ASF</b>	No
<b>ATA (IDE)</b>	AT Attachment 6 with Packet Interface (ATA/ATAPI-6), Revision 3b
<b>CD Boot</b>	"El Torito" Bootable CD-ROM Format Specification Version 1.0
<b>EDD</b>	- Enhanced Disk Drive Specification Version 1.1 - BIOS Enhanced Disk Drive Specification Version 3.0
<b>EHCI</b>	Enhanced Host Controller Interface for Universal Serial Bus, Revision 1.0
<b>PCI Express</b>	- PCI Express Mini Card Electromechanical Specification Revision 1.2 - PCI Express Base Specification, Revision 2.0 - PCI Express Base Specification, Revision 3.0 - MXM Graphics Module Mobile PCI Express Module Electromechanical Specification Version 3.0, Revision 3.1
<b>PMM</b>	POST Memory Manager Specification, Version 1.01
<b>SATA</b>	- Serial ATA Specification, Revision 1.0a - Serial ATA II: Extensions to Serial ATA 1.0, Revision 2.6 - Serial ATA II Cables and Connectors Volume 2 Gold - SATA-IO SATA Revision 3.0 Specification
<b>SPD</b>	PC SDRAM Serial Presence Detect (SPD) Specification, Revision 1.2B
<b>TPM</b>	Trusted Computing Group TPM Specification Version 1.2
<b>USB</b>	- Universal Serial Bus Revision 1.1 Specification - Universal Serial Bus Revision 2.0 Specification - Universal Serial Bus Revision 3.0 Specification

### Social and Environmental Responsibility

<b>Eco-Label Certifications &amp; Declarations</b>	<p>This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:</p> <ul style="list-style-type: none"> <li>● ENERGY STAR® (energy-saving features available on selected configurations-Windows only)</li> <li>● US Federal Energy Management Program (FEMP)</li> <li>● IT ECO declaration</li> </ul>
<b>Batteries</b>	<p>The battery in this product complies with EU Directive 2006/66/EC Battery size: CR2032 (coin cell) Battery type: Lithium Metal</p> <p>The battery in this product does not contain:</p> <ul style="list-style-type: none"> <li>● Mercury greater than 5ppm by weight</li> <li>● Cadmium greater than 10ppm by weight</li> <li>● Lead greater than 40ppm by weight</li> </ul>

### System Technical Specifications

<b>Restricted Material Usage</b>	This product meets the material restrictions specified in HP's General Specification for the Environment. <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf">http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf</a> Hewlett-Packard is committed to compliance with all applicable environmental laws and regulations, including the European Union Restriction of Hazardous Substances (RoHS) Directive. HP's goal is to exceed compliance obligations by meeting the requirements of the RoHS Directive on a worldwide basis.
<b>Low Halogen Statement</b>	This product is low halogen except for power cords, cables and peripherals. Service parts obtained after purchase may not be Low Halogen.
<b>End-of-Life Management and Recycling</b>	Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: <a href="http://www.hp.com/recycle">http://www.hp.com/recycle</a> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. This product is greater than 90% recyclable by weight when properly disposed of at end of life.
<b>Hewlett-Packard Corporate Environmental Information</b>	For more information about HP's commitment to the environment: Global Citizenship Report <a href="http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html">http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html</a>  Eco-label certifications <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html">http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html</a>  ISO 14001 certificates: <a href="http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html">http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html</a>
<b>Additional Information</b>	<ul style="list-style-type: none"> <li>• This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.</li> <li>• Plastic parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.</li> <li>• This product is &gt;90% recycle-able when properly disposed of at end of life.</li> </ul> <p>EPEAT Gold - ENERGY STAR qualified configurations of this product are in compliance with the IEEE 1680 (EPEAT) standard at the Gold level where HP registers workstation products. See <a href="http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24">http://ww2.epeat.net/CompanyDetail.aspx?CompanyID=24</a> for registration status in your country.</p>
<b>Packaging</b>	HP Workstation product packaging meets the HP General Specification for the Environment at <a href="http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html">http://www.hp.com/hpinfo/globalcitizenship/society/gen_specifications.html</a> <ul style="list-style-type: none"> <li>• Does not contain restricted substances listed in HP Standard 011-1 General Specification for the Environment</li> <li>• Does not contain ozone-depleting substances (ODS)</li> <li>• Does not contain heavy metals (lead, mercury, cadmium or hexavalent chromium) in excess of 100 ppm sum total for all heavy metals listed</li> <li>• Maximizes the use of post-consumer recycled content materials in packaging materials</li> <li>• All packaging material is recyclable</li> <li>• All packaging material is designed for ease of disassembly</li> <li>• Reduced size and weight of packages to improve transportation fuel efficiency</li> <li>• Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards</li> </ul>
<b>Packaging Materials</b>	
<b>Internal</b>	Cushions and plastic bags made of low density polyethylene (LDPE).
<b>External</b>	Outer carton, accessories carton, and insert made of corrugated paper board.

