

User experience: Performance, battery life, and surface temperature of Acer Aspire TimelineX 4820TG vs. ASUS U45Jc

Executive summary

Acer® commissioned Principled Technologies (PT) to measure and compare the performance, battery life, and surface temperature of the Acer Aspire® TimelineX 4820TG and ASUS U45Jc notebook systems. Both systems contained an Intel® Core™ i5 Processor 450M 2.40GHz and ran the Microsoft® Windows® 7 Home Premium 64-bit operating system.

Acer provided the test systems. PT set up the systems and executed all tests.

We measured system performance using the following industry-standard benchmarks:

- Futuremark® PCMark® Vantage v1.0.2.0
- Futuremark 3DMark®06 v1.2.0
- Futuremark 3DMark Vantage v1.0.2

We then measured the battery life of the systems using the BAPCo® MobileMark® 2007 v1.06 Productivity 2007 test.

We conducted a custom test using a thermal imaging camera and surface temperature probe to determine the surface temperature (in Celsius) of the notebook systems in key spots that affect the user's comfort while working on the system. We tested the temperature of the systems while they were running four different workloads: idle, a video file, a Prime95, and 3DMark06. Note that, for all thermal tests, we ran two Internet Explorer® browser windows—one open to the MSN® homepage and one open to the Yahoo® homepage—in the background.

KEY FINDINGS

- The Acer Aspire TimelineX 4820TG achieved the following performance increases over the ASUS U45Jc: 2.0% faster PCMark Vantage performance, 120.5% faster 3DMark06 performance, and 236.2% faster 3DMark Vantage performance. (See Figure 1.)
- The Acer Aspire TimelineX 4820TG produced a battery life score of 8 hours 22 minutes on the MobileMark 2007 Productivity 2007 test, 7.6% less than the ASUS U45Jc's score of 9 hours 3 minutes. (See Figure 2.)
- On the Acer Aspire TimelineX 4820TG, surface temperatures of key spots ranged from 7.3 to 10.1 degrees above ambient temperature while idle,* and from 4.7 to 11.9 degrees above ambient temperature while running Prime95. On the ASUS U45Jc, surface temperatures of key spots ranged from 3.6 to 8.7 degrees above ambient temperature while idle,* and from 1.7 to 14.9 degrees above ambient temperature while running Prime95. (See Figures 3, 4, 7, and 8.)

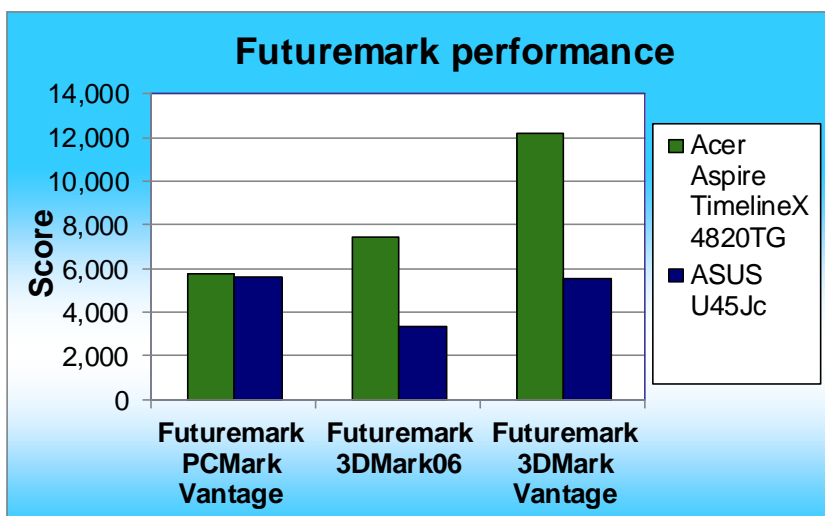


Figure 1: Performance scores for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebooks. Higher scores are better.

As Figure 1 shows, the Acer Aspire TimelineX 4820TG notebook produced the following median scores: a PCMark Vantage score of 5,798, 2.0 percent faster than the ASUS U45Jc notebook's score of 5,687; a 3DMark06 score of 7,498, 120.5 percent faster than the ASUS U45Jc notebook's score of 3,401; and a 3DMark Vantage score of 3,466, 236.2 percent faster than the ASUS U45Jc notebook's score of 1,031.

*During all thermal testing, including idle, each notebook had two Internet Explorer sessions open.

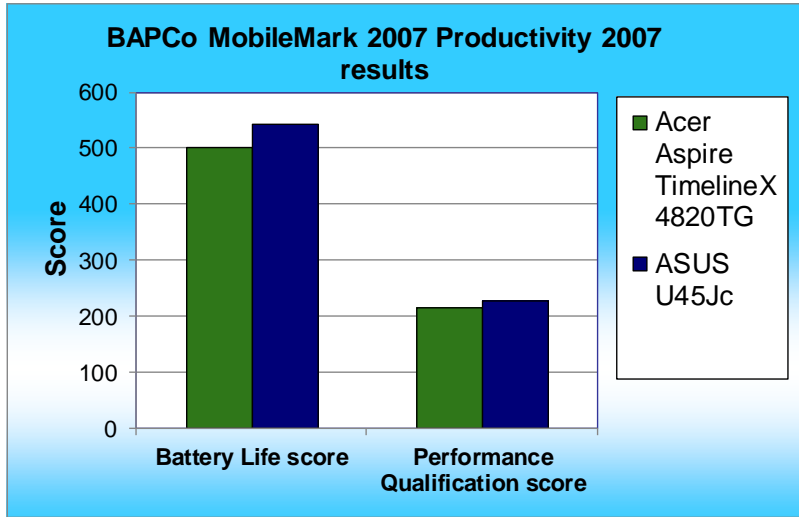
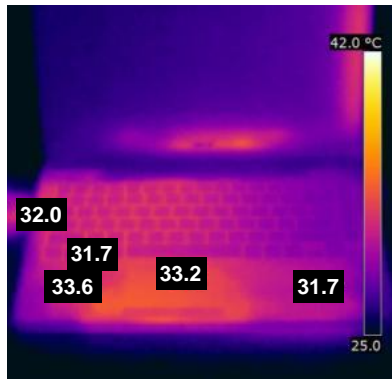


Figure 2: MobileMark 2007 Productivity 2007 Battery Life score and Performance Qualification score for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebook systems. Higher scores are better.

