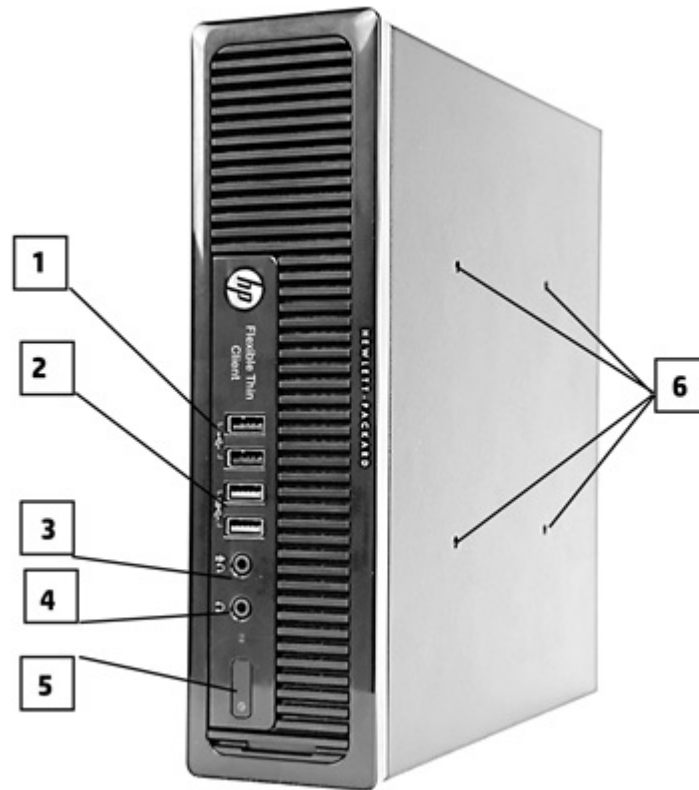


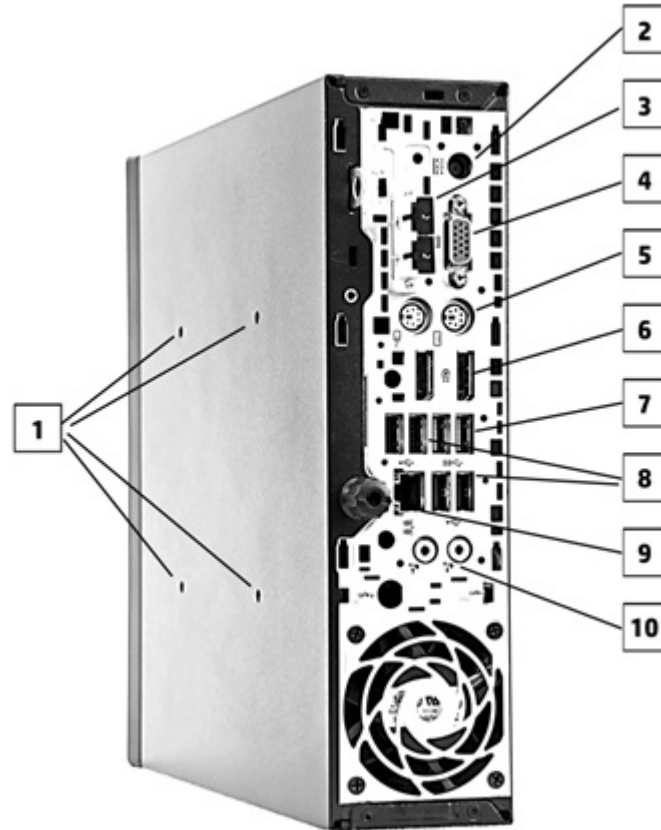
### Overview



1. USB 2.0 connectors (two)
2. USB 3.0 connectors (two)
3. Audio connector (microphone / headset out)
4. Audio connector (speaker / headset out)
- 4.5. Flash drive activity indicator light (not called-out in image above)
5. Power button (with integrated power indicator light)
6. Mounting points for HP Quick Release or other VESA mount

### Overview

### HP t820 Thin Client Rear View



1. Mounting points for HP Quick Release or other VESA mount
2. Power in (from external power supply)
3. SC Fiber Network Connector (optional)
4. VGA monitor out
5. PS/2 keyboard and mouse connectors
6. DisplayPort 1.2 connectors (two)
7. USB 3.0 connectors (two)
8. USB 2.0 connectors (four)
9. 10/100/1000 Mbps Ethernet RJ-45 port
10. Audio connectors (line in / line out)