<b>Manageability</b>	
<b>Industry Standard Specifications</b>	This product meets the following industry standard specifications for manageability functionality: <ul style="list-style-type: none"> <li>• DASH 1.1 required functionalities via integrated Intel LAN</li> </ul>
<b>Intel Active Management</b>	Intel Active Management Technology (Intel® AMT) 9.0

### System Technical Specifications

<b>Technology (AMT)</b>	<p>An advanced set of remote management features and functionality which provides network administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 9.0 includes the following advanced management functions:</p> <ul style="list-style-type: none"> <li>● Power Management (on, off, reset, graceful shutdown, sleep and hibernate)</li> <li>● Hardware Inventory (includes BIOS and firmware revisions)</li> <li>● Hardware Alerting</li> <li>● Agent Presence</li> <li>● System Defense Filters</li> <li>● Serial Over LAN (SOL)</li> <li>● IDE Redirect</li> <li>● Remote Configuration</li> <li>● TLS-PSK Setup and Configuration</li> <li>● TLS-PKI Setup and Configuration</li> <li>● Cisco NAC/SDN Support</li> <li>● ME Wake-on-LAN</li> <li>● DASH 1.1 compliance</li> <li>● IPv6 Support</li> <li>● Fast Call for Help - a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection</li> <li>● Remote Scheduled Maintenance - pre-schedule when the PC connects to the IT or service provider console for maintenance. Remote PCs can get required patches, be inventoried, etc by connecting to their IT console or Service Provider when it's convenient</li> <li>● Remote Alerts - automatically alert IT or service provider if issues arise</li> <li>● Access Monitor - Provides oversight into Intel® AMT actions to support security requirements</li> <li>● PC Alarm Clock</li> <li>● Microsoft NAP Support</li> <li>● Host Base set-up and configuration</li> <li>● Management Engine (ME) firmware roll back</li> <li>● Enhanced KVM resolution</li> <li>● KVM Remote Control</li> <li>● Local Time Sync to UTC</li> <li>● Remote Memory Dump Command - Creates memory dump for debug</li> <li>● Wireless Management in Sleep States</li> <li>● Desktop Wireless Manageability</li> </ul>
<b>Intel® vPro™ Technology</b>	<p>The HP Z1 G2 Workstation supports Intel vPro technology when configured with a processor branded "featuring Intel vPro Technology"</p>
<b>Remote Manageability Software Solutions</b>	<p>The HP Z1 Workstation is supported on the following remote manageability software consoles:</p> <ul style="list-style-type: none"> <li>● LANDesk Management Suite (PSG recommended solution)</li> <li>● Microsoft System Center Configuration Manager</li> <li>● HP Client Automation Enterprise</li> </ul> <p>For questions or support for manageability needs, please visit <a href="http://www.hp.com/go/easydeploy">http://www.hp.com/go/easydeploy</a></p>
<b>System Software Manager</b>	<p>For questions or support for SSM, please visit: <a href="http://www.hp.com/go/ssm">http://www.hp.com/go/ssm</a></p>
<b>Service, Support, and Warranty</b>	<p>On-site Warranty and Service (<a href="#">Note 1</a>): One, Three, Four &amp; Five -years (options available), limited warranty and service offering delivers on-site, next business-day (<a href="#">Note 2</a>) service for parts and labor and includes free telephone support (<a href="#">Note 3</a>) 8am - 5pm. Global coverage (<a href="#">Note 2</a>) ensures that any product purchased in one country and transferred to another, non-restricted country will remain fully covered under the</p>

