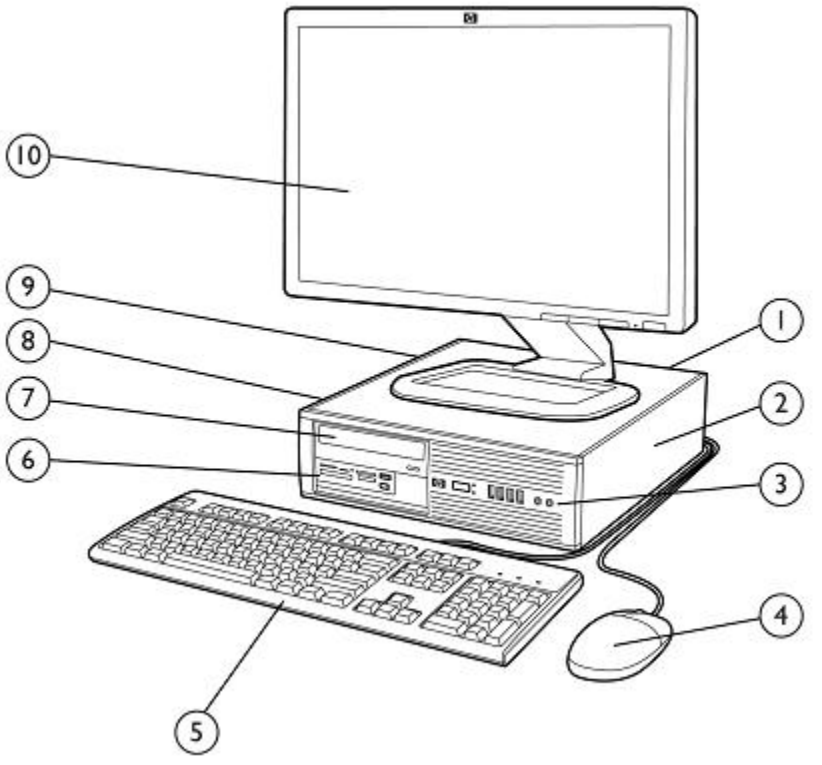
**Small Form Factor**




1. Rear I/O includes (6) USB 2.0 ports, serial port, PS/2 mouse and keyboard ports, RJ-45 network interface, DisplayPort and VGA video interfaces, and audio in/out jacks

2. Low profile expansion slots include (1) PCI slot, (1) PCI Express x1 slots and (2) PCI Express x16 graphics slot

**NOTE:** 2nd PCIe x16 slot has x4 connectivity.

3. Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack

4. HP Optical Mouse

5. HP Keyboard

6. 3.5” external drive bay supporting a media card reader or a secondary hard disk drive

7. 5.25” external drive bay supporting an optical disk drive

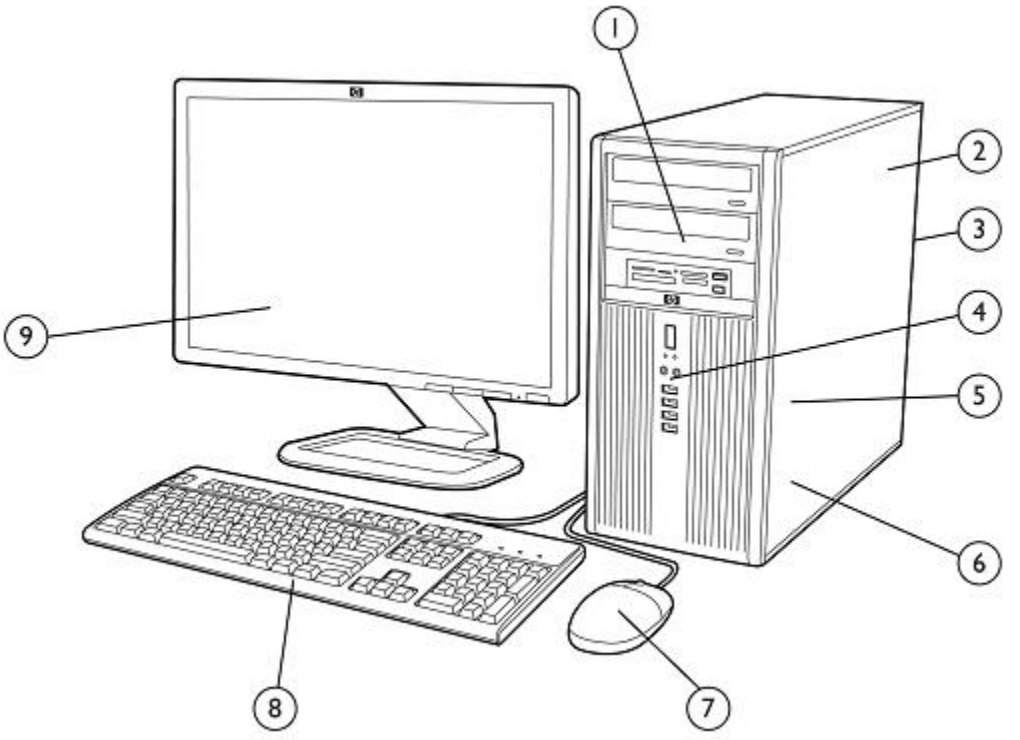
8. 3.5” internal drive bay supporting primary hard disk drive

9. 240W standard or high efficiency Power Supply

10. HP Monitor (sold separately)

*Overview*

**Convertible Minitower**




1. (3) 5.25”external drive bays supporting optical disk drives, removable hard disk drives, or the HP Media Card Reader

2. 320W standard or high efficiency Power Supply

3. Rear I/O includes (6) USB 2.0 ports, serial port, PS/2 mouse and keyboard ports, RJ-45 network interface, DisplayPort and VGA video interfaces, and audio in/out jacks

4. Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack

5. (3) 3.5” internal drive bays supporting multiple hard disk drives

6. Full height expansion slots include (3) full-length PCI slots, (1) PCI Express x1 slot, and (2) full-length PCI Express x16 graphics slots
**NOTE:** 2nd PCIe x16 slot has x4 connectivity.

7. HP Optical Mouse

8. HP Keyboard

9. HP Monitor (sold separately)

*Overview*

## At A Glance

- Designed for long-term deployment within medium to large commercial and institutional organizations
- Guaranteed lengthy purchase lifecycles and image stability
- Standard efficiency or 89% high efficiency energy saving power supplies; high efficiency power supplies certified 80 PLUS® Gold by Ecos Consulting
- ENERGY STAR qualified models available; all ENERGY STAR qualified models are certified EPEAT Gold
- Intel® Q57 Express chipset
- Intel® Core™ and Pentium® processors
- DDR3 Synchronous Dynamic Random Access Memory (SDRAM)
- Software image fully compatible across all models and form factors
- BIOS developed and engineered by HP for better security, manageability and software image stability
- Integrated dual independent monitor support via both a VGA and DisplayPort video/audio interface
- Created using industry leading Design for Environment standards
- Intel® Core™ Processor with vPro™ Technology (on select models)
- Supports industry standard management protocols including DASH and Intel® Standard Manageability
- Models can be configured with multiple hard disk drives in a RAID array
- Selected configurations with global availability easily set up and ordered through HP.com Business to Business portals (http://h10019.www1.hp.com/business-site/index.html)
- Tailored HP Factory Express deployment and lifecycle services available (http://h71028.www7.hp.com/enterprise/cache/97688-0-0-225-121.aspx)
- Protected by HP Services, including standard warranties up to 5-5-5 (terms and conditions vary by country; certain restrictions and exclusions apply)
- Tool-less serviceability features for easier upgrades and repairs
- Choice of professional chassis form factors to accommodate the desired mix between expandability and size
- HP unique Convertible Minitower chassis delivers true expandability, and is easily configured for vertical or horizontal orientation

*Standard Features and Configurable Components (availability may vary by country)*

## Operating Systems

**Preinstalled**

- Genuine Windows Vista Business (32-bit)[1]
- Genuine Windows Vista Home Basic (32-bit)1
- Genuine Windows 7 Professional Edition (32-bit)[2]
- Genuine Windows 7 Professional Edition (64-bit)[2]
- Genuine Windows XP Professional (available through downgrade rights from Genuine Windows 7 Professional) [2,3]
- Genuine Windows 7 Home Premium Edition (32-bit or 64-bit)[2]
- Genuine Windows 7 Home Basic Edition (32-bit)[2]
- FreeDOS

**Supported**

- Genuine Windows Vista Enterprise Edition[1]
- Genuine Windows 7 Enterprise Edition[2]
- Genuine Windows 7 Ultimate Edition[2]
- Novell SUSE Linux Enterprise Desktop 11[4]

**Certified**

- Certified Red Hat Enterprise Linux 64[4]

[1] Certain Windows Vista product features require advanced or additional hardware. See www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and www.microsoft.com/windowsvista/getready/capable.mspx for details. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: www.windowsvista.com/upgradeadvisor

[2] System may require upgraded and/or separately purchased hardware and/or a 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.

[3] Windows 7 Professional disk may be included for future upgrade if desired. To qualify for this downgrade an end user must be a business (including governmental or educational institutions) and is expected to order at least 25 customer systems with the same custom image.

[4] The following features are not supported on Linux certified systems:

- HP 22-in-1 media card reader
- Trusted Platform Module (TPM) 1.2 Security Chip
- Intel Gigabit CT Desktop NIC Card
- Broadcom NetXtreme GbE Ethernet Plus NIC
- HP 802.11b/g/n wireless NIC
- LSI 56K Int'l SoftModem
- HP USB Smartcard keyboard
- HP Serial port adapter
- HP Parallel port adapter
- HP eSATA port adapter
- HP FireWire/IEEE 1394 I/O card
- RAID
- Media Card Reader (22-in-1) with 1394 port
- NVIDIA NVS G310 SH Graphics Card
- NVIDIA Quadro NVS 290 Graphics Card
- NVIDIA Quadro NVS 295 Graphics Card
- ATI Radeon HD 4550 Graphics Card
- ATI Radeon HD 4650 DP Graphics Card
- SATA Blu-Ray Writer Drive
- NVIDIA GeForce 310 DP PCIe x16 Graphics Card

**Value Added Software** (included with all models; not included when configured with FreeDOS)

- HP ProtectTools Security Suite
- HP Software Management Agent
- Computrace for Desktops agent (optional)*
- HP Insight Diagnostics
- PDF Complete

* Computrace available as an optional aftermarket service; separate software and subscription are required

**Value Added Software** (included with select models; not included when configured with FreeDOS)

- Computer Setup Utility
- McAfee Total Protection Anti-Virus*
- Roxio Creator Business
- HP Power Assistant
- Microsoft Office Trial Version
- Mozilla Firefox for HP Virtual Browser
- Corel WinDVD

* 60 day trial period for McAfee Total Protection for Small Business software. Internet access required to receive updates. First update included. Subscription required for updates thereafter

**HP Client Management Solutions** (available for free download from the Internet) http://www.hp.com/go/easydeploy)

- HP Client Automation Starter*
- HP SoftPaq Download Manager
- HP Client Catalog for Microsoft SMS
- HP Systems Software Manag

* Available from your HP Sales Representative or HP Channel Partner

**Value Added Services and Features**

- HP Stable Platform Program
- Intel Stable Platform Program
- Business-to-Business Portals
- HP Global Series Services
- Factory Express Deployment and Lifecycle Services
- Intel Standard Manageability
- Intel® Core™ processor with vPro™ technology
- Trusted Platform Module (TPM) v1.2
  TPM module disabled where restricted by law; for example, Russia.

**Service and Support**

On-site warranty and service[1]: three year (3/3/3) limited warranty and service offering delivers three years of parts, labor and on-site repair. Response time is next business day[2] and includes free telephone support[3] 24 x 7. Global coverage[2] ensures any product purchased in one country and transferred to another non-restricted country will remain fully covered under the original warranty and service offering. Some countries/regions do not offer one year onsite and labor.

[1] Terms and conditions may vary by country. Certain restrictions and exclusions apply.

[2] On-site services 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.

[3] Technical telephone support applies only to HP configured, HP and HP qualified third party hardware and software. Toll-free calling and 24 x 7 support may not be available in some countries.

