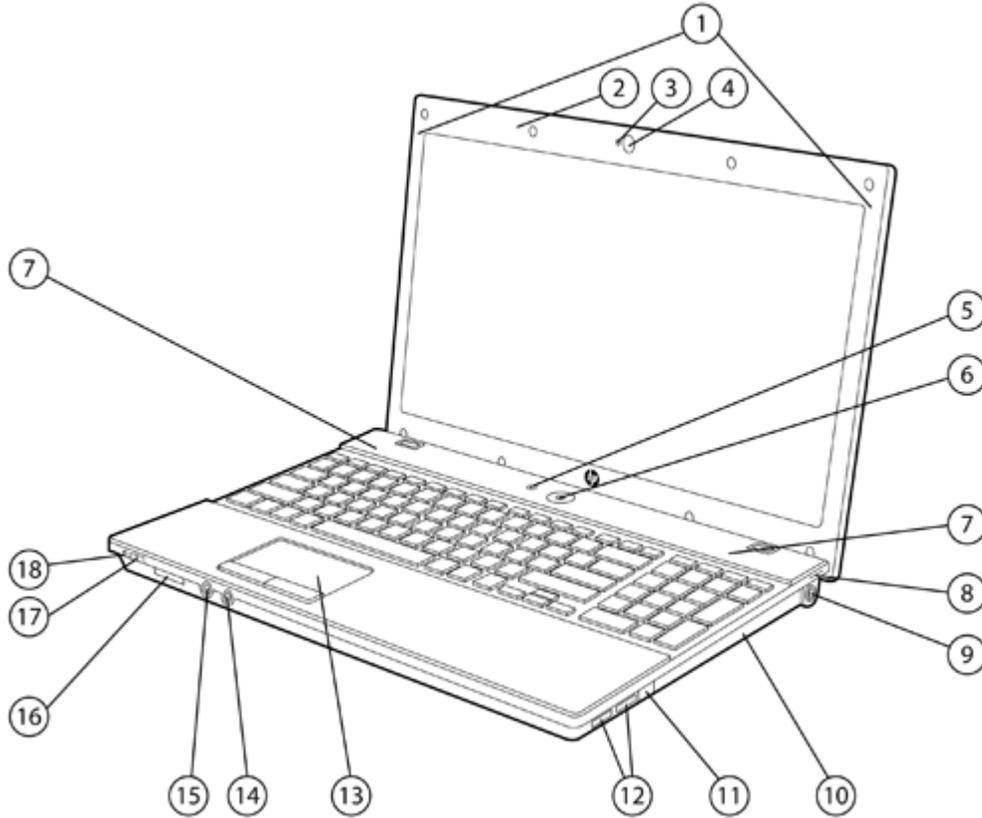


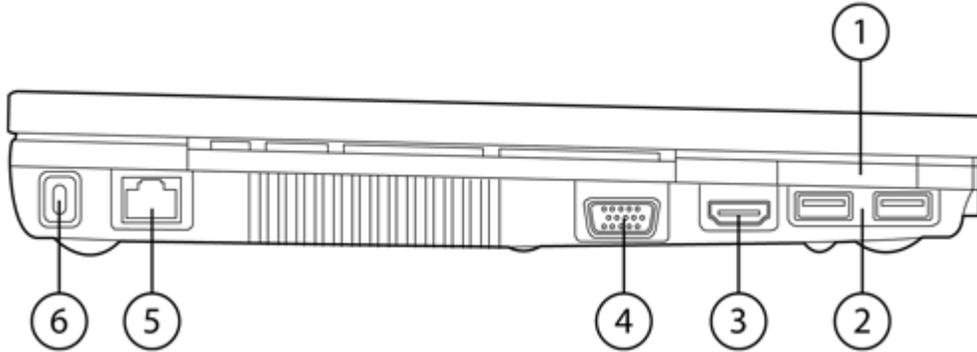
Overview

HP recommends Windows Vista® Business

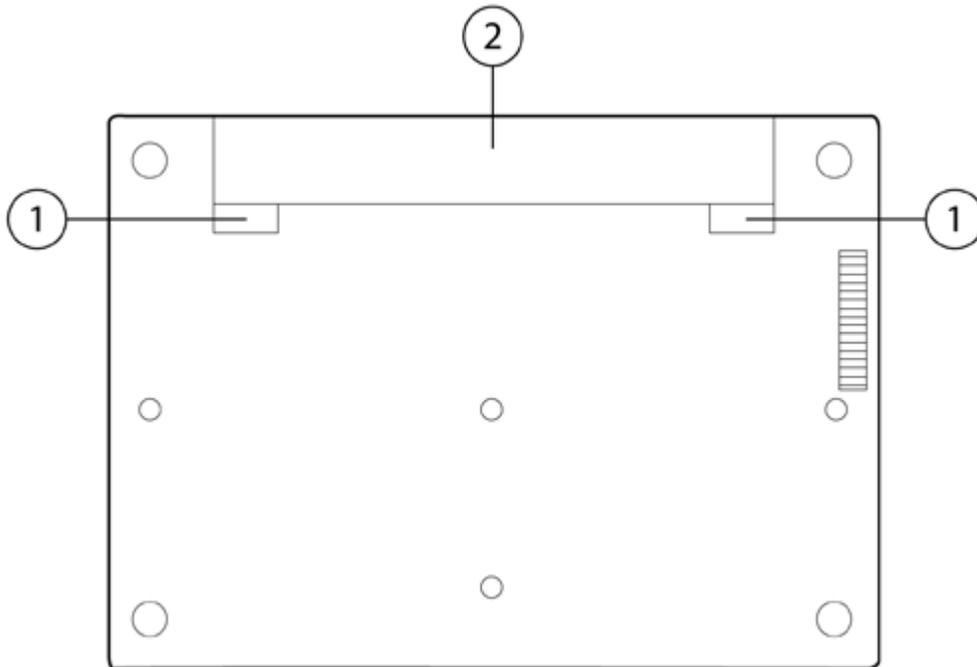


- | | |
|--|--|
| 1. WLAN and WWAN antennas (select models) | 10. Optical drive |
| 2. Integrated microphone | 11. Optional RJ-11/modem port |
| 3. Webcam light (works with optional webcam) | 12. (2) USB 2.0 ports |
| 4. Optional 2 MP webcam | 13. Touchpad with scroll zone |
| 5. Quick Look button | 14. Stereo microphone in |
| 6. Power button with LED indicator | 15. Stereo headphone/line out |
| 7. Stereo speakers | 16. Media Card Reader |
| 8. Battery charging LED indicator | 17. Wireless switch with LED indicator |
| 9. Power connector | 18. Hard drive activity LED indicator |

Overview



- 1. ExpressCard/34 slot
- 2. (2) USB 2.0 ports
- 3. HDMI port
- 4. VGA connector (external monitor/projector)
- 5. RJ-45/Ethernet port
- 6. Kensington Lock slot