### System Technical Specifications

	<p>original warranty and service offering.</p> <p><b>NOTE 1:</b> Terms and conditions may vary by country. Certain restrictions and exclusions apply.</p> <p><b>NOTE 2:</b> On-site service may be provided pursuant to a service contract between HP and an authorized HP third-party provider, and is not available in certain countries. Global service response times are based on commercially reasonable best effort and may vary by country.</p> <p><b>NOTE 3:</b> Technical telephone support applies only to HP-configured, HP and HP-qualified, third-party hardware and software. Toll-free calling and 24x7 support service may not be available in some countries.</p> <p>HP Care Pack Services extend service contracts beyond the standard warranties. Service starts from date of hardware purchase. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at <a href="http://www.hp.com/go/lookuptool">http://www.hp.com/go/lookuptool</a>. Additional HP Care Pack Services information by product is available at <a href="http://www.hp.com/hps/carepack">http://www.hp.com/hps/carepack</a>. Service levels and response times for HP Care Packs may vary depending on your geographic location.</p>
<b>Product Change Notification</b>	<ul style="list-style-type: none"><li>● Program to proactively communicate Product Change Notifications (PCNs) and Customer Advisories by email to customers, based on a user-defined profile.</li><li>● PCNs provide advance notification of hardware and software changes to be implemented in the factory providing time to plan for transition.</li><li>● Customer Advisories provide concise, effective problem resolution, greatly reducing the need to call technical support.</li></ul>



### Technical Specifications - Processors

**Processors**

Intel® Xeon® processor E3-1280v3, Quad-Core, 8 MB cache, 3.6 GHz, up to 4.0 GHz with Intel Turbo Boost Technology

Intel® Xeon® processor E3-1245v3, Quad-Core, 8 MB cache, 3.4 GHz, up to 3.8 GHz with Intel Turbo Boost Technology

Intel® Xeon® processor E3-1225v3, Quad-Core, 8 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology

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Intel® Core™ i5-4570 processor, Quad-Core, 6 MB cache, 3.2 GHz, up to 3.6 GHz with Intel Turbo Boost Technology

Intel® Core™ i3-4130 processor, Dual-Core, 4 MB cache, 3.4 GHz

### Technical Specifications - Hard Drives

<b>SATA Hard Drives for HP Workstations</b>	<b>500GB SATA 10K rpm SFF HDD</b>	<b>Capacity</b>	500GB		
		<b>Height</b>	0.6 in; 1.53 cm		
		<b>Width</b>		<b>Media Diameter</b>	2.5 in; 6.36 cm
				<b>Physical Size</b>	2.75 in; 6.99 cm
		<b>Interface</b>	Serial ATA (6Gb/s)		
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s		
		<b>Buffer</b>	64MB		
		<b>Cache</b>	Adaptive		
		<b>Seek Time (typical reads, includes controller overhead, including settling)</b>		<b>Single Track</b>	1.2ms (typical)
				<b>Average</b>	3.6ms
				<b>Full Stroke</b>	9.0ms (typical)
				<b>Rotational Speed</b>	10K rpm
		<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)		
	<b>1TB SATA 10K rpm SFF HDD</b>	<b>Capacity</b>	1TB		
		<b>Height</b>	0.6 in; 1.53 cm		
		<b>Width</b>		<b>Media Diameter</b>	2.5 in; 6.36 cm
				<b>Physical Size</b>	2.75 in; 6.99 cm
		<b>Interface</b>	Serial ATA (6Gb/s)		
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s		
		<b>Buffer</b>	64MB		
		<b>Cache</b>	Adaptive		
		<b>Seek Time (typical reads, includes controller overhead, including settling)</b>		<b>Single Track</b>	1.2ms (typical)
				<b>Average</b>	3.6ms
				<b>Full Stroke</b>	9.0ms (typical)
				<b>Rotational Speed</b>	10K rpm
		<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)		
	<b>500GB SATA 7200 rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>	500GB		
		<b>Height</b>	1 in; 2.54 cm		
		<b>Width</b>		<b>Media Diameter</b>	3.5 in; 8.9 cm
				<b>Physical Size</b>	4 in; 10.17 cm
		<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled		
		<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s		
		<b>Buffer</b>	16MB		

