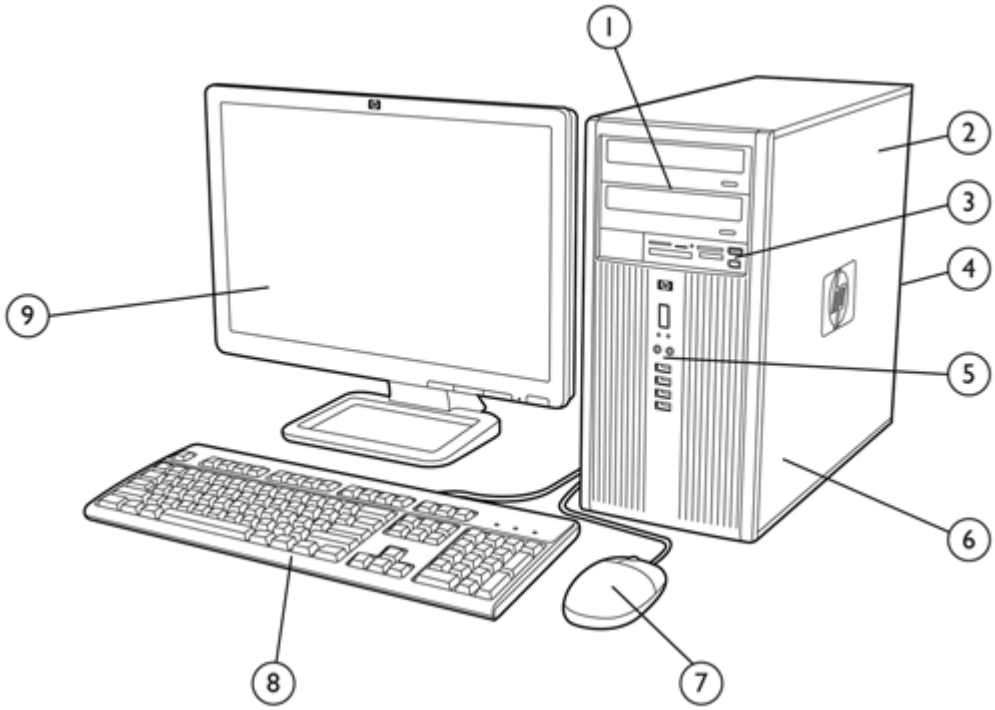
*Overview*

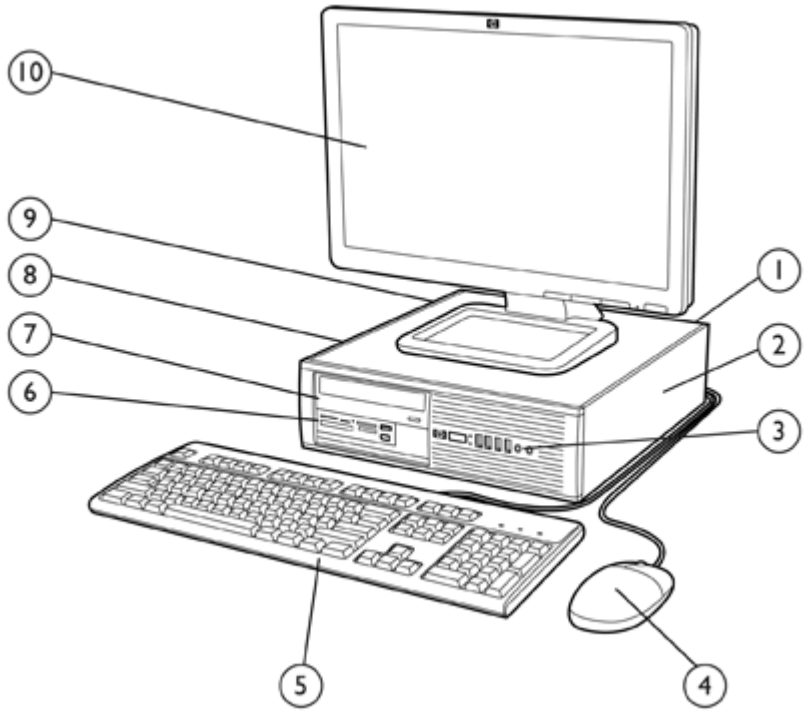
Microtower




1. (2) 5.25" external optical disk drive bays
   (2) 3.5" internal hard disk drive bays
2. 320-watt standard efficiency power supply, Active Power Factor Correction (PFC)
   Optional: 89% efficient energy saving power supply
3. (1) 3.5" external bay for optional HP 22-in-1 Media Card Reader, pocket media drive, or other 3.5" device
4. Rear I/O: (6) USB 2.0, (1) standard serial port, (1) optional serial port, (1) optional parallel port, (2) PS/2, (1) RJ-45, (1) VGA, (1) audio in, (1) audio out, (1) Display Port
5. Front I/O: (4) USB 2.0, headphone and microphone, Dual Color Diagnostic LEDs
6. (1) full-height PCI slot, (2) full-height PCIe x1 slots, (1) full-height PCIe x16 (ADD2/SDVO) slot
7. HP Optical Scroll Mouse (PS/2 or USB), or HP USB Laser Mouse
8. HP Standard Keyboard (PS/2 or USB) or HP USB Smartcard Keyboard
9. HP monitor (sold separately)

*Overview*

Small Form Factor




1. Rear I/O: (6) USB 2.0, (1) standard serial port, (1) optional serial port, (1) optional parallel port, (2) PS/2, (1) RJ-45, (1) VGA, audio in/out , (1) DisplayPort
2. (1) low profile PCI slot, (2) low profile PCIe x1 slots, (1) low profile PCIe x16 (SDVO/ADD2) slot
3. Front I/O: (4) USB 2.0, headphone and microphone, Dual Color Diagnostic LEDs
4. HP Optical Scroll Mouse (PS/2 or USB), or HP USB Laser Mouse
5. HP Standard Keyboard (PS/2 or USB) or HP USB Smartcard Keyboard
6. (1) 3.5" external bay for optional HP 22-in-1 Media Card Reader, pocket media drive, or other 3.5" device
7. (1) 5.25" external bay for optional optical drive, or other 5.25" device (bay tilts up for device removal and insertion)
8. (1) 3.5-inch internal drive bay supporting primary hard disk drive
9. 240-watt power supply
   Optional: 89% efficient energy saving power supply
10. HP Monitor (sold separately)

