*Overview*
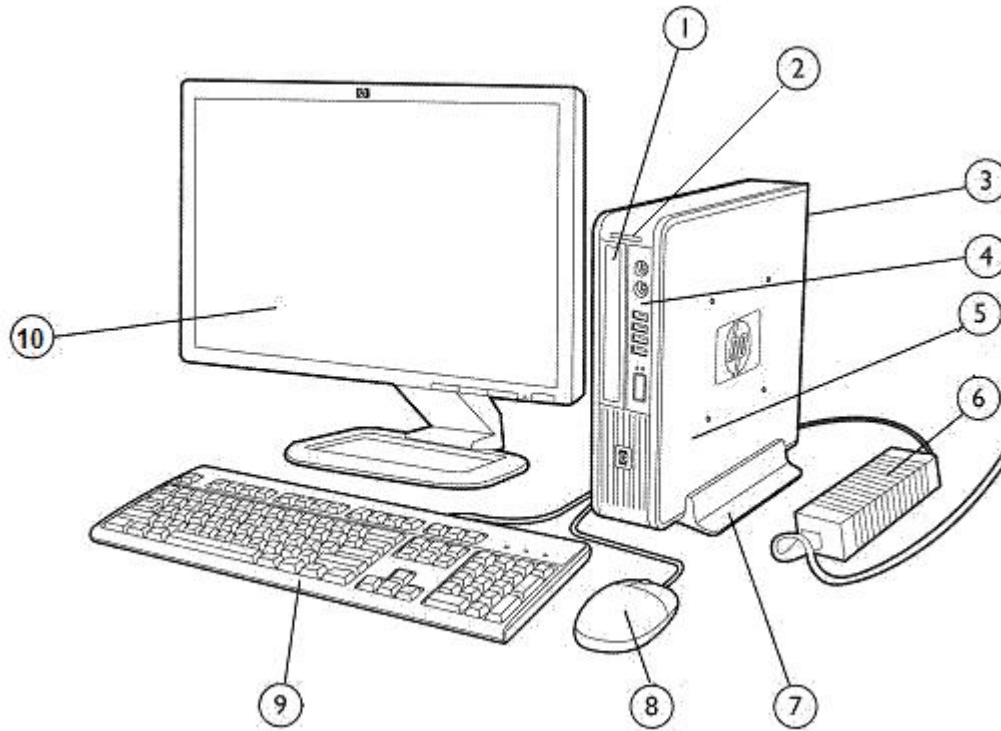
## HP Compaq 8000 Elite Ultra Slim Desktop Business PC



1    Optical Disc Drive
2    Secure Digital (SD) Card Reader
3    Rear I/O includes (6) USB 2.0 ports, DisplayPort and VGA video interfaces, PS/2 mouse and keyboard ports, RJ-45 network interface, audio in/out jack
4    Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack
5    2.5" internal hard disk drive bay
6    135W 87% efficient external Power Adapter
7    HP USDT Tower Stand (sold separately)
8    HP Optical Mouse
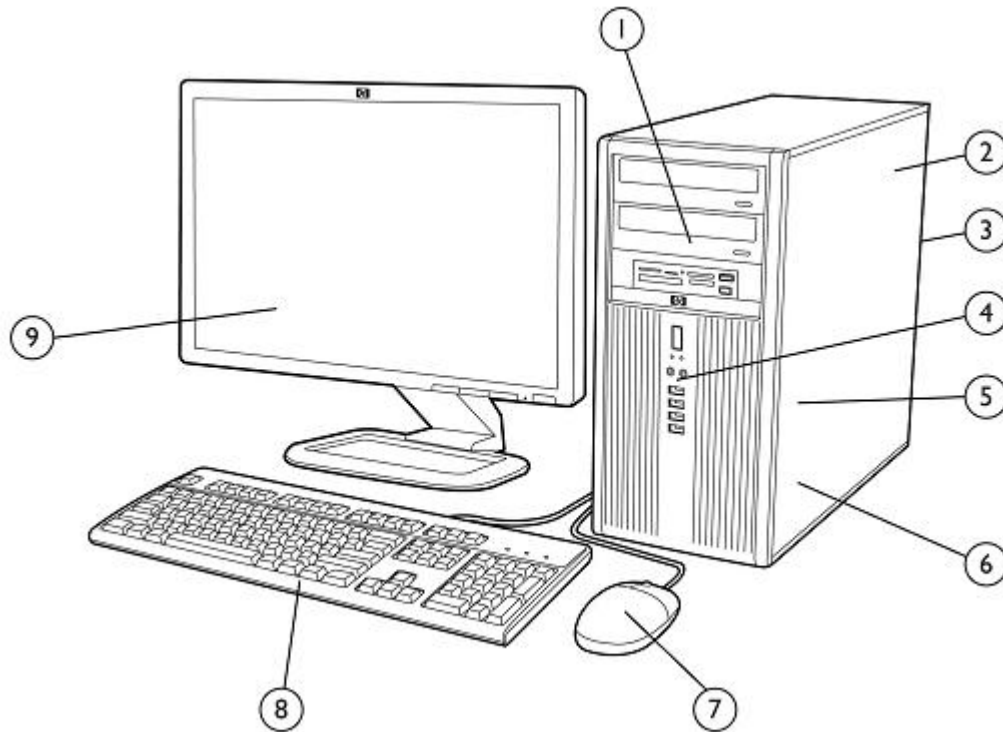9    HP Keyboard
10   HP Monitor (sold separately)

*Overview*

## HP Compaq 8000 Elite Small Form Factor Business PC
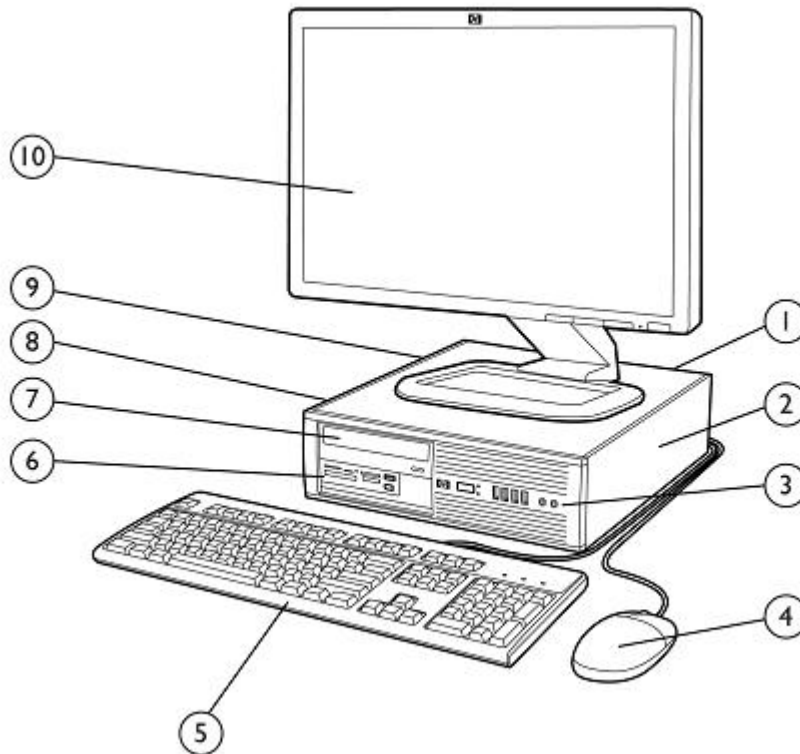


1   Rear I/O includes (6) USB 2.0 ports, serial port, PS/2 mouse and keyboard ports, RJ-45 network interface, DisplayPort and VGA video interfaces, and audio in/out jacks
2   Low profile expansion slots include (1) PCI slot, (2) PCI Express x1 slots and (1) PCI Express x16 graphics slot
3   Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack
4   HP Optical Mouse
5   HP Keyboard
6   3.5" external drive bay supporting a media card reader or a secondary hard disk drive
7   5.25" external drive bay supporting an optical disk drive
8   3.5" internal drive bay supporting primary hard disk drive
9   240W standard or 89% high efficiency Power Supply
10  HP Monitor (sold separately)

*Overview*

## HP Compaq 8000 Elite Convertible Minitower Business PC



1   (3) 5.25" external drive bays supporting optical disk drives, removable hard disk drives, or the HP Media Card Reader
2   320W standard or 89% high efficiency Power Supply
3   Rear I/O includes (6) USB 2.0 ports, serial port, PS/2 mouse and keyboard ports, RJ-45 network interface, DisplayPort and VGA video interfaces, and audio in/out jacks
4   Front I/O includes (4) USB 2.0 ports, dedicated headphone output, and a microphone/headphone jack
5   (3) 3.5" internal drive bays supporting multiple hard disk drives
6   Full height expansion slots include (3) full-length PCI slots, (1) PCI Express x1 slot, and (2) full-length PCI Express x16 graphics slots
    NOTE: Second PCIe x16 slot has x4 connectivity.
7   HP Optical Mouse
8   HP Keyboard
9   HP Monitor (sold separately)

# QuickSpecs

*Overview*

## At A Glance

- Designed for long-term deployment within corporate, enterprise, public sector and mid-market commercial organizations
- Choice of three professional chassis form factors to accommodate any desired mix between expandability and size
- BIOS developed and engineered by HP for better security, manageability and software image stability
- Intel® Q45 Express chipset featuring integrated GMA 4500 integrated graphics
- DDR3 Synchronous Dynamic Random Access Memory (SDRAM)
- Intel® Core™ 2 Processor with vPro™ Technology (requires select processors)
- Supports industry standard management protocols including Intel Standard Manageability and DASH 1.1 (via optional Broadcom NIC card)
- Integrated dual independent monitor support via both a VGA and DisplayPort video interface
- Standard efficiency or 89% high efficiency energy saving power supplies available on the CMT and SFF models
- 87% efficient energy saving external power adapter standard with USDT models
- ENERGY STAR qualified models available (dependent upon the desired configuration)
- CMT and SFF models can be configured with multiple hard disk drives in a RAID array
- Guaranteed lengthy purchase lifecycles and image stability
- Software image fully compatible across all models and form factors
- Created using industry leading Design for Environment standards
- Selected configurations with global availability easily set up and ordered through HP.com Business to Business portals (http://h10019.www1.hp.com/business-site/index.html)
- Tailored HP Factory Express deployment and lifecycle services available (http://h71028.www7.hp.com/enterprise/cache/97688-0-0-225-121.aspx)
- Protected by HP Services, including standard warranties up to 5-5-5 (terms and conditions vary by country; certain restrictions and exclusions apply)
- Tool-less serviceability features for easier upgrades and repairs

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

## Operating Systems

| | |
|---|---|
| Preinstalled | Genuine Windows 7 Home Basic Edition (32-bit)[2] |
| | Genuine Windows 7 Home Premium Edition (32-bit or 64-bit)[2] |
| | Genuine Windows 7 Professional Edition (32-bit or 64-bit)[2] |
| | FreeDOS |
| | |
| Supported | Genuine Windows Vista Enterprise Edition[1] |
| | Genuine Windows Vista Business (32-bit)[1] |
| | Genuine Windows Vista Home Basic[1] |
| | Genuine Windows 7 Enterprise Edition[2] |
| | Genuine Windows 7 Ultimate Edition[2] |
| | |
| Certified | Novell SUSE Linux Enterprise Desktop 11[†] |
| | Red Hat Enterprise Linux 64[††] |

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

[2] System may require upgraded and/or separately purchased hardware and/or a DVD drive to install the Windows 7 software and take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

[†] 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 Gigabit CT Desktop NIC
- Broadcom NetXtreme Gigabit Ethernet PCIe NIC Plus Card
- HP ADD2 SDVO PCIe DVI-D adapter
- 2nd serial port adapter (including low profile)
- Power Management features (US ENERGY STAR)

[††] The following features are not supported by Red Hat Enterprise Linux 64:

- HP 22-in-1 Media Card Reader with PCI Card
- Integrated 1.2 TPM Embedded Security Chip
- Intel Gigabit CT Desktop NIC
- Broadcom NetXtreme Gigabit Ethernet PCIe NIC Plus Card (DASH functionality)
- 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)

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

- SATA Blu-ray Writer
- Broadcom NetXtreme Gigabit Ethernet Plus (DASH 1.1) PCIe NIC Card
- ATI Radeon HD 4550 Dual Head PCIe x16 Graphics Card
- ATI Radeon HD 4650 (1 GB DH) PCIe x16 Graphics Card
- NVIDIA GeForce 310 DP PCIe x16 Graphics Card
- Nvidia Quadro NVS 290 Graphics Card
- NVIDIA Quadro NVS 295 (256MB DH) PCIe x16 Graphics Card

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

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

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

| | |
|---|---|
| Computer Setup Utility | HP Total Care Advisor |
| Antivirus software* | Microsoft Office 2010 preloaded (purchase of a Product |
| Roxio Creator Business | Key required to activate a full Office 2010 suite)** |
| HP Power Manager | Firefox HP Virtual Browser |
| | Corel WinDVD |

* May be Norton or McAfee antivirus software. First 60 days included. Subscription required for live updates thereafter. Internet access required.
** Microsoft Office 2010 Preloaded includes reduced functionality versions of Word and Excel. Purchase of Product Key required to activate full Office 2010 suite available at participating resellers/retailers and http://www.office.com.