*Standard Features and Configurable Components (availability may vary by country)*

| Power Supply | Small Form Factor | Convertible Minitower |
|---|---|---|
| Standard Efficiency | 240W active PFC | 320W active PFC |
| High Efficiency* | 240W active PFC<br>87/89/85% efficient at 20/50/100% load | 320W active PFC<br>87/89/85% efficient at 20/50/100% load |
| Operating Voltage Range | 90 – 264 VAC | 90 – 264 VAC |
| **Ports** | | |
| USB 2.0 | Front – four (4) ports<br>Rear – six (6) ports | |
| Serial | One port standard; second port available optionally | |
| Parallel | One port available optionally | |
| eSATA | One port available optionally | |
| PS/2 | Color coded support for keyboard (purple) and mouse (green) | |
| Video | VGA and DisplayPort provide integrated dual independent monitor support | |
| DVI output | Available via optional DisplayPort to DVI Adapter | |
| Audio | Front – microphone & headphone<br>Rear – line input (supports microphone or line input), line out<br>**NOTE:** See Audio/Visual section for information on re-taskable audio ports. DisplayPort also supports audio. | |
| NIC | Industry standard RJ-45 port accesses the integrated network interface controller | |
| **Slots** | | |
| Type and quantity | (1) PCI<br>(1) PCI Express x1<br>(2) PCI Express x16 | (3) PCI<br>(1) PCI Express x1 (half-length)<br>(2) PCI Express x16 |
| Slot specifications | Low Profile<br>25W max. cards | Full height<br>75W max. for cards in both x16 slots<br>Primary x16 slot supports 75W or 35W card<br>Secondary x16 slot supports 35W card when primary slot is limited to 35W card<br>Secondary slot functions electrically as an x4 slot |

## Chipset

Intel Q57 Express supporting Intel® Core™ processor with vPro™ technology

## Processors

**NOTE:** all models configured with Intel® Core™ processors with 4 cores require a discrete graphics solution

**Intel Pentium Processors:**

Intel Pentium G6950 Processor
2.80 GHz, 3M total cache
2 cores/2 threads
Integrated Intel® HD Graphics

**Intel Core i3 Processors:**

Intel Core i3-530 Processor
2.93 GHz, 4M total cache
2 cores/4 threads
Integrated Intel® HD Graphics

Intel Core i3-540 Processor
3.06 GHz, 4M total cache
2 cores/4 threads
Integrated Intel® HD Graphics

**Intel Core i5 Processors:**

Intel Core i5-650 Processor
3.2 GHz, 4M total cache
2 cores/4 threads
Integrated Intel® HD Graphics
Intel® Core™ processor with vPro™ technology
Intel® Stable Image Platform Program (SIPP)

Intel Core i5-660 Processor
3.33 GHz, 4M total cache
2 cores/4 threads
Integrated Intel® HD Graphics
Intel® Core™ processor with vPro™ technology
Intel® Stable Image Platform Program (SIPP)

Intel Core i5-670 Processor
3.46 GHz, 4M total cache
2 cores/4 threads
Integrated Intel® HD Graphics
Intel® Core™ processor with vPro™ technology
Intel® Stable Image Platform Program (SIPP)

Intel Core i5-750 Processor
2.66 GHz, 8M total cache
4 cores/4 threads
Requires a discrete graphics solution

Intel Core i5-750S (low power) Processor
2.40 GHz, 8M total cache
4 cores/4 threads
Requires a discrete graphics solution

**Intel Core i7 Processors:**

Intel Core i7-860 Processor
2.80 GHz, 8M total cache
4 cores/8 threads
Requires a discrete graphics solution
Intel® Core™ processor with vPro™ technology
Intel® Stable Image Platform Program (SIPP)

Intel Core i7-870 Processor
2.93 GHz, 8M total cache
4 cores/8 threads
Requires a discrete graphics solution
Intel® Core™ processor with vPro™ technology
Intel® Stable Image Platform Program (SIPP)

## Redundant Array of Independent Drives (RAID)

- DriveLock is supported while in RAID mode. Users can manage the DriveLock password from within F10 Setup. Locked drives will be displayed as such in the RAID option ROM interface.
- Hard drive information can be viewed within F10 Setup while in RAID mode. Previously, the hard drives will not appear in Drive Configuration when switching to RAID mode.
- DPS Self Test can be executed on physical hard drives while in RAID mode.
- The RAID Setup Utility (accessed through CTRL-I) can be protected by the F10 Setup password.

**NOTE:** RAID 1 is the only RAID configuration offered via factory configurations. The pre-configured systems:

- *Are complete RAID systems and have both drives installed. If the CMT is configured with three hard disk drives, the third drive is would be unpartitioned and not part of the RAID array*
- *Have the necessary Option ROM configuration.*
- *Are pre-loaded and pre-installed with all required Intel software.*
- *Include a preinstalled operating system that is mirrored mode out of the box.*

Please refer to the HP White Paper titled "Advanced Host Controller Interface (AHCI) and Redundant Array of Independent Disks (RAID) on HP Compaq 8100 Elite Series PCs" at: http://www.hp.com for more information and instructions.

## DDR3 Synchronous DRAM NON-ECC System Memory

Memory upgrades are accomplished by adding single or multiple DIMMs of the same or varied sizes. This chart does not represent all possible memory configurations. The HP Compaq 8100 Elite Series PC supports non-ECC DDR3 PC3-10600 (1333 MHz)* and PC3-8500 (1066 MHz)* memory.

**CAUTION:** You must shut down the computer and disconnect the power cord before adding or removing memory modules. Regardless of the power-on state, voltage is always supplied to the memory modules as long as the computer is plugged in to an active AC outlet. Adding or removing memory modules while voltage is present may cause irreparable damage to the memory modules or system board.

Supports up to 16 GB of DDR3 SDRAM using DIMM modules. Slot 1 is black and must always be populated. Not all memory configurations possible are represented below.

**NOTE:** For systems configured with more than 3 GB of memory and a 32-bit operating system, all memory may not be available due to system resource requirements. Addressing memory above 4 GB requires a 64-bit operating system.

| Total Memory | Slot | | | |
|---|---|---|---|---|
| | Channel A | | Channel B | |
| | 1 (black) | 2 (white) | 3 (white) | 4 (white) |
| 1GB (single channel) | 1 GB | | | |
| 2 GB (dual channel) | 1 GB | | 1 GB | |
| 4 GB (dual channel) | 1 GB | 1 GB | 1 GB | 1 GB |
| 8 GB (dual channel) | 2 GB | 2 GB | 2 GB | 2 GB |
| 16 GB (dual channel) | 4 GB | 4 GB | 4 GB | 4 GB |

* The Intel Q57 Express chipset includes a built-in Management Engine (ME), which allocates memory for manageability functions. Management Engine memory is shared with system memory. If the PC contains a single DIMM, 16 MB of memory is pre-allocated for it at system startup. If the PC contains two DIMMs, 32 MB of memory is pre-allocated. This memory is not made available to the operating system, just as pre-allocated video memory is not available.

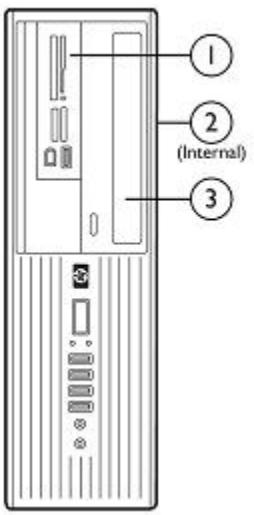
## Memory Configurations

1GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (1 x 1GB)
2GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (1 x 2GB)
2GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (1 x 2GB)
3GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (1GB + 2GB)
4GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (1 x 4GB)
4GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (2 x 2GB)
8GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (2 x 4GB)
8GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (4 x 2GB)
16GB DDR3 SDRAM PC3-10600 (1333MHz) non ECC (4 x 4GB)

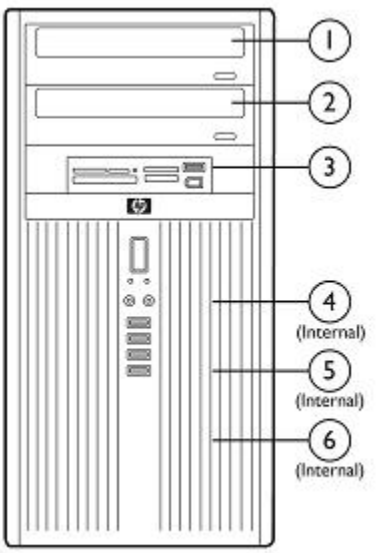
*Standard Features and Configurable Components (availability may vary by country)*

| Expandability | Small Form Factor | Convertible Minitower |
|---|---|---|
| PCI slot | (1) slot<br>Low profile (2.5”); Half length (6.6”)<br>25W max. power | (3) slots<br>Full height (4.2”); Full length<br>25W max. power |
| PCI Express x16 slot | (2) slots<br>Low profile (2.5”); Half length (6.6”)<br>25W max. power<br>Secondary slot functions electrically as an x4 slot | Full height (4.2”); Full length<br>75W max. for cards in both x16 slots<br>Primary x16 slot supports 75W or 35W card<br>Secondary x16 slot supports 35W card when primary slot is limited to 35W card<br>Secondary slot functions electrically as an x4 slot |
| PCI Express x1 slot | (1) slot<br>Low profile (2.5”); Half length (6.6”)<br>10W max. power | (1) slot<br>Half height; Half length<br>10W max. power |
| External Drive Bays | | |
| 3.5" | (1) bay available for Media Card Reader unless used for a secondary hard drive | N/A<br>**NOTE**: A 3.5”device can be used in 5.25” bay with an adapter. |
| 5.25" | 1 bay (8.19" depth) | 3 bays<br>Top two bays accept drives up to 8.19” depth<br>Bottom bay accepts drives up to 5.7”depth |
| Internal Drive Bays | 1 bay for primary hard disk drive<br><br>A secondary HDD can be installed in 3.5” external bay if not used for an external device | 3 bays for 3.5” hard disk drives<br><br>2.5" SSD can be installed with an adapter bracket |
| Hard Drive Controller | Serial ATA with support for SATA 1.5-Gb/s and 3.0-Gb/s hard drives | |
| SATA Interfaces | (4) Serial ATA interfaces<br>**NOTE**: Three common SATA ports and one that can optionally be used for eSATA | (5) Serial ATA interfaces<br>**NOTE**: Four common SATA ports and one that can optionally be used for eSATA |
| Host SATA Controller | Advanced Host Controller Interface (AHCI) Revision 1.2. The specification includes a description of the hardware/software interface between system software and the host controller hardware. | |

**Small Form Factor**




**Convertible Minitower**



*Standard Features and Configurable Components (availability may vary by country)*

| Storage – Drive Support | | | | | | |
|---|---|---|---|---|---|---|
| | SFF | | | CMT | | |
| | MCR | ODD | HDD SSD | MCR | ODD | HDD SSD |
| Quantity Supported | 1 | 1 | 2 | 1 | 2 | 3 |
| Position | 1 | 3 | 2,1 | 3 | 1,2 | 4,5,6 |

### Hard Disk Drives

160GB Hard Disk Drive
7,200 rpm, 8MB cache, 3.0 GB/s, 3.5” drive

160GB Hard Disk Drive
10,000 rpm, 16MB cache, 3.0 GB/s, 2.5” drive (includes 3.5” adapter)

160GB Removable Hard Disk Drive
7,200 rpm, 8MB cache, 3.0 GB/s

---

250GB Hard Disk Drive
7,200 rpm, 8MB cache, 3.0 GB/s, 3.5” drive

250GB Removable Hard Disk Drive
7,200 rpm, 8MB cache, 3.0 GB/s

---

320GB Hard Disk Drive
7,200 rpm, 8MB cache, 3.0 GB/s, 3.5” drive

---

500GB Hard Disk Drive
7,200 rpm, 16MB cache, 3.0 GB/s, 3.5” drive

---

1 TB Hard Disk Drive
7,200 rpm, 16MB cache, 3.0 GB/s, 3.5” drive

---

### Solid State Drives

64GB Solid State Drive
2.5" drive (includes 3.5” adapter)

---

### Optical Disc Drives (5.25”)

DVD-ROM Drive[1]

SuperMulti LightScribe DVD Writer Drive[1,2,3]

Blu-Ray Writer Drive

[1]For playing DVDs, Corel WinDVD 8
[2]For writing CDs, choice of Sonic/Roxio Easy Media Creator 9 orRoxio Business Creator 10
[3]For writing CDs and DVDs, video editing and authoring DVDs, choice of Sonic/Roxio Easy Media Creator 9 or Roxio Business Creator 10

---

### Media Card Readers

Media Card Reader (22-in-1)

Media Card Reader (22-in-1) with 1394 port

---

*Standard Features and Configurable Components (availability may vary by country)*

### Security

Trusted Platform Module (TPM) 1.2[1]
Stringent Security (via BIOS)[2]
SATA Port Disablement (via BIOS)
Drive Lock
RAID Configurations
HP ProtectTools security software
Serial, Parallel, USB enable/disable (via BIOS)
Optional USB Port Disable at factory (user configurable via BIOS)
Removable Media Write/Boot Control
Power-On Password (via BIOS)
Setup Password (via BIOS)
Solenoid Hood Lock / Sensor
Support for chassis padlocks and cable lock devices

[1]TPM module disabled where use is restricted by law; for example, Russia.
[2]This setting is defaulted to disable, but when enabled, the PW jumper will not clear the BIOS pre-boot authentication passwords.

---

### Network Interface Connection

Intel 82578 GbE Network Connection (integrated)
Intel Gigabit CT Desktop NIC Card
Broadcom NetXtreme GbE Ethernet Plus NIC (PCIe x1)
**NOTE:** The integrated network connection is required to support the vPro Technology features.

---

HP 802.11 b/g/n Wireless NIC (PCIe x1)
**NOTE:** These wireless network interface solutions will disable the vPro Technology features.

---

### Modem

LSI Hi-Speed 56K International Soft Modem (PCIe x1)

---

### Graphics

Integrated graphics with Intel Pentium processor, Intel Core i3 processors, and select Intel Core i5 processors:
Intel HD Graphics (integrated) on selected models

Available discrete graphics cards:
NVIDIA GeForce 310 DP PCIe x16 Graphics Card
Nvidia Quadro NVS 290 Graphics Card
Nvidia Quadro NVS 295 Graphics Card
ATI Radeon HD 4550 Graphics Card
ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card (CMT only)
HP ADD2 SDVO + DVI-D Video Adapter

---

HP DisplayPort to DVI-D Adapter
HP DisplayPort to VGA Adapter

### Audio/Visual

High Definition Audio with Realtek ALC261 codec (all ports are stereo)
Microphone/Headphone* and dedicated headphone front ports
Line-out and Line-In rear Ports*
Multi-streaming capable*
Internal Speaker (standard)
HP Thin USB Powered Speakers
HP TV Tuner (Americas) PCIe x1 Card

* The front microphone port is re-taskable as a Line-in, Microphone-in or Headphone . Rear audio input ports are re-taskable as Line-in or Microphone-in. External speakers must be powered externally. Multistreaming can be enabled in the Realtek control panel to allow independent audio streams to be sent to/from the front and rear jacks. This allows for different audio applications to use separate audio ports on the system. For example, the front jacks could be used with a headset for a communications application while the rear jacks are being used with external speakers and a multimedia application.