*Overview*

## At A Glance

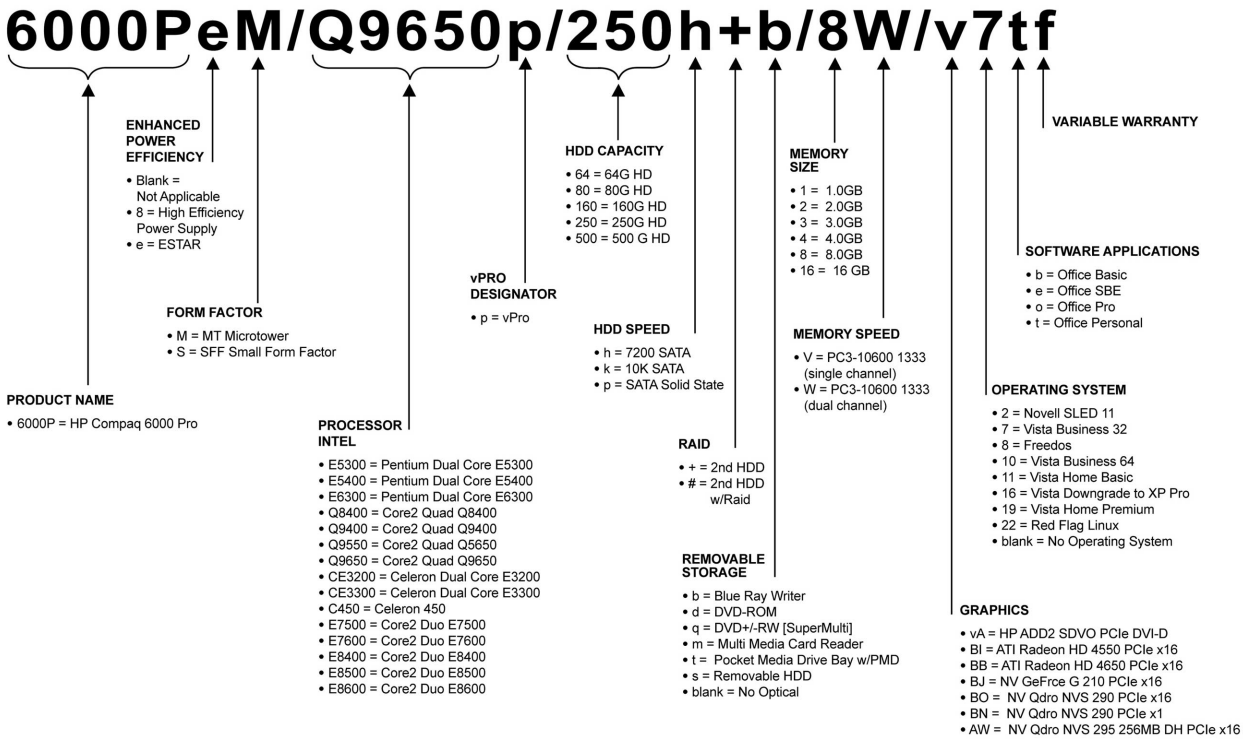
- The HP Compaq 6000 Pro Business PC is designed to be the foundation of your business with enhanced features and proven technology
- Intel® Q43 Express chipset, Intel Core™ 2 Duo processors, Intel Core 2 Quad processors, and Intel Graphics Media Accelerator 4500 integrated graphics
- Embedded TPM1.2 compliant security module* (Vista Bit-Locker ready)
- Support for up to 500-GB SATA 3.0Gb/s Smart IV hard drives
- Value-added software on select models
  - HP Support Assistant
  - HP Software Agent
  - McAfee Anti-Virus with 60 day Live Update Subscription
  - HP Vision Diagnostics software
  - Microsoft Office 2007
  - PDF Complete
  - Computrace Enabler for Desktops (select countries)
  - HP System Software manager
  - HP Power Manager
  - Firefox- HP Virtual Browser
- Value-added software available for free download from the Web (http://www.hp.com/go/easydeploy)
  - HP Client Automation – Starter Edition
  - HP SoftPaq Download Manager
  - HP System Software Manager
  - HP Client Catalog for Microsoft SMS
- Fully compatible software OS image across all models (Microtower, Small Form Factor)
- HP BIOS for security, manageability and software image stability
- Protected by HP Services, including standard warranties up to 5-5-5 (terms and conditions vary by country; certain restrictions and exclusions apply)
- 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)

*TPM module disabled where use is restricted by law; for example, Russia.

*Configurable Components - Select Models (localized by Regions)*

## Model Key and Example

NOTE: This diagram is an example that illustrates how to read the model number. It is not intended to give every available configuration choice specified in the body of this document and may include references to features that are out of date and no longer available. Because the configurations offered vary by region, some features listed may not be available in all countries.



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

| | | |
|---|---|---|
| Operating System - One of the following | Preinstalled | Genuine Windows 7 Professional Edition 32*<br>Genuine Windows 7 Professional Edition 64*<br>Windows XP Professional (available through downgrade rights from Genuine Windows 7 Professional)*+<br>Genuine Windows 7 Home Premium Edition 32*<br>Genuine Windows 7 Home Premium Edition 64*<br>Genuine Windows 7 Home Basic Edition 32*<br>Genuine Windows Vista Business 32**<br>Genuine Windows Vista Home Basic 32**<br>Windows XP Professional (available through downgrade rights from Genuine Windows Vista Business)**++<br>Novell SUSE Linux Enterprise Desktop 11†<br>FreeDOS |
| | Supported | Genuine Windows Vista Business 64**<br>Genuine Windows Vista Enterprise 32**<br>Genuine Windows Vista Enterprise 64** |
| | Certified | Novell SUSE Linux Enterprise Desktop 11†<br>Red Hat Enterprise Linux†† |

NOTE: Windows XP Mode, available as a separate download for Windows 7 Professional, works with virtualization software such as Windows Virtual PC to run older Windows XP business software on the Windows 7 desktop.

* Not available in all countries. Offered when Windows 7 is generally available. 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. See: http://www.microsoft.com/windowsvista/getready/hardwarereqs.mspx and: http://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: http://www.windowsvista.com/upgradeadvisor.

+ Windows 7 Professional disk may also 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 annually at least 25 customer systems with the same custom image.

++ Windows Vista Business disk may also 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 annually at least 25 customer systems with the same custom image.

† The following features are not supported by Novell SUSE Linux Enterprise Desktop:

- HP 22-in-1 Media Card Reader with PCI Card
- DisplayPort
- HP ProtectTools
- SATA Blu-ray Writer playback of commercial movies
- Intel PRO/1000 CT Gigabit Ethernet NIC
- Broadcom NetXtreme Gigabit Ethernet PCIe NIC Plus Card
- HP ADD2 SDVO PCIe DVI-D adapter

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

- 2nd serial port adapter (including low profile)
- Power Management features (US ENERGY STAR)

†† The following features are not supported by Red Hat Enterprise Linux:

- HP 22-in-1 Media Card Reader with PCI Card
- Integrated 1.2 TPM Embedded Security Chip
- Intel PRO/1000 CT Gigabit Ethernet NIC
- Broadcom NetXtreme Gigabit Ethernet PCIe NIC Plus Card
- LSI PCEe x1 Hi-Speed 56K International SoftModem
- HP ADD2 SDVO PCIe DVI-D adapter
- HP FireWire / IEEE 1394 PCI Card (full height and low profile)
- 2nd serial port adapter (including low profile)
- HP Wireless 802.11b/g/n PCIe x1 Card
- HP USB Smartcard Keyboard
- Power Management features (US ENERGY STAR)

---

| | | |
|---|---|---|
| **Value-added Software** (on select models; not included with FreeDOS) | HP Software Agent | Microsoft Office 2007 Basic |
| | HP Support Assistant | Microsoft Office 2007 Personal |
| | HP Systems Software Manager | Microsoft Office 2007 Professional |
| | HP Vision Diagnostics | Microsoft Office 2007 Small Business Edition |
| | HP Power Manager | DASH 1.1 Manageability* |
| | McAfee Total Protection Anti-Virus with 60 day trial Subscription | Computrace Enabler for Desktops (select countries)** |
| | Roxio Creater Business (select models) | SRS Premium Sound Software for HP Thin USB Powered Speakers (select models) |
| | Firefox-HP Virtual Browser | Corel WinDVD (select models) |

* Requires Broadcom NetXtreme Gigabit Ethernet Plus (DASH 1.1) PCIe NIC
** Requires HP LoJack Pro for ProtectTools for full functionality. Tracking and tracing subscription sold separately.