- 1. Battery release latches
- 2. Battery bay

Overview

At A Glance

- Genuine Windows Vista Business 32, Genuine Windows Vista Business with downgrade to Windows XP Professional custom installed, Genuine Windows Vista Home Premium 32, Genuine Windows Vista Home Basic 32, and SuSE Linux
- Thin, lightweight design starting at 5.7 lb/2.59 kg and 1.24 in/31.5 mm thin at front
- Glossy Noir (black) finish
- Widescreen 15.6-inch diagonal LED-backlit HD display with 16:9 aspect ratio, BrightView optional
- Flexible wireless connectivity options:
 - Integrated HP un2400 EV-DO/HSDPA Mobile Broadband Module provides worldwide Gobi mobile Internet technology
 - Integrated 802.11 a/b/g/n draft 2.0 or b/g wireless LAN module
 - Bluetooth® 2.0
- ATI Mobility Radeon HD 4330 discrete graphics
or Mobile Intel Graphics Media Accelerator 4500MHD integrated graphics
- HDMI port for connecting to high-resolution displays
- Optional optical drives include Blu-ray ROM DVD+/-RW SuperMulti DL LightScribe Drive for high-definition playback and burning custom labels directly to your discs
- Available with Intel® Core™ 2 Duo or Intel® Celeron® processor
- Integrated Media Card Reader
- Enhanced security features including HP ProtectTools Security Manager, Disk Sanitizer, and HP SpareKey
- Optional integrated 2 MP webcam
- Full-sized spill-resistant keyboard with separate numeric keypad
- Up to 500 GB 5400 rpm with HP 3D DriveGuard protection
- Up to 8 GB of 800 MHz DDR2 SDRAM supported, dual channel memory support

Standard Features

Processors

Intel Core 2 Duo Processor T9600 (2.8 GHz, 6 MB L2 cache, 1066 MHz FSB)*
Intel Core 2 Duo Processor P8700 (2.53 GHz, 3 MB L2 cache, 1066 MHz FSB)*
Intel Core 2 Duo Processor P7370 (2.0 GHz, 3 MB L2 cache, 1066 MHz FSB)*
Intel Core 2 Duo Processor T6570 (2.10 GHz, 2 MB L2 cache, 800 MHz FSB)*
Intel Celeron Dual-Core Processor T1700 (1.83 GHz, 1 MB L2 cache, 667 MHz FSB)*
Intel Celeron Processor 900 (2.20 GHz, 1 MB L2 cache, 800 MHz FSB)*

NOTE: Processor speed denotes maximum performance mode; processors will run at lower speeds in battery optimization mode.

* Intel's numbering is not a measurement of higher performance.

Operating System

Preinstalled

Genuine Windows Vista Business 32*
Genuine Windows Vista Home Basic 32*
Genuine Windows Vista Home Premium 32*
Genuine Windows Vista Business with downgrade to Windows XP Professional custom installed*†
SuSE Linux
FreeDOS

Supported

Genuine Windows Vista Business 64*

Certified

SuSE Linux Enterprise Desktop 10

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

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

Chipset

Mobile Intel PM45 Express Chipset with ICHM9, 1066 MHz front side bus (models with discrete graphics)
or
Mobile Intel GM45 Express Chipset with ICHM9, 1066 MHz front side bus (models with integrated graphics)
or
Mobile Intel GL40 Express Chipset , 667 MHz front side bus (models with integrated graphics)

Standard Features

Graphics

Models with discrete graphics:

ATI Mobility Radeon HD 4330 graphics with 512 MB dedicated video memory

- up to 1024 MB HyperMemory* in units with Windows XP and 2 GB or more of system memory

- up to 1280 MB HyperMemory* in units with Windows Vista Business and 2 GB or more of system memory

Models with integrated graphics and Mobile Intel GM45, GL40 Express chipset:

Mobile Intel Graphics Media Accelerator 4500MHD

- up to 1024 MB of total graphics memory* in units with Windows XP and 2 GB or more of system memory

- up to 1759 MB of total graphics memory* in units with Windows Vista Business and 4 GB or more of system memory

Microsoft DirectX 10.1 (discrete), 10 (integrated) capable

*Indicates dedicated video memory and shared system memory.

Display

Internal

15.6-inch diagonal LED-backlit HD anti-glare (1366 x 768 resolution)

15.6-inch diagonal LED-backlit HD BrightView (1366 x 768 resolution)

External

Up to 32-bit per pixel color depth

VGA port supports resolutions up to 1600 x 1200 at 75 Hz, and lower resolutions at up to 100 Hz.

HDMI 1.3 port supports direct connection to high-definition displays with up to 1920 x 1080 resolution and 7-channel audio with one convenient cable (not included).

NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

Memory

Standard

800 MHz DDR2 SDRAM; two slots supporting dual channel memory

1024 MB or 2048 MB

Maximum

Upgradeable to 8192 MB with 4096 MB SODIMMs in slots 1 and 2

Dual-channel

Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory slots.

NOTE: Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed. Full availability of 4 GB or more of memory requires Windows Vista Business 64-bit or Linux. With Windows 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.

Standard Features

Communications

Marvell Ethernet (10/100/1000 NIC)*

Optional 56K V.92 modem**

* The term "10/100/1000" or "Gigabit" Ethernet indicates compliance with IEEE standard 802.3ab for Gigabit Ethernet, and does not connote actual operating speed of 1 Gb/s. For high-speed transmission, connection to a Gigabit Ethernet server and network infrastructure is required.

** Designed for downloads from 56K modem compliant sources. Maximum achievable download transmission rates currently do not reach 56 KB/s, and will vary with line conditions. Modem availability is subject to country regulatory approval.

Wireless Devices

Support for a broad range of secure, integrated wireless LAN and wireless WAN options featuring support for the latest industry standards. Wireless LAN is factory configurable or available as an option to be added later. Broadband Wireless (WWAN) requires Windows Vista Business or Windows XP Professional and is available in select countries as a factory configurable feature only. Integrated Bluetooth is also available (factory configurable only) and can be combined with any of the supported wireless LAN and wireless WAN options.

HP un2400 EV-DO/HSPA Mobile Broadband Module

Integrated WWAN module with Gobi global mobile Internet technology that provides worldwide connection to both CDMA (EVDO) and UMTS (HSPA) wireless networks.

NOTE: Separately purchased mobile network operator service is required.

Two 850/900/1800/1900/2100 MHz antennas integrated in the top of the display panel support current and future WWAN technologies.

All 802.11 integrated wireless LAN options

Wi-Fi certified*

Wired Equivalent Privacy (WEP) support up to 128-bit keys

Wi-Fi Protected Access (WPA) and WPA2 support

802.1x authentication support, including EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, and LEAP

Advanced Encryption Standard (AES) support

Dual antennas integrated in the display enclosure

Intel WiFi Link 5100

Integrated support for 802.11a, b, g, and n draft 2.0*

Cisco Compatible Extensions support

Up to 450 mbps data rate

Broadcom 4322AGN 802.11a/b/g/draft-n Wi- Fi Adapter

Integrated support for 802.11a, b, g, and n draft 2.0*

Cisco Compatible Extensions support

Up to 300 mbps data rate

Broadcom 4312G 802.11b/g WiFi Adapter

Integrated support for 802.11 b and g

Cisco Compatible Extensions support

Up to 54 mbps data rate

HP Integrated Module with Bluetooth Wireless Technology

Bluetooth Specification v2.0 compliant

Works with a wide range of Bluetooth devices

* 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 (Intel 802.11a/b/g only).

Standard Features

Keyboard

The HP spill-resistant keyboard is designed using a Mylar film that minimizes the risk of damage to sensitive components underneath. The 101/102-key compatible keyboard features an industry standard, full-pitch key layout with desktop keyboard features, such as the isolated inverted-T cursor control keys, editing keys, both left and right control and alt keys, and 12 function keys. US and International key layouts are available. Other features include a full numeric keypad, hotkeys for instant access to power conservation, brightness, and other features, 19.05 x 19.05 mm key pitch (center-to-center spacing), 3.0 mm stroke, and comfort-dished keycaps.