### Input Devices

HP PS/2 Standard Keyboard
HP USB Standard Keyboard
HP USB SmartCard Keyboard
HP USB Mini Keyboard
HP USB & PS/2 Washable Keyboard

PS/2 Optical Scroll Mouse
USB Optical Scroll Mouse
USB Laser Scroll Mouse

## Miscellaneous

HP FireWire (IEEE 1394) Card
HP Serial Port Adapter
HP Parallel Port Adapter
HP eSATA Port Adapter
HP Small Form Factor PC Tower Stand
Configure CMT in desktop orientation

*After-Market Options (availability may vary by region)*

| Communications | Part Number |
|---|---|
| HP Wireless 802.11 b/g/n NIC Card | FH971AA |
| Broadcom NetXtreme GbE Ethernet Plus NIC Card | FS215AA |
| Intel Gigabit CT Desktop NIC Card | FH969AA |
| LSI Hi-Speed 56K Int'l Soft Modem Card | FH970AA |
| RJ11 Modem Adapter Kit | DC131C |

**NOTE:** The use of a NIC Card (wired or wireless) will disable the vPro Technology features.

| Graphics | Part Number |
|---|---|
| ATI Radeon HD 4550 Graphics Card | AT042AA |
| ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card | VN566AA |
| Nvidia Quadro NVS 290 Graphics Card | KG748AA |
| Nvidia Quadro NVS 295 Graphics Card | FY943AA |
| Nvidia GeForce 310 DP PCIe x16 Graphics Card | VG885AA |

| | |
|---|---|
| DMS59 DVI Dual-head Connector Cable | DL139A |
| HP DVI to DVI cable | DC198A |
| HP DisplayPort To DVI-D adapter | FH973AA |
| HP DisplayPort To DL DVI-D adapter | NR078AA |
| HP DisplayPort to VGA Adapter | AS615AA |
| HP DisplayPort Cable Kit | VN567AA |

| Hard Disk Drives | Part Number |
|---|---|
| HP 160GB SATA NCQ SMART IV Hard Disk Drive | PY277AT |
| HP 250GB SATA NCQ SMART IV Hard Disk Drive | PY278AA |
| HP 500GB SATA NCQ SMART IV Hard Disk Drive | KW347AA |
| HP eSATA Adapter | FH966AA |
| HP Removable SATA Hard Drive Enclosure (frame & carrier) | RY102AA |
| HP Removable SATA Hard Drive Enclosure (Carrier Only) | RY103AA |

| Input/Output Devices | Part Number |
|---|---|
| HP PS/2 Standard Keyboard | DT527A |
| HP USB Standard Keyboard | DT528A |
| HP USB Gray Keyboard | DT529A |
| HP 2.4GHz Wireless Keyboard & Mouse | NB896AA#xxx |
| HP USB Mini Keyboard | AS601AA |
| HP USB Washable Keyboard | VF097AA |

| | |
|---|---|
| HP PS/2 Optical Scroll Mouse | EY703AA |
| HP USB Optical Scroll Mouse | DC172B |
| HP USB Laser Mouse | GW405AA |

*After-Market Options (availability may vary by region)*

## DDR3 SDRAM System Memory

| | Part Number |
|---|---|
| 1 GB DIMM | AT023AA |
| 2 GB DIMM | AT024AA |
| HP 4-GB PC3-10600 (DDR3-1333 MHz) DIMM | VH638AA |

## HP Monitors

| | Part Number |
|---|---|
| All HP monitors are supported that accept a graphics output provided by this PC. | |

## Multimedia Devices

| | Part Number |
|---|---|
| HP Thin USB Powered Speakers | KK912AA |

| | |
|---|---|
| DVD-ROM Drive | AR629AA |
| SuperMulti LightScribe Drive | AR630AA |
| Blu-Ray Writer Drive | AR482AA |

## Removable Media Storage

| | Part Number |
|---|---|
| HP USB External Diskette Drive | DC141B |
| HP Media Card Reader (22-in-1) | AR941AA |
| HP Media Card Reader (22-in-1) with FireWire (IEEE 1394) | AR942AA |

## Security Devices

| | Part Number |
|---|---|
| HP/Kensington MicroSaver Cable Lock | PC766A |
| HP Business PC Security Lock | PV606AA |
| HP (2009) SFF Wall Mount/Security Sleeve | VN570AA |
| HP 2009 (SFF) Solenoid Lock and Hood Sensor | BP428AA |
| HP (CMT) Solenoid Lock and Hood | DE618A |
| HP ProtectTools Version 5.0 (1 User) Software | VR893AA |
| HP USB SmartCard Keyboard | ED707AA |

## Software Solutions

| | Part Number |
|---|---|
| HP Client Automation Standard | T3488AA (qty 1)<br>TA599AA (qty 10)<br>TA600AA (qty 100)<br>TA601AA (qty 500)<br>T3489AA (qty 1000) |

## Stands and Accessories

| | Part Number |
|---|---|
| HP (2009) SFF Tower Stand | VN568AA |
| HP Serial Port Adapter | PA716A |
| HP Parallel Port Adapter | KD061AA |
| HP 5.25” Blank Bezel Kit (50 pack) | DC177B |
| HP FireWire (IEEE 1394) Card | PA997A |

| | Small Form Factor | Convertible Minitower |
|---|---|---|
| **Dimensions** | | |
| Chassis (H x W x D) | 3.95 x 13.30 x 14.9 in<br>100 x 338 x 378.5 mm | 17.63 x 7.00 x 17.5 in<br>447.8 x 177.8 x 444.5 mm |
| System Volume | 790.26 cu in<br>12.95 L | 2160 cu in<br>35.4 L |
| Tower Stand (H x W x D) | 1.12 x 7.01 x 7.87 in<br>28.5 x 178 x 200 mm | N/A |
| Packaging (H x W x D) | 9.00 x 19.68 x 23.38 in<br>228.6 x 499.9 x 593.85 mm | 22.64 x 12.72 x 24.41 in<br>575.0 x 323 x 620 mm |
| System Weight* | 16.72 lbs<br>7.6 kg | 24.54 lbs<br>11.15 kg |
| Shipping Weight* | 17.86 lbs<br>8.1 kg | 34.0 lbs<br>15.42 kg |
| Max Supported Weight (desktop orientation) | 77 lb<br>35 kg | 77 lbs<br>35 kg |
| *Configured with 1 hard drive, 1 optical drive, no diskette drive, and no PCI card. | | |

**Unit Environment and Operating Conditions**

General Unit Operating Guidelines

- Keep the computer away from excessive moisture, direct moisture and the extremes of heat and cold, to ensure that unit is operated within the specified operating range.
- Leave a 10.2 cm (4 in) clearance on all vented sides of the computer to permit the required airflow.
- Never restrict airflow into the computer by blocking any vents or air intakes.
- Do not stack computers on top of each other or place computers so near each other that they are subject to each other's re-circulated or preheated air.
- Occasionally clean the air vents on the front, back, and any other vented side of the computer. Lint, dust and other foreign matter can block the vents and limit the airflow.
- If the computer is to be operated within a separate enclosure, intake and exhaust ventilation must be provided on the enclosure, and the same operating guidelines listed above will still apply.

| | |
|---|---|
| Temperature Range | Operating: 50° to 95° F (10° to 35° C)*<br>Non-operating: –22° to 140° F(–30° to 60° C) |
| Relative Humidity | Operating: 10% to 90% (non-condensing at ambient)<br>Non-operating: 5% to 95% (non-condensing at ambient) |
| Maximum Altitude (unpressurized) | Operating: 10,000 ft (3048 m)<br>Non-operating: 30,000 ft (9144 m) |

*Operating temperature is de-rated 1.0 deg C per 300 m (1000 ft) to 3000 m (10,000 ft) above sea level, no direct sustained sunlight. Maximum rate of change is 10 deg C/Hr. The upper limit may be limited by the type and number of options installed.

*Technical Specifications*

| Power Supply | SFF | CMT |
|---|---|---|
| Standard Efficiency | 240W standard efficiency active PFC | 320W standard efficiency active PFC |
| High Efficiency* | 240W 89% efficient active PFC | 320W 89% efficient active PFC |
| Operating Voltage Range | 90 – 264 VAC | 90 – 264 VAC |
| Rated Voltage Range | 100 – 240 VAC | 100 – 240 VAC |
| Rated Line Frequency | 50/60 Hz | 50/60 Hz |
| Operating Line Frequency Range | 47 – 63 Hz | 47 – 63 Hz |
| Rated Input Current | 4A | 5.5A |
| Rated Input Current with Energy Efficient* Power Supply | 4A | 5.5A |
| Current Leakage (NFPA 99) | < 275 µA | < 450 µA |
| System Heat Dissipation | Typical 198 btu/hr (50 kg-cal/hr) Maximum 818 btu/hr (204 kg-cal/hr) | Typical 222 btu/hr (56 kg-cal/hr) Maximum 1091 btu/hr (272 kg-cal/hr) |
| System Heat Dissipation with Energy Efficient* Power Supply | Typical 150 btu/hr (38 kg-cal/hr) Maximum 818 btu/hr (204 kg-cal/hr) | Typical 171 btu/hr (43 kg-cal/hr) Maximum 1091 btu/hr (272 kg-cal/hr) |
| Power Supply Fan | 92mm variable speed | 92mm variable speed |
| External Power Adapter | | |
| Dimensions | N/A | N/A |
| Total Cord Length | N/A | N/A |

*High efficiency power supply is a requirement for ENERGY STAR qualification in conjunction with a select range of processors and modules

**ROM BIOS Information**

Key features of the HP BIOS include:

- Deployment and manageability – HP BIOS provides several technologies that help integrate the HP Elite PC into the enterprise, such as PXE, remote configuration, remote control, and F10 Setup support for 12 languages.
- Select models feature either Intel Standard Manageability or Core 2 processor with vPro Technology.
- Stability – HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- Computrace agent – For tracking and tracing services, available in select countries, separate software and purchase of a subscription is required.
- Thermal and power management – The HP BIOS provides and enables thermal and power management technologies so component temperatures are managed for high reliability and to assist in operating the HP Business Desktop computer in any enterprise environment.
- Acoustic performance – Industry leading acoustic emissions across the range of operating conditions.
- Serviceability – HP BIOS provides diagnostic and detailed service information.
- Upgrades and recovery – HP BIOS provides numerous ways to upgrade HP Business Desktop computers, including BIOS updates from within DOS (Flashbin), BIOS updates from within Windows (HPQFlash), HP Client Manager, and fail-safe recovery. In addition, the HP Business Desktop BIOS Utilities tool enables replicated BIOS setup throughout the Enterprise; it is available from within the BIOS software and from the support website.

Additional HP BIOS Features

- Power-On password – Helps prevent an unauthorized user from powering on the system.
- Administrator password – Also known as the setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS version cannot be changed and changes cannot

be made to BIOS settings using F10 setup or under the OS.
- Advanced Configuration and Power Interface (ACPI) – Represents a significant innovation in power and configuration management, allowing operating systems and applications to manage power based on activity and usage. HP Elite models use ACPI to provide power conservation features.
- S5 Max Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 1W is S5 (when turned off). When S5 Max Power Savings feature is enabled power to slots is turned off along with WOL functionality.

**Other Features**

- 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.
- System Management BIOS v2.6
- Intel Wired for Management support; industry wide initiative to make Intel architecture based PCs, servers and mobile computers more inherently manageable out-of-the-box and over the network
- Dual State Power Button; acts as both an on/off button and a suspend-to-sleep button

**Serviceability Features**

- Dual colored power LED on front of computer to indicate either normal or fault condition
- Diagnostic LED Explanation Table:
  - Number of 1-second red LED blinks followed by a 2-second pause, then repeats:
    - 2 – processor thermal protection activated
    - 3 – processor not installed
    - 4 – power supply failure
    - 5 – memory error
    - 6 – video error
    - 7 – PCA failure (ROM detected failure prior to video)
    - 8 – invalid ROM, bootblock recovery mode
    - 9 – system not fetching code
    - 10 – system hang while loading an option ROM
- System/Emergency ROM
- Flash ROM
- CMOS Battery Holder for easy replacement
- Flash Recovery with Video Configuration Record Software
- 5 Aux Power LED on System PCA
- Processor ZIF Socket for easy Upgrade
- Over-Temp Warning on Screen (Requires IM Agents)
- Clear Password Jumper
- DIMM Connectors for easy Upgrade
- Clear CMOS Button
- NIC LEDs (integrated) (Green & Amber)
- Dual Color Power and HD LED - To Indicate Normal Operations and Fault Conditions
- Color coordinated cables and connectors
- Tool-less Hood Removal
- Front power switch
- System memory can be upgraded without removing the system board or any internal components
- Tool-less Hard Drive, CD & Diskette Removal
- Green Pull Tabs, and Quick Release Latches for easy Identification