---

| | | |
|---|---|---|
| **Value-added Software** (available for free download from the Web http://www.hp.com/go/easydeploy) | HP Client Automation – Starter Edition | HP Client Catalog for Microsoft SMS |
| | HP Client Manager from Symantec | HP Systems Software Manager |
| | HP SoftPaq Download Manager | HP Disk Sanitizer, External Edition |

---

| | | |
|---|---|---|
| **Value-added Services and Features** | HP Stable Platform Program | Factory Express Deployment and Lifecycle Services |
| | Business-to-Business Portals | TPM 1.2 Security chip* |
| | HP Global Series Services | |

* TPM module disabled where use is restricted by law; for example, Russia.

---

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

**Service and Support**

On-site Warranty and Service Note 1: This limited warranty and service offering delivers parts, labor and on-site repair for terms up to 5 years. Response time is next business-day Note 2 and includes free telephone support Note 3 24 x 7. Global coverage Note 2 ensures that any product purchased in one country and transferred to another non-restricted country will remain fully covered under the original warranty and service offering. Some countries/regions do not offer one year onsite and labor. For HP Care Pack services see: http://www.hp.com/go/lookuptool.

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

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

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

| | Microtower | Small Form Factor |
|---|---|---|
| **Chassis Dimensions** (H x W x D) | 14.85 x 6.95 x 16.96 in<br>377.2 x 176.5 x 430.8 mm | 3.95 x 13.30 x 14.90 in<br>100.3 x 337.8 x 378.5 |
| **Optional Tower Stand Dimensions** (H x W x D) | N/A | 1.05 x 6.95 x 7.83 in<br>(26.75 x 176.46 x 198.87 mm) |
| **System weight*** | 20.5 lb (9.3 kg) | 16.0 lb (7.26 kg) |
| **System volume** | 1739 cu in | 941.63 cu in |
| **Shipping weight*** | 28.79 lb (13.06 kg) | 26.70 lb (12.11 kg) |
| **Maximum supported weight** (desktop orientation) | N/A | 77.1 lb (35 kg) |
| **Shipping box dimensions** (H x W x D) | 19.69 x 12.2 x 23.62 in<br>500 x 310 x 600 mm | 9.72 x 19.68 x 22.67 in<br>246.9 x 499.9 x 575.8 mm |

* Configured with 1 hard drive, 1 optical drive, no diskette drive, and no PCI card.

| | | |
|---|---|---|
| **Power Supply** | 320W power supply – active PFC | 240W power supply – active PFC |
| **Energy Efficient Power Supply** | 320W 89% efficient power supply – active PFC | 240W 89% efficient power supply – active PFC |

| **Ports** | |
|---|---|
| USB 2.0 | 10 (4 front, 6 rear) |
| Serial | 1 standard with 2nd optional |
| Parallel | 1 optional |
| PS/2 | 1 keyboard, 1 mouse |
| Video | analog for integrated graphics |
| DVI output | available via HP DisplayPort to DVI-D Adapter |
| Support for Multi-Monitor | 1 Standard DisplayPort and 1 Standard VGA |
| Audio | Integrated High Definition audio with internal speaker<br>Front – mic and headphone<br>Rear – input (supports microphone or line input), line out |
| NIC (RJ-45) | Integrated Intel 82567LM Gigabit Network Connection Ethernet |

| | | MT | SFF |
|---|---|---|---|
| Chipset | Intel Q43 Express chipset | X | X |
| Processor and Speed* One of the following | **Intel Celeron Dual-Core Processors:** | | |
| | Intel Celeron E3200 Processor (2.4-GHz, 2 MB L2 cache, 800-MHz FSB) | X | X |
| | Intel Celeron E3300 Processor (2.5-GHz, 2 MB L2 cache, 800-MHz FSB) | X | X |
| | **Intel Pentium Dual-Core Processors:** | | |
| | Intel Pentium dual-core E5300 Processor (2.6-GHz, 2MB L2 cache, 800-MHz FSB) | X | X |
| | Intel Pentium dual-core E5400 Processor (2.70-GHz, 2MB L2 cache, 800-MHz FSB) | X | X |
| | Intel Pentium dual-core E6300 Processor (2.80-GHz, 2MB L2 cache, 800-MHz FSB) | X | X |
| | **Intel Core 2 Duo Processors:** | | |
| | Intel Core 2 Duo E7500 Processor (2.93-GHz, 3 MB L2 cache, 1066-MHz FSB) | X | X |
| | Intel Core 2 Duo E7600 Processor (3.06-GHz, 3 MB L2 cache, 1066-MHz FSB) | X | X |
| | Intel Core 2 Duo E8400 Processor (3.0-GHz, 6 MB L2 cache, 1333-MHz FSB) | X | X |
| | Intel Core 2 Duo E8500 Processor (3.16-GHz, 6 MB L2 cache, 1333-MHz FSB) | X | X |
| | Intel Core 2 Duo E8600 Processor (3.33-GHz, 6 MB L2 cache, 1333-MHz FSB) | X | X |
| | **Intel Core 2 Quad Processors:** | | |
| | Intel Core 2 Quad Q8400 Processor (2.66-GHz, 4 MB L2 cache, 1333-MHz FSB) | X | X |
| | Intel Core 2 Quad Q9400 Processor (2.66-GHz, 6 MB L2 cache, 1333-MHz FSB) | X | X |
| | Intel Core 2 Quad Q9550 Processor (2.83-GHz, 12 MB L2 cache, 1333-MHz FSB) | X | X |
| | Intel Core 2 Quad Q9650 Processor (3.0-GHz, 12 MB L2 cache, 1333-MHz FSB) | X | X |

* Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families.

Memory

**Supports un-buffered non-ECC DDR3 SDRAM**

The Intel Q43 Express chipset supports un-buffered non-ECC DDR3 SDRAM (synchronous dynamic random access memory) of up to 16GB total memory, and at a frequency of up to 1066MHz.

NOTE: 1066MHz system memory frequency of operation requires at least PC3-8500 (DDR3-1066) memory type for all populated memory modules, and an Intel processor with FSB (front side bus) of at least 1066MHz.

System Memory upgrades are accomplished by adding DDR3 SDRAM module(s) to empty DIMM slots on the System Board.

CAUTION: Voltage is supplied to the memory modules whenever the computer is connected 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. The computer must be shut down with the AC power removed (disconnect AC power cord at rear chassis or at AC outlet) prior to adding or removing SDRAM modules.

