



Performance comparison of three notebook PCs with Intel and VIA processors

Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to run a set of performance tests on the following notebook systems in their out-of-the-box (OOB) configurations:

- an HP 2133 Mini-Note PC with a VIA C7-M 1.20GHz processor-based system (which we refer to as System A)
- an HP 530 Notebook PC with an Intel Celeron M 520 1.60GHz processor-based system (which we refer to as System B)
- an HP Compaq 6720s Notebook PC with an Intel Celeron 550 2.00GHz processor-based system (which we refer to as System C)

Intel specified the test systems and provided the tests, test procedures, and test settings. PT purchased the systems from www.HP.com, set up the systems, and executed all tests. See Appendixes A and B for greater detail on the systems.

We ran the following five custom consumer application tests that simulate tasks a typical user would perform:

- **Microsoft Office 2007 multitasking**—one test that uses PowerPoint 2007 to print to an XPS file while at the same time using Word 2007 to combine two documents.
- **Music ripping**—one test that uses Apple iTunes 7.6 to rip a .wav music file to mp3 format
- **Photo editing**—one test that automatically “smart fixes” a group of 50 digital photos using Adobe Photoshop Elements 6.0
- **Spreadsheet recalculation**—one test that uses Microsoft Office Excel 2007 to recalculate a spreadsheet
- **Video converting**—one test that uses Videora iPod Converter to convert an .avi video file to a MPEG-4, H.264 file

As the Key findings state, the two Intel Celeron and Celeron M processor-based systems performed better on every test than the VIA C7-M processor-based system, while costing \$30 and \$80 less.

The Test results section provides greater detail about the Key findings above and the Test methodology section explains how we ran the tests. Appendix A provides the price of the test systems and Appendix B details their configurations.

Test results

Figure 1 presents the medians of all test scores for the systems. We ran each test five times and reported the median of those runs. In an event of a tie, we chose the first chronological run. Lower scores are better, because they represent the time, in seconds, that the system required to complete the test. A lower time indicates that the system completed the work faster. The comparative ratings indicate how much faster System B or C is than System A on each test.

Key findings

- The two Intel Celeron and Celeron M processor-based systems performed better on every test than the VIA C7-M processor-based system, while costing \$30 and \$80 less.
- The Intel Celeron M 520 processor-based system performed 204 percent to 471 percent better than the VIA C7-M processor-based system in custom consumer applications tests, while costing \$80 less.
- The Intel Celeron 550 processor-based system performed 303 percent to 621 percent better than the VIA C7-M processor-based system in custom consumer applications tests, while costing \$30 less.

Test	Performance Results			Comparative ratings		
	System A VIA C7-M 1.20 GHz	System B Intel Celeron M 520 1.60 GHz	System C Intel Celeron 550 2.00 GHz	System A VIA C7-M 1.20 GHz	System B Intel Celeron M 520 1.60 GHz	System C Intel Celeron 550 2.00 GHz
Custom consumer application tests (seconds – lower is better for performance results; higher is better for comparative ratings)						
Microsoft Office 2007 multitasking— PowerPoint with Word	789	231	178	1.00	3.42	4.43
Music ripping—Apple iTunes 7.6	1,262	221	175	1.00	5.71	7.21
Photo editing—Adobe Photoshop Elements 6.0	1,462	297	216	1.00	4.92	6.77
Spreadsheet recalculation— Microsoft Office 2007 Excel	274	90	68	1.00	3.04	4.03
Video converting—Videora iPod Converter	337	95	75	1.00	3.55	4.49

Figure 1: Performance results and comparative performance ratings for the test systems. For performance results, lower numbers are better. For comparative ratings, higher numbers are better.

Test methodology

This section discusses some differences in the configurations of the test systems and details the methodologies we followed in testing them.