### Overview

#### At A Glance

##### Hardware features:

- Choice between two powerful 4th generation Intel CPUs for handling the most demanding client virtualization environments (Citrix HDX including HDX 3D Pro, VMware Horizon View, and Microsoft Remote FX)
- Intel Q87 Express chipset supporting Intel 4rd generation Core processors, featuring integrated Intel HD 4600 Graphics and vPro Technology (available with select processors)
- The HP t820 Flexible Thin Client is factory equipped to simultaneously support up to three monitors when configured with an Intel Core i5 CPU and utilizing the on-board Intel® HD 4600 Graphics card with 1 x VGA and 2 x DisplayPort connectors.
- Wi-Fi option: 802.11 a/b/g/n mini-PCIe internal module with dual internal antennas for enterprise-class performance and security
- Fiber networking option: HP Mini PCIe 100 Mbps SC Fiber NIC factory-installed option
- Security features: TCG certified TPM chipset, BIOS designed to address NIST SP 800-147 guidelines, cable lock slot, lockable rear port cover option, case intrusion detection option, and Intel vPro/SIPP capabilities with Core i5 CPU.
- New, progressive commercial design
- HP developed and engineered UEFI BIOS for better security, manageability and software image stability
- Intel Clarkville i217LM GbE LOM integrated network connection
- DDR3 Synchronous Dynamic Random Access Memory (SDRAM)
- Dual digital monitor support via dual integrated DisplayPort ports (supports DisplayPort 1.2)
- 87% efficient energy saving external power adapter standard
- ENERGY STAR® qualified models certified EPEAT® Gold
- Created using industry leading Design for Environment standards
- Low halogen design\*
- Protected by HP Services, including standard warranties up to 3-3-3 (terms and conditions vary by country; certain restrictions and exclusions apply)
- Tool-less serviceability features for easier upgrades and repairs
- All models TAA Compliant (in North America)

\* This product is low halogen except for power cords, cables and peripherals, as well as the customer-configurable 100 Mbps Fiber NIC module which are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.

##### Software features for Genuine Windows® Embedded Standard 7E (WES7E):

- Microsoft® Windows® Embedded Standard 7 SP1 (WES 7E or WS7E) with support for RemoteFX and local applications, providing a richer user experience
- Internet Explorer 9 (IE9) for genuine Internet Explorer browsing and Web-application interfaces
- Excellent rich multimedia experience and enhanced USB device support in VDI environments
- Latest protocol support from Citrix Receiver Standard 4.0 with Storefront support, RDP 8 w/RemoteFX, and VMware Horizon View Mgr 5.3
- Enhanced Write Filter and File-Based Write Filter provide complete flexibility to protect the entire Flash disk, or configure areas of the disk for persistent access by local applications
- Microsoft Firewall for enhanced data security
- Support 802.1x LAN-based authentication for greater security
- HP Universal Print Driver provides instant access to a range of HP print devices without downloading separate drivers.
- Integrated 802.11a/b/g/N with dual internal antennas configurations available
- Standard configurations:
  - HP t820 standard chassis - 16 GB or greater Flash drive and 4 GB RAM
- Improved quality of experience for end users using HP Velocity
  - Available only on HP thin clients
  - HP Velocity enables IT managers to monitor network activity and optimize end-user experience
  - HP Velocity intelligently reduces network packet loss and retransmissions providing a better experience for the end user

### Overview

#### Software features for Genuine Windows® Embedded Standard 7P (WES7P):

In addition to the software features in WES7E:

- A 64-bit OS for improved performance and support for larger memory installations (up to 16 GB)
- Windows Touch (Multi-touch support) for touch-screen monitors
- Multi-language support brings multilingual capabilities letting users select a preferred display language, or to easily install a number of other languages
- DirectAccess feature allows remote users to securely access enterprise shares, websites, and applications without connecting to VPN
- BrancheCache WAN optimization technology
- AppLocker application "whitelisting"
- AntiMalware and Windows Defender software providing additional protection from virus, worms, and spyware
- Snipping tool for easy screen capture copying and pasting
- Remote media streaming to enhance multimedia user experience
- Photo Viewer for easy image viewing
- Standard configurations:
  - HP t820 standard chassis -16 GB or greater Flash drive and 4 GB RAM
- Improved quality of experience for end users using HP Velocity
  - Available only on HP thin clients
  - HP Velocity enables IT managers to monitor network activity and optimize end-user experience
  - HP Velocity intelligently reduces network packet loss and retransmissions providing a better experience for the end user