As Figure 2 shows, the Acer Aspire TimelineX 4820TG notebook system produced a battery life score of 502 minutes (8 hours 22 minutes) on the MobileMark 2007 Productivity 2007 test, 7.6 percent less time than the ASUS U45Jc notebook's score of 543 minutes (9 hours 3 minutes). The Acer Aspire TimelineX 4820TG notebook produced a median MobileMark 2007 Productivity 2007 performance qualification score of 216, 5.1 percent slower than the ASUS U45Jc notebook's score of 227.

Figures 3 through 10 show the thermal images of each notebook during thermal testing. During all thermal testing, including idle, each notebook had two Internet Explorer sessions open.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

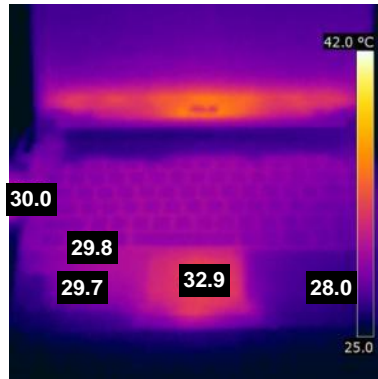
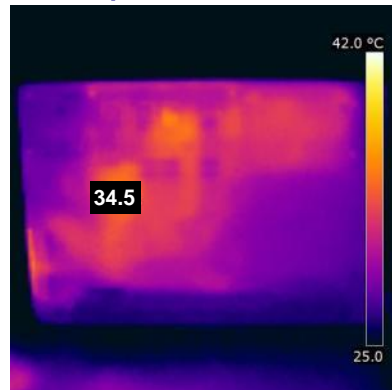


Figure 3 shows the surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while idle. The ambient temperature in our labs when both systems were idle was 24.4 degrees. The Acer Aspire TimelineX 4820TG temperatures ranged from 31.7 to 33.6 degrees, 7.3 to 9.2 degrees above the ambient temperature, while the ASUS U45Jc temperatures ranged from 28.0 to 32.9 degrees, 3.6 to 8.5 degrees above ambient temperature.

Figure 3: Surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebook systems while idle. Lower numbers are better.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

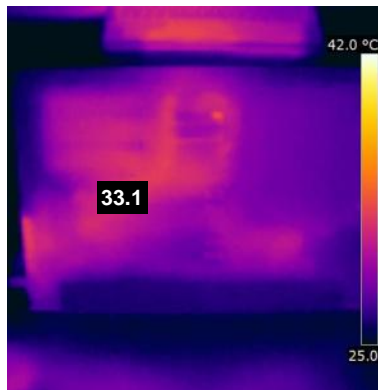
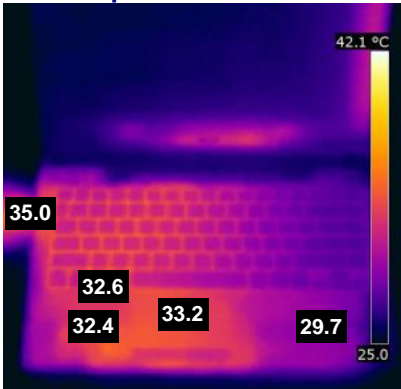


Figure 4 shows the underside surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while idle. The Acer Aspire TimelineX 4820TG's temperature was 34.5 degrees, 10.1 degrees above the ambient temperature of 24.4 degrees, while the ASUS U45Jc's temperature was 33.1 degrees, 8.7 degrees above the ambient temperature of 24.4 degrees.

Figure 4: Underside surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebook systems while idle. Lower numbers are better.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

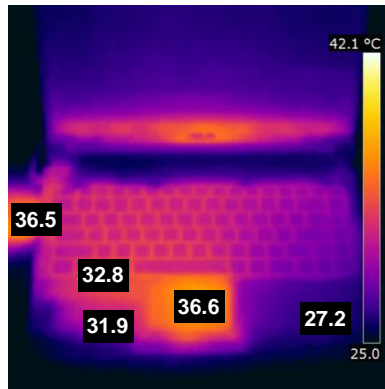
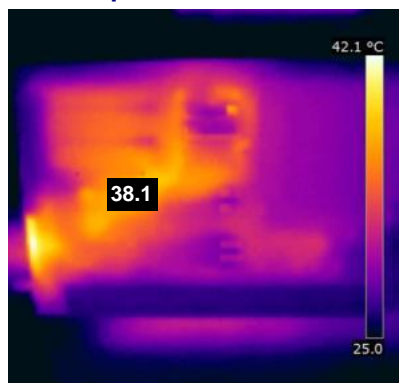


Figure 5: Surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebooks while playing a video file. Lower numbers are better.

Figure 5 shows the surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while playing an .MP4 file with Windows Media Center. The ambient temperature in our labs was 24.0 degrees. The Acer Aspire TimelineX 4820TG temperatures ranged from 29.7 to 35.0 degrees, 5.7 to 11.0 degrees above ambient temperature, while the ASUS U45Jc temperatures ranged from 27.2 to 36.6 degrees, 3.2 to 12.6 degrees above ambient temperature.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

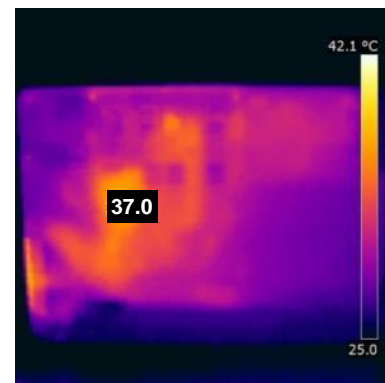
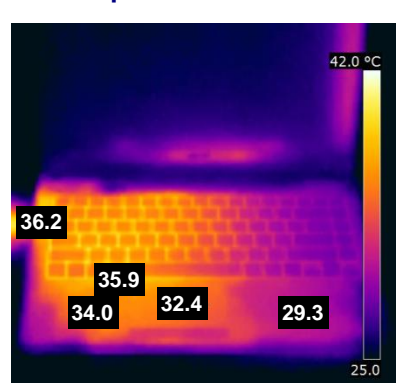


Figure 6: Underside surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebook while playing a video file. Lower numbers are better.