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**HP Client Management Solutions** (available for free download from the Internet)

http://www.hp.com/go/easydeploy)

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

* Available from your HP Sales Representative or HP Channel Partner

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**Value Added Services and Features**

| | |
|---|---|
| HP Stable Platform Program | Factory Express Deployment and Lifecycle Services |
| Intel Stable Platform Program | Intel Standard Manageability |
| Business-to-Business Portals | Intel Core 2 Processor with vPro Technology |
| HP Global Series Services | Trusted Platform Module (TPM) v1.2* |

* TPM module disabled where restricted by law, i.e. Russia.

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**Service and Support**

On-site warranty and service[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[2] and includes free telephone support[3] 24 x 7. Global coverage[2] ensures any product purchased in one country and transferred to another non-restricted country will remain fully covered under the original warranty and service offering. Some countries/regions do not offer one year onsite and labor.

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

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

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

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

## Chipset

| | USDT | SFF | CMT |
|---|---|---|---|
| Intel Q45 Express with Intel GMA 4500 Graphics | X | X | X |

## Processor

| | USDT | SFF | CMT |
|---|---|---|---|
| **Intel Celeron Processors** | | | |
| Intel Celeron E3200 Processor<br>2.40 GHz, 1M L2 cache, 800 MHz FSB | X | X | X |
| Intel Celeron E3300 Processor<br>2.50 GHz, 1M L2 cache, 800 MHz FSB | X | X | X |
| Intel Celeron E3500 Processor<br>2.70 GHz, 1M L2 cache, 800 MHz FSB | X | X | X |
| **Intel Pentium Processors:** | | | |
| Intel Pentium E5300 Processor<br>2.60 GHz, 2M L2 cache, 800 MHz FSB | X | X | X |
| Intel Pentium E5400 Processor<br>2.70 GHz, 2M L2 cache, 800 MHz FSB | X | X | X |
| Intel Pentium E5700 Processor<br>3.00 GHz, 2M L2 cache, 800 MHz FSB | X | X | X |
| Intel Pentium E6300 Processor<br>2.80 GHz, 2M L2 cache, 1066 MHz FSB | X | X | X |
| Intel Pentium E6500 Processor<br>2.93 GHz, 2M L2 cache, 1066 MHz FSB | X | X | X |
| Intel Pentium E6800 Processor<br>3.33 GHz, 2M L2 cache, 1066 MHz FSB | X | X | X |
| **Intel Core 2 Duo Processors:** | | | |
| Intel Core 2 Duo E7500 Processor<br>2.93 GHz, 3M L2 cache, 1066 MHz FSB | X | X | X |
| Intel Core 2 Duo E7600 Processor<br>3.06 GHz, 3M L2 cache, 1066 MHz FSB | X | X | X |
| Intel Core 2 Duo E8400 Processor<br>3.0 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology | X | X | X |
| Intel Core 2 Duo E8500 Processor<br>3.16 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology | X | X | X |
| Intel Core 2 Duo E8600 Processor<br>3.33 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology | X | X | X |
| **Intel Core 2 Quad Processors:** | | | |

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

| | | | |
|---|---|---|---|
| Intel Core 2 Quad Q8400 Processor<br>2.66 GHz, 4M L2 cache, 1333 MHz FSB | | X | X |
| Intel Core 2 Quad Q8400s Processor (low power)<br>2.66 GHz, 4M L2 cache, 1333 MHz FSB | X | | |
| Intel Core 2 Quad Q9500 Processor<br>2.83 GHz, 6M L2 cache, 1333 MHz FSB | | X | X |
| Intel Core 2 Quad Q9505 Processor<br>2.83 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology | | X | X |
| Intel Core 2 Quad Q9505s Processor (low power)<br>2.83 GHz, 6M L2 cache, 1333 MHz FSB with vPro Technology | X | | |
| Intel Core 2 Quad Q9550 Processor<br>2.83 GHz, 12M L2 cache, 1333 MHz FSB with vPro Technology | | X | X |
| Intel Core 2 Quad Q9550s Processor (low power)<br>2.83 GHz, 12M L2 cache, 1333 MHz FSB with vPro Technology | X | | |
| Intel Core 2 Quad Q9650 Processor<br>3.0 GHz, 12M L2 cache, 1333 MHz FSB with vPro Technology | | X | X |

## Intel Core 2 Processor with vPro Technology

All HP Compaq 8000 Elite Series models featuring this technology include processors which are part of the Intel 2010 Stable Image Platform Program (SIPP) designed to ensure the stability promise inherent in the value proposition of the HP Compaq 8000 Elite Series Business PC, thus making these models the most stable, secure, and manageable platforms available to enterprises today

The 2010 SIPP processors are:

- Core 2 Duo E8400, E8500, E8600
- Core 2 Quad Q9505, Q9505s, Q9550, Q9550s, Q9650

Intel's Core 2 Processor with vPro Technology suite of features includes:

**Intel Advanced Management Technology (AMT) v5.0** – An advanced set of remote management features and functionality which provides network administrators the latest and most effective tools to remotely discover, heal, and protect networked client systems regardless of the system's health or power state. AMT 5.0 includes all features described as part of Intel Standard Manageability plus the following advanced management functions:

- Fast Call for Help – a client inside or outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection
- Remote Scheduled Maintenance – pre-schedule when the PC connects to the IT or service provider console for maintenance. Remote PCs can get required patches, be inventoried, etc by connecting to their IT console or Service Provider when it's convenient
- Remote Alerts – automatically alert IT or service provider if issues arise
- Access Monitor – Provides oversight into Intel® AMT actions to support security requirements

**Microsoft NAP Support** – Allows AMT 5.0 to gain access to a Microsoft NAP enabled 802.1x network OOB to enable OOB SW updates, inventories, remote diagnostics, etc. NAP is a new platform and solution that controls access to network resources based on a client computer's identity and compliance with corporate governance policy. NAP allows network administrators to define granular levels of network access based on who a client is, the groups to which the client belongs, and the degree to which that client is compliant with corporate governance policy. If a client is not compliant, NAP provides a mechanism to automatically bring the client back into compliance and then dynamically increase its level of network access.

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

When a client attempts to access the network or communicate on the network, it must present its system health state or proof of health compliance. If a client cannot prove it is compliant with system health requirements (for example, that it has the latest operating system and antivirus updates installed), its access to the network or communication on the network can be limited to a restricted network containing server resources so that health compliance issues can be remedied. After the updates are installed, the client requests access to the network or attempts the communication again. If compliant, the client is granted unlimited access to the network or the communication is allowed.

### Redundant Array of Independent Drives (RAID)

Flexible implementation:

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

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

- Are only available on the CMT and SFF form factors. The USDT does not support RAID as it does not allow for more than one hard disk drive.
- Are complete RAID systems and have both drives installed. If the CMT is configured with three hard disk drives, the third drive is would be unpartitioned and not part of the RAID array
- Have the necessary Option ROM configuration.
- Are pre-loaded and pre-installed with all required Intel software.
- Include a preinstalled operating system that is mirrored mode out of the box.

Please refer to the HP White Paper titled "Advanced Host Controller Interface (AHCI) and Redundant Array of Independent Disks (RAID) on HP Compaq 8000 Elite Series PCs" at: http://www.hp.com for more information and instructions.

### DDR3 Synchronous DRAM NON-ECC System Memory

Memory upgrades are accomplished by adding single or multiple DIMMs of the same or varied sizes. This chart does not represent all possible memory configurations. The HP Compaq 8000 Elite Series PC supports non-ECC DDR3 PC3-10600 (1333 MHz) and PC3-8500 (1066 MHz) memory.

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

### Memory Configurations: Ultra Slim Desktop

Maximum Memory*          Supports up to 8 GB of DDR3 SDRAM using SO-DIMM modules. Slot 1 is black and must always be populated. Not all memory configurations possible are represented below.

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

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

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

\* The Intel Q45 Express chipset includes a built-in Management Engine (ME), which allocates memory for manageability functions. Management Engine memory is shared with system memory. If the PC contains a single SO-DIMM, 16 MB of memory is pre-allocated for it at system startup. If the PC contains two SO-DIMMs, 32 MB of memory is pre-allocated. This memory is not made available to the operating system, just as pre-allocated video memory is not available.

## Memory Configurations: Small Form Factor and Convertible Minitower

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

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

NOTE:

The Q45 chipset Graphics Memory Controller Hub (GMCH) supports DDR3 memory technology up to a maximum of 1066 MHz. Therefore, systems configured with PC3-10600 (1333 MHz) memory DIMMs will operate at 1066 MHz.

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

NOTE: The Intel Q45 Express chipset includes a built-in Management Engine (ME), which allocates memory for manageability functions. Management Engine memory is shared with system memory. If the PC contains a single SO-DIMM, 16 MB of memory is pre-allocated for it at system startup. If the PC contains two SO-DIMMs, 32 MB of memory is pre-allocated. This memory is not made available to the operating system, just as pre-allocated video memory is not available.

# QuickSpecs

*Standard Features and Configurable Components (availability may vary by country)*
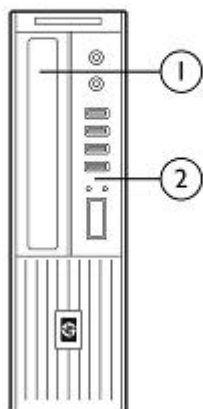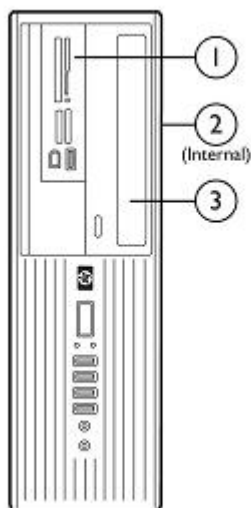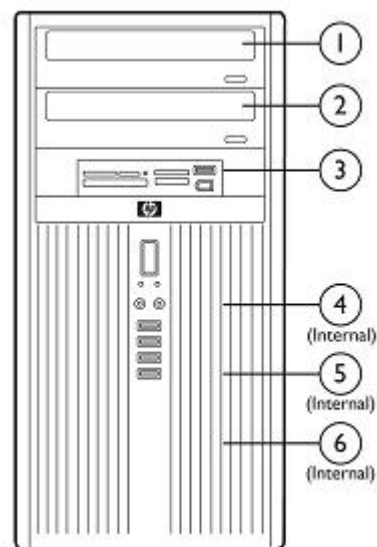
| Ultra-slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|

| Storage - Drive Support | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Ultra Slim Desktop | | | Small Form Factor | | | Convertible Minitower | | |
| | SDR | ODD | HDD | MCR | ODD | HDD | MCR | ODD | HDD |
| Quantity Supported | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 |
| Position | 1 | 2 | 3 | 1 | 3 | 2,1 | 3 | 1,2 | 4,5,6 |

| Data Storage Drives | USDT | SFF | CMT |
|---|---|---|---|
| **160-GB Hard Disk Drives** | | | |
| 160GB 2.5" Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | X | | |
| 160GB 3.5" Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |
| 160GB 2.5" Hard Disk Drive<br>10,000 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart III | | X | X |
| 160GB Removable Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |
| **250-GB Hard Disk Drives** | | | |
| 250GB 2.5" Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | X | | |
| 250GB 3.5" Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |
| 250GB Removable Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |

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

### 320-GB Hard Disk Drives

| | | | |
|---|:-:|:-:|:-:|
| 320GB 3.5" Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |
| 320-GB 2.5" Self Encrypting Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | X | X | X |
| 320GB Removable Hard Disk Drive<br>7,200 rpm, 8MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |

### 500-GB Hard Disk Drives

| | | | |
|---|:-:|:-:|:-:|
| 500GB 3.5" Hard Disk Drive<br>7,200 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |
| 500GB Removable Hard Disk Drive<br>7,200 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |

### 1-TB Hard Disk Drives

| | | | |
|---|:-:|:-:|:-:|
| 1 TB 3.5" Hard Disk Drive<br>7,200 rpm, 16MB cache, 3.0 GB/s, NCQ, Smart IV | | X | X |

### Solid State Drives

| | | | |
|---|:-:|:-:|:-:|
| 64GB 2.5" Solid State Drive | X | X | X |
| 80-GB 2.5" Solid State Drive | X | X | X |

### Optical Disc Drives

| | | | |
|---|:-:|:-:|:-:|
| DVD-ROM Drive[1] | | X | X |
| Slimline DVD-ROM Drive[1] | X | | |
| SuperMulti DVD Writer Drive[1,2,3] | | X | X |
| Slimline SuperMulti DVD Writer Drive[1,2,3] | X | | |
| Blu-Ray Writer Drive | | X | X |

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

### Media Card Readers

| | | | |
|---|:-:|:-:|:-:|
| Media Card Reader (22-in-1) | | X | X |
| Media Card Reader (22-in-1) with 1394 port | | X | X |
| Secure Digital (SD) HC Reader | X | | |

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

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

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

| Network Interface Connection | USDT | SFF | CMT |
|---|---|---|---|
| Intel 82567LM GbE Network Connection (integrated) | X | X | X |
| Intel Gigabit CT Desktop NIC Card | | X | X |
| Broadcom NetXtreme GbE Ethernet Plus NIC (PCIe x1) | | X | X |
| HP 802.11 b/g/n Wireless NIC (PCIe x1) | | X | X |
| Intel Wi-Fi Link 5100 a/b/g/n Wireless NIC (mini PCI) | X | | |

NOTE: These wireless network interface solutions will disable the vPro Technology features.

| Modem | USDT | SFF | CMT |
|---|---|---|---|
| LSI Hi-Speed 56K International Soft Modem (PCIe x1) | | X | X |

| Graphics | USDT | SFF | CMT |
|---|---|---|---|
| Intel Graphics Media Accelerator 4500 (integrated) | X | X | X |
| Nvidia GeForce 310 DP PCIe x16 Graphics Card | | X | X |
| Nvidia Quadro NVS 290 Graphics Card | | X | X |
| Nvidia Quadro NVS 295 Graphics Card | | X | X |
| NVIDIA NVS 300 PCIe x16 512MB Graphics Card | | X | X |
| NVIDIA NVS 300 PCIe x1 512MB Graphics Card | | X | X |
| ATI Radeon HD 4550 Graphics Card* | | X | X |
| ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card | | X | X |
| HP ADD2 SDVO + DVI-D Video Adapter | | X | X |

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

| | | | |
|---|---|---|---|
| HP DisplayPort to DVI-D Adapter | X | X | X |
| HP DisplayPort to VGA Adapter | X | X | X |
| HP DisplayPort to HDMI Adapter | X | X | X |
| HP DisplayPort Cable | X | X | X |

* When ordered with an Nvidia Quadro NVS 295 card, the PC is shipped with two DisplayPort to VGA Adapters. When an Nvidia Quadro NVS 295 card is purchased as an after-market option, it comes with two DisplayPort to DVI-D Adapters.