HP recommends dual-channel symmetric configurations for the best memory performance.
For best performance, add the same amount of total memory to each channel and do not inter-mix

memory module speeds. For dual-channel symmetric performance, the total amount of memory in each channel must be equal. If memory module speeds are inter-mixed, the memory operating frequency will default to the slowest speed.

*Microtower and Small Form Factor*

**Maximum Memory***

Supports up to 16GB of un-buffered non-ECC DDR3 SDRAM.

Slot 1 is black and must always be populated. Not all possible memory configurations are represented in the table below.

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

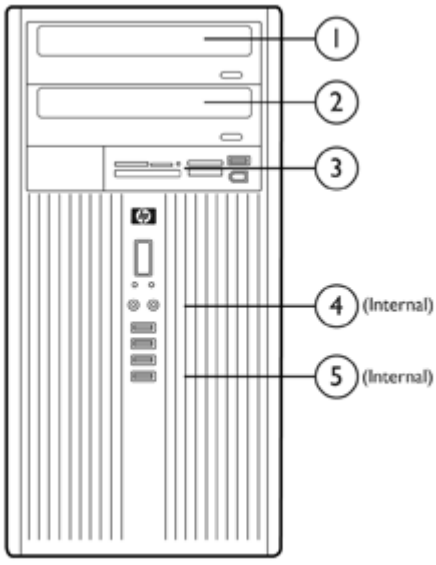
| Total Memory | DIMM Slot Population | | | |
|---|---|---|---|---|
| | Channel A | | Channel B | |
| | 1 (black) | 2 (white) | 3 (white) | 4 (white) |
| 1-GB (Single Channel) | 1GB | | | |
| 2-GB (Dual Channel Symmetric) | 1GB | | 1GB | |
| 3-GB (Dual Channel Asymmetric) | 2GB | | 1GB | |
| 4-GB (Dual Channel Symmetric) | 2GB | | 2GB | |
| 4-GB (Dual Channel Symmetric) | 1GB | 1GB | 1GB | 1GB |
| 8-GB (Dual Channel Symmetric) | 2GB | 2GB | 2GB | 2GB |
| 16-GB maximum (Dual Channel Symmetric) | 4GB | 4GB | 4GB | 4GB |

* The Intel Q43 Express chipset includes an integrated Management Engine (ME) micro-controller, which requires system memory to support manageability functions. If the system memory configuration is single-channel or dual-channel asymmetric, 16MB of system memory is pre-allocated for the ME at system startup. If the memory configuration is dual-channel symmetric, 32 MB of memory is pre-allocated for the ME at system startup. This pre-allocated memory is not available to the operating system, just as pre-allocated video memory is not available.

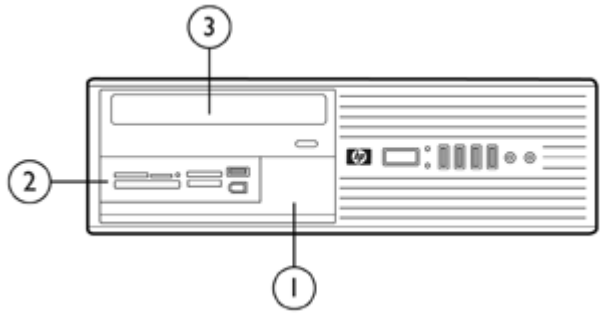
*Standard Features and Configurable Components (availability may vary by country)*

| Expandability | Microtower | Small Form Factor |
|---|---|---|
| PCI slots | 1 full-height | 1 low-profile |
| Max power per slot | 35W | 35W |
| PCIe x1 slot | 2 | 2 |
| Max power per slot | 10W | 10W |
| PCIe x16 slot (also functions as SDVO/ADD2 slot) | 1 full-height | 1 low-profile |
| Max power per slot | 75W | 35W |
| External Bays | | |
| 3.5" | 1 | 1 |
| 5.25" | 2 | 1 |
| IDE | | |
| Internal 3.5" HDD Bays | 2 | 1 |
| Hard Drive Controller (SATA) Supported | SATA | SATA |
| Hard Drive Interfaces Supported | SATA 3.0Gb/s | SATA 3.0Gb/s |

Microtower




Small Form Factor



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

| Storage – Drive Support | | | | | | |
|---|---|---|---|---|---|---|
| | Microtower | | | Small Form Factor | | |
| | Media Card Reader or Pocket Media Drive (optional) | 5.25" Serial ATA Devices | 3.5" Serial ATA Devices | Media Card Reader or Pocket Media Drive (optional) | 5.25" Serial ATA Devices | 3.5" Serial ATA Devices |
| Quantity Supported | 1 | 2 | 2 | 1 | 1 | 2 |
| Position Supported | ③ | ①, ② | ③, ④, ⑤ | ② | ① | ②, ③ |
| Controller | USB/Diskette | SATA | SATA | USB/Diskette | SATA | SATA |

NOTE: The SATA port labeled SATA3 on the system board can be enabled by the BIOS as an eSATA port. Using it for an eSATA drive will require a separately purchased cable with an eSATA connector.

| | | MT | SFF |
|---|---|---|---|
| **Hard Drive** One or two of the following | 160-GB SATA 3.0-Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 250-GB SATA 3.0-Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 320-GB SATA 3.0-Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 500-GB SATA 3.0-Gb/s Hard Drive (16MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 80-GB SATA 3.0-Gb/s Hard Drive (16MB Cache,10,000 RPM, NCQ, Smart III) | X | X |
| | 160-GB SATA 3.0-Gb/s Hard Drive (16MB Cache, 10,000 RPM, NCQ, Smart III) | X | X |
| | 3.5" Removable 160-GB SATA 3.0 Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 3.5" Removable 250-GB SATA 3.0 Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 3.5" Removable 500-GB SATA 3.0 Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 2nd hard drive, 160-GB SATA 3.0-Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 2nd hard drive, 250-GB SATA 3.0-Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 2nd hard drive, 320-GB SATA 3.0-Gb/s Hard Drive (8MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 2nd hard drive, 500-GB SATA 3.0-Gb/s Hard Drive (16MB Cache, 7200 RPM, NCQ, Smart IV) | X | X |
| | 2nd hard drive, 80-GB SATA 3.0-Gb/s Hard Drive (16MB Cache,10,000 RPM, NCQ, Smart III) | X | X |
| | 2nd hard drive,160-GB SATA 3.0-Gb/s Hard Drive (16MB Cache, 10,000 RPM, NCQ, Smart III) | X | X |
| | NOTE: NCQ functionality requires a user set-up BIOS setting. | | |
| **Solid State Drive** | 64-GB Solid State Drive | X | X |