#### Software features for Genuine Windows® Embedded Standard 8 (WES8):

- The newest Microsoft embedded software based on Windows 8
- A 64-bit OS for improved performance and support for larger memory installations (up to 16 GB)
- Smooth, immersive experiences with technologies like advanced Multi Touch and Windows 8 applications
- The latest RDP8 and Remote FX client software
- WES8 offers a secure platform that is intelligent systems ready
- Latest Internet Explorer 10 (IE10) for genuine Internet Explorer browsing, HTML 5 support and Web-application interfaces
- Latest protocol support from Citrix Receiver Standard 4.0 with Storefront support, RDP 8 w/RemoteFX, and VMware Horizon View Mgr 5.3
- Excellent rich multimedia experience and enhanced USB device support in VDI environments
- Integrated 802.11a/b/g/N with dual internal antennas configurations available
- Standard configurations: 16 GB Flash drive and 4 GB RAM
- Improved quality of experience for end users using HP Velocity
  - Available only on HP thin clients
  - HP Velocity enables IT managers to monitor network activity and optimize end-user experience
  - HP Velocity intelligently reduces network packet loss and retransmissions providing a better experience for the end user

All Windows Embedded 8 devices must be activated. Customers have the option via Internet connection, telephone, or indirectly through a proxy for large deployments.

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

### OPERATING SYSTEMS

#### Preinstalled

Windows® Embedded Standard (WES) 7E (32-bit)

Windows® Embedded Standard (WES) 7P (64-bit)

Windows® Embedded Standard (WES) 8 (64-bit)\*

\* WES 7P and WES 8 configurations coming soon

### CHIPSET

Intel® Q87 Express

### PROCESSOR

Intel® Core™ i5-4570S Processor

Up to 3.6 GHz Maximum Turbo Frequency (2.9 GHz base frequency)

6 MB cache, 4 cores, 4 threads

Intel Graphics HD 4600

Supports Intel vPro Technologies and Intel's Stable Image Platform Program (SIPP), Virtualization technology (VT-x), and Virtualization for directed I/O (VT-d)

Intel® Pentium® G3220 Processor

3.0 GHz base frequency

3 MB cache, 2 cores, 2 threads

Intel Graphics HD

### GRAPHICS

#### Integrated on all models (depends on processor)

Intel Graphics 4600

**NOTE:** When the HP t820 model configuration includes an Intel Core i5 processor but not a discrete MXM graphics card, all three monitor ports are driven by the processor's integrated graphics engine. When the model is configured with an Intel Pentium only 2 of the 3 graphics display ports are active. Due to a limitation with the Intel integrated graphics, when a DisplayPort to DVI or HDMI adapter is installed, the VGA port will not be active.

#### Optional Discrete Graphics Solutions

AMD Radeon HD 7650A (MXM)

**NOTE:** When this MXM graphics card is installed in the USDT all three monitor ports are active. The integrated processor graphics will operate the top DisplayPort while the discrete ATI graphics will operate the bottom Multi-Stream DisplayPort and the VGA output.

#### Adapters and Cables

DisplayPort to DVI-D Adapter

DisplayPort to HDMI Adapter

DisplayPort to VGA Adapter

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

### STORAGE

#### SATA Solid State Drive

16 GB MLC mSATA 6.0 Gb/s

32 GB MLC mSATA 6.0 Gb/s

### MEMORY

	Type	Maximum	# of Slots
HP t820	DDR3 non-ECC Up to 1600 MT/s	16 GB	2 SODIMM

**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.

### NETWORKING/COMMUNICATIONS

#### Ethernet (RJ-45)

Intel I217LM Gigabit Network Connection (standard)

#### Wireless

Intel Centrino Advanced-N 6205 802.11 a/b/g/n PCI Express Mini Card Wireless Network Connection (optional)

**NOTE:** Either the integrated network connection or the Intel Centrino wireless NIC is required to support Intel vPro Technology features.

### AUDIO/MULTIMEDIA

HD audio with Realtek ALC221 codec (all ports are stereo)

Microphone\* and headphone front ports (3.5mm)

Line-out and Line-In rear Ports\* (3.5mm)

Multi-streaming capable\*

Internal Speaker (standard)

\* The front microphone port is re-taskable as a Line-in, Microphone-in or Headphone-out port. Rear audio input ports are re-taskable as a Line-in or Microphone-in port. External speakers must be powered externally. 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. 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.

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

### AUDIO/MULTIMEDIA

HD audio with Realtek ALC221 codec (all ports are stereo)

Microphone\* and headphone front ports (3.5mm)

Line-out and Line-In rear Ports\* (3.5mm)

Multi-streaming capable\*

Internal Speaker (standard)

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### KEYBOARDS AND POINTING DEVICES

#### Keyboard

HP PS/2 Keyboard

HP USB Keyboard

USB Smart Card (CCID) Keyboard

HP Wireless Keyboard and Mouse Combo

#### Mice

PS/2 Optical Mouse

USB Optical Mouse

USB Laser Mouse

### HP BIOS

#### Key features of the HP BIOS include:

- Deployment and manageability - HP BIOS provides several technologies that help integrate the HP t820 Flexible Thin Client 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 Intel Core vPro Processor Technology.
- Stability - HP BIOS supports the HP stable product roadmap by releasing only critical BIOS changes to the factory and advanced change notification.
- UEFI specification 2.1
- 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 t820 Thin Client 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.
- HP BIOS uses PKI signing of the BIOS for trusted BIOS upgrades and recovery.