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

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

| Input Devices | USDT | SFF | CMT |
|---|---|---|---|
| PS/2 Standard Keyboard | X | X | X |
| USB Standard Keyboard | X | X | X |
| USB CCID SmartCard Keyboard | X | X | X |
| USB Mini Keyboard | X | X | X |
| USB and PS/2 Washable Keyboard | X | X | X |
| | | | |
| PS/2 Optical Scroll Mouse | X | X | X |
| USB Optical Scroll Mouse | X | X | X |
| USB Laser Scroll Mouse | X | X | X |
| USB and PS/2 Washable Mouse | X | X | X |

| Miscellaneous | USDT | SFF | CMT |
|---|---|---|---|
| FireWire (IEEE 1394) Card | | X | X |
| Serial Port Adapter (RS-232 compatible) | | X | X |
| Parallel Port Adapter | | X | X |
| eSATA Port Adapter | | X | X |

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

| | | | |
|---|---|---|---|
| PC Tower Stand | X | X | |
| Configure CMT in desktop orientation | | | X |
| Rear Port/Cable Control Cover | X | | |

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

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

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

| Graphics Solutions | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| ATI Radeon HD 4550 Graphics Card | | X | X | AT042AA |
| ATI Radeon HD 4650 DP (1GB) PCIe x16 Graphics Card | | | X | VN566AA |
| Nvidia Quadro NVS 290 PCIe x16 Graphics Card | | X | X | KG748AA |
| Nvidia Quadro NVS 290 PCIe x1 Graphics Card | | X | | KN586AA |
| Nvidia Quadro NVS 295 Graphics Card | | X | X | FY943AA |
| NVIDIA NVS 300 PCIe x16 512MB Graphics Card | | X | X | BV456AA |
| NVIDIA NVS 300 PCIe x1 512MB Graphics Card | | X | X | BV457AA |
| Nvidia GeForce 310 DP PCIe x16 Graphics Card | | X | X | VG885AA |
| HP ADD2 SDVO + DVI-D Video Adapter | | X | X | DY674A |

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

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

| Hard Disk Storage Drives | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| HP 160GB SATA NCQ SMART IV Hard Disk Drive | | X | X | PY277AT |
| HP 250GB SATA NCQ SMART IV Hard Disk Drive | | X | X | PY278AA |
| HP 320GB SATA NCQ SMART IV Hard Disk Drive | | X | X | FH963AA |
| HP 500GB SATA NCQ SMART IV Hard Disk Drive | | X | X | KW347AA |
| | | | | |
| HP 64-GB Solid State Drive | X | X | X | VG679AA |
| HP 80-GB Solid State Drive | X | X | X | BM848AA |
| | | | | |
| HP eSATA Adapter | | X | X | FH966AA |
| HP Removable SATA Hard Drive Enclosure (frame & carrier) | | X | X | RY102AA |
| HP Removable SATA Hard Drive Enclosure (Carrier Only) | | X | X | RY103AA |

| Input Devices | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| HP PS/2 Standard Keyboard | X | X | X | DT527A |
| HP USB Standard Keyboard | X | X | X | DT528A |
| HP USB Mini Keyboard | X | X | X | AS601AA |
| HP USB Gray Keyboard | X | X | X | DT529A |
| HP USB SmartCard Keyboard | X | X | X | ED707AA |
| HP USB Keyboard and Mouse Kit | X | X | X | RC465AA |
| | | | | |
| HP USB Washable Keyboard | X | X | X | VF097AA |
| HP USB and PS/2 Washable Mouse | X | X | X | BM866AA |
| HP USB and PS/2 Washable Keyboard and Mouse Kit | X | X | X | BU207AA |
| | | | | |
| HP PS/2 Optical Scroll Mouse | X | X | X | EY703AA |
| HP USB Optical Scroll Mouse | X | X | X | DC172AT |
| HP USB Laser Mouse | X | X | X | GW405AT |
| HP USB Travel Mouse | X | X | X | RH304AA |
| | | | | |
| HP 2.4GHz Wireless Keyboard and Mouse | X | X | X | NB896AA |

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

| System Memory | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| 1 GB DIMM | | X | X | AT023AA |
| 2 GB DIMM | | X | X | AT024AA |
| 4 GB DIMM | | X | X | VH638AA |
| 1 GB SO-DIMM | X | | | VH639AA |
| 2 GB SO-DIMM | X | | | VH640AT |
| 4 GB SO-DIMM | X | | | VH641AT |

| Multimedia Devices | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| HP Thin USB Powered Speakers | X | X | X | KK912AA |

| | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| DVD-ROM Drive | | X | X | AR629AA |
| SuperMulti Drive | | X | X | AR630AA |
| Blu-Ray Writer Drive | | X | X | AR482AA |
| DVD-ROM Drive (Slimline | X | | | VP033AA |
| SuperMulti Drive (Slimline) | X | | | VP034AA |

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

| Security Devices | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| HP/Kensington MicroSaver Cable Lock | X | X | X | PC766A |
| HP Business PC Security Lock | X | X | X | PV606AA |
| HP USDT Rear Port Controller Cover | X | | | VN571AA |
| HP SFF Solenoid Lock and Hood Sensor | | X | | BP428AA |
| HP CMT Solenoid Lock and Hood Sensor | | | X | DE618A |
| HP SFF Wall Mount/Security Sleeve | | X | | VN570AA |

| HP Client Automation Software | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| HP Client Automation – Standard Edition (single seat) | X | X | X | T3488AA |
| HP Client Automation – Standard Edition (10 seats) | X | X | X | TA599AA |
| HP Client Automation – Standard Edition (100 seats) | X | X | X | TA600AA |
| HP Client Automation – Standard Edition (500 seats) | X | X | X | TA601AA |
| HP Client Automation – Standard Edition (1,000 seats) | X | X | X | T3489AA |

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

## Stands and Accessories

| | USDT | SFF | CMT | Part Number |
|---|---|---|---|---|
| HP Integrated Work Center Stand | X | | | GN783AA |
| HP USDT Tower Stand | X | | | VN568AA |
| HP SFF Tower Stand | | X | | VN569AA |
| HP Integrated Work Center – Small Form Factor | | X | | QK549AA |
| HP Serial Port Adapter (RS-232 compatible) | | X | X | PA716A |
| HP Parallel Port Adapter | | X | X | KD061AA |
| HP 5.25" Blank Bezel Kit (50 pack) | | X | X | DC177B |
| HP FireWire (IEEE 1394) Card | | X | X | PA997A |

*Technical Specifications*

| Weights and Dimensions (configured with 1 HDD and 1 ODD) | Ultra-slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|---|
| Chassis (H x W x D) | 2.6 x 9.9 x 10 in 66 x 251.5 x 254 mm | 3.95 x 13.30 x 14.9 in 100 x 338 x 378.5 mm | 17.63 x 7.00 x 17.5 in 447.8 x 177.8 x 444.5 mm |
| System Volume | 257.5 cu in 4.22 L | 782.77 cu in 12.8 L | 2160 cu in 35.4 L |
| Tower Stand (H x W x D) | 1.07 x 4.92 x 6.69 in 27.2 x 124.9 x 169.9 mm | 1.12 x 7.01 x 7.87 in 28.5 x 178 x 200 mm | N/A |
| Packaging (H x W x D) | 8.60 x 15.68 x 19.68 in 218.4 x 398.3 x 499.9 mm | 9.00 x 19.68 x 23.38 in 228.6 x 499.9 x 593.85 mm | 22.64 x 12.72 x 24.41 in 575.0 x 323 x 620 mm |
| System Weight | 6.75 lb 3.07 kg | 16.72 lb 7.6 kg | 24.54 lb 11.15 kg |
| Shipping Weight | 14.42 lb 6.54 kg | 17.86 lb 8.1 kg | 34.0 lb 15.42 kg |
| Max Supported Weight (desktop orientation) | 77 lb 35 kg | 77 lb 35 kg | 77 lb 35 kg |

| I/O Ports | Ultra-slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|---|
| USB 2.0 | Front – four (4) ports Rear – six (6) ports | | |
| Serial | N/A | one RS-232 compatible port standard second port available optionally | |
| Parallel | N/A | one port available as an option | |
| eSATA | N/A | one port available as an option | |
| PS/2 | color coded support for keyboard (purple) and mouse (green) | | |
| Video | VGA and DisplayPort provide integrated dual independent monitor support | | |
| DVI output | available via optional DisplayPort to DVI Adapter | | |
| Audio | Front – microphone & headphone Rear – line input (supports microphone or line input), line out Note: See Audio/Visual section for information on re-taskable audio ports | | |
| NIC | Industry standard RJ-45 port accesses the integrated network interface controller | | |

| Slots | Ultra-slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|---|
| Type and quantity | (1) mini PCI Express | (1) PCI (2) PCI Express x1 (1) PCI Express x16 | (3) PCI (1) PCI Express x1 (half-length) (2) PCI Express x16 |
| Slot specifications | | Low profile – 2.5" Length: 6.6" 25W maximum | Full height – 4.2" Primary x16 slot supports 75W or 35W card Secondary x16 slot supports 35W card |

*Technical Specifications*

| | | | |
|---|---|---|---|
| | | | Secondary slot functions electrically as a x4 slot |
| PCI | N/A | (1) | (3) 25W max. power |
| PCI Express x16 | N/A | (1) | (2) 75W max. power (primary) 35W max. power (secondary) |
| PCI Express x1 | N/A | (2) 10W max. power | (1) 10W max. power |

| Bays | Ultra-slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|---|
| 3.5" external | N/A | 1 bay available for Media Card Reader unless used for a secondary hard drive | N/A |
| 5.25" external | N/A | 1 bay – 8.19" depth | 3 bays Top two bays accept drives up to 8.19" depth Bottom bay accepts drives up to 5.7" depth |
| Slimline | 1 bay for ODD | N/A | N/A |
| Secure Digital (SD) Reader | SD Reader or blank | N/A | N/A |
| Internal Drive Bays | 1 bay for 2.5" drive | 1 bay for 3.5" drive | 3 bays for 3.5" drives |

| Controller | Ultra-slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|---|
| Hard Drive Controller | Serial ATA Supports SATA 1.5-GB/s and 3.0-GB/s | | |
| SATA Interfaces | (1) Total | (4) Total: (3) common SATA (1) eSATA | (5) Total: (4) common SATA (1) eSATA |
| Host SATA Controller | Advanced Host Controller Interface (AHCI) Revision 1.2. The specification includes a description of the hardware/software interface between system software and the host controller hardware. | | |

*Technical Specifications*

## Unit Environment and Operating Conditions

General Unit Operating Guidelines

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

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

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

| Power Supply | Ultra Slim Desktop | Small Form Factor | Convertible Minitower |
|---|---|---|---|
| Standard Efficiency | N/A | 240W active PFC | 320W active PFC |
| High Efficiency* | 135W active PFC <br> 87% efficient | 240W active PFC <br> 87/89/85% efficient at <br> 20/50/100% load | 320W active PFC <br> 87/89/85% efficient at <br> 20/50/100% load |
| Operating Voltage Range | 90 – 264 VAC | 90 – 264 VAC | 90 – 264 VAC |
| Rated Voltage Range | 100 – 240 VAC | 100 – 240 VAC | 100 – 240 VAC |
| Rated Line Frequency | 50/60 Hz | 50/60 Hz | 50/60 Hz |
| Operating Line Frequency Range | 47 – 63 Hz | 47 – 63 Hz | 47 – 63 Hz |
| Rated Input Current | N/A | 4A | 5.5A |
| Rated Input Current with Energy Efficient* Power Supply | 2.4A | 4A | 5.5A |
| Current Leakage (NFPA 99) | $< 250 \mu A$ | $< 275 \mu A$ | $< 450 \mu A$ |
| Power Supply Fan | N/A | 92mm variable speed | 92mm variable speed |
| Power Cord Length | N/A | 6 ft (1.83 m) | 6 ft (1.83 m) |
| External Power Adapter | | | |
| Dimensions | 6.7 x 2.6 x 1.5 in | N/A | N/A |
| Total Cord Length | 12 ft 8 in | N/A | N/A |