### Technical Specifications - Hard Drives

	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	2 ms
		<b>Average</b>	11 ms
		<b>Full Stroke</b>	21 ms
	<b>Rotational Speed</b>		7,200 rpm
	<b>Logical Blocks</b>		976,773,168
	<b>Operating Temperature</b>		41° to 131° F (5° to 55° C)
<b>1TB SATA 7200 rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>		1 Terabyte (1000 GB)
	<b>Height</b>		1 in; 2.54 cm
	<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
		<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>		Serial ATA (6.0Gb/s), NCQ enabled
	<b>Synchronous Transfer Rate</b> (Maximum)		Up to 600MB/s
	<b>Buffer</b>		64MB
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	2 ms
		<b>Average</b>	11 ms
		<b>Full Stroke</b>	21 ms
	<b>Rotational Speed</b>		7,200 rpm
	<b>Logical Blocks</b>		1,953,525,168
	<b>Operating Temperature</b>		41° to 131° F (5° to 55° C)
<b>2.0TB SATA 7200 rpm 6Gb/s 3.5" HDD</b>	<b>Capacity</b>		2TB
	<b>Height</b>		1 in; 2.54 cm
	<b>Width</b>	<b>Media Diameter</b>	3.5 in; 8.9 cm
		<b>Physical Size</b>	4 in; 10.17 cm
	<b>Interface</b>		Serial ATA (6.0Gb/s), NCQ enabled
	<b>Synchronous Transfer Rate</b> (Maximum)		Up to 600MB/s
	<b>Buffer</b>		64MB
	<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b>	1.0 ms
		<b>Average</b>	11 ms
		<b>Full Stroke</b>	18 ms
	<b>Rotational Speed</b>		7,200 rpm
	<b>Logical Blocks</b>		3,907,029,168
	<b>Operating Temperature</b>		41° to 131° F (5° to 55° C)
<b>3.0TB SATA 7200 rpm</b>	<b>Capacity</b>		3.0TB

### Technical Specifications - Hard Drives

#### 6Gb/s 3.5" HDD

<b>Height</b>	1 in; 2.54 cm
<b>Width</b>	<b>Media Diameter</b> 3.5 in; 8.9 cm
	<b>Physical Size</b> 4 in; 10.17 cm
<b>Interface</b>	Serial ATA (6.0Gb/s), NCQ enabled
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s
<b>Buffer</b>	64MB
<b>Seek Time</b> (typical reads, includes controller overhead, including settling)	<b>Single Track</b> 0.6 ms
	<b>Average</b> 11 ms
	<b>Full Stroke</b> Not specified
<b>Rotational Speed</b>	7,200 rpm
<b>Operating Temperature</b>	41° to 131° F (5° to 55° C)

#### SATA SSDs for HP Workstations

##### HP 256GB SATA 6Gb/s SSD

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

##### HP 256GB mSATA 6Gb/s SSD

<b>Capacity</b>	256GB
<b>Interface</b>	6Gb/s SATA

##### HP 512GB SATA 6Gb/s SSD

<b>Capacity</b>	512GB
<b>Height</b>	0.28 in; 0.7 cm
<b>Width</b>	<b>Physical Size</b> 2.5 in; 6.36 cm
<b>Interface</b>	SATA 6Gb/s
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 500MB/s (Sequential Read)
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)

##### Seagate 600 Pro 120GB SATA SSD

<b>Capacity</b>	120GB
<b>Height</b>	0.276 in; 0.7 cm
<b>Width</b>	<b>Physical Size</b> 2.76 in; 7.01 cm
<b>Interface</b>	SATA 6Gb/s
<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s
<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)

### Technical Specifications - Hard Drives

<b>Seagate 600 Pro 240GB SATA SSD</b>	<b>Capacity</b>	240GB	
	<b>Height</b>	0.28 in; 0.7 cm	
	<b>Width</b>		<b>Physical Size</b> 2.76 in; 7.01 cm
	<b>Interface</b>	SATA 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	
<b>Seagate 600 Pro 480GB SATA SSD</b>	<b>Capacity</b>	480GB	
	<b>Height</b>	0.28 in; 0.7 cm	
	<b>Width</b>		<b>Physical Size</b> 2.76 in; 7.01 cm
	<b>Interface</b>	SATA 6Gb/s	
	<b>Synchronous Transfer Rate (Maximum)</b>	Up to 600MB/s	
	<b>Operating Temperature</b>	32° to 158° F (0° to 70° C)	