Configuration differences

Intel specified the test systems. PT purchased the systems from www.HP.com. We made the systems as identical and as close in price as possible, but could not avoid the following differences that might affect performance:

- The RAM speeds in the systems differ. The VIA C7-M processor-based system's RAM is running at 667MHz, while the two Intel Celeron processor-based systems' RAM are running at 533MHz.
- The hard disk vendors differ. The VIA C7-M processor-based system uses a Fujitsu MHY2120BH, while the Intel Celeron M 520 processor-based system uses a Seagate ST9120822AS and the Intel Celeron 550 processor-based system uses a Hitachi HTS542512K9SA00.
- The motherboard chipsets differ. The VIA C7-M processor-based system uses the VIA CN896 motherboard chipset, while the Intel Celeron M 520 processor-based system uses the Intel 945 motherboard chipset and the Intel Celeron 550 processor-based system uses the Intel 965 motherboard chipset.
- The hard disk controllers differ. The VIA C7-M processor-based system uses the VIA VT8237S controller, while the Intel Celeron M 520 processor-based system uses the Intel 82801GME (ICH7-M/U) controller and the Intel Celeron 550 processor-based system uses the Intel 82801HBM (ICH-8-ME) controller.
- The integrated graphic adapters differ. The VIA C7-M processor-based system uses the VIA Chrome 9 HC IGP graphics adapter, while the Intel Celeron M 520 processor-based system uses the Intel GMA 950 graphics adapter and the Intel Celeron 550 processor-based system uses the Intel GMA X3100 graphics adapter.

For more details on the system configurations, see Appendix B.

Initial setup

When the systems arrived, we unpacked and set up each one. We went through the following process with each PC the first time we booted it:

HP 2133 Mini-Note PC

1. At the Software Installation screen, select English Windows Vista Home Basic Edition, and press Enter.
2. At the Please review the installation options screen, press F10.
3. At the Set up Windows screen, select United States, English and U.S. keyboard, and click Next.

4. At the Microsoft and Manufacturer End User License Agreements, select Yes, I accept them, and click Next.
5. Type a user name.
6. Leave the password blank, and click Next.
7. Name the computer with its model, and click Next.
8. At the Help protect Windows automatically screen, click Ask me later (because our goal is to test each PC as it came directly out of the box).
9. At the Review your time and date settings, select Eastern Time, and click Next.
10. At the Thank you screen, click Start.
11. At the manufacturer's registration screen, fill in the required information, and click Begin.
12. Uncheck Send anonymous usage data to the manufacturer, and click Next.
13. At the Congratulations screen, click Finish.
14. Reboot the system.
15. At the Windows Welcome screen, uncheck Run at startup.

HP 530 Notebook PC

1. At the Set up Windows screen, select United States, English and U.S. keyboard, and click Next.
2. At the Microsoft and Manufacturer End User License Agreements, select Yes, I accept them, and click Next.
3. Type a user name.
4. Leave the password blank, and click Next.
5. Name the computer with its model, and click Next.
6. At the Help protect Windows automatically screen, click Ask me later (because our goal is to test each PC as it came directly out of the box).
7. At the Review your time and date settings, select Eastern Time, and click Next.
8. At the Thank you screen, click Start.
9. At the manufacturer's registration screen, fill in the required information, and click Begin.
10. Uncheck Send anonymous usage data to the manufacturer, and click Next.
11. At the Congratulations screen, click Finish.
12. Reboot the system.
13. At the Windows Welcome screen, uncheck Run at startup.

HP 6720 Notebook PC

1. At the Set up Windows screen, select United States, English and U.S. keyboard, and click Next.
2. At the Microsoft and Manufacturer End User License Agreements, select Yes, I accept them, and click Next.
3. Type a user name.
4. Leave the password blank, and click Next.
5. Name the computer with its model, and click Next.
6. At the Help protect Windows automatically screen, click Ask me later (because our goal is to test each PC as it came directly out of the box).
7. At the Review your time and date settings, select Eastern Time, and click Next.
8. At the Thank you screen, click Start.
9. At the manufacturer's registration screen, fill in the required information and click Begin.
10. Uncheck Send anonymous usage data to the manufacturer, and click Next.
11. At the Congratulations screen, click Finish.
12. Reboot the system.
13. At the Windows Welcome screen, uncheck Run at startup.
14. At the Norton Internet Security screen, click Next.
15. At the User Account Control dialog, click Continue.
16. At the License Agreement screen, select I agree, and click Next.
17. At the 60 day Subscription Status screen, click Next.
18. Click Finish.
19. At the LiveUpdate screen, click Next.
20. Click Finish.
21. Close the Norton Internet Security Console.