Figure 6 shows the underside surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while playing an .MP4 file with Windows Media Center. The Acer Aspire TimelineX 4820TG temperature was 38.1 degrees, 14.1 degrees above the ambient temperature of 24.0 degrees, while the ASUS U45Jc temperature was 37.0 degrees, 13.0 degrees above the ambient temperature of 24.0 degrees.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

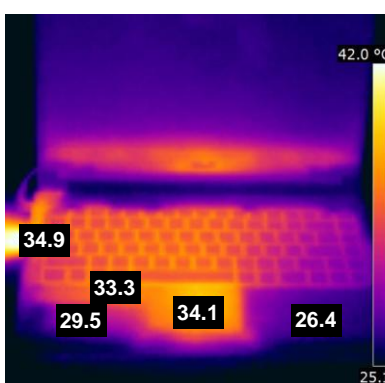
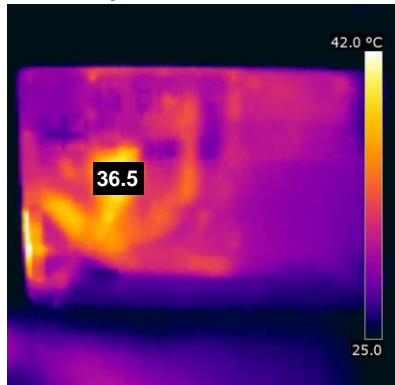


Figure 7: Surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebooks while running Prime95. Lower numbers are better.

Figure 7 shows the surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while running Prime95. For the Acer Aspire TimelineX 4820TG, the ambient temperature in our labs was 24.6 degrees. The Acer Aspire TimelineX 4820TG temperatures ranged from 29.3 to 36.2 degrees, 4.7 to 11.6 degrees above ambient temperature. For the ASUS U45J, the ambient temperature in our labs was 24.7 degrees. The ASUS U45Jc temperatures ranged from 26.4 to 34.9 degrees, 1.7 to 10.2 degrees above ambient temperature.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

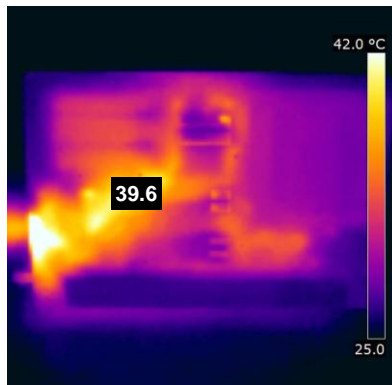
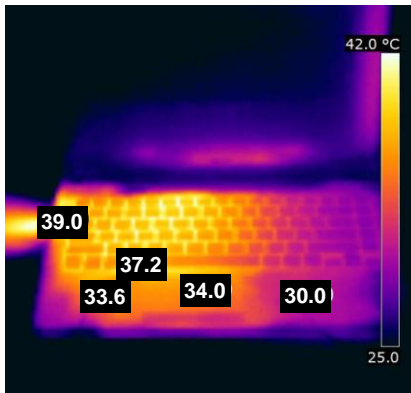


Figure 8 shows the underside surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while running Prime95. The Acer Aspire TimelineX 4820TG temperature was 36.5 degrees, 11.9 degrees above the ambient temperature of 24.6 degrees. The ASUS U45Jc temperature was 39.6 degrees, 14.9 degrees above the ambient temperature of 24.7 degrees.

Figure 8: Underside surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebooks while running Prime95. Lower numbers are better.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

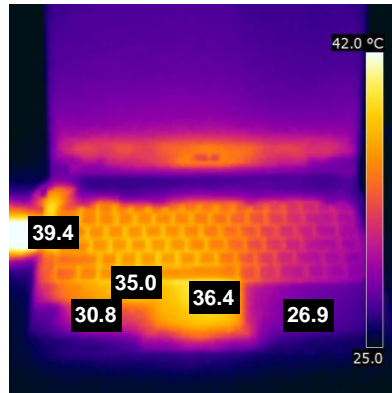
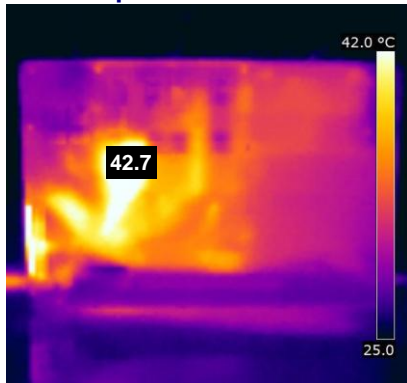


Figure 9 shows the surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while running 3DMark06. For the Acer Aspire TimelineX 4820TG, the ambient temperature in our labs was 24.7 degrees. The Acer Aspire TimelineX 4820TG temperatures ranged from 30.0 to 39.0 degrees, 5.3 to 14.3 degrees above ambient temperature. For the ASUS U45Jc, the ambient temperature in our labs was 25.3 degrees. The ASUS U45Jc temperatures ranged from 26.9 to 39.4 degrees, 1.6 to 14.1 degrees above ambient temperature.

Figure 9: Surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebooks while running 3DMark06. Lower numbers are better.

Acer Aspire TimelineX 4820TG



ASUS U45Jc

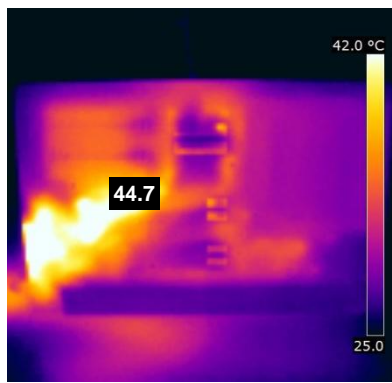


Figure 10 shows the underside surface temperatures of the Acer Aspire TimelineX 4820TG and ASUS U45Jc while running 3DMark06. The Acer Aspire TimelineX 4820TG temperature was 42.7 degrees, 18.0 degrees above the ambient temperature of 24.7 degrees. The ASUS U45Jc temperature was 44.7 degrees, 19.4 degrees above the ambient temperature of 25.3 degrees.