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

*Technical Specifications*

| ROM BIOS Information |
|---|

Key features of the HP BIOS include:

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

Additional HP BIOS Features

- Power-On password – Helps prevent an unauthorized user from powering on the system.
- Administrator password – Also known as the setup password, this helps prevent unauthorized changes to the system configuration. If the administrator password is not known, the BIOS version cannot be changed and changes cannot be made to BIOS settings using F10 setup or under the OS.
- Advanced Configuration and Power Interface (ACPI) – Represents a significant innovation in power and configuration management, allowing operating systems and applications to manage power based on activity and usage. HP Elite models use ACPI to provide power conservation features.
- S5 Max Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 1W is S5 (when turned off). When S5 Max Power Savings feature is enabled power to slots is turned off along with WOL functionality.

| Other Features |
|---|

- Advanced Configuration and Power Management Interface (ACPI). Allows the system to wake from a low power mode. Controls system power consumption, making it possible to place individual cards and peripherals in a low-power or powered-off state without affecting other elements of the system.
- System Management BIOS v2.6
- Intel Wired for Management support; industry wide initiative to make Intel architecture based PCs, servers and mobile computers more inherently manageable out-of-the-box and over the network
- Dual State Power Button; acts as both an on/off button and a suspend-to-sleep button

*Technical Specifications*

| Serviceability Features |
| --- |
| • Dual colored power LED on front of computer to indicate either normal or fault condition<br>• Diagnostic LED Explanation Table:<br>    ○ Number of 1-second red LED blinks followed by a 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 recovery mode<br>        ■ 9 – system not fetching code<br>        ■ 10 – system hang while loading an option ROM<br>• System/Emergency ROM<br>• Flash ROM<br>• CMOS Battery Holder for easy replacement<br>• Flash Recovery with Video Configuration Record Software<br>• 5 Aux Power LED on System PCA<br>• Processor ZIF Socket for easy Upgrade<br>• Over-Temp Warning on Screen (Requires IM Agents)<br>• Clear Password Jumper<br>• DIMM Connectors for easy Upgrade<br>• Clear CMOS Button<br>• NIC LEDs (integrated) (Green & Amber)<br>• Dual Color Power and HD LED – To Indicate Normal Operations and Fault Conditions<br>• Color coordinated cables and connectors<br>• Tool-less Hood Removal<br>• Front power switch<br>• System memory can be upgraded without removing the system board or any internal components<br>• Tool-less Hard Drive, CD & Diskette Removal<br>• Green Pull Tabs, and Quick Release Latches for easy Identification<br>    Note:<br>    thumb screw release mechanism is used with the Ultra-slim Desktop chassis cover. |

| Additional Features | Description |
| --- | --- |
| Intel® Standard Manageability* | • Requires the utilization of the integrated network connection<br>• Available with selected processors not part of the Intel Stable Intel Platform Program (SIPP)<br>• Intel Advanced Management Technology (AMT) v3.2<br>• Basic PC management capabilities such as asset inventory, HW alerting, SOL/IDE-R, remote configuration, agent presence and system defense.<br>• DASH 1.1 compliance. Support for profile updates.<br>• Host VPN support for local management VPN tunneling |
| * 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 http://www.intel.com/technology/platform-technology/intel-amt/. | |
| Intel Core 2 Processor with vPro Technology | • Requires the utilization of the integrated network connection<br>• Available with selected processors which are part of the Intel Stable Intel Platform |

*Technical Specifications*

|  |  |
|---|---|
|  | Program (SIPP)<br>● Intel Advanced Management Technology (AMT) v5.0<br>● Intel Standard Manageability technologies (see above for a list of features)<br>● Fast Call for Help – client outside the firewall may initiate a call for help via BIOS screen, periodic connections, or alert triggered connection<br>● Audit Logs – policy based log of AMT actions to deter rogue administrator actions<br>● Microsoft NAP Support – allows AMT to gain access to a Microsoft NAP enabled 802.1x network OOB to enable OOB SW updates, inventories, remote diagnostics, etc.<br>● Remote Scheduled Maintenance – Pre-schedule when the PC connects to the IT or service provider console for maintenance<br>● Remote Alerts – automatically alert IT or service provider if issues arise<br>● Access Monitor – Provides oversight to support security requirements |
| 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 |
| TXT (Trusted Execution Technology) and VT-d (Virtualized devices) | TXT allows for secure management (via TPM) and measured launch of VMM, as well as teardown of secrets in unexpected reset case. TXT support provided in select Intel processors<br><br>VT-d is a chipset technology that virtualizes directed I/O<br><br>Together, TXT and VT-d may be used to support verified launch of a known trusted VMM that also may protect VMs from accessing each other's memory. |
| Computrace | Computrace agent support standard |
| Towerable Orientation | Product can be oriented as either a desktop or a tower |
| Drive Lock | Implementation of the industry standard ATA Security feature set. When enabled, it prevents software access to user data on the drive until one or two user-defined passwords are provided. |
| Drive Protection System | DPS Access through F10 Setup during Boot |
|  | 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 |
|  | 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. |
|  | The system expands on the Self-Monitoring, Analysis, and Reporting Technology (SMART), a continuously running systems diagnostic that alerts the user to certain types of failures. |
| SMART Technology (Self-Monitoring, Analysis and Reporting Technology) | Allows hard drives to monitor their own health and to raise flags if imminent failures were predicted |
| SMART I – Drive Failure Prediction | Predicts failures before they occur. Tracks fault prediction and failure indication parameters such as re-allocated sector count, spin retry count, calibration retry count |
| SMART II – Off-Line Data Collection | By avoiding actual hard drive failures, SMART hard drives act as "insurance" against unplanned user downtime and potential data loss from hard drive failure |
| SMART III – Off-Line Read Scanning with Defect Reallocation | IOEDC: I/O Error Detection Circuitry |

*Technical Specifications*

| SMART IV – End-to-End CRC for hard drives | Detects errors in Read/Write buffers on HDD cache RAM |
|---|---|
| | Interface in F10 setup provides confirmation of SMART IV support. |

*Technical Specifications - Audio*

## High Definition Audio

| | |
|---|---|
| Type | Integrated |
| HD Stereo Codec | Realtek 4-channel ALC261 codec |
| | Front microphone-In (150-K ohm Input Impedance |
| | Rear Line-In/Microphone input (150-K ohm Input Impedance, function is configurable by audio driver) |
| Audio I/O Ports | Rear Line-Out* (190 ohms Output Impedance, expects at least a 10-K ohm load) |
| | Front Headphone-Out (0.5 Ohm Output Impedance, expects at least a 32 ohm load) Front Microphone/Headphone jack is re-task able to provide Microphone input, line-in or Headphone output to support connecting two headphones to the front of the system. When configured as a second front headphone output, both front headphone outputs are always driven with the same signal. |
| Internal Speaker Amplifier | For the internal speaker only. External speakers must be powered externally. Rear Line-in audio port is re-taskable as either Line-in or Microphone-In. |
| Multistreaming Capable | Multi-streaming 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 |
| # of Channels on Line-Out (mono/stereo) | Stereo (Left & Right channels) |
| Internal Audio Speaker Power Rating | 1.5 W |
| Internal Speaker | Yes |
| External Speaker Jack (Line-Out) | Yes |

Note:
The audio ports/jacks provided by all of our systems are 3.5mm in diameter. This would include both the front jacks and rear jacks, for audio in/out, mic in and headphone out.

# QuickSpecs

*Technical Specifications - Audio*

## HP Thin USB Powered Speakers

| | |
|---|---|
| On/Off/Volume Controls | Right side of right speaker |
| Power LED | Front of right speaker (green) |
| Frequency Response | FO to 20kHz |
| Watts | 2/3 watt (normal/maximum) |
| Dimensions/Speaker (H x W x D) | 5.72 x 3.74 x 0.96 in<br>14.52 x 9.50 x 2.45 cm |
| Net Weight | 0.68 lbs<br>0.31 kg |
| Color | Black |

| | | |
|---|---|---|
| Environmental (all conditions non-condensing) | Operating Temperature: | 14° to 104° F<br>−10° to 40° C |
| | Relative Humidity | 40% to 90% |
| Speaker Cable Length | Input Cord: | 5.91 ft<br>1800mm |
| | L-channel Cord: | 3.28 ft<br>1000mm |
| | USB Cord: | 5.91 ft<br>1800mm |

*Technical Specifications - Communications*

## Intel 82578 GbE Network Connection (integrated)

| | |
|---|---|
| Connector | RJ-45 |
| Controller | Intel 82578 Gigabit platform LAN Connect Networking Controller |
| Memory | 24 KB FIFO packet buffer memory |
| Data rates supported | 10/100/1000 Mbps |
| Compliance | IEEE 802.1P, 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 | PCIe-like interface for 1000 speed, SMBus interface for lower 10/100 speeds. |
| Data rates supported | 10/100/1000 Mbps |
| Compliance | IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3 ab and 802.3u compliant |
| Data transfer mode | At gigabit GLCI (Intel proprietary 802.3 series-based interface) is for Data, LCI (parallel bus) for MDIO, at 10/100 LCI for both data and MDIO, GLCI is idle. |
| Hardware certifications | FCC B, CE, TUV- cTUVus Mark Canada and United States, TUV- GS Mark for European Union |
| Power requirement | Requires 3.3V & 1.2V. Power consumption 761 Milliwatts |
| ACBS | Intel Auto Connect Battery Saving feature |
| Boot ROM support | Yes |
| Network transfer mode | Full-duplex Half-duplex (not supported for the 1000BASE-T transceiver) |
| Network transfer rate | 10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps |
| Operating temperature | 0° to 85° C |
| Management | WOL, auto MDI crossover, PXE, Muti-port teaming, RSS, Advanced cable diagnostic. |
| Alerting | ASF 2.0 support, AMT 3.0 support |

# QuickSpecs

*Technical Specifications - Communications*

## Broadcom NetXtreme GbE Ethernet Plus Network Interface Controller

| | |
|---|---|
| Connector | RJ-45 |
| Controller | Broadcom 5761 PCI-Express LAN Controller |
| Memory | 8 MB NVRAM serial Flash |
| Data rates supported | 10/100/1000 Mbps |
| Compliance | IEEE 802.1P, 802.1Q, 802.2, 802.3, 802.3AB, 802.3u, and 802.3x |
| Bus architecture | PCI-Express |
| Data path width | Single Channel PCI-Express |
| Data transfer mode | Bus Master DMA |
| Hardware certifications | FCC class B, Canada and US NRTL Mark, C-Tick for Australia, BSMI for Taiwan, VCCI for Japan, MIC for Korea, GOST for Russia, UL listed (E212044), European Union Notice (CE 0682) |
| Power requirement | 1.8W @ 3.3V |
| Boot ROM support | Yes |
| Network transfer mode | Full-duplex |
| | Half-duplex (not available for the 1000BASE-T transceiver) |
| Network transfer rate | 10BASE-T (half-duplex) 10 Mbps |
| | 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) |
| | Operating humidity 131° F (55° C) with 5% to 95% non-condensing humidity |
| Dimensions | 2.75 in x 4.13 in (7 cm x 10.5 cm), low profile compatible |
| Operating system driver support | Windows Vista 32-bit SP1, Windows Vista x64 SP1, Windows XP 32 bit professional |
| Management capabilities | ACPI, WOL and DMI 2.0, PXE 2.0, WfM 2.0, Broadcom mgmt utility, ASF2.0, DASH 1.0 and DASH 1.1 profiles |

*Technical Specifications - Communications*

## Intel GbE CT Desktop Network Interface Connection

| | |
|---|---|
| Connector | RJ-45 |
| Controller | Intel 82574L 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 |
| 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 (actual rate limited by PCI Bus) |
| Environmental | Operating temperature 32° to 131°F (0° to 55° C) |
| | 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) |
| Management | WOL, PXE, DMI, WFM 2.0 |

## HP Wireless Network Connection 802.11 b/g/n

| | |
|---|---|
| Dimensions (L x H) | 3.3 x 4.7 in<br>8.5 x 12 cm |
| Weight | 0.08 lbs<br>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% |

| 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 |

# QuickSpecs

*Technical Specifications - Communications*

| Power consumption | 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 mode | +19 dBm +/- 1.0 dB maximum |
| | 802.11g mode | +17 dBm +/- 1.0 dB maximum |
| | EWC mode | +17 dBm +/- 1.0 dB maximum (total power in all transmit chains) |

| | 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 |
| Receive sensitivity | 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 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 |
| Data transfer rate | 39 Mbps (20 MHz EWC) | 27 Mbps |