Pointing device

Touchpad with scroll zone, two pick buttons

Expansion card slots

ExpressCard/34 slot

Supports ExpressCard/34 (34 mm x 75 mm x 5 mm) card sizes

Media Card Reader

Supports SD (Secure Digital), MMC (MultiMedia Card), Memory Stick, Memory Stick Pro, Memory Stick Duo*, xD-Picture card

* Memory Stick Duo Adapters are required and sold separately. Inserting a Memory Stick Duo Card directly into your notebook could damage the memory card and/or notebook.

Storage

Internal Storage Device 160/250/320/500 GB 5400 rpm SMART SATA II Hard Drive

NOTE: Up to 10 GB is reserved for the system recovery software.

HP 3D DriveGuard (Windows models only)

The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive. Uses three-axis digital motion detection with intelligent sensitivity to help protect the hard drive during normal use from shock and vibration. The digital accelerometer temporarily halts all data transfer and parks the hard drive when abrupt motion is detected.

Fixed optical drives

Blu-ray ROM DVD+/-RW SuperMulti DL LightScribe Drive*
DVD+/-RW SuperMulti DL LightScribe Drive

*Models with integrated graphics require Mobile Intel GM45 Express chipset and Windows Vista to support the Blu-ray DVD drive; models with discrete graphics support it with either Windows Vista or Windows XP.

Interfaces

External monitor	One (VGA)
HDMI	One – 1.3 compliant
Stereo microphone in	One
Stereo headphone/line out	One
Power connector	One
RJ-11/modem (optional)	One
RJ-45/Ethernet	One
USB 2.0	Four
LED status indicators	Seven

Standard Features

Audio/Visual

High Definition Audio support
Integrated stereo speakers
Integrated microphone
Stereo headphone/line out
Stereo microphone in

Optional 2 MP webcam

- Supports videoconferencing and still image capture
- Improved quality for video streaming and still image capture (1600x1200 resolution)
- Up to 30 frames/sec
- Fixed focus lens
- 16-bit true color (camera sensor up to UXGA resolution)

Software

Preinstalled software with Windows Vista

HP Recovery Manager
HP Help and Support Center
HP ProtectTools Security Manager
HP QuickLaunch Buttons Software
HP QuickLook 2
HP Connection Manager
HP Wireless Assistant
HP 3D DriveGuard
Microsoft Office Ready with 60-day Office Professional 2007 Trial Edition (select models)
PDF Complete SE
Intervideo WinDVD – DVD Player
Roxio Creator Business (for optional DVD+/-RW and DVD/CDRW drives)
McAfee Total Protection*
Synaptics Touchpad Driver
Microsoft Windows Live Messenger (select models)
Webcam Software (with optional 2 MP webcam)

Additional software available from the web

HP SoftPaq Download Manager

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

HP Recovery Manager

Models shipped with Windows Vista include HP Recovery Manager. HP Recovery Manager enables fast recovery of the factory preinstalled image if the system becomes corrupted or if important system files are accidentally deleted. Up to 10 GB of the hard drive is reserved for the system recovery software.

Standard Features

HP ProtectTools Security Manager HP ProtectTools Security Manager is the security platform for business notebooks and desktops. The HP ProtectTools Security Manager is an extensible client security console that delivers enhanced security capabilities through add-on software modules. The following modules are available on the hard drive (also downloadable from the web) and can be configured in Software Setup:

- BIOS Configuration for HP ProtectTools
- Credential Manager for HP ProtectTools
- Device Access Manager for HP ProtectTools
- Drive Encryption for HP ProtectTools
- File Sanitizer for HP ProtectTools
- Privacy Manager for HP ProtectTools

Security	Standard Features	HP ProtectTools Security Manager Easy Setup Wizard One Step Login Enhanced Pre-Boot Security HP SpareKey Disk Sanitizer Configuration Control Hardware Memory Change Alert Ownership Tag Setup Password Power-On Password HP 3D DriveGuard (Windows models only) Kensington Lock Slot Support for Computrace / LoJack for Laptops (must be purchased separately) HP Privacy Filter (must be purchased separately)
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For more information on HP security solutions refer to: <http://www.hp.com/go/security>.

Power Supply	External 65-watt Smart AC adapter External 90-watt Smart AC adapter (discrete graphics only) 6-foot (1.8-meter) power cord included; total length including external AC adapter is 12 feet (3.66 meter) HP Fast Charge*
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* HP Fast Charge recharges your battery up to 90% within 90 minutes when the system is off.

Battery	Primary battery	6-cell (47 WHr) Li-Ion battery 8-cell (63 WHr) Li-Ion battery
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Standard Features

Battery Life

Primary 8-cell
(63 WHr) battery

Integrated graphics

Up to 7 hours

Discrete graphics

Up to 4 hours and 30 minutes

Primary 6-cell
(47 WHr) battery

Up to 5 hours

Up to 3 hours and 15 minutes

NOTE: The listed battery life measurements were taken on models running Microsoft Windows Vista. Battery life will vary depending on the product configuration, product model, applications loaded on the product, power management settings of the product, and the product features used by the customer. As with all batteries, the maximum capacity of this battery will decrease with time and usage.

System Standby Time

Up to 1 week

Power Conservation

Supports enhanced Intel SpeedStep technology with Intel Core 2 Duo (allows Battery Optimized Mode, Maximum Performance Mode, or Automatic mode)

ATI PowerPlay technology

Hibernation

Standby

ACPI compliance

Service and Support

HP Services offers limited 3-year, 1-year and 90-day warranty options depending on country; 1-year limited warranty on primary battery. Warranty upgrades are also available. HP Care Pack Services extend service contracts beyond the standard warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: <http://www.hp.com/go/lookuptool>. Additional HP Care Pack Services information by product is available at:

<http://www.hp.com/hps/carepack>.

NOTE: Certain restrictions and exclusions apply. Consult the HP Customer Support Center for details. <http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp>.

Select Model(s)

Standard Features

4510s FM847UT#ABA Smart Buy	Processor	Intel Celeron Dual-Core Processor T1700 (1.83 GHz, 1 MB L2 cache, 667 MHz FSB)*
	Operating System	Genuine Windows Vista Home Basic 32
	Chipset	Mobile Intel GL40 Express Chipset , 667 MHz front side bus
	System Memory	2048-MB 800-MHz DDR2 SDRAM (1 DIMM) Memory operates at a maximum of 667-MHz with Celeron processor
	Hard Drive	250-GB 5400 rpm SATA HDD
	Display	15.6-inch diagonal LED-backlit HD anti-glare (1366 x 768 resolution)
	Graphics	Mobile Intel Graphics Media Accelerator 4500MHD graphics
	Audio	High Definition Audio support Integrated stereo speakers; Integrated microphone; Stereo headphone/line out; Stereo microphone in
	Integrated Web Cam	2 MP Camera included
	Communications	Marvell Ethernet (10/100/1000 NIC) 56K V.92 modem
	Integrated Wireless	Broadcom 4312G 802.11b/g WiFi Adapter
	Pointing Device	Touchpad with scroll zone, two pick buttons
	Optical Drive	DVD+/-RW SuperMulti DL LightScribe Drive
	Battery	6-cell (47 WHr) Lithium-Ion
	Power	External 65-watt Smart AC adapter
	Warranty	1 Year Limited Warranty