Figure 10: Underside surface temperature results for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebooks while running 3DMark06. Lower numbers are better.

Figure 11 shows the temperature difference, in degrees Celsius, between the ambient temperature and the surface temperature we recorded and present in the thermal images (Figures 3 through 10). Note that palm rest L-R results only report the temperature difference between the left and right palm rest. For all results, lower temperatures are better. During all thermal testing, including idle, each notebook had two Internet Explorer sessions open.

Notebook system	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Test	Idle + MSN + Yahoo	
Ambient temperature	24.4°C	24.4°C
Fan outlet area	$\Delta T=7.6$	$\Delta T=5.6$
Keyboard cover rest	$\Delta T=7.3$	$\Delta T=5.4$
Palm rest L (Point A)	$\Delta T=9.2$	$\Delta T=5.3$
Palm rest R (Point B)	$\Delta T=7.3$	$\Delta T=3.6$
Palm rest L-R	$\Delta T=1.9$	$\Delta T=1.7$
Touch pad	$\Delta T=8.8$	$\Delta T=8.5$
Underside	$\Delta T=10.1$	$\Delta T=8.7$
Test	Playing a video file + MSN + Yahoo	
Ambient temperature	24.0°C	24.0°C
Fan outlet area	$\Delta T=11.0$	$\Delta T=12.5$
Keyboard cover rest	$\Delta T=8.6$	$\Delta T=8.8$
Palm rest L (Point A)	$\Delta T=8.4$	$\Delta T=7.9$
Palm rest R (Point B)	$\Delta T=5.7$	$\Delta T=3.2$
Palm rest L-R	$\Delta T=2.7$	$\Delta T=4.7$
Touch pad	$\Delta T=9.2$	$\Delta T=12.6$
Underside	$\Delta T=14.1$	$\Delta T=13.0$
Test	Running Prime95 + MSN + Yahoo	
Ambient temperature	24.6°C	24.7°C
Fan outlet area	$\Delta T=11.6$	$\Delta T=10.2$
Keyboard cover rest	$\Delta T=11.3$	$\Delta T=8.6$
Palm rest L (Point A)	$\Delta T=9.4$	$\Delta T=4.8$
Palm rest R (Point B)	$\Delta T=4.7$	$\Delta T=1.7$
Palm rest L-R	$\Delta T=4.7$	$\Delta T=3.1$
Touch pad	$\Delta T=7.8$	$\Delta T=9.4$
Underside	$\Delta T=11.9$	$\Delta T=14.9$
Test	Running 3DMark06 + MSN + Yahoo	
Ambient temperature	24.7°C	25.3°C
Fan outlet area	$\Delta T=14.3$	$\Delta T=14.1$
Keyboard cover rest	$\Delta T=12.5$	$\Delta T=9.7$
Palm rest L (Point A)	$\Delta T=8.9$	$\Delta T=5.5$
Palm rest R (Point B)	$\Delta T=5.3$	$\Delta T=1.6$
Palm rest L-R	$\Delta T=3.6$	$\Delta T=3.9$
Touch pad	$\Delta T=9.3$	$\Delta T=11.1$
Underside	$\Delta T=18.0$	$\Delta T=19.4$

Figure 11: Detailed surface temperature results for each notebook system in each test. Lower temperatures are better.

Figure 12 presents the system dimensions, in inches, for the two notebook systems. To measure the height of each notebook, we used a tape measure and measured along the front, middle, and back side of each notebook. When measuring an open notebook, we opened the screen so that it was straight at a 90-degree angle.

Notebook system dimensions	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Length (inches)	13-1/2	13-1/4
Width (inches)	9-5/8	9-5/8
Height when closed (inches)	1 front, 1-3/16 middle, 1-1/4 back	1-3/32 front, 1-3/16 middle, 1-1/4 back
Height when open (inches)	3/4 front, 7/8 middle, 9-7/8 back	7/8 front, 15/16 middle, 10 back

Figure 12: System dimensions for the two notebook systems.

The Workloads section provides details on the benchmarks we used. The Test results section and Appendix A show the test results in more detail. The Test methodology section explains how we ran the tests. Appendix C details the system configurations.

Workloads

Futuremark PCMark Vantage v1.0.2.0

Futuremark's PCMark Vantage v1.0.2.0 benchmark suite tests system CPU and GPU performance, RAM speeds, and hard drive read/write speeds. The benchmark runs common tasks such as video playback, audio and video transcoding, data encryption, Windows mail, game testing, and Web page rendering. For more information on this benchmark, see

<http://www.futuremark.com/benchmarks/pcmarkvantage/introduction/>.

Futuremark 3DMark06 v1.2.0

Futuremark's 3DMark06 v1.2.0. benchmark suite tests system GPU DirectX®9 performance and CPU workload processing performance, primarily to report a system's 3D gaming capability. Tests include HDR rendering, shadow mapping, and pixel shading. For more information on this benchmark, see

<http://www.futuremark.com/benchmarks/3dmark06/introduction/>.

Futuremark 3DMark Vantage v1.0.2

Futuremark's 3DMark Vantage v1.0.2 benchmark suite tests system GPU DirectX10 performance, and requires either Microsoft Windows Vista or Windows 7. 3DMark Vantage v1.0.2 includes testing of GPU-powered physics, DirectX10-specific features, and procedural volumetric effects. Like 3DMark06 v1.2.0, 3DMark Vantage v1.0.2 provides an indication of a system's 3D gaming capability. For more information on this benchmark, see

<http://www.futuremark.com/benchmarks/3dmarkvantage/introduction/>.

BAPCo MobileMark 2007 Productivity 2007

Our goal was to see how long the Acer Aspire TimelineX 4820TG notebook battery would last running BAPCo's MobileMark 2007 Productivity 2007 battery-life benchmark test compared to the ASUS U45Jc.

MobileMark 2007 Productivity 2007 is an industry-standard benchmark that provides a battery life rating and a performance rating based on common office scenarios. In our tests, we focus solely on the battery life rating. MobileMark 2007 Productivity 2007 includes applications and workloads specific to mobile systems. These include office activities like file and document management, data processing, and rich content creation. This module provides a score for battery life of the tested applications.