*Technical Specifications*

| Additional Features | Description |
|---|---|
| Computrace | Computrace agent included; separate software and subscription required |
| DT or MT Orientation | Product can be oriented in either a tower or desktop orientation |
| Drive Lock | Implementation of the industry standard ATA Security feature set. When enabled, it prevents software access to user data on the drive until one or two user-defined passwords are provided. |
| Drive Protection System | DPS Access through F10 Setup during Boot<br>● A diagnostic hard drive self test. It scans critical physical components and every sector of the hard drive for physical faults and then reports any faults to the user.<br>● Running independently of the operating system, it can be accessed through a Windows-based diagnostics utility or through the computer's setup procedure. It produces an evaluation on whether the hard drive is the source of the problem and needs to be replaced.<br>The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures. |
| SMART Technology (Self-Monitoring, Analysis and Reporting Technology)<br>SMART I – Drive Failure Prediction<br>SMART II – Off-Line Data Collection<br>SMART III – Off-Line Read Scanning with Defect Reallocation<br>SMART IV – End-to-End CRC for hard drives | Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted<br>● Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count<br>● By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure<br>● IOEDC: I/O Error Detection Circuitry<br>● Detects errors in Read/Write buffers on HDD cache RAM<br>Interface in F10 setup provides confirmation of SMART IV support. |

| | | |
|---|---|---|
| **High Definition Audio** | **Type** | Integrated |
| | **High Definition Stereo Codec** | Yes - Realtek 4-channel ALC261 codec |
| | **Audio Jacks** | Front microphone-In (150-K ohm Input Impedance)<br>Rear Line-In/Microphone input (150-K ohm Input Impedance, function is configurable by audio driver)<br>Rear Line-Out* (190 ohms Output Impedance, expects at least a 10-K ohm load)<br>Front Headphone-Out (0.5 Ohm Output Impedance, expects at least a 32 ohm load)<br>Front Microphone/Headphone jack is re-task able to provide Microphone input, line-in or Headphone output to support connecting two headphones to the front of the system. When configured as a second front headphone output, both front headphone outputs are always driven with the same signal. |
| | Internal Speaker Amplifier is for the internal speaker only. External speakers need to be powered externally. Rear Line-In audio port is re-task able as Line-In or Microphone-In. | |
| | **Multistreaming Capable** | Multistreaming can be enabled in the Realtek control panel to allow independent audio streams to be sent to/from the front and rear jacks. |
| | **Sampling** | 8 kHz - 192 kHz |
| | **Wavetable Syntheses** (software) | Yes - Uses OS soft wavetable |
| | **Analog Audio** | Yes |
| | **Number of Channels on Line-Out** (mono/stereo) | Stereo (Left & Right channels) |
| | **Internal Audio Speaker Power Rating** | 1.5 W |
| | **Internal Speaker** | Yes |
| | **External Speaker Jack** (Line-Out) | Yes |

| | | |
|---|---|---|
| **Intel 82578 Gigabit Network Connection (integrated)** | **Connector** | RJ-45 |
| | **Controller** | Intel 82578 Gigabit platform LAN Connect Networking Controller |
| | **Memory** | 24 KB FIFO packet buffer memory |
| | **Data rates supported** | 10/100/1000 Mbps |
| | **Compliance** | • IEEE 802.3i (10Base-T)<br>• IEEE 802.3u (100Base-TX)<br>• IEEE 802.3ab (1000Base-T)<br>• IEEE 802.3u (Auto-negotiation)<br>• IEEE 802.3af (Power over Ethernet)<br>• IEEE 1588 (Time Sync)<br>• IEEE 802.1ae (MacSec) |
| | **Bus architecture** | PCIe-based MAC to PHY interface |
| | **Data transfer mode** | PCIe-like interface for 1000 speed, SMBus interface for lower 10/100 speeds. |
| | **Hardware certifications** | FCC B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union |
| | **Power requirement** | Requires 3.3V & 1.2V.<br>Power consumption 761 Milliwatts |
| | **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 |
| | **Environmental** | **Operating temperature** 0° to 85° C |
| | **Management capabilities** | WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic. |
| | **Alerting** | AMT 6.0 support |

| | | |
|---|---|---|
| **Broadcom NetXtreme GbE Ethernet Plus NIC** | **Connector** | RJ-45 |
| | **Controller** | Broadcom 5761 PCI-Express LAN Controller |
| | **Memory** | 8 MB NVRAM serial Flash |
| | **Data rates supported** | 10/100/1000 Mbps |
| | **Compliance** | IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x |
| | **Bus architecture** | PCI-Express |
| | **Data path width** | Single Channel PCI-Express |
| | **Data transfer mode** | Bus Master DMA |
| | **Hardware certifications** | FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682) |
| | **Power requirement** | 1.8W @ 3.3V |
| | **Boot ROM support** | Yes |
| | **Network transfer mode** | Full-duplex |
| | | Half-duplex (not available for the 1000BASE-T transceiver) |

| | | |
|---|---|---|
| | **Network transfer rate** | 10BASE-T (half-duplex) 10 Mbps<br>10BASE-T (full-duplex) 20 Mbps<br>100BASE-TX (half-duplex) 100 Mbps<br>100BASE-TX (full-duplex) 200 Mbps<br>1000BASE-T (full-duplex) 2000 Mbps |
| | **Environmental** | **Operating temperature** 32° to 131°F (0° to 55° C)<br>**Operating humidity** 131° F (55° C) with 5% to 95% non-condensing humidity |
| | **Dimensions** | 2.75 in x 4.13 in (7 cm x 10.5 cm), low profile compatible |
| | **Operating system driver support** | Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional |
| | **Management capabilities** | ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles |
| **Intel Gigabit CT Desktop NIC** | **Connector** | RJ-45 |
| | **Controller** | Intel 82574L Gigabit Ethernet Controller |
| | **Memory** | 40KB configurable transmit/receive FIFO Buffers |
| | **Data rates supported** | 10/100/1000 Mbps |
| | **Compliance** | IEEE 802.1P, 802,1Q, 802.2, 802.3, 802.3AB and 802.3u compliant, 802.3x flow control, 802.1as Time synch offload |
| | **Bus architecture** | PCIe Base 1.1 (2.5 GT/s) x1 |
| | **Data path width** | X1, 250 MB/s, Bi-directional interface |
| | **Data transfer mode** | Bus-master DMA |
| | **Hardware certifications** | (see EPS for more certification details)<br>EMI: FCC Class B<br>Intel 25-GS3000 Environmental Specification.<br>EN-55024: 1998 specification (see EPS for details)<br>EN-55022: Class A 1998 specification.<br>EN-60950-1 first Edition specification.<br>C-Tick specification, Class A<br>VCCI Class 1 specification.<br>CE specification and CE Mark.<br>UL 60950-1 first Edition specification.<br>CSA 60950-1 first Edition specification.<br>BSMI CNS13438 Class A specification<br>Korean MIC Class A specification.<br>European RoHS directive<br>China RoHS directive |
| | **Power requirement** | 3.3V and 3.3V Aux, 2.1 Watts max in 1000Base-T (D0) |
| | **Boot ROM support** | Yes |
| | **Network transfer rate** | 10BASE-T (half-duplex) 10 Mbps<br>10BASE-T (full-duplex) 20 Mbps<br>100BASE-TX (half-duplex) 100 Mbps<br>100BASE-TX (full-duplex) 200 Mbps<br>1000BASE-T (full-duplex) 2000 Mbps (actual rate limited by PCI Bus) |
| | **Environmental** | **Operating temperature** 0 °C to 55 °C (operating)<br>-40 to 70 °C (non-operating)<br>**Operating humidity** 85% at 131° F (55° C) |
| | **Dimensions** | Low-profile, half-length form factor conforming to PCIe* CEM v1.1 (55 mm x 119 mm) |

| | | |
|---|---|---|
| | **Management capabilities** | SMBus, WOL, PXE |

| | | | | |
|---|---|---|---|---|
| **HP Wireless 802.11b/g/n (PCIe)** | **Dimensions** (L x H) | 3.3 x 4.7 inches (8.5 x 12 cm) | | |
| | **Weight** | 0.08 pounds (40 g) | | |
| | **Controller** | Ralink RT2790 | | |
| | **System interface** | PCIExpress x1 | | |
| | **Network standard** | 802.11 b/g/n | | |
| | **Frequency band** | 2.400 - 2.497 GHz | | |
| | **Operating temperature** | 14° to 149°F, operating (-10° to 65°C, operating) | | |
| | **Storage temperature** | -40° to 176°F, non-operating (-40° to 80°C, non-operating) | | |
| | **Humidity** | 10-90% operating<br>5-95% non-operating | | |
| | **Operating voltage** | 3.3V +/- 9%<br>12V +/- 8% | | |
| | **Power consumption** | Platform/WLAN Mode | Power Consumption | |
| | | Maximum Power Consumption | 10 Watts | |
| | | Transmit Only | 4 Watts maximum averaged power over 1 second | |
| | | Transmit Packet or Active Scanning | 1000 mA peak current for 100 microseconds or longer | |
| | | Receive Only Mode or Idle without IEEE PSP mode enabled | 3 Watts maximum averaged over 1 second | |
| | | Idle, with IEEE PSP mode enabled | 1.0 Watts maximum averaged over 1 second | |
| | | Transmit Disabled (turned off in software) | 50 mW maximum, averaged over 1 second | |
| | | Platform in S3 or S4 (power removed from Low Profile PCI Express Card) | 5 mW maximum, averaged over 1 second | |
| | **Output power** (approximately) | **802.11b modes** | **802.11g modes** | **EWC modes** |
| | | +19 dBm +/- 1.0 dB maximum | +17 dBm +/- 1.0 dB maximum | +17 dBm +/- 1.0 dB maximum (total power in all transmit chains) |
| | **Receive sensitivity** | **Mode** | **Data rate** | **Sensitivity** |
| | | 802.11b | 1 Mbps | -94 dBm |
| | | 802.11b | 11 Mbps | -85 dBm |
| | | 802.11g | 6 Mbps | -91 dBm |
| | | 802.11g | 18 Mbps | -85 dBm |
| | | 802.11g | 48 Mbps | -75 dBm |
| | | 802.11g | 54 Mbps | -72 dBm |
| | | EWC (2.4 GHz) | 6.5 Mbps | -87 dBm |
| | | EWC (2.4 GHz) | 54 Mbps | -82 dBm |
| | | EWC (2.4 GHz) | 81 Mbps | -78 dBm |
| | | EWC (2.4 GHz) | 162 Mbps | -74 dBm |
| | | EWC (2.4 GHz) | 270 Mbps | -68 dBm |

| | | | |
|---|---|---|---|
| | EWC (2.4 GHz) | 300 Mbps | -64 dBm |
| **Data transfer rate** | **Data Rate (MCS)** | **Minimum Throughput** | |
| | 1 Mbps (802.11 b) | 700 kbps | |
| | 2 Mbps (802.11 b) | 1.4 Mbps | |
| | 5.5 Mbps (802.11 b) | 3.5 Mbps | |
| | 11 Mbps (802.11 b) | 5.9 Mbps | |
| | 12 Mbps (802.11 g) | 6 Mbps | |
| | 18 Mbps (802.11 g) | 9 Mbps | |
| | 24 Mbps (802.11 g) | 12 Mbps | |
| | 36 Mbps (802.11 g) | 18 Mbps | |
| | 48 Mbps (802.11 g) | 21 Mbps | |
| | 54 Mbps (802.11 g) | 22.5 Mbps | |
| | 6.5 Mbps (20 MHz EWC) | 4.5 Mbps | |
| | 13 Mbps (20 MHz EWC) | 9 Mbps | |
| | 19.5 Mbps (20 MHz EWC) | 13.5 Mbps | |
| | 26 Mbps (20 MHz EWC) | 18 Mbps | |
| | 39 Mbps (20 MHz EWC) | 27 Mbps | |
| | 52 Mbps (20 MHz EWC) | 36 Mbps | |
| | 58.5 Mbps (20 MHz EWC) | 40 Mbps | |
| | 65 Mbps (20 MHz EWC) | 45 Mbps | |
| | 78 Mbps (20 MHz EWC) | 54 Mbps | |
| | 104 Mbps (20 MHz EWC) | 72 Mbps | |
| | 117 Mbps (20 MHz EWC) | 81 Mbps | |
| | 130 Mbps (20 MHz EWC) | 91 Mbps | |
| | 13.5 Mbps (40 MHz EWC) | 8 Mbps | |
| | 27 Mbps (40 MHz EWC) | 16 Mbps | |
| | 40.5 Mbps (40 MHz EWC) | 24 Mbps | |
| | 54 Mbps (40 MHz EWC) | 32 Mbps | |
| | 81 Mbps (40 MHz EWC) | 48 Mbps | |
| | 108 Mbps (40 MHz EWC) | 64 Mbps | |
| | 121.5 Mbps (40 MHz EWC) | 72 Mbps | |
| | 135 Mbps (40 MHz EWC) | 81 Mbps | |

**Security**

- IEEE and WiFi compliant 64 / 128 bit WEP encryption
- AES: CCM
- 802.1x authentication
- WPA: 802.1x. WPA-PSK and TKIP
- WPA2 certification
- IEEE 802.11i
- Cisco Certified Extensions, all versions through V5

| | | |
|---|---|---|
| | **Antenna** | HP part number 497792-001 |
| | **Certifications** | Wi-Fi certified |
| | **Certifications for use by country** | United States, Canada, Peru, Taiwan |
| **LSI PCIe x1 56K International SoftModem** | **Data Transmission** | Technology speeds: 56,000 Kbps maximum downstream data, controllerless<br>**NOTE:** 56 Kbps technology refers to download speeds only and requires compatible modems at server sites. Other conditions may limit modem speed. FCC limitations allow a maximum of 53 Kbps during download transmissions. |
| | **Data Speeds** | (Upload only) 33,600/31,200/28,800/26,400/21,600/19,200/ 16,800/14,400/12,000/9,600/7,200/4,800/2,400/1,200/300 |
| | **Data Standards** | ITU-T V.90, ITU-T, ITU-T V.34, V.44, V.42, V.42bis21, V.32bis, Bell 212A, and Bell 103 |
| | **Fax Speeds** | 14,400/12,000/9,600/7,200/4,800/2,400/1,200/300 b/s |
| | **Fax Mode Capabilities** | ITU-T T.31 class 1 FAX, V. 17, V.29, V.27ter, and V.21 Channel 2 |
| | **Error Correction and Data Compression** | V.44, 42bis, V.42 and MNP2-5 |
| | **Power Management** | PCI Bus Power Management Interface Specification (PCI-PM) Revision 1.2, Appendix A. D0, D3hot, and D3cold. Wake on Ring state when in D3cold. If the power management event (PME) feature is enabled in D3cold, a modem can wake the system via WAKE# (WAKEN) or beacon. Meets PCI Express 1.1 standard. |
| | **Upgradeability** | Driver upgradeable for future enhancements |
| | **Video** | ITU-T V.80 video ready interface |
| | **Other** | TIA/EIA 602 standard AT command set<br>Integrated DTE interface with speeds of up to 115.2 Kbps, parallel 16550a UART-compatible interface<br>Optional ring wakeup signal |
| | **Operating Temperature** | 32° to 158° F (0° to 70° C) |
| | **Operating Humidity** | 20% to 90%, non-condensing |
| | **Power** | Requires a 3.3-V auxiliary power rail on PCI express bus<br>Uses only one PCI express load (i.e., one grant/request pair), one shared IRQ, one electrical load |
| | **Chipset** | LSI SV92EX - Integrated PCI interface with 3.3-V tolerant buffers and CardBus support |
| | **Dimensions** (L X H) | Complies with PCI express low profile specifications-6.7 x 2.3 in (17.0 x 5.8 cm) and supports high- and low-profile brackets |
| | **Connection** | Single RJ-11 connector |
| | **Other Features** | Digital line protection, call progress monitoring via on-board piezo device, support for high profile and low profile brackets, PnP ID support |
| | **Safety** | UL recognized to UL 1950, 3rd edition (U.S. and Canada); IEC 950 (TUV, NEMKO, DEMKO, SEMKO); CE Mark, EC 950 (TUV, NEMKO, DEMKO, SEMKO, CE mark |
| | **EMC** | FCC Part 15, IC ES003, EN 55022, 3rd edition, EN 55024, annex A, EN 61000-4-6, EN 61000-4-8 |
| | **Telecom** | FCC Part 68, IC-CS-03 (Canada); Worldwide PTT approvals<br>Not available in Korea or the Republic of South Africa. |

| | |
|---|---|
| **Other** | The SV92EX device is packaged in a 32-pin micro leadless chip carrier (MLCC). The SV92EX is fully compliant with the PCI Express revision 1.1 specification. WHQL approved; ASPM compliant. |