4510s FM852UA#ABA Regional	Processor	Intel Core 2 Duo Processor T6570 (2.10 GHz, 2 MB L2 cache, 800 MHz FSB)*
	Operating System	Genuine Windows Vista Business 32 with downgrade to Windows XP Professional custom installed*†
	Chipset	Mobile Intel GM45 Express Chipset with ICHM9, 1066 MHz front side bus
	System Memory	2048-MB 800-MHz DDR2 SDRAM (1 DIMM)
	Hard Drive	160-GB 5400 rpm SATA HDD
	Display	15.6-inch diagonal LED-backlit HD anti-glare (1366 x 768 resolution)
	Graphics	Mobile Intel Graphics Media Accelerator 4500MHD graphics
	Audio	High Definition Audio support; Integrated stereo speakers Integrated microphone; Stereo headphone/line out; Stereo microphone in
	Integrated Web Cam	Not included
	Communications	Marvell Ethernet (10/100/1000 NIC) 56K V.92 modem
	Integrated Wireless	Intel WiFi Link 5100; supports 802.11a, b, g, and n draft 2.0; Bluetooth 2.0
	Pointing Device	Touchpad with scroll zone, two pick buttons
	Optical Drive	DVD+/-RW SuperMulti DL LightScribe Drive
	Battery	6-cell (47 WHr) Lithium-Ion
	Power	External 65-watt Smart AC adapter
	Warranty	1 Year Limited Warranty

Standard Features

4510s FM848UT#ABA Smart Buy	Processor	Intel Core 2 Duo Processor T6570 (2.10 GHz, 2 MB L2 cache, 800 MHz FSB)*
	Operating System	Genuine Windows Vista Business 32 with downgrade to Windows XP Professional custom installed*†
	Chipset	Mobile Intel GM45 Express Chipset with ICHM9, 1066 MHz front side bus
	System Memory	2048-MB 800-MHz DDR2 SDRAM (1 DIMM)
	Hard Drive	250-GB 5400 rpm SATA HDD
	Display	15.6-inch diagonal LED-backlit HD anti-glare (1366 x 768 resolution)
	Graphics	Mobile Intel Graphics Media Accelerator 4500MHD graphics
	Audio	High Definition Audio support; Integrated stereo speakers Integrated microphone; Stereo headphone/line out; Stereo microphone in
	Integrated Web Cam	2MP Camera included
	Communications	Marvell Ethernet (10/100/1000 NIC) 56K V.92 modem
	Integrated Wireless	Intel WiFi Link 5100; supports 802.11a, b, g, and n draft 2.0
	Pointing Device	Touchpad with scroll zone, two pick buttons
	Optical Drive	DVD+/-RW SuperMulti DL LightScribe Drive
	Battery	6-cell (47 WHr) Lithium-Ion
Power	External 65-watt Smart AC adapter	
Warranty	1 Year Limited Warranty	

4510s FM853UT#ABA Smart Buy	Processor	Intel Core 2 Duo Processor T6570 (2.10 GHz, 2 MB L2 cache, 800 MHz FSB)*
	Operating System	Genuine Windows Vista Business 32 with downgrade to Windows XP Professional custom installed*†
	Chipset	Mobile Intel GM45 Express Chipset with ICHM9, 1066 MHz front side bus
	System Memory	2048-MB 800-MHz DDR2 SDRAM (1 DIMM)
	Hard Drive	250-GB 5400 rpm SATA HDD
	Display	15.6-inch diagonal LED-backlit HD anti-glare (1366 x 768 resolution)
	Graphics	Mobile Intel Graphics Media Accelerator 4500MHD graphics
	Audio	High Definition Audio support; Integrated stereo speakers Integrated microphone; Stereo headphone/line out; Stereo microphone in
	Integrated Web Cam	2MP Camera included
	Communications	Marvell Ethernet (10/100/1000 NIC) 56K V.92 modem
	Integrated Wireless	Intel WiFi Link 5100; supports 802.11a, b, g, and n draft 2.0: Bluetooth 2.0
	Pointing Device	Touchpad with scroll zone, two pick buttons
	Optical Drive	DVD+/-RW SuperMulti DL LightScribe Drive
	Battery	8-cell (63 WHr) Lithium-Ion
Power	External 65-watt Smart AC adapter	

Standard Features

Warranty 1 Year Limited Warranty

4510s FM849UT#ABA Smart Buy	Processor	Intel Core 2 Duo Processor T6570 (2.10 GHz, 2 MB L2 cache, 800 MHz FSB)*
	Operating System	Genuine Windows Vista Business 32 with downgrade to Windows XP Professional custom installed*†
	Chipset	Mobile Intel GM45 Express Chipset with ICHM9, 1066 MHz front side bus
	System Memory	3072-MB 800-MHz DDR2 SDRAM (2 DIMM)
	Hard Drive	320-GB 5400 rpm SATA HDD
	Display	15.6-inch diagonal LED-backlit HD BrightView (1366 x 768 resolution)
	Graphics	Mobile Intel Graphics Media Accelerator 4500MHD graphics
	Audio	High Definition Audio support; Integrated stereo speakers Integrated microphone; Stereo headphone/line out; Stereo microphone in
	Integrated Web Cam	2MP Camera included
	Communications	Marvell Ethernet (10/100/1000 NIC) 56K V.92 modem
	Integrated Wireless	Intel WiFi Link 5100; supports 802.11a, b, g, and n draft 2.0: Bluetooth 2.0
	Pointing Device	Touchpad with scroll zone, two pick buttons
	Optical Drive	DVD+/-RW SuperMulti DL LightScribe Drive
	Battery	6-cell (47 WHr) Lithium-Ion
	Power	External 65-watt Smart AC adapter
	Warranty	1 Year Limited Warranty

Options

Memory	HP 1 GB (DDR2 800 MHz) SODIMM	KT292AA
	HP 2 GB (DDR2 800 MHz) SODIMM	KT293AA
	HP 4 GB (DDR2 800 MHz) SODIMM	KT294AA
Storage	HP Notebooks USB Diskette Drive	DC361B
	HP Primary SATA 250 GB 5400 rpm Hard Drive	AK072AA
	HP Primary SATA 120 GB 7200 rpm Hard Drive	AH920AA
	HP 250 GB USB Pocket Media Hard Drive	FE477AA
Expansion	HP USB 2.0 Docking Station	FQ834AA
Power	HP 90W Smart AC Adapter	ED495AA#ABA
	HP 65W Smart AC Adapter	ED494AA#ABA
	HP 90W Smart Combo Adapter	AJ652AA#ABA
	HP 90W Smart Auto/Truck Adapter	ED493AA
Carrying Cases	HP Basic Carrying Case	AJ078AA
	HP Basic Backpack	AM863AA
	HP Basic Messenger	AP355AA
	HP Value Nylon Case	RR314AA
	HP Universal Nylon Case	RR315AA
	HP Executive Leather Case	RR316AA
	HP Deluxe Nylon Backpack	RR317AA
	HP Deluxe Roller Case	GD405AA
Security	HP/Kensington MicroSaver Security Lock	PC766A
Input/Output Devices	HP USB Keyboard & Mouse Bundle	RC465AA#ABA
	HP USB/PS2 Optical 2-Button Scroll Mouse	DC369A
	HP USB Optical Travel Mouse	RH304AA
	HP Mobile Audio Speakers	FS944AA

Memory

800 MHz DDR2 SDRAM

Two DIMM slots supporting dual channel memory

DIMM sizes supported: 1024 MB and 2048 MB

- Standard Memory**
- 1024 MB (1024 MB x 1)
 - 2048 MB (2048 MB x 1 or 1024 MB x 2)
 - 3072 MB (2048 MB x 1024 MB)
 - 4096 MB (2048 MB x 2)

Optional Memory Upgrades Support for up to 8192 MB of memory with the installation of optional DDR2 SDRAM memory kits. Both memory slots are user accessible. Please refer to the Hardware and Software Guide for installation procedures. Maximized dual-channel performance requires SODIMMs of the same size and speed in both memory slots.