MobileMark 2007 Productivity 2007 includes the following applications with their corresponding tasks:

- Microsoft Project 2003 (project management)
- Microsoft Excel® 2003 (calculation sheets)
- Microsoft Outlook® 2003 (emails, calendars, scheduler)

- Microsoft PowerPoint® 2003 (slide presentations)
- Microsoft Word® 2003 (formatted text documents)
- WinZip® Computing and WinZip Pro 10.0 (compressed archives)
- Adobe® Photoshop® CS2 (manipulated and compressed images)
- Adobe Illustrator® CS2 (manipulated images)
- Adobe Flash® 8 (vector graphics, animation)

MobileMark 2007 measures system battery life in minutes. MobileMark 2007 records system battery life at the start of the Productivity 2007 benchmark. It repeats the benchmark workload until the system battery life depletes, or until the system powers down due to low battery life. At the 7 percent battery life setting, MobileMark 2007 records a timestamp once per minute. At the end of the benchmark, it compares the beginning timestamp to the final (last recorded) timestamp. MobileMark 2007 derives its system battery life rating as the number of minutes between the start and end timestamps.

We followed the run rules that BAPCo specifies for MobileMark 2007 here: <http://www.bapco.com/support/mobilemark2007/Manual/rules.html>.

For more information on this benchmark, see <http://www.bapco.com/products/mobilemark2007/>.

Custom thermal test

We measured the temperature of the notebook systems in key spots that affect the user's comfort while working on the system. See the Test methodology section for more information on how we did so, and Appendix B for the schematic of the notebooks we used to show the key spots we tested.

Test results

Figure 13 presents the median scores for the notebook systems on the benchmark tests we performed. Higher scores are better. We conducted three runs. For Futuremark PCMark Vantage, we used the median of the PCMark Suite scores to determine the sub-scores. For Futuremark 3DMark06 and 3DMark Vantage, we used the median of the 3DMark Scores to determine the sub-scores. For BAPCo MobileMark 2007, we used the median of the Battery Life scores to determine the Performance Qualification score. For BAPCo MobileMark 2007 Productivity 2007, we conducted one conditioning run. We then conducted three official runs. (Complete test results appear in Appendix A.)

Test	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Futuremark PCMark Vantage 1.0.2.0		
PCMark Suite	5,798	5,687
Memories Suite	4,045	3,185
TV and Movies Suite	3,646	3,694
Gaming Suite	5,140	3,311
Music Suite	5,303	6,112
Communication Suite	4,602	4,796
Productivity Suite	4,583	5,126
HDD Test Suite	3,272	4,190
Futuremark 3DMark06 1.2.0		
3D Mark Score	7,498	3,401
SM2.0 Score	2,712	1,287
HDR/SM3.0 Score	3,364	1,221
CPU Score	2,798	2,612
Futuremark 3DMark Vantage 1.0.2 run in Performance Level mode		
3DMark Score	3,466	1,031
GPU Score	2,939	801

Test	Acer Aspire TimelineX 4820TG	ASUS U45Jc
CPU Score	7,485	7,396
Futuremark 3DMark Vantage 1.0.2 Performance Level with Post Processing disabled		
GPU Score	9,338	3,011
BAPCo MobileMark 2007 v1.06 Productivity 2007	(61 nits)	(63 nits)
MobileMark 2007 - Productivity - Performance Qualification score	216	227
MobileMark 2007 - Productivity - Battery Life score (minutes)	502	543

Figure 13: Median benchmark scores for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebook systems we tested. Higher scores are better.

Test methodology

This section details the methodologies we followed in testing the systems. The Super Hybrid Engine is a technology created by ASUS. It gives users the ability to adjust the clock and bus speed to increase performance and extend battery life. The Super Hybrid Engine automatically manages and regulates power distribution based on usage requirements. We had this feature disabled, the default setting, in our testing.

Measuring disk performance with PCMark Vantage 1.0.2.0

Installing and patching PCMark Vantage

1. Download the PCMark_Vantage_v100_installer.exe Windows package from www.futuremark.com/benchmarks/pcmarkvantage/download/.
2. Install PCMark Vantage 1.0.0 with the default options by double-clicking the PCMark_Vantage_v100_installer.exe file.
3. At the Welcome screen, click Next.
4. At the License Agreement window, click I accept the terms of the license agreement, and click Next.
5. At the Setup Type window, click Express, and click Next.
6. At the Ready to Install the Program window, click Install.
7. When the PCMark Vantage Read Me page opens in your web browser, review the document, and click Close when you are finished.
8. At the InstallShield Wizard complete screen, click Finish.
9. Launch PCMark Vantage 1.0.0 by clicking on the PCMark Vantage x64 desktop icon. Enter the registration code, click Register, and click OK.
10. Exit PCMark Vantage 1.0.0.
11. Download the PCMark Vantage 1.0.2.0 Patch (PCMark_Vantage_v102_patch_1901.exe Windows package) from www.futuremark.com/benchmarks/pcmarkvantage/download/.
12. Install the patch by double-clicking the PCMark_Vantage_v102_patch_1901.exe file.
13. At the Welcome screen, click Next.
14. At the Update Complete screen, click Finish.

Running PCMark Vantage 1.0.2.0

1. Reboot the system, and wait 2 minutes.
2. Double-click the PCMark Vantage desktop icon to launch the benchmark.
3. Verify all test suites are selected, and that the HDD Suite target is set to C:.
4. Accept the default settings, and click Run Benchmark.
5. When the benchmark run completes, click Submit results.
6. Take a screenshot of the results, and record them as follows:
 - PCMark Suite
 - Memories Suite
 - TV and Movies Suite
 - Gaming Suite
 - Music Suite

- Communication Suite
 - Productivity Suite
 - HDD Test Suite
7. Perform steps 1 through 6 two more times, and report the median of the three runs.