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

| | | | |
|---|---|---|---|
| **Removable Storage** - One or more of the following depending on form factor (see Storage - Drive Support section above) | **Pocket Media Drive** | | |
| | 250GB Pocket Media Drive | X | X |
| | **Media Reader** | | |
| | HP 22-in-1 Media Card Reader (USB connection on the system board) | X | X |
| | HP 22-in1 (with 1394) Media Card Reader (USB connection on the system board) | X | X |
| | **Optical Drives** | | |
| | SATA DVD-ROM Drive | X | X |
| | SATA SuperMulti LightScribe DVD Writer Drive | X | X |
| | SATA Blu-ray Writer | X | X |
| **Security** | TPM 1.2 Embedded Security Chip* | X | X |
| | HP Desktop Security lock kit (lock and cable) | X | X |
| | Security cable with Kensington lock | X | X |
| | HP Chassis Security Kit | X | X |
| | Optional HP ProtectTools 5.0 security software suite | X | X |
| | Optional LoJack Pro tracking and tracing subscription | X | X |
| | Optional USB Port Disable at factory (user configurable via BIOS) | X | X |
| | * TPM module disabled where use is restricted by law; for example, Russia. | | |
| **NIC** | Intel 82567LM Gigabit Network Connection (integrated on system board) | X | X |
| | Broadcom NetXtreme Gigabit Ethernet Plus PCIe NIC | X | X |
| | Broadcom NetXtreme Gigabit Ethernet Plus (DASH 1.1) PCIe NIC Card (with cable for internal USB header) | X | X |
| | Intel Gigabit CT Desktop NIC | X | X |
| **Wireless** | HP 802.11 b/g/n Wireless PCIe x1 card (full height bracket) | X | |
| | HP 802.11 b/g/n Wireless PCIe x1 card (low profile bracket) | | X |
| **Modem** | LSI PCIe x1 56K International SoftModem | X | X |

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

| | | | |
|---|---|---|---|
| Graphics | Integrated Intel Graphics Media Accelerator 4500 | X | X |
| | ATI Radeon HD 4650 (1 GB DH) PCIe x16 Graphics Card | X | |
| | ATI Radeon HD 4550 Dual Head PCIe x16 Graphics Card | X | X |
| | NVIDIA Quadro NVS 290 PCIe x1 Graphics Card | X | X |
| | NVIDIA Quadro NVS 290 (256MB DH) PCIe x16 Graphics Card | X | X |
| | NVIDIA Quadro NVS 295 (256MB DH) PCIe x16 Graphics Card | X | X |
| | NVIDIA GeForce 310 DP PCIe x16 Graphics Card | X | X |
| | HP ADD2 SDVO PCIe DVI-D adapter | X | X |
| | HP DisplayPort to VGA Adapter | X | X |
| | HP DisplayPort to DVI-D Adapter | X | X |
| Audio | Integrated High Definition audio with Realtek ALC261 codec (all ports are stereo) | X | X |
| | Microphone and Headphone front ports* | X | X |
| | Line-out and Line-In rear ports* | X | X |
| | Multistreaming capable* | X | X |
| | Internal Speaker | X | X |
| | HP Thin USB Powered Speakers (optional) | X | X |
| | * Re-taskable ports; see technical specifications page 21. | | |
| Input Devices | Keyboard - One of the following | | |
| | HP PS/2 Standard Keyboard | X | X |
| | HP USB Standard Keyboard | X | X |
| | HP Smartcard Keyboard | X | X |
| | HP USB PS/2 Washable Keyboard | X | X |
| | HP USB Mini Keyboard | X | X |
| | Mouse - One of the following | | |
| | USB 2-Button Laser Mouse | X | X |
| | PS/2 2-Button Optical Scroll Mouse | X | X |
| | USB 2-Button Optical Scroll Mouse | X | X |
| Miscellaneous | 2nd serial port adapter | X | |
| | 2nd serial port adapter (low profile) | | X |
| | Parallel port adapter | X | X |
| | HP FireWire / IEEE 1394 Adapter | X | X |
| | Tower stand | | X |

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

| | | MT | SFF | Part Number |
|---|---|---|---|---|
| Communications | Wireless LAN | | | |
| | HP 802.11 b/g/n Wireless PCIe x1 card | X | X | FH971AA |
| | NICs | | | |
| | Broadcom NetXtreme Gigabit Ethernet Plus (DASH 1.1) PCIe NIC (with cable for internal USB header) | X | X | EA833AA |
| | Intel Gigabit CT Desktop NIC | X | X | FH969AA |
| | Modem | | | |
| | LSI PCIe x1 56K International SoftModem | X | X | FH970AA |
| Graphics | Single head solutions | | | |
| | HP ADD2 SDVO PCIe DVI-D Adapter | X | X | DY674A |
| | Multi head solutions | | | |
| | ATI Radeon HD 4550 (256MB DH) PCIe x16 Card | X | X | AT042AA |
| | ATI Radeon HD 4650 (1 GB DH) PCIe x16 Graphics Card | X | | VN566AA |
| | HP DisplayPort to VGA Adapter | X | X | AS615AA |
| | HP DisplayPort to DVI-D Adapter | X | X | FH973AA |
| | NVIDIA Quadro NVS 290 (256MB DH) PCIe x1 Graphics Card | X | X | KN586AA |
| | NVIDIA Quadro NVS 290 (256MB DH) PCIe x16 Graphics Card | X | X | KG748AA |
| | NVIDIA Quadro NVS 295 (256MB DH) PCIe x16 Graphics Card | X | X | FY943AA |
| | NVIDIA GeForce 310 DP PCIe x16 Graphics Card | X | X | VG885AA |
| Hard Drives | Serial ATA Hard Drives | | | |
| | HP 160-GB SATA 3.0-Gb/s 7200 rpm Hard Drive | X | X | PY277AA |
| | HP 250-GB SATA 3.0-Gb/s 7200 rpm Hard Drive | X | X | PY278AA |
| | HP 320-GB SATA 3.0-Gb/s 7200 rpm Hard Drive | X | X | FH963AA |
| | HP 500-GB SATA 3.0-Gb/s 7200 rpm Hard Drive | X | X | KW347AA |
| | HP 80-GB SATA 3.0-Gb/s 10,000 rpm Hard Drive | X | X | EM172AA |
| | HP 160-GB SATA 3.0-Gb/s 10,000 rpm Hard Drive | X | X | EW222AA |
| | HP Removable SATA Hard Drive Enclosure (Frame & Carrier) | X | X | RY102AA |
| | HP Removable SATA Hard Drive Enclosure (Carrier Only) | X | X | RY103AA |

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

| | | | | |
|---|---|---|---|---|
| Input/Output Devices | HP PS/2 Standard Keyboard | X | X | DT527A |
| | HP USB Standard Keyboard | X | X | DT528A |
| | HP USB Smartcard Keyboard | X | X | ED707AA |
| | HP USB Gray Standard Keyboard | X | X | DT529A |
| | HP USB PS/2 Washable Keyboard | X | X | VF097AA |
| | HP USB Mini Keyboard | X | X | AS601AA |
| | HP 2.4 GHz Wireless Keyboard and Mouse | X | X | NB896AA |
| | HP USB Laser Mouse | X | X | GW405AA |
| | HP PS/2 2-Button Optical Scroll Mouse | X | X | EY703AA |
| | HP USB 2-Button Optical Scroll Mouse | X | X | DC172B |
| Memory (DIMMs) | PC3-10600 (DDR3, 1333MHz) DIMMs Non-ECC | | | |
| | HP 4-GB PC3-10600 (DDR3 1333 MHz) DIMM | X | X | VH638AA |
| | HP 2-GB PC3-10600 (DDR3 1333MHz) DIMM | X | X | AT024AA |
| | HP 1-GB PC3-10600 (DDR3 1333 MHz) DIMM | X | X | AT023AA |
| Monitors | All HP monitors are supported that accept a graphics output provided by this PC. The LP3065 monitor can be supported by installing a graphics card that supports a dual-link DVI-D output. | | | |
| Multimedia | HP Thin USB Powered Speakers | X | X | KU901AV |
| Optical Drives | DVD-ROM Drive | | | |
| | HP SATA DVD-ROM Drive | X | X | AH047AA |
| | DVD Writer | | | |
| | SATA Blu-ray Writer | X | X | AR481AA |
| | HP SATA SuperMulti LightScribe DVD Writer Drive | X | X | GF343AA |
| Removable Storage | Removable Drives | | | |
| | HP 250GB Pocket Media Drive | X | X | FE477AA |
| | Multimedia | | | |
| | HP 22-in-1 Media Card Reader | X | X | FX273AA |
| | HP 22-in-1 (with 1394) Media Card Reader | X | X | KN518AA |