Up to	Slot 1	Slot 2
1024 MB	1024 MB	Empty
2048 MB	1024 MB	1024 MB
3072 MB	2048 MB	1024 MB
4096 MB	2048 MB	2048 MB
8192 MB	4096 MB	4096 MB

NOTE: This chart does not represent all possible memory configurations. Due to the non-industry standard nature of some third-party memory modules, we strongly recommend using only HP branded memory modules to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed. Full availability of 4 GB or more of memory requires Windows Vista Business 64-bit or Linux. With Windows 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.

Memory Upgrades	HP 1 GB (DDR2 800 MHz) SODIMM	KT292AA
	HP 2 GB (DDR2 800 MHz) SODIMM	KT293AA
	HP 4 GB (DDR2 800 MHz) SODIMM	KT294AA

Storage

Removable Media Drive Support

	Quantity Supported	Drive Bay
Blu-ray ROM DVD+/-RW SuperMulti DL LightScribe Drive*	One	Fixed optical drive bay
DVD+/-RW SuperMulti DL LightScribe Drive	One	Fixed optical drive bay

*Models with integrated graphics require Mobile Intel GM45 Express chipset and Windows Vista to support the Blu-ray DVD drive; models with discrete graphics support it with either Windows Vista or Windows XP.

Internal Storage Device

	Quantity Supported	Drive Bay
Hard Drives		
500 GB 5400 rpm SMART SATA II Hard Drive	One	Dedicated hard drive bay
320 GB 5400 rpm SMART SATA II Hard Drive	One	Dedicated hard drive bay
250 GB 5400 rpm SMART SATA II Hard Drive	One	Dedicated hard drive bay
160 GB 5400 rpm SMART SATA II Hard Drive	One	Dedicated hard drive bay

Technical Specifications

System Unit	Dimensions (HxWxD)	1.24 in (at front) x 14.6 in x 9.83 in 31.5 mm (at front) x 371.8 mm x 249.6 mm
	Weight	Starting at 5.7 lb (2.59 kg)
	NOTE: Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes 8-cell battery, hard drive, and optical drive. Weight varies by configuration and components.	
Stand-Alone Power Requirements (AC Power)	Nominal Operating Voltage	18.5 V
	Average Operating Power	with integrated graphics: 12.8 W with discrete graphics: 21.25 W
	Max Operating Power	< 90 W or < 65W
Temperature	Operating	32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical)
	Non-operating	-4° to 140° F (-20° to 60° C)
Relative Humidity	Operating	10% to 90%, non-condensing
	Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature
Shock	Operating	125 G, 2 ms, half-sine
	Non-operating	200 G, 2 ms, half-sine
Random Vibration	Operating	0.75 grms
	Non-operating	1.50 grms
Altitude (unpressurized)	Operating	-50 to 10,000 ft (-15.24 to 3,048 m)
	Non-operating	-50 to 40,000 ft (-15.24 to 12,192 m)
Industry Standard Certifications	UL	Yes
	CSA	Yes
	FCC Compliance	Yes
	ENERGY STAR®	Yes
	EPEAT	Gold
	ICES	Yes
	Australia / NZ A-Tick Compliance	Yes
	CCC	Yes
	Japan VCCI Compliance	Yes
	MIC	Yes
	BSMI	Yes
	CE Marking Compliance	Yes
	BNCI or BELUS	Yes
	CIT	Yes
	GOST	Yes
	Saudi Arabian Compliance (ICCP)	Yes
SABS	Yes	

Technical Specifications

UKRSERTCOMPUTER Yes

For accessibility information on HP products, please visit: <http://www.hp.com/accessibility>.

HP 90W Smart AC Adapter

Dimensions	5.00 x 1.97 x 1.1 in (12.7 x 5.0 x 2.9 cm)
Weight	0.82 lb (370 g)
Input	100 to 240 VAC
	Input Efficiency 83% min at 115 VAC
	Input frequency range 47 to 63 Hz
	Input AC current 1.5 A at 90 VAC, 0.75 A at 180 VAC PFC Version
	2.4 A at 90 VAC, 1.2 A at 180 VAC NON PFC Version
Output	Output power 65W 90W
	DC output 19.0V
	Hold-up time 5 msec at 115 VAC input
	Output current limit <11A, Over voltage protection- 29V max automatic shutdown
Connector	3 pin/grounded, mates with interchangeable cords
Environmental Design	Operating temperature 32° to 104° F (0° to 40° C)
	Non-operating (storage) temperature -4° to 149° F (-20° to 65° C)
	Altitude 0 to 10,000 ft (0 to 3,048 m)
	Humidity 20% to 80%
	Storage Humidity 10% to 90%
EMI and Safety Certifications	CE Mark – full compliance with LVD and EMC directives; Worldwide safety standards – IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals – C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF– over 200,000 hours at 25°C ambient condition.

Technical Specifications

HP 65W Smart AC Adapter	Dimensions	4.17 x 1.85 x 1.1 in (10.6 x 4.7 x 2.8 cm)		
	Weight	0.62 lb (280 g)		
	Input	100 to 240 VAC		
		Input Efficiency	83% min at 115 VAC	
		Input frequency range	47 to 63 Hz	
	Output	Input AC current	1.7 A at 90 VAC, 0.85 A at 180 VAC	
		Output power 65W	65W	
		DC output	18.5V	
		Hold-up time	5 msec at 115 VAC input	
		Output current limit	Output current limit <11A, Over voltage protection- 29V max automatic shutdown	
	Connector	3 pin/grounded, mates with interchangeable cords		
	Environmental Design	Operating temperature	32° to 104° F (0° to 40° C)	
		Non-operating (storage) temperature	-4° to 149° F (-20° to 65° C)	
		Altitude	0 to 10,000 ft (0 to 3,048 m)	
		Humidity	20% to 80%	
Storage Humidity		10% to 90%		
EMI and Safety Certifications	CE Mark – full compliance with LVD and EMC directives; Worldwide safety standards – IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals – C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF – over 200,000 hours at 25°C ambient condition.			

8-Cell (63 WHr) Lithium-Ion battery (ZZ08063)	Dimensions (H x W x L)	0.8 x 2.3 x 10.6 in (2.0 x 5.8 x 27.0 cm)		
	Weight	0.35 lb (0.427 kg)		
	Cells/Type	8-cell Lithium-Ion		
	Energy	Watt-hour Capacity	63 WHr	
	Temperature	Operating (Charging)	32° to 113° F (0° to 45° C)	
		Operating (Discharging)	14° to 140° F (-10° to 60° C)	
		Non-operating	-4° to 140° F (-20° to 60° C)	
	Battery Re-Charge Time	System in OFF mode or Standby	2.5 hours	
		System ON	3 to 5 hours (depending on system power consumption)	
		HP Fast Charge Technology	Charges the battery up to 90% within 1.5 hours when system is OFF	

Technical Specifications

6-Cell (47 WHr) Lithium-Ion battery (ZZ06047)	Dimensions (H x W x L)	0.8 x 2.3 x 8.0 in (2.0 x 5.8 x 20.3 cm)		
	Weight	0.710 lb (0.322 kg)		
	Cells/Type	6-cell Lithium-Ion		
	Energy	Watt-hour Capacity	47 WHr	
	Temperature	Operating (Charging)	32° to 113° F (0° to 45° C)	
		Operating (Discharging)	14° to 140° F (-10° to 60° C)	
		Non-operating	-4° to 140° F (-20° to 60° C)	
	Battery Re-Charge Time	System in OFF mode or Standby	2.5 hours	
		System ON	3 to 5 hours (depending on system power consumption)	
		HP Fast Charge Technology	Charges the battery up to 90% within 90 minutes when system is OFF	