Measuring graphics performance with 3DMark06 1.2.0

Installing and patching 3DMark06

1. Download the 3DMark06_v120_1901.exe package from <http://www.futuremark.com/benchmarks/3dmarkvantage/download/>.
2. Install 3DMark06 1.2.0 with the default options by double-clicking the 3DMark06_v120_1901.exe file.
3. At the Welcome screen, click Next.
4. At the License Agreement screen, click the I accept the terms of the license agreement radio button, and click Next.
5. At the Installation Destination screen, accept default destination by clicking Next.
6. At the Begin installation screen, click Install.
7. When the Question pop-up appears, click Yes.
8. At the Installing Microsoft DirectX pop-up, click the I accept the agreement radio button, and click Next.
9. At the DirectX Setup screen, click Next.
10. At the Installation Complete screen, click Finish.
11. At the OpenAL Installer screen, click OK.
12. At the OpenAL Installer message pop-up, click OK.
13. At the Futuremark Registration screen, enter the registration code, and click Next.
14. At the InstallShield Wizard Complete screen, click Finish.
15. When the 3DMark06 Read Me page appears in your Web browser, review the document, and click Close when you are finished.

Running 3DMark06 1.2.0

1. Reboot the system and wait 2 minutes.
2. Double-click the 3DMark06 desktop icon to launch the benchmark.
3. Close the Tip of the Day pop-up.
4. Click Select... under Tests, and click Select all. Click OK.
5. Accept the default settings, and click Run 3DMark.
6. When the benchmark run completes, click To Excel, and save the results as an Excel file by clicking Save.
7. Record the results from the 3DMark Score window or the Excel file as follows:
 - 3D Mark Score
 - SM2.0 Score
 - HDR/SM3.0 Score
 - CPU Score
8. Perform steps 1 through 7 two more times, and report the median of the three runs.

Measuring graphics performance with 3DMark Vantage 1.0.2

Installing and patching 3DMark Vantage

1. In order to run the default Performance test it is necessary to connect the notebooks to an external monitor that supports a resolution of 1,280 x 1,024.
2. Download the 3DMark_Vantage_v100_installer.exe Windows package from <http://www.futuremark.com/benchmarks/3dmarkvantage/download/>.
3. Install 3DMark Vantage 1.0.2 with the default options by double-clicking the 3DMark_Vantage_v102_1901.exe file.
4. At the Welcome screen, click Next.
5. At the License Agreement screen, click I accept the terms of the license agreement, and click Next.
6. At the Setup Type screen, click Express, and click Next.
7. At the Ready to Install the Program screen, click Install.

8. When the 3DMark Vantage Read Me page appears in your Web browser, review the document, and click Close when you are finished.
9. At the Setup Complete screen, click Finish.
10. Launch 3DMark Vantage 1.0.2 by double-clicking on the 3DMark Vantage desktop icon. Enter the registration code, and click Register.
11. Exit 3DMark Vantage 1.0.2.

Running 3DMark Vantage 1.0.2

For Performance-level results:

1. Reboot the system, and wait 2 minutes.
2. Double-click the 3DMark Vantage desktop icon to launch the benchmark.
3. In the 3DMark Vantage Main section, click the Preset drop-down menu arrow, and select Performance.
4. Click the Options tab, then click the Graphic Tests tab, and ensure that you select both tests.
5. Click the CPU Tests tab, and ensure that you select both tests.
6. Click the Feature Tests tab, and deselect all six tests by clicking the check mark by each title.
7. Click Run Benchmark.
8. When the benchmark run completes, click Submit results.
9. Take a screenshot of the results, and record them as follows:
 - 3DMark Score
 - GPU Score
 - CPU Score
10. Perform steps 1 through 9 two more times, and report the median of the three runs.

Measuring battery life with MobileMark 2007

Antivirus software conflicts

MobileMark 2007 is not compatible with any virus-scanning software, so we uninstalled any such software present on the notebooks before we installed the benchmark.

Pre-installed software conflicts

MobileMark 2007 installs the following applications, which its test scripts employ:

- Adobe Photoshop 6.0.1
- InterVideo WinDVD® 6.0
- Macromedia® Flash® 5.0
- Microsoft Excel 2002
- Microsoft Outlook 2002
- Microsoft PowerPoint 2002
- Microsoft Word 2002
- Microsoft Visual® C++ 2005 Redistributable
- Netscape® Communicator 6.01
- Network Associates McAfee® VirusScan® 5.13
- WinZip Computing WinZip 8.0

If any of these applications are already on the system under test, they could cause problems with the benchmark due to software conflicts. To avoid any such issues, before we installed the benchmark, we uninstalled all conflicting pre-installed software applications, including different versions of any of the programs MobileMark 2007 uses.

Display brightness and power settings

The brightness of a notebook's display affects its battery life. Therefore, BAPCo requires that, before you test with MobileMark 2007, you make sure the brightness of the notebook's monitor is greater than or equal to 60 nits on a completely white screen while the notebook is unplugged and running on battery power. The measurement follows the standards from the Video Electronics Standards Association (www.vesa.org/Standards/summary/2001_6a.htm).

We complied with this standard for all the tests we ran by setting the notebooks' brightness as close to 60 nits as we could without going below that brightness level. We used the following procedure before we started each test.

Note: This procedure assumes we began with the notebook plugged into the power supply.

1. To create a completely blank, white screen, open Microsoft Paint by clicking Start→All Programs→Accessories→Paint.
2. Open the Attributes by pressing Ctrl+E.
3. Enter dimensions that are larger than the current screen resolution. For example, if the screen resolution is 1,280 x 800, type 1600 for Width and 1200 for Height.
4. Click OK.
5. Press Ctrl+F to view the bitmap image and render the screen totally white.
6. Wait 45 minutes to allow the screen to warm.
7. Unplug the notebook from the power supply, and measure the display's brightness using a luminance meter in the center of the screen. (We used the Gossen Mavolux 5032 C.)
8. If the reading is below or significantly greater than 60 nits, use the notebook's keyboard screen-brightness-adjustment keys to bring the display as close to 60 nits as possible, then retest.
9. Allow the notebook to run on battery power for 10 minutes, re-measure the display, and adjust the brightness up or down as necessary.
10. Verify that the notebook saved the brightness setting by plugging in the system, unplugging it, and taking another reading.

Note: If the notebook did not save this setting, use its power-management application(s) to set the brightness appropriately, and save that setting. If saving the settings is ineffective, use the keyboard brightness setting keys to adjust the screen to bring the display as close to 60 nits as possible. Next, note how many times you pressed the button to achieve the desired brightness. After unplugging the system under test, use the keyboard to set the desired brightness by pressing the brightness button as many times as you previously noted to return the screen to the correct brightness level.