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

| | | | | |
|---|---|---|---|---|
| Security | Kensington lock | X | X | PC766A |
| | HP Business PC Security Lock | X | X | PV606AA |
| | HP Chassis Security Kit | X | X | AR639AA |
| | HP ProtectTools 5.0 Client Security Software including<br>HP ProtectTools Security Manager<br>Credential Manager for HP ProtectTools<br>Device Access Manager for HP ProtectTools<br>Drive Encryption for HP ProtectTools<br>Embedded Security for HP ProtectTools<br>Java Card Security for HP ProtectTools<br>LoJackPro for HP ProtectTools<br>Privacy Manager for HP ProtectTools<br>File Sanitizer for HP ProtectTools | X | X | TBD |
| | HP 2009 Wall Mount/Security Sleeve | | X | TBD |
| Manageability | HP Client Configuration Manager, Premium Edition | X | X | T3488AA<br>(use T3489AA for 1000 licenses) |
| | Broadcom NetXtreme Gigabit Ethernet Plus (DASH 1.1) PCIe NIC (with cable for internal USB header) | X | X | EA833AA |
| Brackets/Stands | HP 2009 Small Form Factor Tower Stand | | X | VN569AA |
| Miscellaneous Accessories | HP Serial Port Adapter Kit | X | X | PA716A |
| | HP Parallel Port Adapter Kit | X | X | KD061AA |
| | HP FireWire / IEEE 1394 Adapter | X | X | PA997A |

| Unit Environment and Operating Conditions | Microtower | Small Form Factor |
|---|---|---|
| General Unit Operating Guidelines<br>• 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.<br>• Leave a 10.2 cm (4 in) clearance on all vented sides of the computer to permit the required airflow.<br>• Never restrict airflow into the computer by blocking any vents or air intakes.<br>• 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.<br>• 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.<br>• 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. | | |

| | Microtower | | Small Form Factor | |
|---|---|---|---|---|
| **Power Supply** | 320-watt BTX power supply - Active PFC | 320-watt 89% efficient* BTX power supply - Active PFC | 240-watt BTX power supply - Active PFC | 240-watt 89% efficient* BTX power supply - Active PFC |
| Operating Voltage Range | 100-240VAC | 100-240VAC | 100-240VAC | 100-240VAC |
| Rated Voltage Range | 115V/230V | 115V/230V | 115V/230V | 115V/230V |
| Rated Line Frequency | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz |
| Operating Line Frequency Range | 47-63 Hz | 47-63 Hz | 47-63 Hz | 47-63 Hz |
| Rated Input Current | 5.5A | 5.5A | 4A | 4A |
| Heat Dissipation (NEED TO UPDATE) | Typical 315 btu/hr (79 kg-cal/hr) Maximum 1575 btu/hr (397 kg-cal/hr) | Typical 270 btu/hr (68 kg-cal/hr) Maximum 1280 btu/hr (322 kg-cal/hr) | Typical 315 btu/hr (79 kg-cal/hr) Maximum 1260 btu/hr (317 kg-cal/hr) | Typical 270 btu/hr (68 kg-cal/hr) Maximum 1025 btu/hr (258 kg-cal/hr) |
| Power Supply Fan | Variable speed fan | Variable speed fan | Variable speed fan | Variable speed fan |
| ENERGY STAR Compliant | | X | | X |
| FEMP Standby Power Compliant (<1W in S5 - Power Off)** | X | X | X | X |
| Power Consumption in ENERGY STAR Mode - Suspend to RAM (S3) (Instantly Available PC) | <4W | <3W | <4W | <3W |

* Energy efficient power supply is a requirement for ENERGY STAR qualification in conjunction with a select range of processors and modules
** Power consumption in the Off/Apparent Off mode is measured and reported with the network interface controller "Wake on LAN" feature disabled in F10 Setup (default is "enabled").

| ROM BIOS Information |
|---|
| Key features of the HP BIOS include:<br><br>• Deployment and manageability - HP BIOS provides several technologies that help integrate the HP Business desktop computer into the enterprise, such as PXE, remote configuration, remote control, and F10 Setup support for 12 languages.<br>• Stability - HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.<br>• Security - HP BIOS offers a robust and flexible set of security features to help the system administrator secure their systems from removal of sensitive data, and help prevent access by unauthorized users. Ability to disable USB ports.<br>• Tracking and tracing capabilities in case of theft available in select countries (subscription sold separately).<br>• Thermal and power management - The HP BIOS provides and enables thermal and power management technologies to assist in operating the HP Business Desktop computer in any enterprise environment.<br>• Serviceability - HP BIOS provides diagnostic and detailed service information.<br>• Upgrades and recovery - HP BIOS provides numerous ways to upgrade HP Business Desktop computers, including BIOS updates from within DOS (Flashlite), BIOS updates from within Windows (HPQFlash, SSM), 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.<br><br>Additional HP BIOS Features<br><br>• 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.<br>• 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. Provides power conservation features under Windows XP.<br>• Mute internal speaker<br>• Disable USB ports |

| Other Features | Description |
|---|---|
| ACPI-Ready Hardware | Advanced Configuration and Power Management Interface (ACPI).<br><br>• Allows the system to wake from a low power mode.<br>• 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. |
| SMBIOS Ver. 2.6 | System Management BIOS, previously known as DMI BIOS, for system management information |
| Wired for Management Support | Intel-driven, industry-wide initiative to make Intel architecture-based PCs, servers and mobile computers more inherently manageable right out of the box and over the network |
| Dual-State Power Button | Power button acts as both an on/off button and suspend-to-sleep button |

| Serviceability Features of System | | |
|---|---|---|
| Dual Color Power LED on Front of Computer (Indicates Normal Operations and Fault Conditions) | | |
| Diagnostic LED Explanation Table | Number of 1-second red LED blinks followed by 2-second pause, then repeats:<br>2-processor thermal protection activated<br>3-processor not installed<br>4-power supply failure<br>5-memory error<br>6-video error<br>7-PCA failure (ROM detected failure prior to video)<br>8-invalid ROM, bootblock recover mode | |
| • System/Emergency ROM | • Flash ROM | • CMOS Battery Holder for easy Replacement |
| • Flash Recovery with Video | • 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 |
| • Restore CD | • Clear CMOS Switch | • NIC LEDs (integrated) (Green & Amber) |