Displays

15.6-inch LED-backlit HD (1366 x 768) anti-glare	Active Area (W x H)	13.54 x 7.59 in (34.4 x 19.3 cm)		
	Diagonal Size	15.6 in (39.6cm)		
	Surface Treatment	Anti-glare		
	Contrast Ratio	300:1 (typical)		
	Refresh Rate	60 Hz		
	Brightness	200 nit (typical)		
	Pixel Resolution	Pitch	0.253 mm	
		Format	1366 x 768	
		Configuration	RGB Stripe	
	Backlight	LED		
	PPI	100 ppi		
	Viewing Angle	±30° Horizontal, ±10° Vertical (minimum)		
		30/30/20/10 (Left/Right/Down/Up) (minimum) or 45/45/35/25 (Left/Right/Down/Up) (typical)		

Technical Specifications

15.6-inch LED-backlit HD (1366 x 768) BrightView	Active Area (W x H)	13.54 x 7.59 in (34.4 x 19.3 cm)	
	Diagonal Size	15.6 in (39.6 cm)	
	Surface Treatment	BrightView (glossy)	
	Contrast Ratio	300:1 (typical)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	Pitch	0.253 mm
		Format	1366 x 768
		Configuration	RGB Stripe
	Backlight	LED	
	PPI	100 ppi	
	Viewing Angle	±30° Horizontal, ±10° Vertical (minimum)	
		30/30/20/10 (Left/Right/Down/Up) (minimum) or 45/45/35/25 (Left/Right/Down/Up) (typical)	

Hard Drives

500 GB 5400 rpm SATA Hard Drive	Drive Weight	0.22 lb (101 g)	
	Capacity	500 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	Synchronous (maximum)	100 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	Single Track	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Technical Specifications

320 GB 5400 rpm SATA Hard Drive	Drive Weight	0.22 lb (101 g)	
	Capacity	320 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	Synchronous (maximum) 100 MB/s (Drive Capability)	
	Seek Time (typical reads, including settling)	Single Track	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	625,142,448	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
Features	ATA Security		

250 GB 5400 rpm SATA Hard Drive	Drive Weight	0.22 lb (101 g)	
	Capacity	250 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	Synchronous (maximum) 100 MB/s (Drive Capability)	
	Seek Time (typical reads, including settling)	Single Track	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	488,397,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
Features	ATA Security		

Technical Specifications

160 GB 5400 rpm SATA Hard Drive	Drive Weight	0.22 lb (101 g)	
	Capacity	160 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	Synchronous (maximum) 100 MB/s (Drive Capability)	
	Seek Time (typical reads, including settling)	Single Track	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	312,581,808	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Removable Storage Drives

DVD+/-RW SuperMulti DL LightScribe Drive	Access Times	Random	< 150ms CD (typical)
			< 160 ms DVD (typical)
	Max Data Transfer Rate	24X CD-ROM	Up to 3,600 KB/s
		8X DVD	Up to 10,800 KB/s
		24X CD-R	Up to 3,600 KB/s
		16X CD-RW	Up to 2,400 KB/s
		8X DVD+R	Up to 10,800 KB/s
		8X DVD+RW	Up to 10,800 KB/s
		8X DVD-R	Up to 10,800 KB/s
		6X DVD-RW	Up to 8100KB/s
		4X - DVD+R Dual Layer	Up to 5,400 KB/s
		4X - DVD-R Dual Layer	Up to 5,400 KB/s
		5X DVD-RAM	Up to 6,750 KB/s
	Transfer Mode	UDMA Mode 5	
Interface	Gen 1 SATA		
Supported Media (read)	CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM		
Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, LightScribe		
Max Media Capacity (read)	8.5 GB		
Max Media Capacity (write)	8.5 GB		

Technical Specifications

	Transport	Tray Loading		
Blu-ray ROM DVD+/-RW SuperMulti DL LightScribe Drive	Access Times	Random	< 190 ms CD-ROM (typical)	
			< 190ms DVD-ROM (typical)	
			<230 ms BD-ROM (typical)	
	Max Data Transfer Rate	24X CD-ROM		Up to 3600KB/s
		8X DVD-ROM		Up to 10800 KB/s
		16X CD-R		Up to 1,200KB/s
		10X CD-RW		Up to 1500 KB/s
		8X DVD+R		Up to 10800 KB/s
		8X DVD+RW		Up to 10,800KB/s
		8X DVD-R		Up to 10800 KB/s
		6X DVD-RW		Up to 8,100 KB/s
		4X - DVD+R Dual Layer		
		4X - DVD-R Dual Layer		Up to 5400 KB/s
		5X DVD-RAM		Up to 6750 KB/s
		4X BD-ROM		Up to 18,000KB/s
Transfer Mode	UDMA Mode 5			
Interface	Gen 1 SATA			
Supported Media (read)	CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW. DVD-RAM, BD-ROM, BD-R, BD-RE			
Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+R(9), DVD+RW, DVD-R, DVD-R(9), DVD-RW, DVD-RAM, LightScribe			
Max Media Capacity (read)	50.0 GB			
Max Media Capacity (write)	8.5 GB			
Transport	Tray Loading			

Audio

Technical Specifications

Hardware	Implementation	ADI 1984AJCPZ High Definition CODEC	
	Touch-Sensitive Volume Controls	Volume up, volume down, and mute	
	Full Duplex	Yes	
	Microphone In	Stereo	
	Headphone/Line Out	Stereo	
	Integrated Microphone	Yes	
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Audio Output Quality	Frequency Response	20 Hz – 20 kHz	
	Signal to Noise Ratio	>85 dB	
	Total Harmonic Distortion	0.01%	
	Noise Floor	-110 dB	
	Play/Record Sampling Rate(s)	8 kHz – 48kHz	
	DAC	16, 20 or 24-bit	
	ADC	16 or 20-bit	
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Integrated Stereo Speakers	Power Rating	1.5 Watts	
	Impedance	4 Ohms	
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Communications			
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Integrated Marvell 10/100/1000 NIC	Ethernet Features	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14)	
		100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30)	
		1000 Mbit/s operation (1000BASE-T; IEEE 802.3z and 802.3ab; IEEE 802.3 clauses 34-42)	
		Auto-Negotiation (Automatic Speed Selection)	
		Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s	
		IEEE 802.1p QoS (Quality of Service) Support	
		IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable)	
		Power Management	ACPI compliant – multiple power modes
			Situation-sensitive features reduce power consumption
		Performance Features	TCP/IP/UDP Checksum Offload (configurable)
		Manageability	Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only)
	PXE 2.1 Remote Boot		
	Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30))		
	Comprehensive diagnostic and configuration software suite		
Interface	PCI Express x1		
NIC Device Driver Name	Marvell Yukon 88E8072 PCI-E Gigabit Ethernet Controller		

Technical Specifications

V.92 56K Data/Fax Modem	Form Factor	MDC 1.5 Daughtercard
	Power Management Support	APM Revision 1.2, ACPI
	Approvals/Certifications	UL, CSA, NEMKO, CCIB, Industry Canada, FCC Part 68, CTR21, FCC Part 15 Class B, Canadian ICES-003 Class B, C.I.S.P.R.22, Australian ACA, CE Mark, Other Countries
	Data Mode Capabilities	V.92 data V.8bis V.80 V44, V.42bis, MNP5 (Compression) V.42 (LAPM, MNP2-4) (Error Correction) Optional symbol rates: 2800, 3429 Asymmetric Symbol rates Synchronous primary channel data signaling rates: 3600, 31200 Automatic rate re-negotiation V.34 V.32bis V.32 V.23 V.22bis V.22 V.21 Bell 212A Bell 103J
	Fax Mode Capabilities	TIA/EIA-578-B (Class 1) T.30, T.4 (Group 3) V.17 V.29 V.27ter V.21 Channel 2
	Command Set	V.250 (Partial) TIA-602 Identification: +GMI, +GMM, +GMR Port control: +IPR, +ICF, +IFC, +ILRR Modulation: +MS, +MR, +MA Error control: +ES, +ER, +EB, +ESR, +ETBM Data compression: +DS, +DR V.251