### Technical Specifications - Graphics

<b>Integrated Intel HD Graphics (Z230/Z1G2)</b>	<b>Form Factor</b>	Integrated in select Intel Xeon E3, Intel Core i7, and Intel Core i5 processors.
		Check specific platform specifications for selections.
	<b>Graphics Controller</b>	Intel HD Graphics
	<b>Memory</b>	Unified Memory Architecture (UMA) frame buffer. Graphics memory is shared with system memory. Size selectable between 64 MB to 512 MB via BIOS setting. Default size is 64 MB. Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (Intel DVMT 5.0), to provide an optimal balance between graphics and system memory use.
	<b>Connectors</b>	Check system platform specifications where Intel HD Graphics are available.
	<b>Maximum Resolution</b>	Display Port: 2560 x 1600 DVI: 1920x1200 VGA: 2048x1536
		<b>NOTE:</b> For DVI and VGA outputs, separate adapters may be required.
	<b>Shading Architecture</b>	Shader Model 5.0
	<b>Supported Graphics APIs</b>	OpenGL 4.0 DirectX 11.1
	<b>Available Graphics Drivers</b>	Windows 7 Windows 8.1
<hr/>		
<b>NVIDIA Quadro K610M 1GB Graphics</b>	<b>Form Factor</b>	MXM v3.1 Type A (82mm x 70mm)
	<b>Graphics Controller</b>	N15M-Q3, 954MHz core clock 192 CUDA cores
	<b>Bus Type</b>	PCI Express Gen 3 x16 (part of MXM v3.1 connector)
	<b>Memory</b>	1GB GDDR5 64 bit wide interface 2600MHz, 20.8 GB/s
	<b>Connectors</b>	One MXM v3.1 connector (285-pin)
	<b>Maximum Resolution</b>	2 x 3840x2160 @ 60Hz digital displays In Z1 G2 application: - Internal Display: 2560x1440 - External Display via DP connector: 2560x1600 - External Display via optional Thunderbolt module: Two 3840x2160
	<b>RAMDAC</b>	Not Applicable
	<b>Image Quality Features</b>	Each color component can be processed at up to 32-bit floating point precision and displayed at up to 12-bit precision. Advanced FXAA and TXAA antialiasing. 16K Texture and Render Processing. MPEG-2 HD and WMV HD video playback (1920x1080p). H.264 hardware decode acceleration. Nvidia Scalable Geometry Engine.
	<b>Shading Architecture</b>	Shader Model 5.0 support

### Technical Specifications - Graphics

<b>Supported Graphics APIs</b>	Full IEEE 764-2008 32-bit DirectX 11.1 Shader Model 5.0 OpenGL 4.3 Compute API support for NVIDIA CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python and Fortran
<b>Available Graphics Drivers</b>	Windows 7 64-bit Windows 8.1 64-bit SUSE Linux Enterprise Desktop 11 64-bit Red Hat Enterprise Linux 6 Workstation 64-bit

See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA graphics drivers

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<b>NVIDIA Quadro K2100M 2GB Graphics</b>	<b>Form Factor</b>	MXM v3.1 Type A (82mm x 70mm)
	<b>Graphics Controller</b>	N15P-Q3, 665MHz core clock 576 CUDA cores
	<b>Bus Type</b>	PCI Express Gen 3 x16 (part of MXM v3.1 connector)
	<b>Memory</b>	2GB GDDR5 128 bit wide interface 3000MHz, 48 GB/s
	<b>Connectors</b>	One MXM v3.1 connector (285-pin)
	<b>Maximum Resolution</b>	2 x 3840x2160 @ 60Hz digital displays In Z1 G2 application: - Internal Display: 2560x1440 - External Display via DP connector: 2560x1600 - External Display via optional Thunderbolt module: Two 3840x2160
	<b>RAMDAC</b>	Not Applicable
	<b>Image Quality Features</b>	Each color component can be processed at up to 32-bit floating point precision and displayed at up to 12-bit precision. Advanced FXAA and TXAA antialiasing. 16K Texture and Render Processing. MPEG-2 HD and WMV HD video playback (1920x1080p). H.264 hardware decode acceleration. Nvidia Scalable Geometry Engine. AES-128 CTR/CBC/ECB decryption modes supported. Nvidia 3D Vision Pro
	<b>Shading Architecture</b>	Shader Model 5.0 support
	<b>Supported Graphics APIs</b>	Full IEEE 764-2008 32-bit DirectX 11.1 Shader Model 5.0 OpenGL 4.3 Compute API support for NVIDIA CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python and Fortran

### Technical Specifications - Graphics

<b>Available Graphics Drivers</b>	Windows 7 64-bit Windows 8.1 64-bit SUSE Linux Enterprise Desktop 11 64-bit Red Hat Enterprise Linux 6 Workstation 64-bit
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See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA graphics drivers