| Serviceability Features of Chassis | | |
|---|---|---|
| • Dual Color Power and HD LED – To Indicate Normal Operations and Fault Conditions | • Color coordinated cables and connectors | • Tool-less Hood Removal (thumbscrews for Microtower, spring-loaded latch for Small Form Factor) |
| • Front power switch | • System memory can be upgraded on Microtower without removing any internal components | • Tool-less Hard Drive, CD & Diskette Removal |
| | | |
| Additional Features | Description | |
| Towerable | Small Form Factor can be oriented as a tower (in addition to desktop orientation) | |
| Drive Self Tests (DPS) | • Drive Protection System<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. | |
| DPS Access through F10 Setup during Boot | | |
| SMART IV Technology*<br>(Self-Monitoring, Analysis and Reporting Technology) | 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 | |
| Intel® Standard Manageability | All models feature Intel Standard Manageability technology including the following*: | |

| | |
|---|---|
| | • Supports industry standards including DASH 1.1 and WSMAN<br>• Enables IT to manage and secure PCs even if they are off or the OS is inoperable.<br>• Remotely manage power states, boot to a diagnostic image, edit the PC BIOS, and inventory software and hardware.<br>• Hardware-level filtering can automatically remove an infected PC from the network while still keeping a connection to the management console for remote remediation. |
| * PCs with Intel Standard Manageability include features of Intel Active Management Technology (Intel AMT). Intel AMT requires the computer system to have an Intel AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. For more information, see www.intel.com/technology/platform-technology/intel-amt/. | |
| DASH 1.1 support (Desktop and Mobile Architecture for System Hardware) | A standards initiative for representing out-of-band management capability for computer systems. It is a secure, web-services based successor to ASF. |
| ASF 2.0 support (Alert Standard Format) | Industry-standard specification for network alerting in operating system-absent environments |

| | | |
|---|---|---|
| High Definition Audio | Type | Integrated |
| | High Definition Stereo Codec | Yes - 4-channel Realtek 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) |

NOTES:
Internal Speaker Amplifier is for Internal Speaker only. External Speakers need to be powered externally.

The rear input port can function as a Line-In or Microphone-In jack.

The front Microphone jack is retaskable to support headphones. When functioning as a headphone jack the same audio stream will be sent to both front jacks.

The front Microphone jack is also retaskable to function as a Line-in jack.

The Realtek Control Panel software required to reassign audio ports is preloaded but must be installed by the customer before these functions can be performed.

| | |
|---|---|
| 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; ability to mute internal speaker through F10 Setup |
| External Speaker Jack (Line-Out) | Yes |

| | | | |
|---|---|---|---|
| Integrated Intel 82567LM Gigabit Network Connection | Connector | | RJ-45 |
| | Controller | | Intel 82567LM Gigabit platform LAN Connect Networking Controller |
| | Memory | | Integrated 96KbB on chip buffer memory |
| | Data rates supported | | 10/100/1000 Mbps |
| | Compliance | | IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3 ab and 802.3u compliant |
| | Bus architecture | | GLCI, LCI interface. Intel specific MAC to PHY interface |
| | Data transfer mode | | At gigabit GLCI (802.3 serdes) is for Data, LCI (parallel bus)for MDIO, at 10/100 LCI for both data and MDIO, GLCI is idle. |
| | Power requirement | | Require 3.3Vaux,1.8V and 1.0V or just 3.3V with integrated regulators Power consumption 1.16 Watts for 82566, whole LOM 2.53 Watts |
| | 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 |
| | | | 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 | 32° to 131°F (0° to 55° C)<br>To 70° C for external regulator |
| | | Operating humidity | 85% at 131° F (55° C) |
| | Management capabilities | | WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic. |
| | Alerting | | ASF 2.0 support, AMT 3.0 support |

| | | |
|---|---|---|
| Intel Gigabit CT Desktop NIC | Connector | RJ-45 |
| | Controller | Intel WG82574L Gigabit Ethernet Controller |
| | Memory | Integrated Dual 48K 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 |
| | Bus architecture | PCI-E 1.0a |
| | Data path width | X1, 250 MB/s, Bi-directional interface |
| | Data transfer mode | Bus-master DMA |
| | Hardware certifications | FCC, B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union |
| | Power requirement | Aux 3.3V, 3.0 Watts in 1000base-T and 2.0 Watts in 100Base-T |
| | Boot ROM support | Yes |

*Technical Specifications - Communications*

| | | |
|---|---|---|
| | 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 85% at 131° F (55° C) |
| | Dimensions | 4.75 x 2.25 x 0.8 in (12.1 x 5.7 x 2.0 cm) |
| | Operating system driver support | Windows Vista Business 64*, Windows Vista Business 32*, Windows Vista Home Basic 32*, Windows XP Professional or Windows XP Home 32*. No driver is required for this device. Native support is provided by the operating system.<br>Red Hat Linux 7.2, Linux 7.3 and Red Hat Enterprise Linux 3<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. |
| | Management capabilities | WOL , PXE, DMI, WFM 2.0 |
| Broadcom NetXtreme Gigabit Ethernet Plus PCIe NIC Card | 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-E |
| | Data path width | Single channel, PCI-E |
| | 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<br>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 (actual rate limited by PCI Bus) |

| | | | |
|---|---|---|---|
| | Environmental | Operating temperature | 32° to 131°F (0° to 55° C) |
| | | 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 | |
| | 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 | |
| HP 802.11b/g/n Wireless PCIe x1 Card | 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<br>121.5 Mbps (40 MHz EWC) 72 Mbps<br>135 Mbps (40 MHz EWC) 81 Mbps |
| | Security | • IEEE and WiFi compliant 64 / 128 bit WEP encryption<br>• AES: CCM<br>• 802.1x authentication<br>• WPA: 802.1x. WPA-PSK and TKIP<br>• WPA2 certification<br>• IEEE 802.11i<br>• 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 |

*Technical Specifications - Communications*

| | |
|---|---|
| **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. |

**Integrated Intel Graphics Media Accelerator 4500**

| | |
|---|---|
| 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 varies 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 boot 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 |
| 2 GB & more | 32 | 1024 |

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

| System Memory | PAVP | 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 as reported by the OS.