*Technical Specifications - Communications*

| | |
|---|---|
| 52 Mbps (20 MHz EWC) | 36 Mbps |
| 58.5 Mbps (20 MHz EWC) | 40 Mbps |
| 65 Mbps (20 MHz EWC) | 45 Mbps |
| 78 Mbps (20 MHz EWC) | 54 Mbps |
| 104 Mbps (20 MHz EWC) | 72 Mbps |
| 117 Mbps (20 MHz EWC) | 81 Mbps |
| 130 Mbps (20 MHz EWC) | 91 Mbps |
| 13.5 Mbps (40 MHz EWC) | 8 Mbps |
| 27 Mbps (40 MHz EWC) | 16 Mbps |
| 40.5 Mbps (40 MHz EWC) | 24 Mbps |
| 54 Mbps (40 MHz EWC) | 32 Mbps |
| 81 Mbps (40 MHz EWC) | 48 Mbps |
| 108 Mbps (40 MHz EWC) | 64 Mbps |
| 121.5 Mbps (40 MHz EWC) | 72 Mbps |
| 135 Mbps (40 MHz EWC) | 81 Mbps |

| | |
|---|---|
| | IEEE and WiFi compliant 64 / 128 bit WEP encryption |
| | AES: CCM |
| | 802.1x authentication |
| Security | WPA: 802.1x. WPA-PSK and TKIP |
| | WPA2 certification |
| | IEEE 802.11i |
| | Cisco Certified Extensions, all versions through V5 |
| Antenna | HP part number 497792-001 |
| Certifications | Wi-Fi certified |
| Certifications for use by country | United States, Canada, Peru, Taiwan |

## Intel WiFi Link 5100 a/b/g/n Wireless Network Interface Connection (USDT)

| | |
|---|---|
| | IEEE 802.11a |
| | IEEE 802.11b |
| | IEEE 802.11g |
| Wireless LAN Standards | IEEE 802.11n |
| | Note:<br>The specifications for 802.11n draft 2.0 are draft specifications and are not final. If the final specifications differ from the draft specifications, it may affect the ability of the notebook to communicate with other 802.11n WLAN devices. In countries where n draft 2.0 is not allowed, this capability is not enabled. |
| | Wi-Fi certified (802.11a/b/g only) |
| Interoperability | Cisco Compatible Extensions Program compliant (802.11a/b/g only) with Microsoft Windows Vista and XP |
| | Tested with wireless access points from several major manufacturers |
| Frequency Band | 2.4 GHz and 5 GHz |
| Antenna Structure | 1 transmit; 2 receive (1x2) |

## Technical Specifications - Communications

| | |
|---|---|
| Data Rates | 802.11b: 1, 2, 5.5, 11 Mbps |
| | 802.11a/g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps |
| | 802.11n (draft): 66 possible data rates, ranging from 6 Mbps to 300 Mbps, depending on the combination of Bandwidth, Modulation Coding Scheme, and Guard Interval used, as defined in IEEE 802.11n (draft) specification |
| Modulation | Direct Sequence Spread Spectrum<br>DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM |
| Security | Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES (support for key sizes of 128, 192, and 256 bits), 802.1x authentication types EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, LEAP, EAP-FAST |
| | Support for Cisco Security Features (proven compatibility with Cisco Aironet infrastructure products through the Cisco Compatible Extensions Program Version 4) with Microsoft Windows Vista and XP only. |
| Sub-channels | Multinational support with frequency bands and channels compliant to local regulations. |
| Media Access Protocol | CSMA/CA (Collision Avoidance) with ACK |
| Network Architecture Models | Ad-hoc (Peer to Peer)<br>Infrastructure (Access Point Required) |
| Roaming | IEEE 802.11 compliant roaming between access points |
| Output Power (for CCK) | 15 dBm |
| Output Power (for OFDM; power varies by data rate) | 15 dBm |
| Power Consumption | Transmit: 2.3 Watts (average, with one spatial streams) |
| | Receive: 1.9 Watts (average with two receive chains |
| | Idle mode: 30 mW (average) |
| | Radio off: 20 mW (max) |
| Power Management | ACPI compliant power management<br>802.11 compliant power saving mode |
| Receiver Sensitivity[4] | 300 Mbps: -68 dBm, 54 Mbps: -74 dBm, 6 Mbps: -90 dBm |
| Antenna Connections | 3 U.FL type connectors, 50 ohm nominal impedance |
| Range | 802.11 a - Typical (@6 Mbps) — 600 feet - Outdoor Open Area / 150 feet - Indoor, Office environment |
| | 802.11 b - Typical (@1 Mbps) — 1200 feet - Outdoor Open Area / 300 feet - Indoor, Office environment |
| | 802.11 g - Typical (@1 Mbps) — 1200 feet - Outdoor Open Area / 300 feet - Indoor, Office environment |
| Form Factor | PCI-Express MiniCard |
| Weight | 0.013 lb (6 g) |
| Dimensions | 0.19 x 1.2 x 2.0 in (4.75 x 29.85 x 50.8 mm) |
| Operating Voltage | 3.3V +/- 9%, 1.5V +/- 5% |
| Temperature | Operating: 32° to 176° F (0° to 80° C)<br>Non-operating: -40° to 176° F (-40° to 80° C) |
| Humidity | Operating: 10% to 90% (non-condensing)<br>Non-operating: 5% to 90% (non-condensing) |

*Technical Specifications - Communications*

| | |
|---|---|
| Altitude | Operating: 0 to 10,000 ft (3,048 m)<br>Non-operating: 0 to 50,000 ft (15,240 m) |

| | **Microsoft Windows XP** | **Microsoft Windows Vista** |
|---|---|---|
| Configuration Utility[5] | • Microsoft Windows XP Wireless Network Connection Manager<br>• Intel PROSet for Microsoft Windows XP (required for Cisco Compatible Extensions support) | • Microsoft Windows Vista Wireless Network Connection Manager.<br>• Intel IHV extensions for Windows Vista available to support Cisco Compatible Extensions. |

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. In Power Save Polling mode and on battery power.
4. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).
5. WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista.

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## LSI 56K International SoftModem PCI Express x1 Card

| | |
|---|---|
| Data Transmission | Technology speeds: 56,000 Kbps maximum downstream data, controllerless |
| | Note:<br>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/<br>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/ |
| 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 |
| | TIA/EIA 602 standard AT command set |
| Other | Integrated DTE interface with speeds of up to 115.2 Kbps, parallel 16550a UART-compatible interface |
| | 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 |
| | Uses only one PCI express load (i.e., one grant/request pair), one shared IRQ, one electrical load |
| Chipset | LSI SV92EX - Integrated PCI interface with 3.3-V tolerant buffers and CardBus support |

## Technical Specifications - Communications

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

*Technical Specifications - Graphics*

## Intel Graphics Media Accelerator (GMA) 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.

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 |
| | 2.0GB & more | 32 | 1024 |

Assumes Management Engine, VT-d enabled and other memory allocated for other BIOS usage

| | System Memory | PVAP | Avail System Memory (MB) | Total Avail GFX Memory (MB) | Dedicated Video Memory (MB) | System Video Memory (MB) | Shared System Memory (MB) |
|---|---|---|---|---|---|---|---|
| | 1 GB | Lite | 952 | 252 | 32 | 96 | 124 |
| | | Heavy | 856 | 294 | 122 | 6 | 166 |
| | 2 GB | Lite | 1976 | 764 | 32 | 96 | 636 |
| | | Heavy | 1880 | 806 | 122 | 6 | 678 |
| Windows Vista Memory Usage | 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 |

| | |
|---|---|
| HW Video Decode | Hardware Accelerated decode for MPEG2 encrypted video; support for PAVP Lite (default) and Heavy ( or Paranoid) modes |
| Maximum Color Depth | 32 bits/pixel |
| Maximum Vertical Refresh Rate | 85 Hz at up to 1920x1440, 75 Hz at 2048x1536. Varies with mode and configuration. See table below. |
| Multi-display Support | Integrated dual independent monitor support facilitated via one VGA port and one DisplayPort integrated on the back plane of the system board and presented as part of the rear I/O set of interfaces. DVI supported via optional HP DisplayPort to DVI-D adapter. |
| Graphics/Video API Support | Microsoft DirectX® 10, OpenGL® 1.5 (OpenGL® 2.0 available in a driver update) |

Maximum Refresh Rate (Hz)

*Technical Specifications - Graphics*

**Resolutions Supported**

| 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:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

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 Graphics Card

| | | |
|---|---|---|
| **Bus Type** | PCI Express x16; low profile | PCI Express x1, low profile |
| **Memory** | 256 MB 400MHz DDR2 SDRAM unified frame buffer, Z-buffer and Texture storage | |
| **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 monitor support | |
| **RAMDAC** | Integrated dual 400MHz | |
| **Maximum Pixel Clock** | 350-MHz | |
| **Overlay planes** | One 16-bit video overlay plane | One 1-bit video overlay plan |
| **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 | |

| | Specification | Description |
|---|---|---|
| **Board Configuration** | Description | G86-825 |
| | Core Clock | 460-MHz |
| | Memory Clock | 400-MHz |
| | Frame Buffer | 256-MB DDR2, 64-bit wide |

*Technical Specifications - Graphics*

| | |
|---|---|
| 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><br>NVIEW advanced multi-display desktop and application management seamlessly integrated into Microsoft Windows |
| Color planes | 32-bit color buffer |
| DVI support | DMS-59 (to dual DVI-SL) |
| Supported graphics APIs | OGL 2.1 & DX10 Support; Shader Model 4.0 |

| Resolutions Supported | Resolution | Maximum Refresh Rate | |
|---|---|---|---|
| | | 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:
Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP

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

*Technical Specifications - Graphics*

## NVIDIA Quadro NVS 295 Graphics Card

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

## NVIDIA NVS 300 Graphics Card

| | |
|---|---|
| Form Factor | PCI Express x16 (generation 2.0)<br>Low Profile, half length, 2.3" x 6.6"<br>Full height bracket utilized when configured to CMT or MT |
| Graphics Controller | Nvidia GT218 GPU |
| Memory Frame Buffer | 512MB DDR3, 64-bit wide |
| Output Connectors | Single DMS-59 connector<br>Supports dual analog displays with included DMS-59 to dual VGA Y cable.<br>Supports dual DVI displays with an optional DMS59 to dual DVI cable. |
| Core Clock | 520MHz |
| Memory Clock | 790MHz |
| Supported Graphics APIs | OpenGL 3.3 support in hardware<br>DirectX 10.0 support in hardware |

### 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

| Resolution | Maximum Refresh Rate (Hz) | |
|---|---|---|
| | Analog | Digital |
| 640 x 480 | 85 | 60 |
| 800 x 600 | 85 | 60 |
| 1024 x 768 | 85 | 60 |
| 1280 x 720 | 85 | 60 |
| 1280 x 1024 | 85 | 60 |
| 1440 x 900 | 75 | 60 |
| 1600 x 1200 | 85 | 60 |
| 1680 x 1050 | 75 | 60 |

*Technical Specifications - Graphics*

| 1920 x 1080 | 85 | 60-R |
|---|---|---|
| 1920 x 1200 | 85 | 60-R |
| 1920 x 1440 | 85 | N/A |
| 2048 x 1536 | 75 | 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 GeForce 310 Graphics Card

| | |
|---|---|
| Bus type | PCI Express (x16 lanes) |
| Board display options | Supports two displays via the DisplayPort and DVI connectors |

| | Specification | Description |
|---|---|---|
| Board configuration | 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 |
| Core power | 22 W (max) |
| Dimensions (H x D) | 2.71 in x 6.60 in<br>68.90 mm x 167.65 mm |
| Weight | 0.30 lb (134.3 g) |
| Maximum vertical refresh rate | 85 Hz |
| Display support | Integrated 400 MHz RAMDAC |
| Display max resolution | 2560 x 1600 digital, 2048 x 1536 analog |

*Technical Specifications - Graphics*

| | Resolution | Maximum Refresh Rate (Hz) | |
|---|---|---|---|
| | | Analog Connection | Digital Connection |
| | 640x480 | 85 | 60 |
| | 800x600 | 85 | 60 |
| | 1024x768 | 85 | 60 |
| | 1280x720 | 85 | 60 |
| | 1280x1024 | 85 | 60 |
| | 1440x900 | 75 | 60 |
| | 1600x1200 | 85 | 60 |
| Supported Resolutions | 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:
Other resolutions may be available but are not recommended as the may not have been tested and qualified by HP
Note:
60-R denotes reduced blanking timings are used on single-link DVI connections and may be used with other digital connections

**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 use in a low profile chassis
Warranty documentation

**Compliance Standards**

| EMC Emissions | EMC Immunity |
|---|---|
| FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use | CISPR 24:1997/EN 55024:1998 - Information Techn Equipment - Immunity Characteristics - Limits and Me Measurement |
| CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment | |
| Canadian Standard ICES-003 is equivalent to CISPR22 | |
| Taiwanese Standard BSMI | |
| Japanese VCCI | |
| Australian C-Tick | |
| Korean (MIC) | |

# QuickSpecs

## Technical Specifications - Graphics

### ATI Radeon HD 4550 Graphics Card

| | |
|---|---|
| Bus type | PCI Express x16 |
| Maximum vertical refresh rate | 85 Hz |
| Display support | Integrated 400 MHz RAMDAC |
| Display max resolution | 1900 x 1200 digital, 2048 x 1536 analog |
| Board display options | Supports two displays via included DMS-59 to dual VGA cable or 2 DVI monitors via optional DMS-59 to dual DVI cable kit part number: DL139A. 4-pin mini-DIN S-video connector for TV output |

| Board configuration | Specification | Description |
|---|---|---|
| | Graphics Chip | RV710 |
| | Core clock | 600 MHz |
| | Memory clock | 800 MHz |
| | Frame buffer | 512 MB DDR3, 64 bit wide |