#### **NVIDIA Quadro K3100M 4GB Graphics**

<b>Form Factor</b>	MXM v3.1 Type B (82mm x 105mm)
<b>Graphics Controller</b>	N15E-Q1, 705MHz core clock 768 CUDA cores
<b>Bus Type</b>	PCI Express Gen 3 x16 (part of MXM v3.1 connector)
<b>Memory</b>	4GB GDDR5 256 bit wide interface 3200MHz, 102.4 GB/s
<b>Connectors</b>	One MXM v3.1 connector (285-pin)
<b>Maximum Resolution</b>	2 x 3840x2160 @ 60Hz digital displays In Z1 G2 application: - Internal Display: 2560x1440 - External Display via DP connector: 2560x1600 - External Display via optional Thunderbolt module: Two 3840x2160
<b>RAMDAC</b>	Not Applicable
<b>Image Quality Features</b>	Each color component can be processed at up to 32-bit floating point precision and displayed at up to 12-bit precision. Advanced FXAA and TXAA antialiasing. 16K Texture and Render Processing. MPEG-2 HD and WMV HD video playback (1920x1080p). H.264 hardware decode acceleration. Nvidia Scalable Geometry Engine. AES-128 CTR/CBC/ECB decryption modes supported. Nvidia 3D Vision Pro
<b>Shading Architecture</b>	Shader Model 5.0 support
<b>Supported Graphics APIs</b>	Full IEEE 764-2008 32-bit DirectX 11.1 Shader Model 5.0 OpenGL 4.3 Compute API support for NVIDIA CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python and Fortran
<b>Available Graphics Drivers</b>	Windows 7 64-bit Windows 8.1 64-bit SUSE Linux Enterprise Desktop 11 64-bit Red Hat Enterprise Linux 6 Workstation 64-bit

See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA graphics drivers



### Technical Specifications - Graphics

<b>NVIDIA Quadro K4100M 4GB Graphics</b>	<b>Form Factor</b>	MXM v3.1 Type B (82mm x 105mm)
	<b>Graphics Controller</b>	N15E-Q3, 705MHz core clock 1152 CUDA cores
	<b>Bus Type</b>	PCI Express Gen 3 x16 (part of MXM v3.1 connector)
	<b>Memory</b>	4GB GDDR5 256 bit wide interface 3200MHz, 102.4 GB/s
	<b>Connectors</b>	One MXM v3.1 connector (285-pin)
	<b>Maximum Resolution</b>	Maximum number of active displays: 4 In Z1 G2 application: - Internal Display: 2560x1440 - External Display via DP connector: 2560x1600 - External Display via optional Thunderbolt module: Two 3840x2160
	<b>RAMDAC</b>	Not Applicable
	<b>Image Quality Features</b>	Each color component can be processed at up to 32-bit floating point precision and displayed at up to 12-bit precision. Advanced FXAA and TXAA antialiasing. 16K Texture and Render Processing. MPEG-2 HD and WMV HD video playback (1920x1080p). H.264 hardware decode acceleration. Nvidia Scalable Geometry Engine. AES-128 CTR/CBC/ECB decryption modes supported. Nvidia 3D Vision Pro
	<b>Shading Architecture</b>	Shader Model 5.0 support
	<b>Supported Graphics APIs</b>	Full IEEE 764-2008 32-bit DirectX 11.1 Shader Model 5.0 OpenGL 4.3 Compute API support for NVIDIA CUDA C, CUDA C++, DirectCompute 5.0, OpenCL, Java, Python and Fortran
<b>Available Graphics Drivers</b>	Windows 7 64-bit Windows 8.1 64-bit SUSE Linux Enterprise Desktop 11 64-bit Red Hat Enterprise Linux 6 Workstation 64-bit	

See [www.hp.com/go/support](http://www.hp.com/go/support) for HP supported NVIDIA graphics drivers