Capturing an image of the hard drive

We used Symantec's Ghost product to capture an exact image of the hard disk to a DVD using the internal DVD-RW drive. Each time we ran a new benchmark or test on a machine, we used the Ghost image DVD to return that machine to the above configuration. After re-imaging, we installed the software necessary to run each test and rebooted. We followed this process to capture the image:

1. Restart the computer.
2. Insert a bootable network CD.
3. Press the Escape key, at the Current Configuration dialog screen, to accept the automatic network options.
4. At the DOS command prompt, use the net use command to map a network drive to the dedicated Ghost image server, i.e., type `net use z: \\ghostserver\ghost`, and press Enter.
5. Type `z :` to change to the mapped drive.
6. Type `ghost`, and press Enter.
7. At the Symantec Ghost screen, click OK.
8. Select Local→Disk→To Image.
9. Click OK.
10. Select the Primary disk, and click OK.
11. Click Save.
12. At the Compress Image dialog, select Fast.
13. At the Proceed dialog, select Yes.
14. When the ghost image is complete, click OK, and exit Ghost.
15. Reboot the computer.

Photo editing test using Adobe Photoshop Elements 6.0

Intel provided the Photos workload, which contains the 103 .JPG images this test uses. These files have the following key characteristics:

- Average resolution: 2,048 x 1,536
- Workload size: 60.3 MB (63,262,990 bytes)

A stopwatch is necessary for this test.

Setting up the test

1. Reset the system to the base test image.
2. Purchase Adobe Photoshop Elements 6.0 from <http://www.adobe.com/products/photoshopelwin/>, and install with default settings:
 - a. At the Welcome to the InstallShield Wizard screen, click Next.
 - b. At the License Agreement screen, leave English as the language, and click Accept.
 - c. At the Customer Information screen, leave User Name as User, Organization blank, enter the serial number, and click Next.
 - d. At the Destination Folder screen, leave the default, and click Next.
 - e. At the Ready to Install the Program screen, click Install.
 - f. When a screen appears indicating that the installation was successful, click Finish.
3. Launch Photoshop Elements 6.0 from the desktop icon.
4. Click Organize.
5. At the Photoshop Elements Organizer dialog, click No.
6. At the Register Photoshop Elements screen, click Register Later.
7. Exit Photoshop Elements.
8. Copy the Photos workload directory to Documents.
9. Reboot the system.
10. Run Disk Defragmenter by clicking Start→All Programs→Accessories→System Tools→Disk Defragmenter.
11. Delete the contents of C:\Windows\Prefetch.
12. Launch Photoshop Elements by double-clicking the desktop icon.
13. Click Organize.
14. From the top menu, click File→Get Photos→From Files and Folders.
15. Browse to the Photos workload directory, select it, and click Open.
16. Click the first .JPG, and press Ctrl-A to select all photos.
17. Uncheck Automatically Fix Red Eyes, and click Get Photos.
18. At the Adobe Photoshop Elements screen, click OK.
19. Click the first .JPG, and press Ctrl-A to select all photos.
20. Type `rundll32.exe advapi32.dll,ProcessIdleTasks` in the Start Search command prompt.
21. Type `perfmon` in the Start Search command prompt.
22. Expand and watch the Disk Monitor. When there are no more disk requests, close Perfmon.

Running the test

1. Prepare the stopwatch.
2. Do the following two things simultaneously:
 - a. Press Ctrl-Alt-M to run the Auto Smart Fix Selected Photos function.
 - b. Start the stopwatch.A progress dialog appears.
3. When Photoshop Elements has finished fixing all the photos and the progress dialog disappears, stop the stopwatch.
4. Record the elapsed time on the stopwatch.
5. Delete the all the edited .JPG images from the Photos workload directory.
6. Empty the Recycle Bin.
7. Repeat the steps four more times without rebooting between runs.

We report the time, in seconds, that Photoshop Elements 6.0 took to auto smart fix the images. Lower times indicate faster performance and are therefore better.