**Dedicated Video Memory**: Memory owned and locked for graphics use as reported

| | |
|---|---|
| | by the OS. (Preallocated)<br><br>System Video Memory: System memory locked and dedicated for graphics use.<br><br>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 | Dual 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 to 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.

| | | |
|---|---|---|
| ATI Radeon HD 4650 (1 GB DH) PCIe x16 Graphics Card (FH Only) | 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 |
| | Board display options | Supports two displays through any combination of two of the three output ports. |

*Technical Specifications - Graphics*

| Board configuration | Specification | Description |
|---|---|---|
| | Graphics Chip | RV730Pro |
| | Core clock | 600 MHz |
| | Memory clock | 500 MHz |
| | Frame buffer | 1 GB DDR3, 128 bit wide |
| Maximum power | 55 W | |
| 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) CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment<br><br>EMC Immunity:<br>CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement. | |

ATI Radeon HD 4650 (! GB) 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.

| | 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** |

* Max HDMI resolution is 1080p
** Only supported when using a dual-link DVI connection
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 4550 (256 MB DH) 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 |

*Technical Specifications - Graphics*

| | |
|---|---|
| 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 | 256 MB DDR2, 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:
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 (KCC)

EMC Immunity:
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.

| | 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 | N/A |

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 PCIe x1 Graphics Card | Bus type | PCIe x1<br>Low profile, both ATX and low profile brackets included |
| | Graphics Controller | Integrated Quadro 290 2D graphics processor unit (GPU) |
| | Memory | 256 MB DDR2 |
| | Connector | Single high-density DMS-59 Flex Connector |
| | Dimensions | Low-profile, 2.586 x 6.6 in (6.57 x 16.76 cm) |
| | Multi-monitor support | Dual analog or digital (Single Link DVI) monitors<br>(DVI support requires optional DVI cable kit DL139A) |
| | RAMDAC | Dual 350 MHz (integrated) |
| | Maximum pixel clock | 350 MHz |
| | Overlay planes | One 1-bit Video overlay plane |
| | 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)<br>IDCT motion compensation<br>5-tap horizontal by 3-tap vertical filtering<br>8:1 up/down scaling |
| | Input/Output connectors | DMS-59 |
| | 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-I single-link connectors cable kit part number: DL139A. |
| | Board configuration | Specification / Description |
| | | Description: G86-825 |
| | | Core clock: 460 MHz |
| | | Memory clock: 400 MHz |
| | | Frame buffer: 256 MB DDR2, 64 bit wide |

NVIDIA Quadro NVS 290 PCIe x1 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*

| | 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 | N/A |

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 Dual Head PCIe x16 Graphics Card | 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 DMS-59 to Dual DVI-I cable. DMS-59 to Dual VGA cable 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-<br>2Independent hardware color controls for video overlay<br>Hardware color-space conversion (YUV 4:2:2 and 4:2:0)<br>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 |

*Technical Specifications - Graphics*

| | | |
|---|---|---|
| NVIDIA Quadro NVS 295 (256MB DH) PCIe x 16 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 DVI-D Adapters<br>('DisplayPort to VGA' and 'DisplayPort to DL DVI' adapters available as an accessory) |
| | 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 Professional 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†.

*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.

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

† 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**: 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
- DVI to VGA adapter
- Software CD with graphics drivers
- Low profile bracket to convert the card for using in a low profile chassis
- 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.

---

**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) |

---

*Technical Specifications - Graphics*

| | | |
|---|---|---|
| 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.

| 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. | |

| | | | | |
|---|---|---|---|---|
| 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)<br>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 | 320,072,933,376 bytes | |
| | | Height | 1 in (2.54 cm) | |
| | | Width | Media diameter: 3.5 in (8.89 cm)<br>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)<br>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) | |
| | 160-GB | **Capacity** | 160,041,885,696 bytes | |
| | | **Height** | 1 in (2.54 cm) | |
| | | **Width** | Media diameter: 3.5 in (8.89 cm)<br>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 Hard Drives | 160-GB | **Capacity** | 160,041,885,696 bytes | |
| | | **Height** | 1 in (2.54 cm) | |
| | | **Width** | Media diameter: 2.5 in (? cm)<br>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) | |
| | 80-GB | **Capacity** | 80,026,361,856 bytes | |
| | | **Height** | 1 in (2.54 cm) | |
| | | **Width** | Media diameter: 2.5 in (? cm)<br>Physical size: 4 in (10.2 cm) | |

*Technical Specifications - Internal Storage*

| | | |
|---|---|---|
| **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** | 156,301,488 | |
| **Operating Temperature** | 41° to 131° F (5° to 55° C) | |

| | | | |
|---|---|---|---|
| **64 GB Solid State Drive** | **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 | |

* 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.

*Technical Specifications - Input/Output Devices*

| | | | |
|---|---|---|---|
| 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 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 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) |

| | | | | |
|---|---|---|---|---|
| HP SATA Blu-ray Writer | 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 | 215.79 Mbits/s (6x) max. | |
| | | DVD-ROM | 16.62 Mbytes/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) | |

*Technical Specifications - Optical Storage*

| | | | |
|---|---|---|---|
| | 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 SATA 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 | |
| | | | 12 VDC ± 5%-200 mV ripple p-p | |
| | | DC Current | 5 VDC (< 1000 mA typical, 1600 mA maximum) | |
| | | | 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) | |
| SATA 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 48X | |
| | | 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 (with 1394) Media Card Reader | 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: 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 |

| | | |
|---|---|---|
| | | 50°C 10% R.H. = 24 hours |
| | Storage Environmental Extremes | 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 |

*Microtower*

**Eco-Label Certifications and 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

**System Configuration**

The configuration used for the Energy Consumption and Declared Noise Emissions data for the Microtower model is based on a typically configured product.

| Energy Consumption | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 30.1794 W | 30.3597 W | 30.4591 W |
| Sleep (Energy Star low power mode) | 2.4888 W | 2.6405 W | 2.4643 W |
| Off | 0.7565 W | 0.8930 W | 0.7409 W |

| Heat Dissipation* | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 103 BTU/hr | 104 BTU/hr | 104 BTU/hr |
| Sleep | 8 BTU/hr | 9 BTU/hr | 8 BTU/hr |
| Off | 3 BTU/hr | 3 BTU/hr | 2 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 | 27 |
| Fixed Disk (random writes) | 3.8 | 28 |

**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 level, see www.epeat.net
- 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 91.3% recyclable when properly disposed of at end of life.

| Packaging Materials | | |
|---|---|---|
| | External | |
| | Corrugated Paper | 1835 g |
| | Internal | |
| | Polyethylene low density solid | 150 g |
| | Polyethylene low density foam | 20 g |

- The Polyethylene low density foam packaging material is made from 100% recycled content.
- The Polyethylene low density Solid packaging material is made from 100% recycled content.
- The corrugated packaging material contains at least 30% recycled content.

### *Small Form Factor*

**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 – Silver

**System Configuration** The configuration used for the Energy Consumption and Declared Noise Emissions data for the Small Form Factor model is based on a typically configured product.

| Energy Consumption | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 29.5659 W | 28.7916 W | 29.1392 W |
| Sleep (Energy Star low power mode) | 2.4243 W | 2.6419 W | 2.4196 W |
| Off | 0.7496 W | 0.9092 W | 0.7371 W |
| **Heat Dissipation*** | **115 VAC** | **230 VAC** | **100 VAC** |
| Normal Operation | 101 BTU/hr | 98 BTU/hr | 100 BTU/hr |
| Sleep | 8 BTU/hr | 9 BTU/hr | 8 BTU/hr |
| Off | 2 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 | 27 |
| Fixed Disk (random writes) | 3.9 | 28 |

*Technical Specifications - Environmental Data*

**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 Silver level, see www.epeat.net
- 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 Carton | 1705 g |
| **Internal** | |
| EPE-Expanded Polyethylene | 198 g |
| Polyethylene low density foam | 39 g |

- 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.
- The Corrugated Carton packaging materials contains at least 75% recycled content.

## *Small Form Factor and Microtower*

***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/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*