### Technical Specifications - Optical and Removable Storage

<b>HP Slim DVD-ROM Drive</b>	<b>Description</b>	12.7mm high, tray-load	
	<b>Mounting Orientation</b>	Either horizontal or vertical	
	<b>Interface Type</b>	SATA / ATAPI	
	<b>Dimensions (WxHxD)</b>	128 x 14 x 128mm	
	<b>Disc Capacity</b>	<b>DVD-ROM</b> Single layer: Up to 4.7 GB Double layer: Up to 8.5 GB	
	<b>Access Times</b>	<b>DVD-ROM Single Layer</b>	<110 ms (typical)
		<b>CD-ROM Mode 1</b>	<110 ms (typical)
		<b>Full Stroke DVD</b>	<230 ms (seek)
		<b>Full Stroke CD</b>	<220 ms (seek)
	<b>Power</b>	<b>Source</b>	SATA DC power receptacle
		<b>DC Power Requirements</b>	5 VDC ± 5%-100 mV ripple p-p
		<b>DC Current</b>	5 VDC - <800mA typical, < 1600 mA maximum
	<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b>	41° to 122° F (5° to 50° C)
		<b>Relative Humidity</b>	10% to 80%
		<b>Maximum Wet Bulb Temperature</b>	84° F (29° C)
<b>Operating Systems Supported</b>	Windows 8 32-bit and 64-bit, Windows 7 Professional 32-bit and 64-bit, Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows 2000, Windows XP Professional or Windows XP Home 32*. Red Hat Enterprise Linux(RHEL) WS4**, 5, 6 Desktop/Workstation, Removed reference to "Novell" because of acquisition and changed product reference to "SUSE Linux Enterprise Desktop 10 & 11", No driver is required for this device. Native support is provided by the operating system.		

<b>HP Slim SuperMulti DVDRW SATA Drive</b>	<b>Description</b>	12.7mm high, tray-load
	<b>Mounting Orientation</b>	Either horizontal or vertical
	<b>Interface Type</b>	SATA/ATAPI
	<b>Dimensions (WxHxD)</b>	128 x 14 x 128mm
	<b>Supported Media Types</b>	DVD-RAM
		DVD+R
		DVD+RW
DVD+R DL		
<b>Disc Capacity</b>	DVD-R DL	8.5 GB DL or 4.7 GB standard
	DVD-R	
	DVD-RW	
	CD-R	
	CD-RW	

### Technical Specifications - Optical and Removable Storage

<b>Access Times</b>	<b>Full Stroke DVD</b>	< 230 ms (seek)
	<b>Full Stroke CD</b>	< 220ms (seek)
<b>Maximum Data Transfer Rates</b>	<b>CD ROM Read</b>	CD-ROM, CD-R Up to 24X CD-RW Up to 24X
	<b>DVD ROM Read</b>	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	
<b>Power</b>	<b>Source</b>	SATA DC power receptacle
	<b>DC Power Requirements</b>	5 VDC ± 5%-100 mV ripple p-p
	<b>DC Current</b>	5 VDC -< 800 mA typical, <1600 mA maximum
<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b>	41° to 122° F (5° to 50° C)
	<b>Relative Humidity</b>	10% to 80%
	<b>Maximum Wet Bulb Temperature</b>	84° F (29° C)
<b>Operating Systems Supported</b>	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.	
<b>Kit Contents</b>	HP SATA SuperMulti DVD Writer drive, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, installation guide, and DVD+R media.	
<b>Approvals</b>	© Copyright 2013 Hewlett-Packard Development Company, L.P. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein. The information contained herein is subject to change without notice.	

<b>HP Slim Blu-ray Writer</b>	<b>Description</b>	12.7mm high, tray-load
	<b>Mounting Orientation</b>	Horizontal
	<b>Interface Type</b>	SATA
	<b>Dimensions (WxHxD)</b>	128 x 14 x 128mm
	<b>Supported Media Types</b>	BD-ROM BD-R BD-RE

### Technical Specifications - Optical and Removable Storage

	DVD-RAM DVD+R DVD+RW DVD+R DL DVD-R DL DVD-R DVD-RW CD-R CD-RW	
<b>Disc Capacity</b>	<b>DVD-ROM</b> <b>CD-ROM</b>	8.5 GB DL or 4.7 GB standard 650MB CD-ROM (Read Only) 800/700/650MB CD-Recordable (Read & Write) 700/650MB CD-Rewritable (Read & Write) 700/650MB High Speed CD-Rewritable (Read & Write) 700/650MB Ultra & Ultra+ Speed CD-Rewritable (Read & Write)
<b>Access Times</b>	<b>Blu-ray</b> <b>Full Stroke DVD</b> <b>Full Stroke CD</b> <b>Blu-ray</b> <b>Startup Time</b>	50 GB DL or 25 GB standard < 200ms (seek) < 200ms (seek) < 230ms (seek) (Time to drive ready from tray loading) BD-ROM (SL/DL) 25S / 28S BD-R (SL/DL) 25S / 28S BD-RE (SL/DL) 25S / 28S DVD-ROM (SL/DL) 18S / 18S DVD-R (SL/DL) 25S / 25S DVD-RW 25S DVD+R (SL/DL) 25S / 25S DVD+RW 25S DVD-RAM 45S CD-ROM 15S
<b>Maximum Data Transfer Rates</b>	<b>CD ROM Read</b> <b>DVD ROM Read</b>  <b>Blu-ray</b>	CD-ROM, CD-R Up to 24X CD-RW Up to 24X 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 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