BAPCo AutoConfig Tool v2.4.1

This tool supports three levels of configuration:

1. Only makes changes that are REQUIRED in order for the benchmark to run.
2. Additionally, makes changes that are RECOMMENDED for repeatable results.
3. Additionally, makes changes that help ensure best results.

We chose Level 3 in the AutoConfig tool.

The BAPCo AutoConfig tool makes the following configuration changes at each of the three levels:

Level 1—Required

- Creates and activates a new power scheme that it names MobileMark 2007
- Disables hibernate, standby, and display standby
- Sets hard drive timeout and CPU power management
Note: See the following Power schemes section for details on this scheme
- Disables Screen Saver
- Disables Windows Update
- Disables Desktop Cleanup Wizard
- Disables User Account Control (UAC)
- Disables Sidebar

Level 2—Recommended

- Completes Level 1
- Disables Windows Security Center warning messages
- Disables Windows Firewall
- Disables incoming Remote Desktop connections

- Disables Windows Error Reporting to Microsoft
- Prevents the Welcome Center from running at startup

Level 3—Best scores

- Completes Level 1 and Level 2
- Disables Windows Defender

Power schemes

The BAPCo AutoConfig tool creates a MobileMark 2007 power scheme, which makes the following power option changes:

- a. Additional settings:
 - Require a password on wakeup: No
- b. Hard disk:
 - Turn off hard disk after: 3 minutes
- c. Wireless adapter settings:
 - Power Saving Mode: Maximum Power Saving
- d. Sleep:
 - Sleep after: Never
- e. USB settings:
 - USB selective suspend setting: Enabled
- f. Power buttons and lid:
 - Lid close action: Do nothing
 - Power button action: Shut down
 - Sleep button action: Sleep
 - Start menu power button: Shut down
- g. PCI Express:
 - Link State Power Management: Maximum power savings
- h. Processor power management:
 - Minimum processor state: 5%
 - Maximum processor state: 100%
- i. Search and Indexing:
 - Power Savings Mode: Power Saver
- j. Display:
 - Turn off display after: Never
 - Adaptive display: Off (Extends the time that Windows waits to turn off the display)
 - Display brightness: 100% (We then adjust the brightness percentage to be no less than 60 nits)
- k. Multimedia settings:
 - When sharing media: Prevent idling to sleep
- l. Battery:
 - Critical battery action: Shut down (on battery), Do nothing (plugged in)
 - Low battery level: 0%
 - Critical battery level: 0%
 - Low battery notification: Off
 - Low battery action: Do nothing

Installing MobileMark 2007 v.1.06 and configuring the system for testing

1. Turn off the wireless network adapter by using the external toggle switch.
2. Insert the MobileMark 2007 Install DVD in the notebook's DVD drive.
3. When the Autoplay appears, click Run setup.exe.
4. At the Welcome screen, click Next.
5. Accept the license agreement, and click Next.

6. At the Choose Destination Location screen, accept the default location of C:\ProgramFiles (x86)\BapCo\MobileMark 2007, and click Next.
7. At the Ready to Install the Program screen, click Install.
8. At the InstallShield Wizard Complete screen, click Finish.
9. Download MobileMark 2007 Patch 5 from <http://www.bapco.com/support>, saving the download to the desktop.
10. Double-click the MobileMark 2007 Patch 5 desktop icon.
11. In the 7-Zip self-extracting archive window, select a location to extract the installation files, and click Extract.
12. Browse to the location of the extracted files, and double-click the MobileMark 2007 folder.
13. Double-click the MobileMark2007_patch folder.
14. Double-click setup.
15. At the Welcome screen, click Next.
16. At the Update Complete window, click Finish.
17. Run the BAPCo Auto-configuration tool, v.2.4.1, or manually set the power options:
 - a. Insert the Auto-configuration tool disc in the notebook's DVD drive.
 - b. Double-click BAPCo_AutoConfig.bat.
 - c. Type **M** to choose MobileMark 2007.
 - d. Type **3** to choose the changes that produce the best possible scores.
 - e. Type **R** to restart the system when the application prompts you to do so.
18. Adjust the screen brightness to no less than 60 nits:
 - a. Click the Windows start button, and type `power options` in the Windows Start Search box.
 - b. Click Change plan settings.
 - c. Click Change advanced power settings.
 - d. Expand the Display option, and change the Display brightness on battery and plugged in to the correct percentage that produces no less than 60 nits.
Note: If you are unable to save these settings, please see the Displaying Brightness section above.
19. Disable automatic disk defragmentation:
 - a. Click the Windows start button, type `disk defragmenter` in the Windows Start Search box, and press Enter.
 - b. Click Configure Schedule.
 - c. Uncheck the box next to Run on a schedule, and click OK.
 - d. Click Close.
20. Disable System Protection:
 - a. Click the Windows start button, and type `System` in the Windows Start Search box. In the search results that appear, click System under the Control Panel heading.
 - b. Click System Protection in the left pane.
 - c. In the System Properties window under the System Protection tab, click the first Available Drive under the Protection Settings heading, and click Configure.
 - d. Click the Turn off system protection radio button, and click OK.
 - e. When prompted with Are you sure you want to turn off system protection on this drive?, click Yes.
 - f. Repeat steps c through e for any other Available Drives as necessary.
 - g. Click OK, and close the System window.
21. Disable Windows Desktop Search indexing:
 - a. Click the Windows start button, type `Indexing Options` in the Windows Start Search box, and press Enter.
 - b. Click Modify.
 - c. Under Change selected locations, uncheck the boxes next to each indexed location, and click OK.
 - d. Click Close.
22. Defragment the hard drive(s):
 - a. Click the Windows start button, type `disk defragmenter` in the Windows Start Search box, and press Enter.
 - b. Highlight the local disk drive under Current status, and click Defragment disk.

- c. When the process is complete, click Close.