#### 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

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

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.

- S5 Max Power Savings setting supports EU Lot6 requirement and allows the computer to power down below 1W in S5 (when turned off). When S5 Max Power Savings feature is enabled power to slots is turned off along with WOL functionality.

### SECURITY

- Trusted Platform Module (TPM) 1.2
- SATA port disablement (via BIOS)
- USB enable/disable (via BIOS)
- Removable media write/boot control
- Power-On password (via BIOS)
- Setup password (via BIOS)
- Hood Sensor (case intrusion detection)
- Solenoid lock support
- Support for chassis padlocks and cable lock devices

### POWER

#### Power Supply

High efficiency	Integrated graphics:	135 W active PFC 87% efficient
	Discrete graphics:	180 W active PFC 87% efficient

### ENVIRONMENTAL & REGULATORY

Energy Star® qualified models available

EPEAT® registered where applicable/supported. See [www.epeat.net](http://www.epeat.net) for registration status by country.

Low halogen (chassis, all internal components and modules)\*

TAA compliant (In US)

\* This product is low halogen except for power cords, cables and peripherals, as well as the customer-configurable 100 Mbps Fiber NIC module which are not Low Halogen. Service parts obtained after purchase may not be Low Halogen.



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

### PORTS

#### I/O Ports - Standard

USB 2.0	2 (front) 4 (rear)
USB 3.0	2 (front) 2 (rear)
Serial (RS-232)	N/A
PS/2	1 keyboard (purple) 1 mouse (green)
Video	1 VGA 2 DisplayPort with multi-stream <b>NOTE:</b> When configured with an Intel Pentium only two of the available video output ports are active.
Audio	Front: headphone/mic Rear: line in/out 3.5mm diameter
RJ-45 Network Interface	1

### SLOTS

PCI Express Mini Card	1 each
MXM Graphics	1 each
mSATA	1 each

### SERVICE AND SUPPORT

On-site Warranty <sup>1</sup>: Three-year (3-3-3) limited warranty delivers three years of on-site, next business day <sup>2</sup> service for parts and labor and includes free telephone support <sup>3</sup> 24 x 7. Three-year onsite and labor are not available in all countries. Service offers terms up to 5 years by choosing a Care Pack. To choose the right level of service for your HP product, visit HP Care Pack Central: [www.hp.com/go/cpc](http://www.hp.com/go/cpc)

**NOTE 1:** Terms and conditions may vary by country. Certain restrictions and exclusions apply. Other warranty variations may be offered in your region.

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

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

### Technical Specifications – Operating Systems, Software and eDocumentation

#### SOFTWARE for HP t820

Host Environment	Protocol	WES 8	WES 7E	WES 7P
Microsoft Remote Desktop Services	RemoteFX (RFX)	?	?	?
	RDP	?	?	?
Citrix	ICA	?	?	?
	HDX	?	?	?
VMware Horizon View	RDP	?	?	?
	PCoIP	?	?	?
Protocol Clients		WES 8	WES 7E	WES 7P
Citrix Receiver (Standard)		4.0	4.0	4.0
VMware Horizon View Client		5.3	5.3	5.3
Remote Graphics Software (RGS)		6	6	6
HP TeemTalk Terminal Emulator		7.3	7.3	7.3
Browser Support		WES 8	WES 7E	WES 7P
Internet Explorer		10	9	9
Security		WES 8	WES 7E	WES 7P
Smart Card		?	?	?
Logon Manager		?	?	?
Read Only Operating System		?	?	?
802.1x		?	?	?
Enhanced Write Filter (EWF)		UWF	EWF	EWF
File-Based Write Filter (FBWF)			FBWF	FBWF
Unified Write Filter (UWF)				
Microsoft Firewall		?	?	?
Session brokers		WES 8	WES 7E	WES 7P
Citrix XenDesktop		?	?	?
VMware Horizon View		5.3	5.3	5.3
Management Tools		WES 8	WES 7E	WES 7P
HP Device Manager		?	?	?
HP ThinState		?	?	?
HP Easy Tools		?	?	?
Microsoft SCCM/EDM agent			?	?
Additional Components		WES 8	WES 7E	WES 7P
HP Velocity		?	?	?
HP Cloud Connection Manager		?	?	?
Universal Print Driver		?	?	?
Windows Media Player		12	12	12
Windows Touch (Multi-touch support)		?		?
		(advanced)		(multi)
Multilanguage support		?		?
Microsoft DirectAccess		via VL*		?
Microsoft BranchCache				?
Microsoft AppLocker				?
Microsoft AntiMalware & Windows Defender		?		?