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

| Compliance standards | EMC Emissions | EMC Immunity |
|---|---|---|
| | FCC Part 15, Subpart B – Unintentional Radiators, Class B Computing Devices for Home & Office Use | CISPR 24:1997/EN 55024:1998 – Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement |
| | CISPR22: 1997/EN 55022:1998 – Class B – Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment | |
| | Canadian Standard ICES-003 is equivalent to CISPR22 | |
| | Taiwanese Standard BSMI | |
| | Japanese VCCI | |
| | Australian C-Tick | |
| | Korean (MIC) | |

*Technical Specifications - Graphics*

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

Note:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

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 Graphics Card

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

*Technical Specifications - Graphics*

Resolutions Supported

| 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:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP

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

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

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

Board configuration

Core power          56 W

## Technical Specifications - Graphics

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

| | EMC Emissions | EMC Immunity |
|---|---|---|
| Board configuration | FCC Part 15, Subpart B - Unintentional Radiators, Class B Computing Devices for Home & Office Use<br>CISPR22: 1997/EN 55022:1998 - Class B - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment<br>Canadian Standard ICES-003 is equivalent to CISPR22<br>Taiwanese Standard BSMI<br>Japanese VCCI<br>Australian C-Tick<br>Korean (MIC) | CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement |

## HP ADD2 SDVO DVI-D Out PCI Express x1 Adapter Card

| | |
|---|---|
| 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<br>Note:<br>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 |

(Resolutions Supported)

*Technical Specifications - Graphics*

## HP DisplayPort to DVI-D Adapter

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

## HP DisplayPort to VGA Adapter

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

| Resolutions Supported | 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:
Other resolutions may be available but are not recommended as they may not have been tested and qualified by HP. Usin
DisplayPort to VGA Adapter may require an update to the graphics driver installed on your system. To install the most up-t
graphics driver go to: www.hp.com.
Note:
60-R denotes reduced blanking timings are used. Not all monitors support reduced blanking timing.

*Technical Specifications - Hard Drives*

## 160-GB 2.5" Hard Disk Drive

| | |
|---|---|
| **Capacity** | 160,041,885,696 bytes |
| **Rotational Speed** | 7,200 rpm |
| **Interface** | Serial ATA (SATA) |
| **Synchronous Transfer Rate** (Maximum) | Up to 3 GB/s |
| **Buffer Size** | 8 MB |
| **Logical Blocks** | 312,581,808 |

**Seek Time** (typical reads, includes controller overhead, including settling)

                    **Single Track:** 2.0 ms
                           **Average:** 12 ms
                     **Full-Stroke:** 22 ms

| | |
|---|---|
| **Height** (nominal) | 0.374 in/9.5 mm |
| **Width** (nominal) | Media diameter: 2.5 in/63.5 mm |
| | Physical size: 2.75 in/70 mm |
| **Operating Temperature** | 41° to 131° F<br>5° to 55° C |

## 250-GB 2.5" Hard Disk Drive

| | |
|---|---|
| **Capacity** | 250,059,350,016 bytes |
| **Rotational Speed** | 7,200 rpm |
| **Interface** | Serial ATA (SATA) |
| **Synchronous Transfer Rate** (Maximum) | Up to 3 GB/s |
| **Buffer Size** | 8 MB |
| **Logical Blocks** | 488,397,168 |

**Seek Time** (typical reads, includes controller overhead, including settling)

                    **Single Track:** 2.0 ms
                           **Average:** 12 ms
                     **Full-Stroke:** 22 ms

| | |
|---|---|
| **Height** (nominal) | 0.374 in/9.5 mm |
| **Width** (nominal) | Media diameter: 2.5 in/63.5 mm |
| | Physical size: 2.75 in/70 mm |
| **Operating Temperature** | 41° to 131° F<br>5° to 55° C |

# QuickSpecs

*Technical Specifications - Hard Drives*

## 160-GB 3.5" Hard Disk Drive

| | |
|---|---|
| **Capacity** | 160,041,885,696 bytes |
| **Rotational Speed** | 7,200 rpm |
| **Interface** | Serial ATA (SATA) |
| **Synchronous Transfer Rate** (Maximum) | Up to 3 GB/s |
| **Buffer Size** | 8 MB |
| **Logical Blocks** | 312,581,808 |

| **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track:** 0.9 ms |
|---|---|
| | **Average:** 9.3 ms |
| | **Full-Stroke:** 18 ms |

| | |
|---|---|
| **Height** (nominal) | 1 in/2.54 cm |
| **Width** (nominal) | Media diameter: 3.5 in/8.89 cm |
| | Physical size: 4 in/10.2 cm |
| **Operating Temperature** | 41° to 131° F |
| | 5° to 55° C |

## 250-GB 3.5" Hard Disk Drive

| | |
|---|---|
| **Capacity** | 250,059,350,016 bytes |
| **Rotational Speed** | 7,200 rpm |
| **Interface** | Serial ATA (SATA) |
| **Synchronous Transfer Rate** (Maximum) | Up to 3 GB/s (limited by the system SATA controller) |
| **Buffer Size** | 8 MB |
| **Logical Blocks** | 488,397,168 |

| **Seek Time** (typical reads, includes controller overhead, including settling) | **Single Track:** 1.0 ms |
|---|---|
| | **Average:** 8.5 ms |
| | **Full-Stroke:** 18 ms |

| | |
|---|---|
| **Height** (nominal) | 1 in/2.54 cm |
| **Width** (nominal) | Media diameter: 3.5 in/8.89 cm |
| | Physical size: 4 in/10.2 cm |
| **Operating Temperature** | 41° to 131° F (5° to 55° C) |

# QuickSpecs

*Technical Specifications - Hard Drives*

## 320-GB 3.5" Hard Disk Drive

| | |
|---|---|
| Capacity | 320,069,031,690 bytes |
| Rotational Speed | 7,200 rpm |
| Interface | Serial ATA (SATA) |
| Synchronous Transfer Rate (Maximum) | Up to 3 GB/s |
| Buffer Size | 8 MB |
| Logical Blocks | 625,142,448 |

| Seek Time (typical reads, includes controller overhead, including settling) | Single Track: 1.0 ms |
|---|---|
| | Average: 8.5 ms |
| | Full-Stroke: 18 ms |

| | |
|---|---|
| Height (nominal) | 1 in/2.54 cm |
| Width (nominal) | Media diameter: 3.5 in/8.89 cm |
| | Physical size: 4 in/10.2 cm |
| Operating Temperature | 41° to 131° F (5° to 55° C) |

## 500-GB 3.5" Hard Disk Drive

| | |
|---|---|
| Capacity | 500,107,862,016 bytes |
| Rotational Speed | 7,200 rpm |
| Interface | Serial ATA (SATA) |
| Synchronous Transfer Rate (Maximum) | Up to 3 GB/s (limited by the system SATA controller) |
| Buffer Size | 16 MB |
| Logical Blocks | 976,773,168 |

| Seek Time (typical reads, includes controller overhead, including settling) | Single Track: 2.0 ms |
|---|---|
| | Average: 11 ms |
| | Full-Stroke: 21 ms |

| | |
|---|---|
| Height (nominal) | 1 in/2.54 cm |
| Width (nominal) | Media diameter: 3.5 in/8.89 cm |
| | Physical size: 4 in/10.2 cm |
| Operating Temperature | 41° to 131° F (5° to 55° C) |

# QuickSpecs

## Technical Specifications - Hard Drives

### 160-GB 10,000 rpm Hard Disk Drive

| | |
|---|---|
| Capacity | 160,041,885,696 bytes |
| Rotational Speed | 10,000 rpm |
| Interface | Serial ATA (SATA) |
| Synchronous Transfer Rate (Maximum) | Up to 3 GB/s (limited by the system SATA controller) |
| Buffer Size | 16 MB |
| Logical Blocks | 312,581,808 |
| Seek Time (typical reads, includes controller overhead, including settling) | Single Track: 0.3 ms<br>Average: 4.6 ms<br>Full-Stroke: 10.2 ms |
| Height (nominal) | 1 in/2.54 cm |
| Width (nominal) | Media diameter: 3.5 in/8.89 cm<br>Physical size: 4 in/10.2 cm |
| Operating Temperature | 41° to 131° F<br>5° to 55° C |

### 64-GB 2.5" Solid State Drive

| | |
|---|---|
| Capacity | 64 GB |
| Interface | Serial ATA (SATA) |
| Architecture | Multi Level Cell (MLC) NAND Flash with wear leveling 10 channel controller |
| Internal transfer rate | Write speed Up to 220 MB/s<br>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<br>Total power consumption <1.12Watt |
| Dimensions (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 |
| Environmental (all conditions, non-condensing) | Operating Temperature: 32° to 158° F (0° to 70° C)<br>Relative Humidity: 5% to 95%<br>Maximum Wet Bulb Temperature (operating) 84° F (29° C) |

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

# QuickSpecs

*Technical Specifications - Hard Drives*

## 80-GB 2.5" Solid State Drive

| | |
|---|---|
| Capacity | 80-GB |
| Interface | Serial ATA (SATA) |
| Architecture | Multi Level Cell (MLC) NAND Flash with wear leveling 10 channel controller |
| Dimensions (W x H x D) | 2.74 x 0.37 x 4 in/6.98 x 0.95 x 10.2 cm |
| Weight | 0.18 lb/80 g |

| | | |
|---|---|---|
| Bandwidth Performance | Sustained Sequential Read: | Up to 250 MB/s |
| | Sustained Sequential Write: | Up to 70 MB/s |
| | Random Read: | Up to 35K IOPs |
| | Random Write: | Up to 6.6K IOPs |
| Latency | Read: | 65-ms |
| | Write: | 85-ms |
| Power | DC power requirement | 5 VDC 5%-100 mV ripple p-p |
| | Total power consumption | 0.15W (active); 0.075W (idle) |
| Useful Drive Life | 35TB written, up to 20GB/day for 5 years | |
| Environmental (all conditions, non-condensing) | Operating Temperature: | 32° to 158° F (0° to 70° C) |
| | Relative Humidity: | 5% to 95% |
| | Maximum Wet Bulb Temperature (operating) | 84° F (29° C) |
| | Shock: | 1,500 G/0.5-ms |

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

# QuickSpecs

*Technical Specifications - Input Devices*

## HP USB Standard Keyboard

| | | |
|---|---|---|
| | Keys | 104, 105, 106, 107, 109 layout (depending upon country) |
| Physical characteristics | 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 |
| 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 |
| | Languages | 38 available |
| Mechanical | 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 |

# QuickSpecs

*Technical Specifications - Input Devices*

| | |
|---|---|
| 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 |

---

## HP 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 |
| | Languages | 38 available |
| | Keycaps | Low-profile design |
| Mechanical | 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 |
| | 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) |

*Technical Specifications - Input Devices*

| Environmental | 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 |

## 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 |
| | 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) |
| Mechanical | 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 |
| | 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) |

*Technical Specifications - Input Devices*

| Environmental | 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 | |
| | 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 | |
| SMARTCARD function | 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 & PS2 Washable 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<br>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 |

*Technical Specifications - Input Devices*

|  |  |  |
|---|---|---|
|  | Microsoft® PC 99 - 2001 | Functionally compliant |
| Mechanical | Keycaps | Stepped -profile design |
|  | Switch actuation | 55-g nominal peak force with tactile feedback |
|  | Switch life | 20 million keystrokes |
|  | Switch type | Contamination-resistant switch membrane |
|  | Key-leveling mechanisms | For all double-wide and greater-length keys |
|  | Cable length | 7 ft<br>2.2 m |
|  | Microsoft PC 99 - 2001 | Mechanically compliant |
|  | Acoustics | 43-dBA maximum sound pressure level |
| Environmental | Operating temperature | 50° to 122° F<br>10° to 50° C |
|  | Non-operating temperature | -4° to 149° F<br>-20° to 65° C |
|  | Operating humidity | 10% to 95% (non-condensing at ambient) |
|  | Non-operating humidity | 0% to 95% (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, cUL, FCC, CE, TUV GS, VCCI, BSMI, C-Tick, KCC, USB-IF, WHQL, EN/IEC 60601-1, IP66/NEMA4X | |
| Ergonomic compliance | ANSI HFS 100, ISO 9241-4, and TUVGS | |

---

## HP Smart Card CCID Keyboard

|  |  |  |
|---|---|---|
|  | Keys | 104, 105, 106, 107, 109 layout<br>(depending upon country |
|  | Form factor | USB basic smart card keyboard |
| Physical Characteristics | Colors | Carbonite/Silver |
|  | Dimensions<br>(H x W x D) | 18.2 x 6.3 x 1.3 in<br>46.3 x 16.1 x 3.3 cm |
|  | Weight | 2 lb<br>0.9 kg minimum |
|  | Operating voltage | + 5VDC ± 5% |