Music ripping test using Apple iTunes 7.6

Intel provided the file this test uses, newAudioTest.wma, and specified the test methodology. The file has the following key characteristics:

- Length (hh:mm:ss): 01:01:24
- Size: 56.5 MB (59,287,245 bytes)

Setting up the test

1. Reset the system to the base test image.
2. Copy the newAudioTest.wma file to the Music directory.
3. Download and install iTunes 7.6 with the following settings from <http://www.apple.com/itunes/download/>.
 - a. At the Welcome to the InstallShield Wizard screen, click Next.
 - b. At the License Agreement screen, select I accept the terms in the license agreement, and click Next.
 - c. At the Choose iTunes Installer Options screen, uncheck Automatically update iTunes, QuickTime, and other Apple software, and click Install.
 - d. At the Congratulations screen, click Finish.
 - e. At the License Agreement screen, click Agree.
 - f. At the Welcome to iTunes screen, click Next.
 - g. At the Find Music Files screen, uncheck both the Add MP3 and AAC files option and the Add WMA files option, and click Next.
 - h. At the Keep iTunes Music Folder Organized screen, select No, I'll change the file and folder names myself, and click Next.
 - i. At the Download Album Artwork screen, click Next.
 - j. At the iTunes Music Store screen, select No, take me to my iTunes Library, and click Finish.
 - k. From the top menu, click Edit→Preferences.
 - l. Click the Advanced tab.
 - m. Click the Importing tab.
 - n. From the Import Using drop-down menu, select MP3 Encoder.
 - o. Uncheck Play songs while importing or converting.
 - p. Uncheck Create filenames with track number.
 - q. Click OK.
 - r. Exit iTunes.
4. Reboot the system.
5. Run Disk Defragmenter by clicking Start→All Programs→Accessories→System Tools→Disk Defragmenter.
6. Delete the contents of C:\Windows\Prefetch.
7. Launch iTunes by double-clicking the desktop icon.
8. From the top menu, click File→Add File to Library.
9. Browse to the newAudioTest.wma test file, select it, and click Open.
10. Leave the iTunes Convert dialog open.
11. Type `rundll32.exe advapi32.dll,ProcessIdleTasks` in the Start Search command prompt.
12. Type `perfmon` in the Start Search command prompt.
13. Expand and watch the Disk Monitor. When there are no more disk requests, close Perfmon.

Running the test

1. Click Convert.
When the progress bar disappears, iTunes has finished encoding.
2. Open a command prompt by clicking Start→All Programs→Accessories→Command Prompt.
3. Run the timestamps.exe by typing `C:\Users\User\Music\iTunes\iTunes Music\Unknown Artist\Unknown Album\timestamps.exe newAudioTest.mp3`.
4. Record the time in seconds.
5. Highlight the newAudioTest item in the iTunes Library.

6. Right-click, and select Delete.
7. Check the box that says Do not ask me again, and click Remove.
8. Click Move to Recycle Bin.
9. Empty the Recycle Bin.
10. Repeat the steps four more times without rebooting between runs.

We report the time, in seconds, that iTunes took to convert the file. Lower times indicate faster performance and are therefore better.

Spreadsheet recalculation using Microsoft Office Excel 2007

Intel provided the file this test uses: BigNumberCrunch.xlsm. The file size is 6.24 MB (6,543,413 bytes).

Setting up the test

1. Reset the system to the base test image.
2. Copy the BigNumberCrunch.xlsm test file to the My Documents directory.
3. Install Microsoft Office 2007 Ultimate Edition with default settings:
 - a. At the Enter your Product Key screen, enter the product key, and click Continue.
 - b. At the License Agreement screen, select I accept the terms of this agreement, and click Continue.
 - c. At the Microsoft Office Ultimate 2007 has been successfully installed screen, click Close.
4. Launch Microsoft Office Excel 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office Excel 2007.
5. Select I want to activate the software over the Internet, and click Next.
6. Click Finish.
7. Uncheck Search Microsoft Office Online for Help content when I'm connected to the Internet, and click Next.
8. Select I don't want to use Microsoft Update, and click Finish.
9. Click the Microsoft Office button located in the upper left corner.
10. Click Excel Options.
11. Click Trust Center located in the left column.
12. Click Trust Center Settings.
13. Click Macro Settings located in the left column, and select Enable all macros.
14. Click OK.
15. Close Excel.
16. Reboot the system.
17. Run Disk Defragmenter by clicking Start→All Programs→Accessories→System Tools→Disk Defragmenter.
18. Delete the contents of C:\Windows\Prefetch.
19. Launch Microsoft Office Excel 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office Excel 2007.
20. Press Ctrl-O.
21. Locate the BigNumberCrunch.xlsm workload file, and click Open.
22. Type `rundll32.exe advapi32.dll,ProcessIdleTasks` in the Start Search command prompt.
23. Type `perfmon` in the Start Search command prompt.
24. Expand and watch the Disk Monitor. When there are no more disk requests, close Perfmon.