**Intel® HD Graphics**

| | |
|---|---|
| **3D/2D Controller** | Microsoft DirectX® 10 based with support for Pixel Shader 3.0 |
| **VGA Controller** | Integrated |
| **DisplayPort** | Integrated, Multimode capable; supports HDCP |
| **Bus Type** | PCI Express™ x16 |
| **RAMDAC** | Integrated, 350 MHz |
| **Memory** | Graphics memory is shared with system memory. Graphics memory usage varie depending on the amount of system memory installed, BIOS settings, operating system, and system load. 32 MB is pre-allocated for graphics use at system boo time. Additional memory can be allocated at boot time by the BIOS for PAVP (Protected Audio Video Playback) support for playback of protected video content. For Vista, use of PAVP heavy mode preallocates an additional 96MB.<br><br>Additional memory is allocated for graphics as needed using Intel's Dynamic Video Memory Technology (DVMT), to provide an optimal balance between graphics and system memory use. |

**Windows XP Memory Usage**:

| Total System Memory | Pre-Allocated (MB) | DVMT (MB) |
|---|---|---|
| .5GB | 32 | 128 |
| 1.0GB | 32 | 512 |
| 1.5GB | 32 | 768 |
| 2GB & more | 32 | 1024 |

**Windows Vista Memory Usage**:
(Assumes Management Engine , VT-d enabled and other memory allocated for other BIOS usage)

| System Memory | PVAP | Avail System Memory (MB) | Total Avail GFX Memory (MB) | Dedicated Video Memory (MB) | System Video Memory (MB) | Shared System Memory (MB) |
|---|---|---|---|---|---|---|
| 1 GB | Lite | 952 | 252 | 32 | 96 | 124 |
| | Heavy | 856 | 294 | 122 | 6 | 166 |
| 2 GB | Lite | 1976 | 764 | 32 | 96 | 636 |
| | Heavy | 1880 | 806 | 122 | 6 | 678 |
| 4 GB | Lite | 4024 | 1759 | 32 | 96 | 1631 |
| | Heavy | 3928 | 1759 | 122 | 6 | 1631 |
| 6 GB | Lite | 6072 | 1759 | 32 | 96 | 1631 |
| | Heavy | 5976 | 1759 | 122 | 6 | 1631 |
| 8 GB | Lite | 8120 | 1759 | 32 | 96 | 1631 |
| | Heavy | 8024 | 1759 | 122 | 6 | 1631 |

**Total Available GFX Memory**: Total graphics memory available to the system a reported by the OS.

**Dedicated Video Memory**: Memory owned and locked for graphics use as reported by the OS. (Preallocated)

**System Video Memory**: System memory locked and dedicated for graphics use

**Shared System Memory**: Memory dynamically allocated for Graphics use

| | |
|---|---|
| **HW Video Decode** | Hardware Accelerated decode for MPEG2 encrypted video; support for PAVP Lite (default) and Heavy ( or Paranoid) modes |
| **Maximum Color Depth** | 32 bits/pixel |

| | |
|---|---|
| **Maximum Vertical Refresh Rate** | 85 Hz at up to 1920x1440, 75 Hz at 2048x1536. Varies with mode and configuration. See table below. |
| **Multi-display Support** | Integrated dual independent monitor support facilitated via one VGA port and one DisplayPort integrated on the back plane of the system board and presented as part of the rear I/O set of interfaces. DVI supported via optional HP DisplayPort tc DVI-D adapter. |
| **Graphics/Video API Support** | Microsoft DirectX® 10, OpenGL® 1.5 (OpenGL® 2.0 available in a driver update) |

**Resolutions Supported**

**NOTE:** Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP.

| | Maximum Refresh Rate (Hz) | |
|---|---|---|
| **Resolution** | **Analog Connection** | **Digital Connection** |
| **640x480** | **85** | **60** |
| **800x600** | **85** | **60** |
| **1024x768** | **85** | **60** |
| **1280x720** | **85** | **60** |
| **1280x1024** | **85** | **60** |
| **1440x900** | **75** | **60** |
| **1600x1200** | **85** | **60** |
| **1680x1050** | **75** | **60** |
| **1920x1080** | **85** | **60-R** |
| **1920x1200** | **85** | **60-R** |
| **1920x1440** | **85** | **N/A** |
| **2048x1536** | **75** | **N/A** |
| **2560x1600** | **N/A** | **60*** |

* Only supported when using a DisplayPort connection

**NOTE:** 60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections.

**NVIDIA Quadro NVS 290 256MB PCIe Dual Head**

| | |
|---|---|
| **Form Factor** | Low Profile |
| **Bus Type** | PCIe x16 |
| **Memory** | 256 MB 400MHz DDR2 SDRAM unified frame buffer, Z-buffer and Texture storage |
| **Connector** | DMS-59; includes one DMS-59 to Dual VGA cable. A DMS-59 to Dual DVI-I cable is available as an option. |
| **Display resolution support** | Dual integrated analog display controllers supporting up to two analog displays at 2048x1536 @ 85Hz on both displays or dual digital displays at 1920x1200 (single-link).<br>NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft Windows |
| **RAMDAC** | Integrated dual 400MHz |
| **Color planes** | 32-bit color buffer |
| **Overlay planes** | Hardware supported |
| **nView architecture** | Advanced multi-display desktop & application management seamlessly integrated into Microsoft Windows. |
| **Multi-Monitor support** | Dual monitor support |
| **DVI support** | DMS-59 (to dual DVI-SL) |
| **High-definition Video Processor** (HDVP) | Full-screen, full-frame video playback of HDTV and DVD content<br>DVD-ready motion compensation for MPEG-2<br>Independent hardware color controls for video overlay<br>Hardware color-space conversion (YUV 4:2:2 and 4:2:0) |

| | | |
|---|---|---|
| | | IDCT motion compensation<br>5-tap horizontal by 3-tap vertical filtering<br>8:1 up/down scaling |
| | **Supported graphics APIs** | OGL 2.1 & DX10 Support; Shader Model 4.0 |

| | | |
|---|---|---|
| **NVIDIA Quadro NVS 295 Graphics Card** | **Form Factor** | 2.731 inches (H) × 6.600 inches (L), Half-Height |
| | **Graphics Controller** | NVIDIA Quadro NVS 295 Graphics Board |
| | **Bus Type** | PCI Express x16, Generation 2.0 |
| | **Memory** | 256 MB GDDR3 SDRAM unified graphics memory |
| | **Connectors** | 2 DisplayPort<br>Comes with 2 DisplayPort to VGA Adapters<br>**NOTE:** When purchased as an after-market option, this comes instead with 2 DisplayPort to DVI-D adapters. |
| | **Maximum Resolution** | Two DisplayPort outputs drive two digital displays up to 2560 x 1600 |
| | **Display Output** | • Drives DisplayPort enabled digital displays at resolutions up to 2560 × 1600 at 60 Hz with reduced blanking<br>• Drives DVI enabled digital displays at resolutions up to 1920 × 1200 at 60 Hz with reduced blanking (through DisplayPort to DVI-D (single link) cable) |
| | **Supported Graphics APIs** | OpenGL 3.0<br>DirectX 10.0 |

| | | |
|---|---|---|
| **NVIDIA GeForce 310 DP PCIe x16 Graphics Card** | **Bus type** | PCI Express (x16 lanes) |
| | **Maximum vertical refresh rate** | 85 Hz |
| | **Display support** | Integrated 400 MHz RAMDAC |
| | **Display max resolution** | 2560x1600 digital, 2048 x 1536 analog |

**NVIDIA GeForce 310 DP PCIe x16 Graphics Card display resolutions and refresh rates**

**NOTE:** Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP.

| Resolution | Maximum Refresh Rate (Hz) | |
|---|---|---|
| | Analog Connection | Digital Connection |
| 640x480 | 85 | 60 |
| 800x600 | 85 | 60 |
| 1024x768 | 85 | 60 |
| 1280x720 | 85 | 60 |
| 1280x1024 | 85 | 60 |
| 1440x900 | 75 | 60 |
| 1600x1200 | 85 | 60 |
| 1680x1050 | 75 | 60 |
| 1920x1080 | 85 | 60-R |
| 1920x1200 | 85 | 60-R |
| 1920x1440 | 85 | N/A |
| 2048x1536 | 75 | N/A |
| 2560x1600 | N/A | 60* |

* Only supported when using a dual-link DVI or DP connection.

**NOTE:** 60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections.

**Board display options** Supports two displays via the DisplayPort and DVI connectors

*Technical Specifications - Graphics*

| | | |
|---|---|---|
| **Board configuration** | **Specification** | **Description** |
| | Graphics Chip | RV620 |
| | Core clock | 750 MHz |
| | Memory clock | 500 MHz |
| | Frame buffer | 512 MB DDR3, 64 bit wide |
| **Audio Support** (through HDMI only) | Integrated HD Audio codec supports linear PCM and Dolby® Digital (7.1) audio formats for HDMI output | |
| **Operating systems support** | Windows 7 Home Basic*, Windows 7 Home Premium*, Windows 7 Professiona Edition 32*, Windows 7 Professional Edition 64*, Windows 7 Ultimate Edition 32*, Windows 7 Ultimate Edition 64*, Windows Vista Business 32†, Windows Vista Business 64†, Windows Vista Home Basic 32†, Windows Vista Home Basic 64†, Windows XP Professional or Windows XP Home 32†.<br><br>*This system may require upgraded and/or separately purchased hardware and/or a 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.<br><br>Windows 7 Business disk may be included for future upgrade if desired. To qualify for this downgrade an end user must be a business (including governmental or educational institutions) and is expected to order at least 25 customer systems with the same custom image<br><br>† Certain Windows Vista product features require advanced or additional hardware. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit http://www.windowsvista.com/upgradeadvisor. For Windows Vista system requirements, visit: http://www.windowsvista.com/systemrequirements.<br><br>Linux x86 and x86_64 distributions using XFree86 or X.Org‡.<br><br>‡Linux drivers are available from ATI's website and may be available in a Linux distribution. Refer to the Open Source and Linux from HP website: http://www.hp.com/wwsolutions/linux/products/clients/ for support information. | |
| **Core power** | 22 W (max) | |
| **Dimensions** (H x D) | 2.71 in x 6.60 in (68.90 mm x 167.65 mm) | |
| **Weight** | 0.30 lb (134.3 g) | |
| **Option kit contents** | • NVIDIA GeForce 310 DP PCIe x16 Graphics Cardwith full height bracket attached<br>• DVI to VGA adapter<br>• Software CD with graphics drivers<br>• Low profile bracket to convert the card for using in a low profile chassis<br>• Warranty documentation | |
| **Compliance standards** | EMC Emissions:<br>a) FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use<br>b) CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment<br>c) Canadian Standard ICES-003 is equivalent to CISPR22<br>d) Taiwanese Standard BSMI<br>e) Japanese VCCI<br>f) Australian C-Tick<br>g) Korean (MIC) | |

EMC Immunity:
CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement.

| | | |
|---|---|---|
| **ATI Radeon HD 4550 Dual Head PCIe x16 Graphics Card** | **Bus type** | PCI Express (x16 lanes) |
| | **Maximum vertical refresh rate** | 85 Hz |
| | **Display support** | Integrated 400 MHz RAMDAC |
| | **Display max resolution** | 1900 x 1200 digital, 2048 x 1536 analog |
| | **Board display options** | Supports two displays via included DMS-59 to dual VGA cable or 2 DVI monitors via optional DMS-59 to dual DVI cable kit part number: DL139A. 4-pin mini-DIN S-video connector for TV output |
| | **Board configuration** | **Specification** / **Description** |
| | | Graphics Chip / RV710 |
| | | Core clock / 600MHz |
| | | Memory clock / 800 MHz |
| | | Frame buffer / 512 MB DDR3, 64 bit wide |
| | **Languages supported** | 24 languages: English, Arabic, Chinese Simplified, Chinese Traditional, Czechoslovakian, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Thai, Turkish |
| | **Compliance standards** | EMC Emissions:<br>a) FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use<br>b) CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment<br>c) Canadian Standard ICES-003 is equivalent to CISPR22<br>d) Taiwanese Standard BSMI<br>e) Japanese VCCI<br>f) Australian C-Tick<br>g) Korean (KCC)<br><br>EMC Immunity:<br>CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement. |