*Technical Specifications - Input Devices*

| | | |
|---|---|---|
| **Electrical** | 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 |
| | Languages | 30+ available |
| **Mechanical** | Keycaps | Standard 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 STCIII |
| | Standard APIs supported | PC/SC, EMV2000, CT-API |
| | Power | USB Port |
| | | Short circuit detection (protects smart card and reader) |
| | | Power supply compliant with ISO7816 and EMV (5V, 60 mA) |
| | | Supports 3-V and 5-V cards |
| | Power consumption | 100-mA maximum draw |
| | Communication | From card — 9600 bps to 330,000 bps |
| | | From computer — 12 Mbps (USB transfer speed) |

*Technical Specifications - Input Devices*

| | | | |
|---|---|---|---|
| | Landing mechanism | Contact device | Friction contact |
| | | Card insertions rating | Up to 100,000 insertion cycles |
| | Interface modes | CCID protocol | |
| | Reader performance interface | USB connection | |
| | Electro-magnetic standards | Europe | 2004/108/EC |
| | | USA | USAFCC part 15 |
| Approvals | CE-Mark, UL, CSA, FCC, CE Mark, TUV, TUV GS, VCCI, BSMI, C-Tick, MIC, EMV2000, USB-IF | | |
| Ergonomic Compliance | ISO 9241-4, TUVGS | | |
| | HP | HP ProtectTools Smart Card | |
| | American Express | Amex Blue | |
| | Axalto (Schlumberger) | Cryptoflex 8K<br>Cryptoflex 16K<br>Cryptoflex 32K<br>Cryptoflex 32K e-gate<br>Cyberflex Access 64K<br>Cyberflex Access 32K<br>Cyberflex 32K e-gate<br>Cyberflex 64K<br>Cyberflex Palmera<br>Payflex-S<br>Payflex 1K<br>Payflex 2K<br>Payflex 4K<br>Payflex 8K<br>Prismera<br>US DoD CAC<br>PrimeFlex Store 8K<br>PrimeFlex Store 2K | |
| | Cardlogix | CLXSU004KK4<br>CLXSU008KK5 | |
| | Safenet, Inc. | Model 300<br>Model 330 | |
| | De-La Rue | VisaCash | |
| | Gemplus | Gem Expresso<br>GKK32K<br>Gemclub Memo<br>GemClub Micro<br>GemXplore<br>GemSafe | |
| Smart Card Compatibility | Infineon | SLE66C322P<br>SLE4406<br>SLE4406E<br>SLE4406E SE<br>SLE4418<br>SLE4428<br>SLE4432<br>SLE4436E<br>SLE4442 | |

*Technical Specifications - Input Devices*

|  |  |  |
|---|---|---|
|  |  | SLE5536 |
| SafLink (Litronic) |  | Forte |
| Shart |  | Java Card |
| Oberthur |  | CosmopollIC v4<br>CosmopollIC v4.1<br>Cosmo ID-One<br>GalatIIC v2.1<br>US DoD CAC |
| Memory Cards |  |  |
| Atmel |  | AT24C01ASC<br>AT24C02SC<br>AT24C04SC<br>AT24C08SC<br>AT24C16SC<br>AT24C32SC<br>AT24C64SC<br>AT24C128SC<br>AT24C256SC<br>AT24C512SC<br>AT88SC153<br>AT88SC1608 |
| ISSI |  | IS23SC4418<br>IS23SC4428 |
| ST |  | 14C02 |
| Telefonkarte |  | SLE4406<br>SLE4436<br>SLE5536 |
| XICOR |  | X24026 |

## HP PS/2 Optical Mouse

| | |
|---|---|
| Dimensions<br>(H x L x W) | 1.56 x 2.44 x 4.61 in<br>3.95 x 6.21 x 11.7 cm |
| Weight | 4.44 oz<br>126 g |
| Environmental | |

| | | |
|---|---|---|
| | Operating temperature | -32° to 104°F<br>0° to 40° C |
| | Non-operating temperature | -4° to 140°F<br>-20° to 60° C |
| | Operating humidity | 10% to 90%<br>(non condensing at ambient) |
| | Non-operating humidity | 10% to 90%<br>(non condensing at ambient) |
| | Operating shock | 40 g, 6 surfaces |

*Technical Specifications - Input Devices*

| | | |
|---|---|---|
| | 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 |
| | Operating voltage | 5 VDC ± 10% |
| | Power consumption | 100mA |
| Electrical | 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 |
| | 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 |
| Mechanical | 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 |
| | Width | 8 mm |
| | Diameter | 1.01 in (25.6 mm) |
| | Maximum rotation speed | 48 rats/sec |
| Scroll wheel | 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 |

*Technical Specifications - Input Devices*

### HP USB Optical Mouse

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

---

### HP USB 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<br>0° to 40° C |
| | Non-operating Temperature | -4° to 140° F<br>-20° to 60° C |
| | Operating Humidity | 10% to 90%<br>(non-condensing at ambient) |
| | Non-operating Humidity | 20% to 80%<br>(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 |

*Technical Specifications - Input Devices*

|  | 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 | |

## Technical Specifications - Optical Storage

### HP Blu-ray Writer Drive

| | |
|---|---|
| AMO Part Number | AR482AA |
| Height | 5.25-inch, half-height, tray-load |
| Orientation | Either horizontal or vertical |
| Interface type | SATA |
| Disc capacity | 50 GB DL or 25 GB standard |
| Dimensions (W x H x D) | 5.9 x 1.7 x 7.5 in<br>15.0 x 4.4 x 19.0 cm |
| Weight (max) | 2.0 lb<br>907g |

| | | | |
|---|---|---|---|
| Disc Capacity | DVD-ROM | 8.5GB DL or 4.7GB standard | |
| | Blu-ray | 50GB DL or 25GB standard | |
| | Full Stroke DVD | < 250 ms (seek) | |
| | Full Stroke CD | < 210 ms (seek) | |
| | Blu-ray | < 275 ms (seek) | |
| | | (Time to drive ready from tray loading) | |
| | Startup Time | BD-ROM (SL/DL) | 25S / 28S |
| | | BD-R (SL/DL) | 25S / 28S |
| | | BD-RE (SL/DL) | 25S / 28S |
| | | DVD-ROM (SL/DL) | 18S / 18S |
| | | DVD-R (SL/DL) | 25S / 25S |
| | | DVD-RW | 25S |
| | | DVD+R (SL/DL) | 25S / 25S |
| | | DVD+RW | 25S |
| | | DVD-RAM | 45S |
| | | CD-ROM | 15S |
| Maximum Data Transfer Rates | CD-ROM Read | CD-ROM up to 40X | |
| | | CD-RW up to 40X | |
| | | 8x CAV | |
| | DVD-ROM Read | DVD-RAM up to 5X | |
| | | DVD+RW up to 10X | |
| | | DVD-RW up to 10X | |
| | | DVD+R DL up to 8X | |
| | | DVD-R DL up to 8X | |
| | | DVD-ROM up to 16X | |
| | | DVD-ROM DL up to 8X | |
| | | DVD+R up to 12X | |
| | | DVD-R up to 12X | |
| | | BD-ROM up to 6X | |
| | | BD-ROM DL up to 4.8X | |

*Technical Specifications - Optical Storage*

| | | |
|---|---|---|
| | Blu-ray | BD-R up to 6X |
| | | BD-R DL up to 4.8X |
| | | BD-R up to 6X |
| | | BD-RE SL/DL up to 4.8X |
| **Power** | Source | SATA DC power receptacle |
| | DC Power Requirement | 5 VDC ± 5%-100 mV ripple p-p<br>12 VDC ± 5%-200 mV ripple p-p |
| | DC Current | 5 VDC -1000 mA typical, 1600 mA maximum<br>12 VDC -600 mA typical, 1400 mA maximum |
| **Environmental** (all conditions non-condensing) | **Temperature** (operating) | 41° to 122° F (5° to 50° C) |
| | **Relative Humidity** (operating) | 10% to 90% |
| | **Maximum Wet Bulb Temperature** (operating) | 86° F (30° C) |

## HP SuperMulti Drive

| | |
|---|---|
| AMO Part Number | AR630AT |
| Height | 5.25-inch, half-height, tray-load |
| Orientation | Either horizontal or vertical |
| Interface type | Serial ATA |
| Dimensions (W x H x D) | 5.9 x 1.7 x 8.0 in<br>(15.0 x 4.4 x 20.3 cm) |
| Weight (max) | 2.6 lb<br>(1.2 kg) |

| | | |
|---|---|---|
| CD Media Read Access | Random | < 120 ms typical |
| | Full Stroke | < 200 ms typical |
| DVD Media Read Access | Random | < 130 ms typical |
| | Full Stroke | < 240 ms typical |
| CD Media Read Transfer | CD-ROM, CD-R Read | Up to 6000 KB/s (40X) |
| | CD-RW Read | Up to 4800 KB/s (32X) |
| | Digital/Analog Audio Playback | Up to 2400 KB/s (16X) |
| | Digital Audio Extraction (CD-ROM, CD-R) | Up to 6000 KB/s (40X) |
| | Digital Audio Extraction (CD-RW) | Up to 4800 KB/s (32X) |
| | Video CD Playback | Up to 2400 KB/s (16X) |
| | DVD-ROM SL Read | Up to 21600 KB/s (16X) |
| | DVD-ROM DL Read | Up to 10800 KB/s (8X) |
| | DVD Video Playback | Up to 10800 KB/s (8X) |
| | DVD Video SL (other than playback) | Up to 21600 KB/s (16X) |
| DVD Media Read Transfer | DVD Video DL (other than playback) | Up to 10800 KB/s (8X) |

# QuickSpecs

## Technical Specifications - Optical Storage

| | | | |
|---|---|---|---|
| **Performance** | | DVD-R | Up to 21600 KB/s (16X) |
| | | DVD+R | Up to 21600 KB/s (16X) |
| | | DVD-RW | Up to 10800 KB/s (8X) |
| | | DVD-R DL | Up to 10800 KB/s (8X) |
| | | DVD+RW | Up to 10800 KB/s (8X) |
| | | CD-R Write | Up to 6000 KB/s (40X) |
| | | CD-RW | 600 KB/s (4X) |
| | CD Media Write Transfer | CD-RW (High speed) | 1500 KB/s (10X) |
| | | CD-RW (Ultra speed) | Up to 3600 KB/s (24X) |
| | | CD-RW (Ultra speed+) | Up to 4800 KB/s (32X) |
| | | DVD+R | Up to 21600 KB/s (16X) |
| | | DVD+R DL (v1.2) | Up to 16200 KB/s (12X) |
| | | DVD+R DL (v1.1) | Up to 10800 KB/s (8X) |
| | | DVD+RW (Volume 2 v1.0) | Up to 10800 KB/s (8X) |
| | | DVD+RW (Volume 1 v1.3) | Up to 5400 KB/s (4X) |
| | | DVD-R (v2.1 rev. 6.0) | Up to 16200 KB/s (12X) |
| | DVD Media Write Transfer | DVD-R (v2.1 rev. 4.0) | Up to 21600 KB/s (16X) |
| | | DVD-R DL (v3.0 rev. 5.0) | Up to 10800 KB/s (8X) |
| | | DVD-R DL (v3.0 rev. 3.0) | Up to 10800 KB/s (8X) |
| | | DVD-RW (v1.2 rev. 3.0) | 8100 KB/s (6X) |
| | | DVD-RW (v1.2 rev. 2.0) | Up to 5400 KB/s (4X) |
| | | DVD-RAM (v2.2 rev. 5.0) | Up to 16200 KB/s (12X) |
| | | DVD-RAM (v2.2 rev. 2.0) | Up to 6750 KB/s (5X) |

| | Media | Read | Write |
|---|---|---|---|
| **Media Compatibility** | 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 |

| | | | |
|---|---|---|---|
| **Power Supply** | | Source | SATA DC power receptacle |
| | DC Power Requirement | 5 VDC ± 5% | 100 mV ripple p-p |
| | | 12 VDC ± 5% | 200 mV ripple p-p |
| | | 5 VDC | <1000 mA (typical) 1600 mA (max.) |

*Technical Specifications - Optical Storage*

|  |  |  |  |
|---|---|---|---|
|  | DC Current | 12 VDC | 1200 mA (typical)<br>2000 mA (max.) |
|  | Total Drive Power<br>(Standby Mode) | | < 2.5W |
| **Rear Panel** | SATA Power Connector, 15-pin<br>SATA Data Connector, 7-pin<br>Markings to identify each connector | | |
| **Environmental conditions** (all conditions non-condensing) | Temperature<br>(operating) | 41° to 122° F<br>(5° to 50° C) | |
|  | Temperature<br>(storage) | –22° F to 140° F<br>(–30° C to 60° C) | |
|  | Relative Humidity | 10% to 90% | |
|  | Maximum Wet Bulb<br>Temperature | 86° F (30° C) | |
|  | Altitude | 0 to 10,171 ft.<br>(0 to 3,100 meters) | |