Running the test

1. Press Ctrl-R on the keyboard to start the test.
2. Record the results, and click OK.
3. Close Excel, and click No to saving the changes you made to the file.
4. Repeat the steps four more times without rebooting between runs.

We report the time, in seconds, that Excel took to perform the spreadsheet recalculation. Lower times indicate faster performance and are therefore better.

Microsoft Office 2007 Word Combine + PowerPoint Print

Intel provided the four video files this test uses. The files have the following key characteristics:

- BusinessPowerPoint.pptx: 6.20 MB (6,512,387 bytes)
- MonteChristoRev1.docx: 1.40 MB (1,468,551 bytes)
- MonteChristoRev2.docx: 2.03 MB (2,133,436 bytes)

Setting up the test

1. Reset the system to the base test image.
2. Copy the three test files to the Documents directory.
3. Install Microsoft Office 2007 Ultimate Edition with default settings:
 - a. At the Enter your Product Key screen, enter the product key, and click Continue.
 - b. At the License Agreement screen, select I accept the terms of this agreement, and click Continue.
 - c. At the Microsoft Office Ultimate 2007 has been successfully installed screen, click Close.
4. Launch Microsoft Office Word 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office Word 2007.
5. Select I want to activate the software over the Internet, and click Next.
6. Click Finish.
7. Uncheck Search Microsoft Office Online for Help content when I'm connected to the Internet, and click Next.
8. Select I don't want to use Microsoft Update, and click Finish.
9. Close Word.
10. Reboot the system.
11. Run disk defragmenter by clicking Start→All Programs→Accessories→System Tools→Disk Defragmenter.
12. Delete the contents of C:\Windows\Prefetch.
13. Launch Microsoft Office Word 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office Word 2007.
14. From the top menu, click Review.
15. Click Compare.
16. Click Combine.
17. In the Original document field, click Browse, and browse to the MonteChristoRev1.docx. Select the file, and click Open.
18. In the Revised document field, click Browse, and browse to the MonteChristoRev2.docx. Select the file, and click Open.
19. Leave the Combine dialog open.
20. Launch Microsoft Office PowerPoint 2007 by clicking Start→All Programs→Microsoft Office→Microsoft Office PowerPoint 2007.
21. Press Ctrl-O.
22. Locate the BusinessPowerPoint.pptx workload file, and click Open.
23. Press Ctrl-P.
24. Make sure that Microsoft XPS Document Writer is selected as the printer.
25. Click OK.
26. Select a location to save, and enter a name for the .xps result file.
27. Leave the Save dialog open.
28. In the Start Search command prompt, type `rundll32.exe advapi32.dll,ProcessIdleTasks`, and press Enter.
29. In the Start Search command prompt, type `perfmon` in the Start Search command prompt, and press Enter.
30. Expand and watch the Disk Monitor. When there are no more disk requests, close Perfmon.

Running the test

1. Click Save at the PowerPoint print dialog. Immediately press Alt-Tab, and click OK to start the Word Combine portion.
2. When the Word Combine finishes, minimize the Word windows, so that you view the PowerPoint window.

3. When the PowerPoint print finishes, close the Word and PowerPoint applications. If an application prompts you to save a document, decline.
4. Open a command prompt by clicking Start→All Programs→Accessories→Command Prompt.
5. Run the timestamps.exe by typing `C:\Users\User\Documents\ timestamps.exe <name of file>.xps`.
6. Record the time in seconds.
7. Repeat the steps four more times without rebooting between runs.

We report the time, in seconds, that PowerPoint took to print the file. Lower times indicate faster performance and are therefore better.