Technical Specifications

HP un2400 EV-DO/HSPA Mobile Broadband Module	Technology/Operating Bands	GSM/GPRS/EDGE: 850MHz(Cell), 900MHz(EGSM), 1800MHz(DCS), 1900MHz (PCS) UMTS/WCDMA with receive diversity: 2100MHz (UTRA FDD Band I), 1900MHz (UTRA FDD Band II), 850MHz (UTRA FDD Band V) 1xEVDO/1xRTT with receive diversity: 850MHz (Band Class0-Cell), 1900MHz (Band Class1-PCS)
	Wireless Protocol Standards	GSM/GPRS/EDGE: Class B, Multi-slot operation, coding schemes CS1 – CS4 and MSC1 – MSC9. UMTS/WCDMA: Release 99 and Release 5 CDMA: 1xEVDO Release 0 and Release A, IS-95A, IS-95B, IS-2000
	Wireless Parametric Standards	Meets or exceeds TIA/EIA IS-98-D
	Maximum Data Rates	UMTS (HSPA) – 7.2 Mbps (Download), 2.0 Mbps (Upload) CDMA (EVDO Release A) – 3.1 Mbps (Download), 1.8 Mbps (Upload)
	Maximum Output Power	GSM/GPRS/EDGE: 32dBm (+/-1) WCDMA: 24dBm (+/-1) CDMA: 24dBm (+/-1)
	Maximum Power Consumption	2500mA (peak); 1000mA (average)
	Power Consumption, Sleep Mode	5 mA
	Power Management	USB selective suspend Integrated notebook wireless button
	Antenna Type	Dual high efficiency 5 band antennae with spatial diversity, mounted in the display enclosure
	Form Factor	PCI-Express MiniCard
	Weight	11.5 g
	Dimensions (Length x Width x Thickness)	2.01 x 1.18 x 0.18 in (51 x 30 x 4.5 mm)
	Voltage, Operating	3.3v +/- 10%
	Temperature, Operating (from TIA/EIA/IS-98-D)	-22° to 140° F (-30° to 60° C) (full RF performance) -22° to 167° F (-30° to 75° C) (reduced RF performance)
	Temperature, Non- operating, 96 hours (from MIL-STD 202 Method 108)	-40° to 185° F (-40° to 85° C)
	Humidity, Non-operating	85% relative humidity for 48 hours @ 185° F (85° C) (non-condensing)
	Configuration Utilities	HP Connection Manager
	LED Activity	LED Off – Radio Off; Solid LED On – Radio On

Intel WiFi Link 5100	Wireless LAN Standards	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n (draft 2.0)*
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Technical Specifications

* 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.

Interoperability	Wi-Fi certified (802.11abg only) Cisco Compatible Extensions Program compliant (802.11abg only) with Microsoft Windows Vista and XP (details at: http://www.hp.com/go/notebooks/WLAN)
Frequency Band	2.4 GHz and 5 GHz
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 DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM
Security¹	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) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power (for CCK)²	15 dBm
Output Power (for OFDM; power varies by data rate)²	15 dBm
Power Consumption	Transmit: 2.3 Watts (average, with one spatial streams) Receive: 1.9 Watts (average with two receive chains) Idle mode ³ : 30 mW (average) Radio off: 20 mW (max)
Power Management	ACPI compliant power management 802.11 compliant power saving mode
Receiver Sensitivity⁴	300 Mbps: -68 dBm, 54 Mbps: -74 dBm, 6 Mbps: -90 dBm
Antenna Connections	3 U.FL type connectors, 50 ohm nominal impedance
Form Factor	PCI-Express Half-MiniCard
Weight	0.013 lb (6 g)
Dimensions	0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm)
Operating Voltage	3.3V +/- 9%, 1.5V +/- 5%

Technical Specifications

Temperature	Operating	32° to 176° F (0° to 80° C)
	Non-operating	-40° to 176° F (-40° to 80° C)
Humidity	Operating	10% to 90% (non-condensing)
	Non-operating	5% to 90% (non-condensing)
Altitude	Operating	0 to 10,000 ft (3,048 m)
	Non-operating	0 to 50,000 ft (15,240 m)
Configuration Utility⁵	Microsoft Windows XP	Choice of Configuration Utility: <ul style="list-style-type: none">• Microsoft Windows XP Wireless Network Connection Manager• Intel PROSet for Microsoft Windows XP (required for Cisco Compatible Extensions support)
	Microsoft Windows Vista	<ul style="list-style-type: none">• Microsoft Windows Vista Wireless Network Connection Manager.• Intel IHV extensions for Windows Vista available to support Cisco Compatible Extensions.
LED Activity	LED Off – Radio OFF; Solid LED On – Radio ON	
	<ol style="list-style-type: none">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.	

Broadcom 4312G 802.11b/g WiFi Adapter	Wireless LAN Standards	IEEE 802.11b IEEE 802.11g	
	Interoperability	Wi-Fi certified Cisco Compatible Extensions Program compliant with Microsoft Windows Vista and XP (details at: http://www.hp.com/go/notebooks/WLAN)	
	Frequency Band	2.4 GHz	
	Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps	
	Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM	
	Security¹	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES, 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.	

Technical Specifications

Media Access Protocol	CSMA/CA (Collision Avoidance) with ACK
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
Roaming	IEEE 802.11 compliant roaming between access points
Output Power (for CCK)²	17 dBm , nominal
Output Power (for OFDM; power varies by data rate)²	15 dBm , nominal
Power Consumption	Idle associated: 250 mW Idle unassociated: 150 mW Transmit: 2.0 W (max) Receive: 2.0 W (max)
Power Management	ACPI compliant power management 802.11 compliant power saving mode
Receiver Sensitivity³	54 Mbps: -71 dBm, 11 Mbps: -85 dBm , 1 Mbps: -95 dBm
Antenna type	High efficiency dual band antenna with spatial diversity, mounted in the display enclosure
Form Factor	PCI-Express Half-MiniCard
Weight	0.013 lb (6 g)
Dimensions	0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm)
Operating Voltage	3.3v +/- 10%
Temperature	Operating 14° to 149° F (-10° to 65° C) Non-operating -40° to 176° F (-40° to 80° C)
Humidity	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
Altitude	Operating 0 to 10,000 ft (3,048 m) Non-operating 0 to 50,000 ft (15,240 m)
Configuration Utility⁴	Microsoft Windows XP Choice of Configuration Utility: <ul style="list-style-type: none">● Microsoft Windows XP Wireless Network Connection Manager● Broadcom Wireless Configuration Utility (required for Cisco Compatible Extensions support) Microsoft Windows Vista <ul style="list-style-type: none">● Microsoft Windows Vista Wireless Network Connection Manager● Broadcom IHV extensions for Windows Vista available to support Cisco Compatible Extensions.
LED Activity	LED Off – Radio OFF; Solid LED On – Radio ON

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. 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).
4. 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

Technical Specifications

Vista.