### Technical Specifications - Optical and Removable Storage

<b>Power</b>	<b>Source</b>	BD-RE SL/DL Up to 6X BD-RE TL 4.8x SATA DC power receptacle
	<b>DC Power Requirements</b>	5 VDC $\pm$ 5%-100 mV ripple p-p
	<b>DC Current</b>	5 VDC -900 mA typical, 2000mA maximum
<b>Operating Environmental</b> (all conditions non-condensing)	<b>Temperature</b>	41° to 122° F (5° to 50° C)
	<b>Relative Humidity</b>	15% to 80%
	<b>Maximum Wet Bulb Temperature</b>	84° F (29° C)
<b>Operating Systems Supported</b>		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.
<b>Kit Contents</b>		HP Blue Laser RW Drive, Cyberlink Power2Go Software, Cyberlink PowerDVD Software, 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.

### Technical Specifications - Controller Cards

<b>HP Thunderbolt 2-port AiO Module</b>	<b>Data Transfer Rate</b>	Supports up to 20 Gb/s (20,000 Mb/s)
	<b>Devices Supported</b>	Thunderbolt™ certified devices
	<b>Ports</b>	Two (2) Thunderbolt™ 2 external 20-Pin output connectors (Side)
	<b>Internal Connectors</b>	TBD ??
	<b>System Requirements</b>	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit, Intel i5 series or higher processor, 128-MB RAM, 1-GB Hard Drive, available PCIe slot.
	<b>Temperature - Operating</b>	50° to 131° F (10° to 55° C)
	<b>Temperature - Storage</b>	-22° to 140° F (-30° to 60° C)
	<b>Relative Humidity - Operating</b>	20% to 80%
	<b>Compliances</b>	FCC Part 15B, cULus 60950, CE Mark EN55022B(1995)/EN55024-1998 STD, Taiwan BSMI CNS13438, Korea MIC
	<b>Operating Systems Supported</b>	Genuine Windows 7 Professional 64-bit, Genuine Windows 8.1 64-bit.
	<b>Kit Contents</b>	HP Thunderbolt™ 2 Module, user documentation and warranty card.
	<b>Warranty</b>	The HP Thunderbolt™ 2 Module has a one-year Limited Warranty or the remainder of the warranty of the HP supported product in which it is installed. Technical support is available seven days a week, 24 hours a day, by phone, as well as online support forums. Certain restrictions and exclusions apply.

### Technical Specifications - Networking and Communications

<b>Integrated Intel I217LM PCIe GbE Controller</b>	<b>Connector</b>	RJ-45
	<b>Controller</b>	Intel I217LM GbE platform LAN connect networking controller
	<b>Memory</b>	3 KB Tx and 3KB Rx FIFO packet buffer memory
	<b>Data Rates Supported</b>	10/100/1000 Mbps
	<b>Compliance</b>	802.1as/1588, 802.1p, 802.1Q, 802.3, 802.3ab, 802.3az, 802.3i, 802.3u, 802.3z
	<b>Bus Architecture</b>	PCI Express and SMBus
	<b>Data Transfer Mode</b>	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
	<b>Power Requirement</b>	Requires 3.3V (integrated regulators for core Vdc)
	<b>Boot ROM Support</b>	Yes
	<b>Network Transfer Mode</b>	Full-duplex; Half-duplex (not supported for the 1000BASE-T transceiver)
	<b>Network Transfer Rate</b>	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
	<b>Management Capabilities</b>	vPro, WOL, auto MDI crossover, PXE, iSCSI Boot, Multi-port teaming, RSS, ACPI, Advanced cable diagnostic, loopback modes, AMT 9.0 support, Circuit Breaker, VLAN, Multicast Listener Discovery (MLD)

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