Video encoding test for iPod using Videora iPod Converter 3.07

Intel provided the video file this test uses. The file has the following key characteristics:

- Narnia.avi: 101 MB (106,669,416 bytes), Length (hh:mm:ss): 00:02:28

Setting up the test

1. Reset the system to the base test image.
2. Copy the video test file to the Documents directory.
3. Download Videora iPod Converter 3.07 from <http://www.videora.com/en-us/Converter/iPod/> and install as follows:
 - a. At the Installer Language screen, select English and click OK.
 - b. At the Welcome screen, click Next.
 - c. At the License Agreement screen, click I agree.
 - d. At the Choose Components screen, click Next.
 - e. At the Choose Install Location screen, accept the default option, and click Install.
 - f. At the Installation Completed screen, click Finish.
4. Launch Videora iPod Converter by double-clicking the desktop icon.
5. At the Initial Settings screen, select iPod Nano – 3rd Generation, and click Finish.
6. Close Videora iPod Converter.
7. Reboot the system.
8. Run disk defragmenter by clicking Start→All Programs→Accessories→System Tools→Disk Defragmenter.
9. Delete the contents of `C:\Windows\Prefetch`.
10. Launch Videora iPod Converter by double-clicking the desktop icon.
11. From the top menu, click Convert.
12. Select the Video File tab.
13. Click the Power Mode button.
14. Click the Select File button.
15. Locate the narnia.avi workload file, and click Open.
16. Check the box next to Show Conversion Details.
17. Leave the Videora Conversion dialog open.
18. Type `rundll32.exe advapi32.dll,ProcessIdleTasks` in the Start Search command prompt.
19. Type `perfmon` in the Start Search command prompt.
20. Expand and watch the Disk Monitor. When there are no more disk requests, close Perfmon.

Running the test

1. Click Start Converting. A progress dialog appears.
2. When Videora iPod Converter finishes, the progress dialog disappears.
3. Convert the Time Elapsed field to seconds, and record this result.
4. Close Videora iPod Converter.
5. Delete the .mp4 result file.
6. Repeat the steps four more times without rebooting between runs.

We report the time, in seconds, that Videora iPod Converter took to convert an .avi to .mp4 format for iPod. Lower times indicate faster performance and are therefore better.

Appendix A – Test system price (not including tax or shipping)

Figure 2 presents the price (not including tax or shipping) information for the test systems from www.HP.com. Purchased April 16, 2008.

System	HP 2133 Mini-Note PC (System A)	HP 530 Notebook PC (System B)	HP Compaq 6720s Notebook PC (System C)
Processor	VIA C7-M	Intel Celeron M 520	Intel Celeron 550
Processor frequency	1.20 GHz	1.60 GHz	2.00 GHz
Purchase date	April 16, 2008	April 16, 2008	April 16, 2008
Price	\$599.99	\$519.99	\$569.99

Figure 2: Price information for the test systems. Prices do not include tax or shipping.

Appendix B – Test system configuration information

This appendix provides detailed configuration information about each of the test PCs.