### Technical Specifications – Operating Systems, Software and eDocumentation

<b>Audio CODECs included</b>	<b>WES 8</b>	<b>WES 7E</b>	<b>WES 7P</b>
MP3	?	?	?
WMA stereo	?	?	?
Microsoft AC3 encoder	?	?	?
Microsoft Dolby audio decoder (AC-3, E-AC-3)	?		
<b>Video CODECs included</b>	<b>WES 8</b>	<b>WES 7E</b>	<b>WES 7P</b>
MPEG-1	?	?	?
MPEG-4 part 2 (DivX, Xvid, H.263)	?	?	?
MPEG-4 part 10 (H.264, AVC)	?	?	?
WMV 7/8/9/ VC-1 & ASF Demuxer	?	?	?

\* Customers will require volume licensing (VL) agreement with Microsoft to enable "Enterprise features". Availability: 2H2013.

**NOTE:** Other add-on software available (see: <http://www.hp.com/support> for latest list of available add-ons). Software performance and support may vary depending on customer environment and backend.

### Technical Specifications – Core vPro Processors

#### INTEL 4th GENERATION CORE vPRO PROCESSORS

All HP t820 Flexible Series Thin Client models featuring this technology include processors that are part of the Intel 2013 Stable Image Platform Program (SIPP) designed to ensure the stability promise inherent in the value proposition of the HP t820 Flexible Thin Client, thus making these models the most stable, secure, and manageable platforms available to enterprises today.

**Intel® Advanced Management Technology (AMT) v9.0** - 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 9.0 includes the following advanced management functions:

- Power Management (on, off, reset)
- Hardware Inventory (includes BIOS and firmware revisions)
- Hardware Alerting
- Agent Presence
- System Defense Filters
- SOL/IDER
- Cisco NAC/SDN Support
- ME Wake-on-LAN
- DASH 1.1 compliance
- IPv6 Support
- 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
- PC Alarm Clock
- Microsoft NAP Support
- Host Base set-up and configuration
- Management Engine (ME) firmware roll back
- Wireless AMT functionality on Desktop (WoDT)
- Enhanced KVM resolution

### Technical Specifications - Graphics

#### Intel HD Graphics

<b>VGA Controller</b>	Integrated
<b>DisplayPort</b>	Multimode capable; supports HDCP, Display Port Audio (2 streams), HBR2 link rates and Multi-Stream Technology for a maximum of 3 displays
<b>Bus Type</b>	N/A
<b>RAMDAC</b>	N/A
<b>Memory</b>	Intel graphics do not have dedicated memory but utilize some of the computer's system memory. The amount of memory used for graphics depends 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.

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.

<b>Maximum Graphics Memory</b>	Microsoft Windows 7	Windows 8
	Up to 1.7GB	Up to 1.8GB

**NOTE:** the actual amount of maximum graphics memory can be less than the amounts listed above depending upon your computer's configuration.

**Maximum Color Depth** 32 bits/pixel

**Graphics/Video API Support** 4th Generation Core processors:

- The Processor Graphics contains a refresh of the seventh generation graphics core enabling substantial gains in performance and lower power consumption. Up to 16 EU support.
- Next Generation Intel Clear Video Technology HD Support is a collection of video playback and enhancement features that improve the end user's viewing experience
  - Encode/transcode HD content
  - Playback of high definition content including Blu-ray Disc
  - Superior image quality with sharper, more colorful images
- DirectX Video Acceleration (DXVA) support for accelerating video processing
  - Full AVC/VC1/MPEG2 HW Decode
- Advanced Scheduler 2.0, 1.0
- DirectX 11.1
- OpenGL 4.0
- Open CL 1.2

#### Supported 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

### Technical Specifications - Graphics

Resolution	Refresh Rates
800x600	60 Hz
1024x768	60 Hz
1152x864	60 Hz
1280x600	60 Hz
1280x720	60 Hz
1280x800	60 Hz
1280x960	60 Hz
1280x1024	60 Hz
1360x768	60 Hz
1366x768	60 Hz
1400x1050	60 Hz
1440x900	60 Hz
1600x900	60 Hz
1600x1200*	60 Hz
1680x1050	60 Hz
1920x1080	60 Hz
1920x1200*	60 Hz
1920x1440*	60 Hz
2560x1440*	60 Hz
2560x1600*	60 Hz

\* Only supported on displays connected to the external DisplayPort connectors.