**ATI Radeon HD 4550 DH PCIe x16 Graphics Card display resolutions and refresh rates**

**NOTE:** Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP.

*Technical Specifications - Graphics*

| Resolution | Maximum Refresh Rate (Hz) | |
|---|---|---|
| | Analog Connection | Digital Connection |
| 640x480 | 85 | 60 |
| 800x600 | 85 | 60 |
| 1024x768 | 85 | 60 |
| 1280x720 | 85 | 60 |
| 1280x1024 | 85 | 60 |
| 1440x900 | 75 | 60 |
| 1600x1200 | 85 | 60 |
| 1680x1050 | 75 | 60 |
| 1920x1080 | 85 | 60-R |
| 1920x1200 | 85 | 60-R |
| 1920x1440 | 85 | N/A |
| 2048x1536 | 75 | N/A |
| 2560x1600 | N/A | N/A |

**NOTE:** 60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections.

**ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card**

| | |
|---|---|
| **Bus type** | PCI Express (x16 lanes) |
| **Maximum vertical refresh rate** | 85 Hz |
| **Display support** | Integrated 400 MHz RAMDAC |
| **Display max resolution** | 2560 x 1600 digital, 2048 x 1536 analog |

**ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card display resolutions and refresh rates**

**NOTE:** Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP

| Resolution | Maximum Refresh Rate (Hz) | |
|---|---|---|
| | Analog Connection | Digital Connection |
| 640x480 | 85 | 60 |
| 800x600 | 85 | 60 |
| 1024x768 | 85 | 60 |
| 1280x720 | 85 | 60 |
| 1280x1024 | 85 | 60 |
| 1440x900 | 75 | 60 |
| 1600x1200 | 85 | 60 |
| 1680x1050 | 75 | 60 |
| 1920x1080 | 85 | 60-R |
| 1920x1200 | 85 | 60-R |
| 1920x1440 | 85 | N/A |
| 2048x1536 | 75 | N/A |
| 2560x1600 | N/A | 60* |

* Only supported when using a dual-link DVI or DP connection

**NOTE:** 60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

**Board display options** Supports two displays via included two DisplayPort and one Dual Link DVI-I connectors.

*Technical Specifications - Graphics*

| Board configuration | Specification | Description |
|---|---|---|
| | Graphics Chip | RV635 |
| | Core clock | 725 MHz |
| | Memory clock | 500 MHz |
| | Frame buffer | 1 GB DDR3, 128 bit wide |

**Languages supported**

24 languages: English, Arabic, Chinese Simplified, Chinese Traditional, Czechoslovakian, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Thai, Turkish

**Operating systems support**

Windows 7 Home Basic*, Windows 7 Home Premium*, Windows 7 Professional Edition 32*, Windows 7 Professional Edition 64*, Windows 7 Ultimate Edition 32*, Windows 7 Ultimate Edition 64*, Windows Vista Business 64**, Windows Vista Business 32**, Windows Vista Home Basic 32**, Windows XP Professional or Windows XP Home 32**.

*This system may require upgraded and/or separately purchased hardware and/or a 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.

** Certain Windows Vista product features require advanced or additional hardware. Windows Vista Upgrade Advisor can help you determine which features of Windows Vista will run on your computer. To download the tool, visit: http://www.windowsvista.com/upgradeadvisor. For Windows Vista system requirements, visit: http://www.windowsvista.com/systemrequirements.

Linux x86 and x86_64 distributions using XFree86 or X.Org***.

*** Linux drivers are available from ATI's website and may be available in a Linux distribution. Refer to the Open Source and Linux from HP website: http://www.hp.com/wwsolutions/linux/products/clients/ for support information.

**Core power**

56 W

**Option kit contents**

- ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card with full height bracket attached
- DVI to VGA adapter
- DisplayPort to DVI-D adapter
- Software CD with graphics drivers
- Warranty documentation

**Compliance standards**

EMC Emissions:
a) FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use
b) CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment
c) Canadian Standard ICES-003 is equivalent to CISPR22
d) Taiwanese Standard BSMI
e) Japanese VCCI
f) Australian C-Tick
g) Korean (MIC)

EMC Immunity:
CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement.

*Technical Specifications - Graphics*

**HP ADD2 SDVO PCIe DVI-D Adapter**

| | |
|---|---|
| **Models** | HP ADD2 SDVO DVI-D Out Adapter |
| **Form Factor** | Low-profile card |
| **DVI-D Connector** | Digital connection only |
| **Dual Head Support** | Yes, when used with the integrated VGA connector |
| **Display Devices Supported** | HP L1740<br>HP L1940T<br>HP L2045W<br>HP LP1965 |

**NOTE:** These graphics adapters offer optimal performance with any display that meets applicable VESA standards.

| | |
|---|---|
| **Color Depth** | All modes support 8-bpp, 16-bpp, and 24-bpp color depths |
| **Host Interface Connector** | Mechanically compliant with PCI-E standard<br>Complies with the Intel ADD2 and Intel Serial Digital Video Output (SDVO) specifications |
| **Dot Clock** | 165 MHz maximum |
| **Display Modes** | Supports display modes that require up to 165-MHz bandwidth on the link, as shown in the following table. |

| Resolution | | 60-Hz LCD | 60-Hz | 75-Hz | 85-Hz |
|---|---|---|---|---|---|
| Blanking | | 5% reduced | GTF | GTF | GTF |
| 640 x 480 | VGA | Yes | Yes | Yes | Yes |
| 800 x 600 | SVGA | Yes | Yes | Yes | Yes |
| 1024 x 768 | XGA | Yes | Yes | Yes | Yes |
| 1280 x 1024 | SXGA | Yes | Yes | No | No |
| 1600 x 1200 | UXGA | Yes | Yes | No | No |

**HP DisplayPort to DVI-D Adapter**

| | |
|---|---|
| **Connectors** | DisplayPort and DVI-D single link connector |
| **Adapter length** | 7.5 in (19.0 cm) |
| **Adapter weight** | .10 lbs (.05 kg) |

**HP DisplayPort to VGA Adapter**

| | |
|---|---|
| **Connectors** | DisplayPort and VGA connector |
| **Adapter length** | 8 in (20 cm) |
| **Adapter weight** | .1 lbs (.06 kg) |
| **Maximum vertical refresh rate** | 85 Hz |
| **Display support** | 162 MHz RAMDAC |
| **Display max resolution** | 1600x1200 |

**HP DisplayPort to VGA adapter display resolutions and refresh rates**

**NOTE:** Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP. Using the HP DisplayPort to VGA Adapter may require an update to the graphics driver installed on your system. To install the most up-to-date graphics driver go to: www.hp.com.

*Technical Specifications - Graphics*

| Resolution | Max refresh rate |
|---|---|
| 640x480 | 85 |
| 800x600 | 85 |
| 1024x768 | 85 |
| 1280x720 | 85 |
| 1280x1024 | 85 |
| 1440x900 | 75 |
| 1600x1200 | 60 |
| 1680x1050 | 60 |
| 1920x1080 | 60-R |
| 1920x1200 | 60-R |
| **NOTE:** 60-R denotes reduced blanking timings are used. Not all monitors support reduced blanking timing. | |

| | | | | |
|---|---|---|---|---|
| **3.5” 7200 RPM Serial ATA Hard Drives** | **500 GB** | **Capacity** | 500,107,862,016 bytes | |
| | | **Height** | 1 in (2.54 cm) | |
| | | **Width** | Media diameter: 3.5 in (8.89 cm) | |
| | | | Physical size: 4 in (10.2 cm) | |
| | | **Interface** | Serial ATA (3.0 Gb/s) | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 3 Gb/s | |
| | | **Buffer** | 16 MB | |
| | | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 2.0 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) | |
| | **320 GB** | **Capacity** | 320,069,031,690 bytes | |
| | | **Height** | 1 in (2.54 cm) | |
| | | **Width** | Media diameter: 3.5 in (8.89 cm) | |
| | | | Physical size: 4 in (10.2 cm) | |
| | | **Interface** | Serial ATA (3.0 Gb/s) | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 3 Gb/s | |
| | | **Buffer** | 8 MB | |
| | | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 1.0 ms |
| | | | **Average** | 8.5 ms |
| | | | **Full-Stroke** | 18 ms |
| | | **Rotational Speed** | 7,200 rpm | |
| | | **Logical Blocks** | 625,142,448 | |
| | | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |
| | **250 GB** | **Capacity** | 250,059,350,016 bytes | |
| | | **Height** | 1 in (2.54 cm) | |
| | | **Width** | Media diameter: 3.5 in (8.89 cm) | |
| | | | Physical size: 4 in (10.2 cm) | |
| | | **Interface** | Serial ATA (3.0 Gb/s) | |
| | | **Synchronous Transfer Rate** (Maximum) | Up to 3 Gb/s | |
| | | **Buffer** | 8 MB | |
| | | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 1.0 ms |
| | | | **Average** | 8.5 ms |
| | | | **Full-Stroke** | 18 ms |
| | | **Rotational Speed** | 7,200 rpm | |
| | | **Logical Blocks** | 488,397,168 | |
| | | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |

*Technical Specifications - Hard Drives*

| | | | |
|---|---|---|---|
| **160 GB** | **Capacity** | 160,041,885,696 bytes | |
| | **Height** | 1 in (2.54 cm) | |
| | **Width** | Media diameter: 3.5 in (8.89 cm) | |
| | | Physical size: 4 in (10.2 cm) | |
| | **Interface** | Serial ATA (3.0 Gb/s) | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 3 Gb/s | |
| | **Buffer** | 8 MB | |
| | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 0.9 ms |
| | | **Average** | 9.3 ms |
| | | **Full-Stroke** | 18 ms |
| | **Rotational Speed** | 7,200 rpm | |
| | **Logical Blocks** | 312,581,808 | |
| | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |

| | | | |
|---|---|---|---|
| **10,000 RPM Serial ATA 160 GB Hard Drives** | **Capacity** | 160,041,885,696 bytes | |
| | **Height** | 1 in (2.54 cm) | |
| | **Width** | Media diameter: 3.0 in (7.62 cm) | |
| | | Physical size: 4 in (10.2 cm) | |
| | **Interface** | Serial ATA (1.5 Gb/s), Native Command Queuing enabled | |
| | **Synchronous Transfer Rate** (Maximum) | Up to 3.0 Gb/s | |
| | **Cache** | 16 Mbytes | |
| | **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track** | 0.3 ms |
| | | **Average** | 4.6 ms |
| | | **Full-Stroke** | 10.2 ms |
| | **Rotational Speed** | 10,000 rpm | |
| | **Logical Blocks** | 312,581,808 | |
| | **Operating Temperature** | 41° to 131° F (5° to 55° C) | |

*Technical Specifications - Hard Drives*

| | | | | |
|---|---|---|---|---|
| **Solid State Drive** | **64 GB** | **Capacity** | 64 GB | |
| | | **NAND Flash Memory** | Multi Level Cell (MLC) with wear leveling controller | |
| | | **Interface type** | SATA 3Gb/sec | |
| | | **Dimensions-external** (W x H x D) | 2.74 x 0.37 x 4 in (6.98 x 0.95 x 10.2 cm) | |
| | | **Weight** | 0.14 lb (65 g) | |
| | | **Internal transfer rate** | **Write speed** | Up to 220 MB/s |
| | | | **Read speed** | Up to 120 MB/s |
| | | **Host transfer rate** | **Ultra DMA mode** | Up to 150 MB/s |
| | | **Power** | **DC power requirement** | 5 VDC 5%-100 mV ripple p-p |
| | | | **Total power consumption** | <1.12Watt |
| | | **Environmental** (all conditions, non-condensing) | **Temperature** (operating) | 32° to 158° F (0° to 70° C) |
| | | | **Relative Humidity** (operating) | 5% to 95% |
| | | | **Maximum Wet Bulb Temperature** (operating) | 84° F (29° C) |
| | | **Regulations** | UL, CSA, EN 60950-2000, CISPR Pub 22 Class B, CNS 13438, AS/NZS CISPR 22:2002 Class B, R1113 and C1172 Class B | |

**NOTE:** For solid state disk drives, GB means 1 billion bytes. 16GB is the unformatted capacity of this drive before a portion of the drive is reserved for flash management features. Actual capacity varies by content and will be less than 15.8GB.

| | | | |
|---|---|---|---|
| **USB Standard Keyboard** | **Physical characteristics** | **Keys** | 104, 105, 106, 107, 109 layout (depending upon country) |
| | | **Dimensions** (L x W x H) | 18.0 x 6.4 x 0.98 in (45.8 x 16.3 x 2.5 cm) |
| | | **Weight** | 2 lb (0.9 kg) minimum |
| | **Electrical** | **Operating voltage** | + 5VDC ± 5% |
| | | **Power consumption** | 50-mA maximum (with three LEDs ON) |
| | | **System interface** | USB Type A plug connector |
| | | **ESD** | CE level 4, 15-kV air discharge |
| | | **EMI - RFI** | Conforms to FCC rules for a Class B computing device |
| | | **Microsoft® PC 99 - 2001** | Functionally compliant |
| | **Mechanical** | **Languages** | 38 available |
| | | **Keycaps** | Low-profile design |
| | | **Switch actuation** | 55-g nominal peak force with tactile feedback |
| | | **Switch life** | 20 million keystrokes (using Hasco modified tester) |
| | | **Switch type** | Contamination-resistant switch membrane |
| | | **Key-leveling mechanisms** | For all double-wide and greater-length keys |
| | | **Cable length** | 6 ft (1.8 m) |
| | | **Microsoft PC 99 - 2001** | Mechanically compliant |
| | | **Acoustics** | 43-dBA maximum sound pressure level |
| | **Environmental** | **Operating temperature** | 50° to 122° F (10° to 50° C) |
| | | **Non-operating temperature** | -22° to 140° F (-30° to 60° C) |
| | | **Operating humidity** | 10% to 90% (non-condensing at ambient) |
| | | **Non-operating humidity** | 20% to 80% (non-condensing at ambient) |
| | | **Operating shock** | 40 g, six surfaces |
| | | **Non-operating shock** | 80 g, six surfaces |
| | | **Operating vibration** | 2-g peak acceleration |
| | | **Non-operating vibration** | 4-g peak acceleration |
| | | **Drop** (out of box) | 26 in (66 cm) on carpet, six-drop sequence |
| | | **Drop** (in box) | 42 in (107 cm) on concrete, 16-drop sequence |
| | **Approvals** | UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC | |
| | **Ergonomic compliance** | ANSI HFS 100, ISO 9241-4, and TUVGS | |
| | **Kit contents** | Keyboard, installation guide, warranty card, safety and comfort guide | |