Broadcom 4322AGN 802.11a/b/g/draft-n WiFi Adapter	Wireless LAN Standards	IEEE 802.11a IEEE 802.11b IEEE 802.11g IEEE 802.11n (draft 2.0)* <i>* 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.</i>
	Interoperability	Wi-Fi certified (802.11abg only) Cisco Compatible Extensions Program compliant (802.11abg only) with Microsoft Windows Vista and XP (details at: http://www.hp.com/go/notebooks/WLAN)
	Frequency Band	2.4 GHz and 5 GHz
	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): 6, 6.5, 9, 12, 13, 13.5, 18, 19.5, 24, 26, 27, 36, 39, 40.5, 48, 52, 54, 58.5, 65, 78, 81, 104, 108, 117, 121.5, 130, 135, 162, 216, 243, 270, 300 Mbps
	Frequency Support	20 MHz: 2.4 GHz and 5 GHz bands 40 MHz: 2.4 GHz and 5 GHz bands
	Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM
	Security¹	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES, 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) Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between access points
	Output Power (for CCK)²	17 dBm
	Output Power (for OFDM; power varies by data rate)²	15 dBm
	Power Consumption	Idle associated: 250 mW Idle unassociated: 150 mW Transmit/Receive 20 MHz channel: 2.0 W (max) Transmit/Receive 40 MHz channel: 2.0 W (max)
	Power Management	ACPI compliant power management 802.11 compliant power saving mode

Technical Specifications

Receiver Sensitivity³	270 Mbps: -61dBm, , 54 Mbps: -72 dBm, 11 Mbps: -85 dBm , 1 Mbps: -92 dBm
Antenna type	High efficiency dual band antenna with spatial diversity, mounted in the display enclosure
Form Factor	PCI-Express Half-MiniCard
Weight	0.013 lb (6 g)
Dimensions	0.19 x 1.06 x 1.18 in (4.75 x 26.8 x 30 mm)
Operating Voltage	3.3v +/- 10%
Temperature	Operating 14° to 149° F (-10° to 65° C) Non-operating -40° to 176° F (-40° to 80° C)
Humidity	Operating 10% to 90% (non-condensing) Non-operating 5% to 95% (non-condensing)
Altitude	Operating 0 to 10,000 ft (3,048 m) Non-operating 0 to 50,000 ft (15,240 m)
Configuration Utility⁴	Microsoft Windows XP Choice of Configuration Utility: <ul style="list-style-type: none">● Microsoft Windows XP Wireless Network Connection Manager● Broadcom Wireless Configuration Utility (required for Cisco Compatible Extensions support) Microsoft Windows Vista <ul style="list-style-type: none">● Microsoft Windows Vista Wireless Network Connection Manager● Broadcom IHV extensions for Windows Vista available to support Cisco Compatible Extensions.
LED Activity	LED Off – Radio OFF; Solid LED On – Radio ON <ol style="list-style-type: none">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. 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).4. 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.

HP Integrated Module with Bluetooth Wireless Technology

Bluetooth Specification	2.0 Compliant
Dimensions	1.02 x 0.55 x 0.22 in (26 x 14 x 5.7 mm)
Frequency Band	2402 to 2480 MHz
Number of Available Channels	79 (1 MHz) available channels
Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric
Transmit Power	-6 dBm to 4 dBm (Bluetooth Class II)

Technical Specifications

Receiver Sensitivity	Better than -80 dBm at 0.1 % raw bit error rate	
Power Consumption	Peak (Tx)	264 mW
	Peak (Rx)	231 mW
	Sleep	<1 mW
Antenna	Internally integrated within module	
Range	Up 33 ft (10 m)	
Electrical Interface	USB 2.0 compliant	
	Microsoft Windows Plug and Play compliant	
OS Support	Microsoft Windows XP Professional and Home	
	Microsoft Windows 2000	
Bluetooth Software Supported	Broadcom Bluetooth for Windows	
	Microsoft Windows XP Bluetooth Software	
Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves	
Security	Full support of Bluetooth Security Provisions	
Power Management	Microsoft Windows ACPI, and USB Bus Support	
	Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff	
Certifications	All necessary regulatory approvals for supported countries, including:	
	FCC (47 CFR) Part 15C, Section 15.247 & 15.249	
	ETS 300 328, ETS 300 826	
	Low Voltage Directive IEC950	
Temperature	Operating	-4° to 158° F (-20° to 70° C)
	Non-operating	-40° to 176° F (-40° to 80° C)
	UL, CSA, and CE Mark	
Humidity	Operating	10% to 90%
	Non-operating	5% to 95%
Altitude	Operating	15,000 ft (4,572 m)
	Non-operating	40,000 ft (12,192 m)
Bluetooth Profiles Supported	(with Bluetooth for Windows 4.0 software)	
	Serial Port Profile (SPP)*	
	Dial-Up Networking (DUN)*	
	Generic Object Exchange Profile (GOEP)	
	Object Push Profile (OPP)*	
	File Transfer Profile (FTP)	
	Synchronization Profile (SYNC)	
	Hard Copy Cable Replacement (HCRP)*	
	Personal Area Networking Profile (PAN)*	
	Human Interface Device Profile (HID)*	
	FAX Profile (FAX)	
Basic Imaging Profile (BIP)		
Headset Profile (HSP)		

Technical Specifications

Hands Free Profile (HFP)

Advanced Audio Distribution Profile (A2DP)

* indicates the profile is also supported by Microsoft Windows XP SP2

Eco Data

Eco-Label Certifications

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

- US Energy Star
- IT ECO declaration
- EPEAT – Gold

System Configuration

The configuration used for the Energy Consumption and Declared Noise Emissions data for this model is based on a "Typically Configured Notebook"

Energy Consumption

	115 VAC	230 VAC	100 VAC
Normal Operation	9.039 W	9.109 W	8.969 W
Sleep (Energy Star low power mode)	0.667 W	0.756 W	0.625 W
Off	0.825 W	0.967 W	0.821 W

Heat Dissipation*

	115 VAC	230 VAC	100 VAC
Normal Operation	31 BTU/hr	31 BTU/hr	31 BTU/hr
Sleep	2 BTU/hr	2 BTU/hr	2 BTU/hr
Off	3 BTU/hr	3 BTU/hr	3 BTU/hr

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

Declared Noise Emissions

(in accordance with ISO 7779 and ISO 9296)

	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Idle	3.3	28.9
Operation	3.7	32.5

*System fan is usually off except when charging the battery

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

The battery type and chemistry used in the product is:

- Li-ion
- High capacity Lithium-Ion battery

Additional

This product is in compliance with the Restrictions of Hazardous Substances



Technical Specifications

information:

(RoHS) directive – 2002/95/EC.

This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.

This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).

This product is in compliance with the IEEE 1680 (EPEAT) standard at the Gold level, see www.epeat.net

Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.

This product contains 0% post consumer recycled plastic (by wt.)

This product is greater than 97.6% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
 - Corrugated carton 670 g
 - CANON bags – several layers 15 g
 - Cardboard & misc. 95 g
- Internal:
 - EPE-Expanded Polyethylene 70 g
- The Corrugated carton packaging material is made from 100% recycled content.
- The CANON bags - several layers packaging materials contains at least 100% recycled content.
- The Cardboard & misc. packaging materials contains at least 100% recycled content.
- The EPE-Expanded Polyethylene packaging materials contains at least 100% recycled content.

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.

Technical Specifications

Material Usage

This product does not contain any of the following substances in excess of regulatory limits (for reference of these limits please refer to the HP General Specification of the Environment

(http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants - may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Nickel - finishes must not be used on the external surface designed to be frequently handled or carried by the user.
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) - except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)

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>

Environment website

<http://www.hp.com/environment>

Eco-label certifications

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

Technical Specifications

productdesign/ecolabels.html

ISO 14001 certificates:

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

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