### AMD Radeon HD 7650A Graphics Card

<b>Form Factor</b>	MXM 3.0
<b>Graphics Controller</b>	AMD Radeon HD 7650A
<b>Output Connector</b>	DisplayPort output through on-board DisplayPort connector
<b>Core Clock</b>	600MHz
<b>Memory Clock</b>	800MHz
<b>Memory</b>	2GB, DDR3, 128-bit wide
<b>Max. Power</b>	35W
<b>HDCP Support</b>	Yes
<b>Supported Graphics APIs</b>	DX11, OpenGL 4.1
<b>Display Support</b>	Maximum number of simultaneous displays: 3 DisplayPort Multistreaming and HBR2 supported. DisplayPort Audio supported for one audio stream

### Technical Specifications - Graphics

#### Supported 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 Connection	DisplayPort 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
1920x1200	85	60
1920x1440	85	60
2048x1536	75	60
2560x1440	N/A	60
2560x1600	N/A	60

### Technical Specifications – Memory

#### System Memory Support

The HP t820 Flexible Series Thin Client supports the 4th generation Intel® Core™ processor family. Based on a new PC micro-architecture, the processor is designed for a two-chip platform consisting of a processor and Platform Controller Hub (PCH). Unlike previous generations, the processor includes an integrated memory controller (IMC). The IMC supports DDR3 protocols with two independent, 64-bit wide channels each accessing one or two DIMMs.

- Two channels of DDR3 unbuffered small outline dual in-line memory modules (SO-DIMM) with a maximum of two DIMMs per channel
- Single-channel and dual-channel memory organization modes
- Data burst length of eight for all memory organization modes
- DDR3 memory data transfer rates of up to 1600 MT/s; actual supported DDR3 data transfer rate determined by the configured processor.
- 64-bit wide channels
- DDR3 system memory I/O voltage of 1.5V
- Theoretical Maximum Memory Bandwidth:
  - 10.6 GB/s in single-channel mode of 21.3 GB/s in dual-channel mode assuming DDR3 1333 MT/s
  - 12.8 GB/s in single-channel mode or 25.6 GB/s in dual-channel mode assuming DDR3 1600 MT/s
  - 32 GB maximum memory support depending upon available number of DIMM sockets
- DDR3-1600 (PC3-12800) DIMMs

**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

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

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

Total Memory	Socket	
	Channel A (black)	Channel B (black)
<b>4 GB</b> (dual channel)	2 GB	2 GB
<b>8 GB</b> (dual channel)	4 GB	4 GB
<b>16 GB</b> (dual channel)	8 GB	8 GB



### Technical Specifications – Networking and Communications

#### Intel® I217LM GbE Network Connection (integrated)

<b>Connector</b>	RJ-45
<b>System Interface</b>	Integrated on PCA
<b>Controller</b>	Intel I217LM GbE platform LAN connect networking controller
<b>Memory</b>	24 KB FIFO packet buffer memory
<b>Data rates supported</b>	10/100/1000 Mbps
<b>IEEE Compliance</b>	802.1P 802.1Q 802.2 802.3 802.3ab 802.3az 802.3u
<b>Bus architecture</b>	PCI Express and SMBus
<b>Data transfer mode</b>	PCIe-based interface for active state operation (S0 state) and SMBus for host and management traffic (Sx low power state)
<b>Power requirement</b>	Requires 3.3V and 0.9V or just 3.3V with integrated regulators Power consumption 0.733 Watts
<b>Boot ROM support</b>	Yes
<b>Network transfer mode</b>	Full-duplex Half-duplex (not supported for the 1000BASE-T transceiver)
<b>Network transfer rate</b>	10BASE-T (half-duplex) 10 Mbps 10BASE-T (full-duplex) 20 Mbps 100BASE-TX (half-duplex) 100 Mbps 100BASE-TX (full-duplex) 200 Mbps 1000BASE-T (full-duplex) 2000 Mbps
<b>Environmental</b>	Operating Temperature: 0° to 85° C Operating Humidity: 60% RH
<b>Management</b>	WOL, auto MDI crossover, PXE, Multi-port teaming, RSS, Advanced cable diagnostic
<b>Alerting</b>	ASF 2.0 support; AMT 9.0 support