*Technical Specifications - Input/Output Devices*

| | | | |
|---|---|---|---|
| **PS/2 Standard Keyboard** | **Physical characteristics** | **Keys** | 104, 105, 106, 107, 109 layout (depending upon country) |
| | | **Dimensions** (L x W x H) | 18.0 x 6.4 x 0.98 in (45.8 x 16.3 x 2.5 cm) |
| | | **Weight** | 2 lb (0.9 kg) minimum |
| | **Electrical** | **Operating voltage** | + 5VDC ± 5% |
| | | **Power consumption** | 50-mA maximum (with three LEDs ON) |
| | | **System interface** | PS/2 6-pin mini din connector |
| | | **ESD** | CE level 4, 15-kV air discharge |
| | | **EMI - RFI** | Conforms to FCC rules for a Class B computing device |
| | | **Microsoft PC 99 - 2001** | Functionally compliant |
| | **Mechanical** | **Languages** | 38 available |
| | | **Keycaps** | Low-profile design |
| | | **Switch actuation** | 55-g nominal peak force with tactile feedback |
| | | **Switch life** | 20 million keystrokes (using Hasco modified tester) |
| | | **Switch type** | Contamination-resistant switch membrane |
| | | **Key-leveling mechanisms** | For all double-wide and greater-length keys |
| | | **Cable length** | 6 ft (1.8 m) |
| | | **Microsoft PC 99 - 2001** | Mechanically compliant |
| | | **Acoustics** | 43-dBA maximum sound pressure level |
| | **Environmental** | **Operating temperature** | 50° to 122° F (10° to 50° C) |
| | | **Non-operating temperature** | -22° to 140° F (-30° to 60° C) |
| | | **Operating humidity** | 10% to 90% (non-condensing at ambient) |
| | | **Non-operating humidity** | 20% to 80% (non-condensing at ambient) |
| | | **Operating shock** | 40 g, six surfaces |
| | | **Non-operating shock** | 80 g, six surfaces |
| | | **Operating vibration** | 2-g peak acceleration |
| | | **Non-operating vibration** | 4-g peak acceleration |
| | | **Drop** (out of box) | 26 in (66 cm) on carpet, six-drop sequence |
| | | **Drop** (in box) | 42 in (107 cm) on concrete, 16-drop sequence |
| | **Approvals** | UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC | |
| | **Ergonomic compliance** | ANSI HFS 100, ISO 9241-4, and TUVGS | |
| **HP USB Smartcard Keyboard** | **Physical characteristics** | **Keys** | 104, 105, 106, 107, 109 layout (depending upon country) |
| | | **Form factor** | USB basic Smart Card keyboard |
| | | **Colors** | Carbonite/Silver |
| | | **Dimensions** (H x W x D) | 18.2 x 6.3 x 1.3 in (46.3 x 16.1 x 3.3 cm) |
| | | **Weight** | 2 lb (0.9 kg) minimum |
| | **Electrical** | **Operating voltage** | + 5VDC ± 5% |
| | | **Power consumption** | 100-mA maximum (with four LEDs ON) |
| | | **System interface** | USB Type A plug connector |

| | | | |
|---|---|---|---|
| | **ESD** | CE level 4, 15-kV air discharge | |
| | **EMI - RFI** | Conforms to FCC rules for a Class B computing device | |
| | **Microsoft PC 99 - 2001** | Functionally compliant | |
| **Mechanical** | **Languages** | 30+ available | |
| | **Keycaps** | Low-profile design | |
| | **Switch actuation** | 55 g nominal peak force with tactile feedback | |
| | **Switch life** | 20 million keystrokes (using Hasco modified tester) | |
| | **Switch type** | Contamination-resistant membrane | |
| | **Key-leveling mechanisms** | For all double-wide and greater-length keys | |
| | **Cable length** | 6 ft (1.8 m) | |
| | **Microsoft PC 99 - 2001** | Mechanically compliant | |
| | **Acoustics** | 43-dBA maximum sound pressure level | |
| **Environmental** | **Operating temperature** | 50° to 122° F (10° to 50° C) | |
| | **Non-operating temperature** | -22° to 140° F (-30° to 60° C) | |
| | **Operating humidity** | 10% to 90% (non-condensing at ambient) | |
| | **Non-operating humidity** | 20% to 80% (non-condensing at ambient) | |
| | **Operating shock** | 40 g, six surfaces | |
| | **Non-operating shock** | 80 g, six surfaces | |
| | **Operating vibration** | 2-g peak acceleration | |
| | **Non-operating vibration** | 4-g peak acceleration | |
| | **Drop** (out of box) | 26 in (66 cm) on carpet, six-drop sequence | |
| | **Drop** (in box) | 42 in (107 cm) on concrete, 16-drop sequence | |
| **SMARTCARD function** | **Support** | All ISO 7816 smart cards | |
| | **Interface** | Reads from and writes to all ISO7816-1, 2, 3, 4 memory and microprocessor smart cards (T=0, T=1) | |
| | **Chipset** | SCM STCII | |
| | **Standard APIs supported** | PC/SC, EMV2000, SET | |
| | **Power** | USB Port<br>Short circuit detection (protects smart card and reader)<br>Power supply compliant with ISO7816 and EMV (5V, 60 mA)<br>Supports 3-V and 5-V cards | |
| | **Power consumption** | 250-mA maximum draw (50 mA for the keyboard with three LEDs ON and 200-mA maximum startup current using a high-current, 60-mA smart card) | |
| | **Communication** | **From card** | Programmable from 9,600 baud to 115,200 baud |
| | | **From computer** | Up to 38,400 baud |

| | | | |
|---|---|---|---|
| | **Landing mechanism** | **Contact device** | Friction contact |
| | | **Card insertions rating** | Up to 100,000 insertion cycles |
| | **Interface modes** | USB communications through USB port<br>SCM protocol<br>Automatic card insertion/removal detection | |
| | **Reader performance interface** | USB connection | |
| | **Electro-magnetic standards** | **Europe** | 89/336/CEE guideline |
| | | **USA** | USAFCC part 15 |

| | | | |
|---|---|---|---|
| **HP PS/2 Optical Scroll Mouse** | **Dimensions** (H x L x W) | 3.95 x 6.21 x 11.7 cm (1.56 x 2.44 x 4.61 in) | |
| | **Weight** | 4.44 oz (126 g) | |
| | **Environmental** | **Operating temperature** | -32° to 104°F (0° to 40° C) |
| | | **Non-operating temperature** | -4° to 140°F ( -20° to 60° C) |
| | | **Operating humidity** | 10% to 90% (non condensing at ambient) |
| | | **Non-operating humidity** | 10% to 90% non condensing |
| | | **Operating shock** | 40 g, 6 surfaces |
| | | **Non-operating shock** | 80 g, 6 surfaces |
| | | **Operating vibration** | 2 g peak acceleration |
| | | **Non-operating vibration** | 4 g peak acceleration |
| | | **Drop** (out of box) | 80 cm height onto asphalt tile over concrete or equivalent, 5-drop in 5 direction except the cable face |
| | **Electrical** | **Operating voltage** | 5 VDC ± 10% |
| | | **Power consumption** | 100mA |
| | | **System consumption** | PS/2 mini-din connector |
| | | **ESD** | CE level 4, 15 kV air discharge |
| | | **EMI-RFI** | Conforms to FCC rules for a Class B computing device |
| | | **Microsoft PC99 - 2001** | Functionally compliant |
| | **Mechanical** | **Resolution** | 400 ± 20% DPI |
| | | **Tracking speed** | 10 in/s (25.4 cm/s) maximum |
| | | **Acceleration** | 100 in/s/s (2.54 m/s/s) |
| | | **Switch actuation** | 61 g nominal peak force |
| | | **Switch life** | 3,000,000 operations (using Hasco modified tester) |
| | | **Switch type** | Low force micro-switches |
| | | **Tracking mechanism life** | 155 mi (250 km) at average speed of 10 in/s |
| | | **Cable length** | 6 ft (1.8 m) |
| | | **Microsoft PC99 - 2001** | Mechanically compliant |
| | **Scroll wheel** | **Width** | 8 mm |
| | | **Diameter** | 1.01 in (25.6 mm) |
| | | **Maximum rotation speed** | 48 rats/sec |

| | | | |
|---|---|---|---|
| | | **Switch type** | Light force micro-switch |
| | | **Switch life** | 1 million operations |
| | | **Mechanical life** | Minimum 200,000 revolutions |
| | **Regulatory approvals** | **Compliant** | UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC |

| | | |
|---|---|---|
| **HP USB Optical Scroll Mouse** | **Dimensions** (H x L x W) | 1.5 x 4.5 x 2.5 in (3.8 x 11.6 x 6.3 cm) |
| | **Weight** | 0.27 lb (0.12 kg) |
| | **Cable length** | 72.8 in (185 cm) |
| | **System requirements** | Microsoft Windows 95, 98, 2000, Me, XP and Vista<br>Available USB port |

| | | | |
|---|---|---|---|
| **HP USB 2-Button Laser Mouse** | **Scroll Wheel** | | 24 |
| | **Maximum Rotation Speed** | | 48 rats/sec |
| | **Switch Type** | | wheel |
| | **Switch Life** | | Button - 3,000,000<br>Wheel - 1,000,000 times<br>Tilt switch - 500,000 times |
| | **Environmental** | **Operating Temperature** | 32° to 104° F (0° to 40° C) |
| | | **Non-operating Temperature** | -4° to 140° F (-20° to 60° C) |
| | | **Operating Humidity** | 10% to 90% (non-condensing at ambient) |
| | | **Non-operating Humidity** | 20% to 80% (non-condensing at ambient) |
| | | **Operating Shock** | 40 g, six surfaces |
| | | **Non-operating Shock** | 80 g, six surfaces |
| | | **Operating Vibration** | 2-g peak acceleration |
| | | **Non-operating Vibration** | 4-g peak acceleration |
| | **Electrical** | **Operating Voltage** | + 5VDC ± 5% |
| | | **Power Consumption** | |
| | | **MTBF** | > 150,000 hrs |
| | | **ESD** | IEC-61000-4-2 criteria B, Contact discharge: +/- 4kV, Air discharge: +/- 8kV |
| | | **EMI-RFI** | FCC Class B |
| | | **PC98** | PC 99 Compliant |
| | **Mechanical** | **Resolution** | 800dpi |
| | | **Tracking Speed** | 25 cm/sec |
| | | **Acceleration** | 0.5mm |
| | | **Switch Actuation** | 0.6N (60gf) |
| | | **Switch Life** | Button - 3,000,000<br>Wheel - 1,000,000 times<br>Tilt switch - 500,000 times |
| | | **Cable Length** | 1850mm |
| | | **PC98-99** | PC99 compliant |

| | |
|---|---|
| **Regulatory Approvals** | UL60950-1, UL 94, UL 746 (A-E), UL 796<br>TUV/GS: EN 60950-1, EN 60825-1<br>FCC Class B, UL 1950, cUL, TUV GS, CE, C-tick, VCCI, BSMI, RRL |

| | | | | |
|---|---|---|---|---|
| **HP Blu-ray Writer Drive Height** | | 5.25-inch, half-height, tray-load | | |
| | **Orientation** | Either horizontal or vertical | | |
| | **Interface type** | SATA/ATAPI | | |
| | **Disc capacity** | 50 GB DL or 25 GB standard | | |
| | **Dimensions** (W x H x D) | 5.9 x 1.7 x 7.5 in (15.0 x 4.4 x 19.0 cm) | | |
| | **Weight** (max) | 2.0 lb (907g) | | |
| | | | **Single-layer** | **Double-layer** |
| | **Write speed** | **BD-R** | 2x, 4x CLV, 6x CAV | 2x, 4x CLV |
| | | **BD-RE** | 2.3x | 2x CLV |
| | | **DVD-R** | 2x, 4x CLV, 8x ZCLV, 8x, 12x PCAV, 16x CAV | 2x, 4x CLV |
| | | **DVD-RW** | 1x, 2x, 4x, 6x CLV | Not supported |
| | | **DVD+R** | 2.4x, 4x CLV, 8x ZCLV, 8x, 12x PCAV, 16x CAV | 2.4x, 4x CLV |
| | | **DVD+RW** | 2.4x, 4x, 6x CLV, 8x ZCLV | Not supported |
| | | **DVD-RAM** | 2x, 3x CLV, 3-5x PCAV | |
| | | **CD-R** | 8x,16x CLV, 24x, 32x PCAV, 40x CAV | |
| | | **CD-RW** | 4x, 10x, 16x CLV, 24x ZCLV | |
| | | | **Single-layer** | **Double-layer** |
| | **Read speeds** | **BD-ROM** | 6x CAV | 4.8x CAV |
| | | **BD-R** | 6x CAV | 4.8x CAV |
| | | **BD-RE** (SL/DL) | 4.8x CAV | 4.8x CAV |
| | | **DVD-ROM** | 16x CAV | 8x CAV |
| | | **DVD-R** | 12x CAV | 8x CAV |
| | | **DVD-RW** | 10x CAV | Not support |
| | | **DVD+R** | 12x CAV | 8x CAV |
| | | **DVD+RW** | 10x CAV | Not support |
| | | **BDMV** (AACS Compliant Disc) | 4.8x CAV | |
| | | **DVD-RAM** | 2x, 3x CLV, 3x-5x PCAV | |
| | | **DVD-Video** (CSS Compliant Disc) | 8x CAV | |
| | | **CD-R/RW/ROM** | 40x / 40x / 40x CAV | |
| | | **CD-DA** (DAE) | 32x CAV | |
| | | **80 mm CD** | 16x CAV | |
| | **Sustained Transfer rate** | **BD-ROM** | 26.97 MB/s (6x) max | |
| | | **DVD-ROM** | 16.62 MB/s (16x) max. | |
| | | **CD-ROM** | 6,000 KB/s (40x) max. | |
| | **Burst Transfer rate** | | 1.5Gbps bits/s (10b side)<br>1.2Gbps bits/s (8b side) | |
| | **Multimedia MPC-3 compliant** | | Yes | |
| | **Access times** (typical reads, including setting) | **Random** | DVD: < 140 ms (typical), CD: < 125 ms (typical) | |
| | | **Full Stroke** | DVD: < 250 ms (seek), CD: < 210 ms (seek) | |