## HP DVD-ROM Drive

| | |
|---|---|
| **AMO Part Number** | AR629AA |
| **Height** | 5.25-inch, half-height, tray-load |
| **Orientation** | Either horizontal or vertical |
| **Interface type** | Serial ATA |
| **Dimensions** (W x H x D) | 5.9 x 1.7 x 8.0 in<br>(15.0 x 4.4 x 20.3 cm) |
| **Weight** (max) | 2.6 lb<br>(1.2 kg) |

| | | | |
|---|---|---|---|
| **Performance** | CD Media Read Access | Random | < 120 ms typical |
|  |  | Full Stroke | < 200 ms typical |
|  | DVD Media Read Access | Random | < 130 ms typical |
|  |  | Full Stroke | < 240 ms typical |
|  | CD Media Read Transfer | CD-ROM, CD-R Read | Up to 6000 KB/s (40X) |
|  |  | CD-RW Read | Up to 4800 KB/s (32X) |
|  |  | Digital/Analog<br>Audio Playback | Up to 2400 KB/s (16X) |
|  |  | Digital Audio Extraction<br>(CD-ROM, CD-R) | Up to 6000 KB/s (40X) |
|  |  | Digital Audio Extraction<br>(CD-RW) | Up to 4800 KB/s (32X) |
|  |  | Video CD Playback | Up to 2400 KB/s (16X) |
|  |  | DVD-ROM SL Read | Up to 21600 KB/s (16X) |
|  |  | DVD-ROM DL Read | Up to 10800 KB/s (8X) |
|  |  | DVD Video Playback | Up to 10800 KB/s (8X) |

*Technical Specifications - Optical Storage*

| | | DVD Video SL (other than playback) | Up to 21600 KB/s (16X) |
|---|---|---|---|
| | DVD Media Read Transfer | DVD Video DL (other than playback) | Up to 10800 KB/s (8X) |
| | | DVD-R | Up to 21600 KB/s (16X) |
| | | DVD+R | Up to 21600 KB/s (16X) |
| | | DVD-RW | Up to 10800 KB/s (8X) |
| | | DVD-R DL | Up to 10800 KB/s (8X) |
| | | DVD+RW | Up to 10800 KB/s (8X) |

| | Media | Read | Write |
|---|---|---|---|
| | CD-ROM | Yes | No |
| | CD-R | Yes | No |
| | CD-RW | Yes | No |
| | DVD-ROM | Yes | No |
| | DVD-ROM DL | Yes | No |
| Media Compatibility | 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 |

| | | | |
|---|---|---|---|
| | Source | SATA DC power receptacle | |
| | DC Power Requirement | 5 VDC ± 5% | 100 mV ripple p-p |
| | | 12 VDC ± 5% | 200 mV ripple p-p |
| Power Supply | | 5 VDC | <1000 mA (typical) 1600 mA (max.) |
| | DC Current | 12 VDC | 1200 mA (typical) 2000 mA (max.) |
| | | Total Drive Power (Standby Mode) | < 2.5W |

| | |
|---|---|
| Rear Panel | SATA Power Connector, 15-pin SATA Data Connector, 7-pin Markings to identify each connector |

| | | |
|---|---|---|
| | Temperature (operating) | 41° to 122° F (5° to 50° C) |
| Environmental conditions (all conditions non-condensing) | Temperature (storage) | –22° F to 140° F (–30° C to 60° C) |
| | Relative Humidity | 10% to 90% |
| | Maximum Wet Bulb Temperature | 86° F (30° C) |
| | Altitude | 0 to 10,171 ft. (0 to 3,100 meters) |

*Technical Specifications - Optical Storage*

### HP Slim SuperMulti Drive

| | | |
|---|---|---|
| AMO Part Number | VP034AA | |
| Height | 12.7mm height | |
| Orientation | Either horizontal or vertical | |
| Interface type | SATA/ATAPI | |
| Disc recording capacity | Up to 8.5 GB DL or 4.7 GB standard | |
| Dimensions (W x H x D) | 5.0 x 0.5 x 5.0 in (128 x 13.6 x 129 mm) | |
| Weight (max) | 0.42 lb (190 g) | |
| Write speeds | DVD-RAM | Up to 5X |
| | DVD-R DL | Up to 4X |
| | DVD+R | Up to 8X |
| | DVD+RW | Up to 4X |
| | DVD+R DL | Up to 4X |
| | DVD-R | Up to 8X |
| | DVD-RW | Up to 6X |
| | CD-R | Up to 24X |
| | CD-RW | Up to 16X |
| Read speeds | DVD-RAM | Up to 5X |
| | DVD-RW, DVD+RW | Up to 8X |
| | DVD-R DL, DVD+R DL | Up to 6X |
| | DVD+R, DVD-R | Up to 8X |
| | DVD-ROM DL, DVD-ROM | Up to 8X |
| | CD-ROM, CD-R | Up to 24X |
| | CD-RW | Up to 24X |
| 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) |
| | Stop Time | < 4 seconds |
| | 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 | Four-pin, DC power receptacle |

*Technical Specifications - Optical Storage*

| | 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) |
| | Total Drive Power (standby mode) | < 2.5 Watt |
| Audio output | Line-Out | 0.7 VRMS |
| | Signal-to-Noise Ratio | 74 dB |
| | Channel Separation | 65 dB |
| Environmental conditions (operating - non-condensing) | Temperature | 41° to 122° F (5° to 50° C) |
| | Relative Humidity | 10% to 90% |
| | Maximum Wet Bulb Temperature | 86° F (30° C) |

## HP Slim DVD-ROM Drive

| | | |
|---|---|---|
| **AMO Part Number** | VP033AA | |
| **Height** | 12.7mm | |
| **Orientation** | Either horizontal or vertical | |
| **Interface type** | SATA/ATAPI | |
| **Dimensions** (W x H x D) | 5.0 x 0.5 x 5.0 in (128 x 13.6 x 129 mm) | |
| **Weight** (max) | 0.42 lb (190 g) | |
| **Read speeds** | DVD+R/-R/+RW/ -RW/+R DL /-R DL | Up to 4X |
| | DVD-ROM | Up to 8X |
| | CD-ROM, CD-R | Up to 24X |
| | CD-RW | Up to 24X |
| **Access time** (typical reads, including settling) | Random DVD | DVD: < 140 ms (typical), CD: < 125 ms (typical) |
| | Random CD | DVD: < 250 ms (seek), CD: < 210 ms (seek) |
| | Data Transfer Modes | ATA PIO mode 4 (16.7 MB/s); ATA Multi-word DMA mode 2 (16.7 MB/s) |
| **Power** | Source | Four-pin, DC power receptacle |
| | DC Power Requirement | 5 VDC ± 5%-100 mV ripple p-p |
| | DC Current | 5 VDC - <1000 mA typical, < 1600 mA maximum |

*Technical Specifications - Optical Storage*

|  | Total Drive Power (standby mode) | < 2.5 Watt |
|---|---|---|
| Audio output | Line-Out | 0.7 VRMS |
|  | Signal-to-Noise Ratio | 74 dB |
|  | Channel Separation | 65 dB |
| **Environmental** (all conditions non-condensing) | Temperature | 41° to 122° F (5° to 50° C) |
|  | Relative Humidity | 5% to 85% |
|  | Maximum Wet Bulb Temperature (operating) | 86° F (30° C) |

*Technical Specifications - Removable Storage*

## HP 22-n-1 Media Card Reader plus 1394 Media Card Reader

| | |
|---|---|
| USB Interface | USB 2.0 High-speed interface<br><br>Note:<br>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<br>(connects to the pass through cable on the media card reader) |
| Advance protocol support | Supports hardware ECC (Error Correction Code) function<br><br>Supports hardware CRC (Cyclic Redundancy Check) function<br><br>Supports MS 4-bit parallel transfer mode<br><br>Supports MS-PRO 4-bit parallel transfer mode<br><br>Supports MS PRO-HG Duo 4-bit parallel transfer mode<br><br>Supports SD 4-bit parallel transfer mode<br><br>Supports high-speed 50Mhz SD 4-bit card (version 2.0)<br><br>Supports high-speed 52Mhz MMC 8-bit card (version 4.2)<br><br>Supports CF v4.0 with PIO mode 6 and Ultra DMA mode |
| Supported media type | CompactFlash Type I<br><br>CompactFlash Type II<br><br>Microdrive<br><br>MultiMediaCard (MMC)<br><br>Reduced Size MultiMediaCard (RS MMC)<br><br>MultiMediaCard 4.2 (MMC Plus, including MMC Plus HC)<br><br>Reduced Size MultiMediaCard 4.2 (MMC Mobile, including MMC Mobile HC)<br><br>Secure Digital Card (SD)<br><br>Secure Digital High Capacity (SDHC)<br><br>miniSD<br><br>miniSD High Capacity<br><br>Micro SD (T-Flash)<br><br>Micro SD HC<br><br>Memory Stick<br><br>Memory Stick Select<br><br>Memory Stick Duo (MS Duo)<br><br>Memory Stick PRO (MS PRO) |

## Technical Specifications - Removable Storage

|  |  |  |
|---|---|---|
| **Supported media type with card adapter** | Memory Stick PRO Duo (MS PRO Duo) | |
| | Memory Stick PRO-HG Duo | |
| | MagicGate Memory Stick (MG) | |
| | MagicGate Memory Stick Duo | |
| | xD-Picture Card | |
| | Memory Stick Micro (M2) | |
| | MMC Micro | |
| **Environmental** | **Operational Environmental Extremes** | Test Parameters/Conditions - Power applied, unit operating on system ±5%<br>nominal supply voltage.<br>10°C 10% R.H. = 24 hours<br>10°C 90% R.H. = 24 hours<br>20°C 90% R.H. = 24 hours<br>30°C 90% R.H. = 24 hours<br>40°C 90% R.H. = 24 hours<br>50°C 90% R.H. = 24 hours<br>50°C 10% R.H. = 24 hours |
| | **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 | |
| | FCC, CE, BSMI, C-Tick, VCCI, MIC, cUL, TUV-T | |

*Technical Specifications - Environmental Data*

Eco-Label Certifications & declarations

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

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

## *Ultra-Slim Desktop*

| *Energy Consumption*<br>(typically configured) | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 26.96 W | 27.61 W | 27.12 W |
| Sleep (Energy Star low power mode) | 3.585 W | 3.63 W | 3.582 W |
| Off | 1.361 W | 1.411 W | 1.359 W |

| Heat Dissipation* | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 92 BTU/hr | 94 BTU/hr | 93 BTU/hr |
| Sleep | 12 BTU/hr | 12 BTU/hr | 12 BTU/hr |
| Off | 5 BTU/hr | 5 BTU/hr | 5 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<br>(LWAd, bels) | Sound Pressure<br>(LpAm, decibels) |
|---|---|---|
| Idle | 3.8 | 28 |
| Fixed Disk<br>(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: Lithium

Additional Information

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

## Technical Specifications - Environmental Data

ISO1043.
- This product contains 0.40% post consumer recycled plastic (by wt.)
- This product is 92.3% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated –3637.5 g
- Internal:
  - Polyethylene low density – 7.6 g
- The corrugated packaging material contains at least 80% recycled content.
- The corrugated packaging material contains at least 0% recycled content.

### Small Form Factor

| Energy Consumption (typically configured) | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 41.4254 W | 40.8627 W | 41.5632 W |
| Sleep (Energy Star low power mode) | 2.7652 W | 2.9789 W | 2.7294 W |
| Off | 1.3332 W | 1.4949 W | 1.3320 W |

| Heat Dissipation* | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 142 BTU/hr | 140 BTU/hr | 142 BTU/hr |
| Sleep | 9 BTU/hr | 10 BTU/hr | 9 BTU/hr |
| Off | 5 BTU/hr | 5 BTU/hr | 5 BTU/hr |

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

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

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

## 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: Lithium

**Additional Information**

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- This product contains 0% post consumer recycled plastic (by wt.)
- This product is 86.2% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated Carton – 1362 g
  - Corrugated – 343 g
- Internal:
  - EPE – Expanded Polyethylene – 198 g
  - Polyethylene low density foam – 39 g
- The Corrugated Carton packaging material is made from 75% recycled content.
- The EPE – Expanded Polyethylene packaging material is made from 100% recycled content.
- The Polyethylene low density foam packaging material is made from 100% recycled content.

### Convertible Minitower

| Energy Consumption (typically configured) | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 42.224 W | 42.076 W | 42.366 W |
| Sleep (Energy Star low power mode) | 2.962 W | 2.886 W | 2.894 W |
| Off | 0.646 W | 0.802 W | 0.652 W |

| Heat Dissipation* | 115 VAC | 230 VAC | 100 VAC |
|---|---|---|---|
| Normal Operation | 144 BTU/hr | 144 BTU/hr | 145 BTU/hr |
| Sleep | 10 BTU/hr | 10 BTU/hr | 10 BTU/hr |
| Off | 2 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.

## Technical Specifications - Environmental Data

**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 | 28 |
| 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: Lithium

**Additional Information**

- This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive - 2002/95/EC.
- This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.
- This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).
- This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold where HP registers commercial desktop products. See http://www.epeat.net for registration status in your country.
- Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.
- This product contains 0% post consumer recycled plastic (by wt.)
- This product is 91.7% recyclable when properly disposed of at end of life.

Packaging Materials

- External:
  - Corrugated – 2550g
- Internal:
  - Polyethylene high density – 160g
- The Corrugated packaging material is made from 38% recycled content.
- The Polyethylene high density packaging material is made from 100% recycled content.

## All Models

**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

## Technical Specifications - Environmental Data

- 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
- 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)
- Nickel finishes that release greater than 0.5 micro-grams/cm$^2$/week, measured according to EN 1811:1998, are not used on any product surface designed to be frequently handled or touched by users.

**Packaging**

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

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

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

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

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

**Hewlett-Packard Corporate Environmental Information**

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

## Technical Specifications - Environmental Data