#### Intel Centrino Advance-N 6205 Wireless Network Interface Connection

<b>Wireless LAN Standards</b>	IEEE 802.11a/b/g/n IEEE 802.11 e, 802.11i, 802.11d, 802.11d, 802.11h
<b>Interoperability</b>	Wi-Fi certified (802.11 a/b/g/n WMM, WPA, WPA2 and WPS) Tested with wireless access points from several major manufacturers OS compatible with Microsoft Windows, Win7 and XP Cisco Compatible Extensions Program compliant (802.11a/b/g only) with Microsoft Windows XP and Windows 7
<b>Frequency Band</b>	2.4 GHz and 5 GHz
<b>Antenna Structure</b>	2 transmit; 2 receive (2x2)



### Technical Specifications – Networking and Communications

	Microsoft Windows XP	Microsoft Windows Win 7
<b>Configuration Utility</b>	<ul style="list-style-type: none"><li>• Microsoft Windows XP Wireless Network Connection Manager</li><li>• Intel PROSet for Microsoft Windows XP (required for Cisco Compatible Extensions support)</li></ul>	<ul style="list-style-type: none"><li>• Intel IHV extensions for Win7 available to support Cisco Compatible Extensions</li></ul>

### Technical Specifications - Audio

#### High Definition Audio

<b>Type</b>	Integrated
<b>HD Stereo Codec</b>	Realtek 2-channel ALC221 codec
<b>Audio I/O Ports</b>	Front microphone-In (150-K ohm Input Impedance) Rear Line-In/Microphone input (150-K ohm Input Impedance, function is configurable by audio driver) 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. All ports are 3.5mm
<b>Internal Speaker Amplifier</b>	1.5W 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.
<b>Multi-streaming Capable</b>	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.
<b>Sampling</b>	8 kHz - 192 kHz
<b>Wavetable Syntheses</b>	Yes - Uses OS soft wavetable
<b>Analog Audio</b>	Yes
<b># of Channels on Line-Out</b>	Stereo (Left & Right channels)
<b>Internal Speaker</b>	Yes
<b>External Speaker Jack</b>	Yes

### Technical Specifications – Power

#### 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)* Non-operating: -22° to 140° F (-30° to 60° C)
Relative Humidity	Operating: 10% to 90% (non-condensing at ambient) Non-operating: 5% to 95% (non-condensing at ambient)
Maximum Altitude (unpressurized)	Operating: 10,000 ft (3048 m) 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

Standard Efficiency	N/A	
High Efficiency*	Integrated graphics:	135W active PFC 87% efficient
	Discrete graphics:	180W active PFC 87% efficient
Operating Voltage Range	90 - 264 VAC	
Rated Voltage Range	100 - 240 VAC	
Rated Line Frequency	50/60 Hz	
Operating Line Frequency Range	47 - 63 Hz	
Rated Input Current	N/A	
Rated Input Current with Energy Efficient* Power Supply	135W: 2.4A 180W: 2.9A	
Current Leakage (NFPA 99)	< 250 µA	
External Power Adapter		
Dimensions	6.7 x 2.6 x 1.5 in	
Total Cord Length	12 ft 8 in	

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

### Technical Specifications – Weights & Dimensions

#### Weights & Dimensions

(configured with 1 HDD & 1 ODD)

<b>Chassis (H x W x D)</b>	2.6 x 9.9 x 10 in 66 x 252 x 254 mm
<b>System Volume</b>	257.5 cu in 4.2 L
<b>System Weight*</b>	6.8 lb 3.1 kg
<b>Max Supported Weight (desktop orientation)</b>	77.0 lb 35.0 kg
<b>Tower Stand (H x W x D)</b>	1.1 x 4.9 x 6.7 in 27 x 125 x 170 mm
<b>Packaging (H x W x D)</b>	8.6 x 15.7 x 19.7 in 218 x 398 x 500 mm
<b>Shipping Weight*</b>	14.4 lb 6.5 kg
<b>Palletization Profile</b>	6-units per layer 10-layer max. 60-units per pallet

### Technical Specifications – Miscellaneous Features

#### Serviceability Features

- Dual colored power LED on front of computer to indicate either normal or fault condition
- Diagnostic LED Explanation Table:
  - Number of 1-second red LED blinks followed by a 2-second pause, then repeats:
    - 2 - processor thermal protection activated
    - 3 - processor not installed
    - 4 - power supply failure
    - 5 - memory error
    - 6 - video error
    - 7 - PCA failure (ROM detected failure prior to video)
    - 8 - invalid ROM, boot block recovery mode
    - 9 - system not fetching code
    - 10 - system hang while loading an option ROM
- HP PC Hardware Diagnostics UEFI:
  - This utility enables hardware level testing outside the operating system on many components. The diagnostics can be invoked by pressing F2 at POST, and is available as a download from HP Support
- System/Emergency ROM
- Flash ROM
- CMOS Battery Holder for easy replacement
- Flash Recovery with Video Configuration Record Software
- One Aux Power LED on System PCA
- Processor ZIF Socket for easy Upgrade
- Over-Temp Warning on Screen (Requires IM Agents)
- Clear Password Jumper
- DIMM Connectors for easy Upgrade
- Clear CMOS Button
- NIC LEDs (integrated) (Green & Amber)
- Dual Color Power and HD LED - To Indicate Normal Operations and Fault Conditions
- Color coordinated cables and connectors
- Tool-less Hood Removal
- Front power switch
- System memory can be upgraded without removing the system board or any internal components
- Tool-less Hard Drive, CD & Diskette Removal
- Green Pull Tabs, and Quick Release Latches for easy Identification