System	HP 2133 Mini Notebook PC (System A)	HP 530 Notebook PC (System B)	HP Compaq 6720S Notebook PC (System C)
General			
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P1C1L / UP	1P1C1L / UP	1P1C1L / UP
Number of physical processors	1	1	1
Single/Dual Core processors	Single	Single	Single
System power management policy	HP Optimized	HP Optimized	HP Optimized
Processor power-saving option	VIA TwinTurbo Technology	Enhanced Intel SpeedStep Technology	Enhanced Intel SpeedStep Technology
System dimensions (length x width x height)	10-1/4" x 6-1/2" x 1-3/8"	14-1/8" x 10-1/2" x 1-1/4"	14-1/8" x 10-1/2" x 1-3/4"
System weight	2 lbs. 12 oz.	5 lbs. 8 oz.	5 lbs. 10 oz.
CPU			
Vendor	VIA	Intel	Intel
Name	C7-M	Celeron M	Celeron
Model number	NA	520	550
Stepping	0	1	1
Socket type and number of pins	Socket nanoBGA2	Socket 479 mPGA	Socket 479 mPGA
Core frequency (GHz)	1.20	1.60	2.00
Front-side bus frequency	800 MHz	533 MHz	533 MHz
L1 cache	64 KB + 64 KB	32 KB + 32 KB	32 KB + 32 KB
L2 cache	128 KB (1 x 128 KB)	1 MB (1 x 1,024 MB)	1 MB (1 x 1,024 MB)
Platform			
Vendor	Hewlett-Packard	Hewlett-Packard	Hewlett-Packard
Motherboard model number	3030	30D5	30D8
Motherboard chipset	VIA CN896	Intel i945GME	Intel GM965
Motherboard revision number	00	03	C0
System/motherboard serial number	CNU8152FRT	CND8090PH2	CNU81303GB
Bios name and version	Hewlett-Packard 68VGU Ver. F.02	Hewlett-Packard 68MVU Ver. F.06	Hewlett-Packard 68MDU Ver. F.09
BIOS settings	Default	Default	Default
Memory module(s)			
Vendor and model number	Mosel V916765G24QCFW-F5	Samsung M4 70T2953EZ3-CE6	Hyundai HYMP112S64CP6-Y5
Type	PC2-5300	PC2-5300	PC2-5300
Speed (MHz)	667	667	667
Speed running in the system (MHz)	667	533	533
Timing/Latency (tCL-tRCD-tRP-tRASmin)	5-5-5-15	4-4-4-12	4-4-4-12
Size	1,024 MB	1,024 MB	1,024 MB
Number of memory module(s)	1 x 1,024	1 x 1,024	1 x 1,024
Chip organization (Single-sided, Double-sided)	Double-sided	Double-sided	Double-sided

System	HP 2133 Mini Notebook PC (System A)	HP 530 Notebook PC (System B)	HP Compaq 6720S Notebook PC (System C)
Channel (Single/Dual)	Single	Single	Single
Hard disk			
Vendor and model number	Fujitsu MHY2120BH	Seagate ST9120822AS	Hitachi HTS542512K9SA00
Size	120 GB	120 GB	120 GB
Buffer size	8 MB	8 MB	8 MB
RPM	5,400	5,400	5,400
Type	SATA 1.5 Gb/s	SATA 1.5 Gb/s	SATA 1.5 Gb/s
Controller	VIA VT8237S	Intel 82801GME (ICH7-M/U)	Intel 82801HBM (ICH8-ME)
Driver	Microsoft 6.0.6000.20707 (6/21/2006)	Intel 8.2.0.1011 (11/15/2006)	Intel 7.5.0.1017 (3/21/2007)
Operating system			
Name	Windows Vista Home Basic	Windows Vista Home Basic	Windows Vista Home Basic
Build number	6000	6000	6000
Service Pack	NA	NA	NA
File system	NTFS	NTFS	NTFS
Kernel	ACPI x86-based PC	ACPI x86-based PC	ACPI x86-based PC
Language	English	English	English
Microsoft DirectX version	DirectX 10	DirectX 10	DirectX 10
Graphics			
Vendor and model number	VIA Chrome 9 HC IGP	Intel GMA 950	Intel GMA X3100
Type	Integrated	Integrated	Integrated
Chipset	VIA Chrome 9 HC IGP	Mobile Intel 945 Express Chipset	Mobile Intel 965 Express Chipset
BIOS version	91.00.02.06	1471	1471
Total Available Graphics Memory	260 MB	251 MB	251 MB
Dedicated Video Memory	128 MB	0 MB	0 MB
System Video Memory	8 MB	64 MB	128 MB
Shared System Memory	124 MB	187 MB	123 MB
Resolution	1,280 x 768 x 32 bit	1,280 x 800 x 32 bit	1,280 x 800 x 32 bit
Driver	VIA 7.14.14.48 (3/26/2008)	Intel 7.14.10.1322 (8/24/2007)	Intel 7.14.10.1322 (8/24/2007)
Sound card/subsystem			
Vendor and model number	SoundMAX Integrated Digital HD Audio	Conexant High Definition Audio	SoundMAX Integrated Digital HD Audio
Driver	Analog Devices 6.10.1.5740 (2/7/2008)	Conexant 4.15.0.0 (3/15/2007)	Analog Devices 6.10.1.5180 (3/9/2007)
Ethernet			
Vendor and model number	Broadcom NetLink Gigabit Ethernet	Intel PRO/100 VE Network Connection	Intel 82562GT 10/100 Network Connection
Driver	Broadcom 10.62.1.2 (11/29/2007)	Intel 8.0.43.0 (10/31/2006)	Intel 9.7.32.0 (2/1/2007)