| | | | |
|---|---|---|---|
| | **Power** | **Source** | SATA DC power receptacle |
| | | **DC Power Requirement** | 5 VDC ± 5%-100 mV ripple p-p<br>12 VDC ± 5%-200 mV ripple p-p |
| | | **DC Current** | 5 VDC -1000 mA typical, 1600 mA maximum<br>12 VDC -600 mA typical, 1400 mA maximum |
| | **Environmental** (all conditions non-condensing) | **Temperature** (operating) | 41° to 122° F (5° to 50° C) |
| | | **Relative Humidity** (operating) | 10% to 90% |
| | | **Maximum Wet Bulb Temperature** (operating) | 86° F (30° C) |
| **HP SuperMulti LightScribe DVD Writer Drive** | **Height** | 5.25-inch, half-height, tray-load | |
| | **Orientation** | Either horizontal or vertical | |
| | **Interface type** | SATA/ATAPI | |
| | **Disc capacity** | 8.5 GB DL or 4.7 GB standard | |
| | **Dimensions** (W x H x D) | 5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm) | |
| | **Weight** (max) | 2.6 lb (1.2 kg) | |
| | **Write speeds** | **DVD-RAM** | Up to 12X |
| | | **DVD+R** | Up to 16X |
| | | **DVD+RW** | Up to 8X |
| | | **DVD+R DL** | Up to 8X |
| | | **DVD-R DL** | Up to 8X |
| | | **DVD-R** | Up to 16X |
| | | **DVD-RW** | Up to 6X |
| | | **CD-R** | Up to 48X |
| | | **CD-RW** | Up to 32X |
| | **Read speeds** | **DVD-RAM** | Up to 12X |
| | | **DVD+RW, DVD-RW, DVD+R DL, DVD-R DL** | Up to 8X |
| | | **DVD-ROM DL** | Up to 8X |
| | | **DVD-ROM, DVD+R, DVD-R** | Up to 16X |
| | | **CD-ROM, CD-R** | Up to 48X |
| | | **CD-RW** | Up to 32X |
| | **Access time** (typical reads, including settling) | **Random** | DVD: < 140 ms (typical), CD: < 125 ms (typical) |
| | | **Full Stroke** | DVD: < 250 ms (seek), CD: < 210 ms (seek) |
| | **Power** | **Source** | SATA DC power receptacle |
| | | **DC Power Requirement** | 5 VDC ± 5%-100 mV ripple p-p<br>12 VDC ± 5%-200 mV ripple p-p |
| | | **DC Current** | 5 VDC (< 1000 mA typical, 1600 mA maximum)<br>12 VDC (< 600 mA typical, 1400 mA maximum) |

| | | | |
|---|---|---|---|
| | **Environmental conditions** (operating - non-condensing) | **Temperature** | 41° to 122° F (5° to 50° C) |
| | | **Relative Humidity** | 10% to 90% |
| | | **Maximum Wet Bulb Temperature** | 86° F (30° C) |

| | | | | |
|---|---|---|---|---|
| **HP DVD-ROM Drive** | **Height** | 5.25-inch, half-height, tray-load | | |
| | **Orientation** | Either horizontal or vertical | | |
| | **Interface type** | SATA/ATAPI | | |
| | **Disc capacity** | Single layer: Up to 4.7 GB (6 times capacity of CD-ROM)<br>Double layer: Up to 8.5 GB (12 times capacity of CD-ROM) | | |
| | **Dimensions** (W x H x D) | 5.9 x 1.7 x 8.0 in (15.0 x 4.4 x 20.3 cm) | | |
| | **Weight** (max) | 2.6 lb (1.2 kg) | | |
| | **Read speeds** | **DVD+R/-R/+RW/ -RW/+R DL /-R DL** | Up to 8X | |
| | | **DVD-ROM** | Up to 16X | |
| | | **DVD-RAM** | Up to 4X | |
| | | **CD-ROM, CD-R** | Up to 40X | |
| | | **CD-RW** | Up to 32X | |
| | **Removable Storage - Media Compatibility - DVD-ROM** | **Media** | **Read** | **Write** |
| | | **CD-ROM** | Yes | No |
| | | **CD-R** | Yes | No |
| | | **CD-RW** | Yes | No |
| | | **DVD-ROM** | Yes | No |
| | | **DVD-ROM DL** | Yes | No |
| | | **DVD-RAM** | Yes | No |
| | | **DVD+R** | Yes | No |
| | | **DVD+R DL** | Yes | No |
| | | **DVD+RW** | Yes | No |
| | | **DVD-R** | Yes | No |
| | | **DVD-RW** | Yes | No |
| | | **DVD-R DL** | Yes | No |
| | **Access times** (typical reads, including setting) | **Random** | DVD: < 140 ms (typical), CD: < 125 ms (typical) | |
| | | **Full Stroke** | DVD: < 250 ms (seek), CD: < 210 ms (seek) | |
| | | **Cache Buffer** | 2 MB (minimum) | |
| | | **Data Transfer Modes** | ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s); ATA UltraDMA Mode 3 (44.4 MB/s -default) | |
| | **Power** | **Source** | SATA DC power receptacle | |
| | | **DC Power Requirement** | 5 VDC ± 5%-100 mV ripple p-p<br>12 VDC ± 5%-200 mV ripple p-p | |
| | | **DC Current** | 5 VDC - <1000 mA typical, < 1600 mA maximum<br>12 VDC -< 600 mA typical, < 1400 mA maximum | |

| | | |
|---|---|---|
| **Environmental** (all conditions non-condensing) | **Temperature** | 41° to 122° F (5° to 50° C) |
| | **Relative Humidity** | 10% to 90% |
| | **Maximum Wet Bulb Temperature** | 86° F (30° C) |

| | | |
|---|---|---|
| **HP 22-in-1 Media Card Reader (with 1394)** | **USB Interface** | USB 2.0 High-speed interface<br><br>**NOTE:** Requires the USB cable to be connected to the internal USB 2.0 port or a USB 2.0 PCI card. |
| | **1394 Interface** | Two IEEE-1394a external ports; 1 IEEE-1394a internal port (connects to the pass through cable on the media card reader) |
| | **Advance protocol support** | • Supports hardware ECC (Error Correction Code) function<br>• Supports hardware CRC (Cyclic Redundancy Check) function<br>• Supports MS 4-bit parallel transfer mode<br>• Supports MS-PRO 4-bit parallel transfer mode<br>• Supports MS PRO-HG Duo 4-bit parallel transfer mode<br>• Supports SD 4-bit parallel transfer mode<br>• Supports high-speed 50Mhz SD 4-bit card (version 2.0)<br>• Supports high-speed 52Mhz MMC 8-bit card (version 4.2)<br>• Supports CF v4.0 with PIO mode 6 and Ultra DMA mode |
| | **Supported media type** | • CompactFlash Type I<br>• CompactFlash Type II<br>• Microdrive<br>• MultiMediaCard (MMC)<br>• Reduced Size MultiMediaCard (RS MMC)<br>• MultiMediaCard 4.2 (MMC Plus, including MMC Plus HC)<br>• Reduced Size MultiMediaCard 4.2 (MMC Mobile, including MMC Mobile HC)<br>• Secure Digital Card (SD)<br>• Secure Digital High Capacity (SDHC)<br>• miniSD<br>• miniSD High Capacity<br>• Micro SD (T-Flash)<br>• Micro SD HC<br>• Memory Stick<br>• Memory Stick Select<br>• Memory Stick Duo (MS Duo)<br>• Memory Stick PRO (MS PRO)<br>• Memory Stick PRO Duo (MS PRO Duo)<br>• Memory Stick PRO-HG Duo<br>• MagicGate Memory Stick (MG)<br>• MagicGate Memory Stick Duo<br>• xD-Picture Card |
| | **Supported media type with card adapter** | • Memory Stick Micro (M2)<br>• MMC Micro |
| | **Environmental** | **Operational Environmental Extremes**<br>Test Parameters/Conditions - Power applied, unit operating on system ±5% nominal supply voltage.<br>10°C 10% R.H. ≥ 24 hours<br>10°C 90% R.H. ≥ 24 hours<br>20°C 90% R.H. ≥ 24 hours<br>30°C 90% R.H. ≥ 24 hours<br>40°C 90% R.H. ≥ 24 hours<br>50°C 90% R.H. ≥ 24 hours<br>50°C 10% R.H. ≥ 24 hours<br><br>**Storage Environmental Extremes**<br>Test Parameters/Conditions<br>140°F (60°C) @ 80% R.H. for 96 hours<br>-22°F (-30°C) @ 20% R.H. for 48 hours<br>No power applied<br>Delta °C < 1.0°C/min<br>Delta % R.H. < 1.5% R.H./min |

| | |
|---|---|
| **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<br>FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUV-T |

**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:

- US ENERGY STAR ®
- IT ECO declaration
- EPEAT Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.

## *Convertible Minitower*

| **Energy Consumption** (typically configured) | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 46.9450 W | 47.0125 W | 46.5123 W |
| Sleep (Energy Star low power mode) | 3.7745 W | 3.7250 W | 3.6882 W |
| Off | 0.7562 W | 0.8895 W | 0.7751 W |

| **Heat Dissipation** (typically configured)* | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 161 BTU/hr | 161 BTU/hr | 159 BTU/hr |
| Sleep | 13 BTU/hr | 13 BTU/hr | 13 BTU/hr |
| Off | 3 BTU/hr | 3 BTU/hr | 3 BTU/hr |

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

**Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)**

| System Fan Off | Sound Power (LWAd, bels) | Sound Pressure (LpAm, decibels) |
|---|---|---|
| Idle | 3.8 | 21 |
| Fixed Disk (random writes) | 3.8 | 21 |

**Batteries**

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

Battery size: CR2032 (coin cell)
Battery type: Li-Ion

**Additional Information**

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive – 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
-
-

- This product contains 0% post consumer recycled plastic (by wt.)
- This product is 90% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated 2550 g
- Internal:
  - Polyethylene high density 160 g
- The corrugated packaging material is made from 37% recycled content.
- The Polyethylene high density packaging material is made from 100% recycled content.

## *Small Form Factor*

| **Energy Consumption** (typically configured) | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 39.787 W | 39.547 W | 39.865 W |
| Sleep (Energy Star low power mode) | 3.2283 W | 3.4659 W | 3.2186 W |
| Off | 1.0477 W | 1.2128 W | 1.0345 W |

| **Heat Dissipation** (typically configured)* | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 161 BTU/hr | 161 BTU/hr | 136 BTU/hr |
| Sleep | 13 BTU/hr | 13 BTU/hr | 11 BTU/hr |
| Off | 3 BTU/hr | 3 BTU/hr | 4 BTU/hr |

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

**Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)**

| System Fan Off | Sound Power (LWAd, bels) | Sound Pressure (LpAm, decibels) |
|---|---|---|
| Idle | 3.7 | 27 |
| Fixed Disk (random writes) | 3.7 | 27 |

**Batteries**

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

Battery size: BR-2032
Battery type: Lithium

**Additional Information**

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive – 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.

- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- This product contains 0% post consumer recycled plastic (by wt.)
- This product is 95.1% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated – 1700 g
- Internal:
  - EPE - Expanded Polyethylene – 160 g
  - Polyethylene low density foam – 160 g
- The Corrugated Carton packaging material is made from 100% recycled content.
- The EPE – Expanded Polyethylene packaging material is made from 100% recycled content
- The Polyethylene low density foam packaging material is made from 100% recycled content

## *Convertible Minitower and Small Form Factor*

**RoHS Compliance**

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. By July 1, 2006, RoHS substances will be virtually eliminated (virtually = to levels below legal limits) for all HP electronic products subject to the RoHS Directive, except where it is widely recognized that there is no technically feasible alternative (as indicated by an exemption under the EU RoHS Directive).

**Material Usage**

This product does not contain any of the following substances in excess of regulatory limits (refer to the HP General Specification for the Environment at: http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel – finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
-

- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

**Packaging**

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

**End-of-life Management and Recycling**

Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

**Hewlett-Packard Corporate Environmental Information**

For more information about HP's commitment to the environment:
Global Citizenship Report
http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Eco-label certifications
http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html
ISO 14001 certificates:
http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html

*Technical Specifications - Environmental Data*