#### Additional Features

#### Description

##### Towerable Orientation

Product can be oriented as either a desktop or a tower

### Technical Specifications - Environmental Data

<b>Environmental Data</b>	<b>Eco-Label Certifications &amp; declarations</b>	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:		
		<ul style="list-style-type: none"><li>● US ENERGY STAR®</li><li>● IT ECO Declaration</li><li>● EPEAT &lt;Gold&gt; registered in the United States. See <a href="http://www.epeat.net">http://www.epeat.net</a> for registration status in your country.</li></ul>		
	<b>Energy Consumption (in accordance with US ENERGY STAR® test method)</b>	<b>115VAC, 60Hz</b>	<b>230VAC, 50Hz</b>	<b>100VAC, 60Hz</b>
	Normal Operation	17.25 W	18.01 W	17.24 W
	Sleep	3.85 W	4.12 W	3.93 W
	Off	3.27 W	3.49 W	3.31 W
	<b>Heat Dissipation*</b>	<b>115VAC, 60Hz</b>	<b>230VAC, 50Hz</b>	<b>100VAC, 60Hz</b>
	Normal Operation	59 BTU/hr	62 BTU/hr	59 BTU/hr
	Sleep	13 BTU/hr	14 BTU/hr	13 BTU/hr
	Off	11 BTU/hr	12 BTU/hr	11 BTU/hr
		* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.		
	<b>Additional Information</b>	<ul style="list-style-type: none"><li>● This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive -2011/65/EC.</li><li>● This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive - 2002/96/EC.</li><li>● This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).</li><li>● This product is in compliance with the IEEE 1680 (EPEAT) standard at the &lt;gold&gt; level, see <a href="http://www.epeat.net">www.epeat.net</a></li><li>● Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.</li><li>● This product contains 12.3% post-consumer recycled plastic (by wt.)</li><li>● This product is 96.1% recycle-able when properly disposed of at end of life.</li></ul>		
	<b>Packaging Materials</b>	<b>External:</b>	PAPER/Corrugated	1526.2 g
		<b>Internal:</b>	PLASTIC/Polyethylene low density	177 g
	<b>RoHS Compliance</b>	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).		
	<b>Material Usage</b>	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:		



### Technical Specifications - Environmental Data

[http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen\\_specifications.html](http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html)):

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

#### Packaging

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

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

#### End-of-life Management and Recycling

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

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information

### Technical Specifications - Environmental Data

**Hewlett-Packard  
Corporate  
Environmental  
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.

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>

After-Market Options (availability may vary by region)

### Graphics Solutions

	<b>Part Number</b>
HP DisplayPort To Dual Link DVI-D Adapter	NR078AA
HP DisplayPort To DVI-D Adapter	FH973AA
HP DisplayPort to HDMI Adapter	BP937AA
HP DisplayPort to VGA Adapter	AS615AA

### Input Devices

	<b>Part Number</b>
HP USB Keyboard	QY776AA
HP USB Gray Keyboard	B6B64AA
HP USB Smart Card (CCID) Keyboard	BV813AA
HP USB Keyboard and Mouse Kit	B1T09AA
HP USB Washable Keyboard	VF097AA
HP USB and PS/2 Washable Mouse	BM866AA
HP USB and PS/2 Washable Keyboard and Mouse Kit	BU207AA
HP PS/2 Mouse	QY775AA
HP USB Mouse	QY777AA
HP USB 1000dpi Laser Mouse	QY778AA
HP Wireless Keyboard and Mouse Combination	QY449AA

### System Memory

	<b>Part Number</b>
HP 4GB DDR3-1600 (PC3-12800) SODIMM	B4U39AA
HP 8GB DDR3-1600 (PC3-12800) SODIMM	B4U40AA

### Security Devices

	<b>Part Number</b>
HP USDT Rear Port Controller Cover	VN571AA
HP Solenoid Lock and Hood Sensor (USDT/SFF)	E0X97AA
HP UltraSlim Cable Lock	H4D73AA

### Stands and Accessories

	<b>Part Number</b>
HP USDT Tower Stand	QP897AA

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

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