System	HP 2133 Mini Notebook PC (System A)	HP 530 Notebook PC (System B)	HP Compaq 6720S Notebook PC (System C)
Wireless			
Vendor and model number	Broadcom 802.11 a/b/g WLAN	Broadcom 802.11 b/g WLAN	Broadcom 802.11 a/b/g WLAN
Driver	Broadcom 4.170.64.5 (1/23/2008)	Broadcom 4.170.25.4 (9/5/2007)	Broadcom 4.170.25.4 (9/5/2007)
Modem			
Vendor and model number	NA	HDAUDIO Soft Data Fax Modem with SmartCP	Agere Systems HDA Modem
Driver	NA	CXT 7.61.0.0 (12/19/2006)	Agere 2.1.74.0 (10/5/2006)
Optical drive(s)			
Vendor and model number	NA	TSSTcorp TS-L462D	Optiarc AD-7561A
Type	NA	CD-RW / DVD-ROM	DVD-RW
USB ports			
Number	2	2	3
Type	2.0	2.0	2.0
Other	Media card reader	NA	Media card reader
IEEE 1394 ports			
Number	0	0	0
Monitor			
LCD type	WXGA	WXGA	WXGA
Screen size	8.9"	15.4"	15.4"
Refresh rate	60 Hz	60 Hz	60 Hz
Battery			
Type	Hewlett-Packard HSTNN-DB63 lithium-ion	Hewlett-Packard HSTNN-FB40 lithium-ion	Hewlett-Packard HSTNN-IB51 lithium-ion
Size (length x width x height)	8-1/4" x 1-1/2" x 7/8"	10-5/8" x 1-5/8" x 7/8"	10-5/8" x 2-3/8" x 3/4"
Rated capacity	2600mAh / 10.8V (28Wh)	2200mAh / 14.4V (32Wh)	4400mAh / 10.8V (47Wh)
Weight	7 oz.	9 oz.	10 oz.

Figure 3: System information for the test systems.



Principled Technologies, Inc.
1007 Slater Road, Suite 250
Durham, NC 27703
www.principledtechnologies.com
info@principledtechnologies.com

Principled Technologies is a registered trademark of Principled Technologies, Inc.
All other product names are the trademarks of their respective owners

Disclaimer of Warranties; Limitation of Liability:

PRINCIPLED TECHNOLOGIES, INC. HAS MADE REASONABLE EFFORTS TO ENSURE THE ACCURACY AND VALIDITY OF ITS TESTING, HOWEVER, PRINCIPLED TECHNOLOGIES, INC. SPECIFICALLY DISCLAIMS ANY WARRANTY, EXPRESSED OR IMPLIED, RELATING TO THE TEST RESULTS AND ANALYSIS, THEIR ACCURACY, COMPLETENESS OR QUALITY, INCLUDING ANY IMPLIED WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE. ALL PERSONS OR ENTITIES RELYING ON THE RESULTS OF ANY TESTING DO SO AT THEIR OWN RISK, AND AGREE THAT PRINCIPLED TECHNOLOGIES, INC., ITS EMPLOYEES AND ITS SUBCONTRACTORS SHALL HAVE NO LIABILITY WHATSOEVER FROM ANY CLAIM OF LOSS OR DAMAGE ON ACCOUNT OF ANY ALLEGED ERROR OR DEFECT IN ANY TESTING PROCEDURE OR RESULT.

IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC. BE LIABLE FOR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH ITS TESTING, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL PRINCIPLED TECHNOLOGIES, INC.'S LIABILITY, INCLUDING FOR DIRECT DAMAGES, EXCEED THE AMOUNTS PAID IN CONNECTION WITH PRINCIPLED TECHNOLOGIES, INC.'S TESTING. CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES ARE AS SET FORTH HEREIN.