Conditioning the battery

1. Plug the AC power adapter into the notebook, and completely charge the battery.
2. Install MobileMark 2007 v1.06, following the steps we outlined in the Installing MobileMark 2007 section earlier in this section.
3. Double-click the MobileMark 2007 icon on the desktop.
4. Highlight the Productivity 2007 item in the left panel.
5. Type `System Conditioning` as the name for this test in the Project Name field in the top-right panel, and click Next Step.
6. If MobileMark 2007 lists no problems or warnings, click Next Step. If it does list any problems or warnings, close MobileMark 2007, and correct the problem(s) before proceeding.
7. After the benchmark integrity check, click Next in the Preparing a new test window.
8. When the benchmark prompts you, unplug the AC power adapter. The Productivity 2007 test begins immediately.
9. The test is complete when the notebook has fully depleted its battery and is no longer operational when running on battery power.
10. Plug the AC power adapter into the notebook, and completely charge the battery.

Measuring battery life with MobileMark 2007 v.1.06

We performed the following steps to run the MobileMark Productivity 2007 benchmark:

1. Double-click the MobileMark 2007 icon on the desktop.
2. Select the Productivity 2007 test by highlighting it in the left panel.
3. Enter a name for this test in the Project Name field in the top right panel, and click Next Step.
4. If MobileMark 2007 lists no problems or warnings, click Next. If it does list any problems or warnings, close MobileMark 2007, and correct the problem(s) before proceeding.
5. After the benchmark integrity check, click Next in the Preparing a new test window.
6. When prompted, unplug the AC power adapter. The test begins immediately.
7. The Productivity 2007 test is complete when the notebook has fully depleted its battery and is no longer operational when running on battery power.

We executed the MobileMark Productivity 2007 test three times on the system and took the median battery life run as the representative score for that test.

Getting the MobileMark 2007 results

After each MobileMark Productivity 2007 test completed, we plugged the AC power adapter into the notebook and turned on the system. MobileMark 2007 started automatically after the system booted, analyzed the test scores, and opened the Test Results Viewer with the results from the last test.

To submit these results to BAPCo, we saved the test results directory by performing the following steps:

1. Browse to the `C:\Program Files (x86)\BAPCo\MobileMark 2007\results` directory.
2. Select My Computer.
3. Select Local Disk (C:).
4. Select the Program Files directory.
5. Select the BAPCo directory.
6. Select the MobileMark2007 directory.
7. Select the results directory. (Note: The name of the directory for the Productivity 2007 results is the name you gave the test in Step 3 of the MobileMark Productivity 2007 process.)

Measuring surface temperatures with the thermal test

This test measures the surface heat of key areas of the notebook computers after 2 hours of running benchmarks, stress tests, or a local MPEG4 file, with a browser launched in the background. The test requires a wireless

network connection and a Digi[®] Watchport[®] sensor to ensure a consistent ambient temperature between 24°C and 26°C.

Setting up the notebook

1. Install GIMPS Prime95 torture test software:
 - a. Download the Prime95 v.2511 64-bit zip file from <http://www.mersenne.org/freesoft/>.
 - b. Unzip the p64v2511.zip file to the desktop.
 - c. Create a desktop shortcut to the Prime95.exe.
2. Install Futuremark's 3DMark06 software as detailed earlier in this section.
3. Note and leave the default power settings.
4. Set the display brightness to 100 percent:
 - a. Click Start.
 - b. In the Start menu's quick search field, type `Power Options`.
 - c. Move the Screen brightness slider all the way to the right.
5. Set the remaining power plan settings as follows:
 - Dim the display: Never
 - Turn off the display: Never
 - Put the computer to sleep: Never
6. Disable the screen saver.
7. Verify the wireless network card is enabled and that the radio is turned on, by either a physical switch or a control panel.
 - a. Right-click the network icon in the system tray, and, from the pop-up menu, select Open Network and Sharing Center.
 - b. From the left panel, select Change adapter settings.
 - c. Right-click Wireless connection, and choose Enable, if it is disabled.
 - d. Check for a physical switch for the wireless radio, and move it to the on position.
 - e. If no physical switch exists, check for a vendor-specific wireless assistant by typing `wireless` in the Start menu's quick search field.
 - f. After you verify the wireless card is both enabled and on, connect to the wireless network.
8. Plug the AC adapter into the notebook, and completely charge the battery.
9. Place the notebook on a desk, away from AC vents, in a windowless office.
10. While running the test, use a Digi Watchport sensor and the Watchport Manager to monitor ambient temperature.

Measuring surface temperature of the idle notebook with a browser open

1. Power the computer on.
2. Launch Internet Explorer, and browse to www.msn.com.
3. Launch a second instance of Internet Explorer, and browse to www.yahoo.com.
4. Allow the notebook to sit idle for 2 hours, with both browser windows open.
5. After 2 hours, take an image of the notebook with a FLIR[®] i7 thermal imaging camera, and measure the temperature of the palm rests, touchpad, keyboard, fan outlet area, and the underside surface with a surface temperature probe. (See Appendix B for details.)
6. Power the computer off, and allow it to return to room temperature.

Measuring surface temperature of the notebook after playing a local video file with a browser open

This test requires a wireless network connection, a browser, and a Digi Watchport sensor to ensure a consistent ambient temperature between 24°C and 26°C.

1. Power the computer on.
2. Launch Internet Explorer, and browse to www.msn.com.
3. Launch a second instance of Internet Explorer, and browse to www.yahoo.com.
4. Open an .MP4 file with Windows Media Center, and allow the notebook to play the video for 2 hours with both browser windows open.

5. After 2 hours, take an image of the notebook with a FLIR i7 thermal imaging camera, and measure the temperature of the palm rests, touchpad, keyboard, fan outlet area, and the underside surface with a surface temperature probe. (See Appendix B for details.)
6. Power the computer off, and allow it to return to room temperature.

Measuring surface temperature of the notebook after running the GIMPS Prime95 torture test with a browser open

This test requires a wireless network connection, a browser, and a Digi Watchport sensor to ensure a consistent ambient temperature between 24°C and 26°C.

1. Power the computer on.
2. Launch Internet Explorer, and browse to www.msn.com.
3. Launch a second instance of Internet Explorer, and browse to www.yahoo.com.
4. Launch Prime95.
5. From the Options menu item, select Torture test.
6. Select In-place FFTs, and change the Number of torture test threads to 1.
7. Allow the notebook to run the torture test for 2 hours with both browser windows open.
8. After 2 hours, take an image of the notebook with a FLIR i7 thermal imaging camera, and measure the temperature of the palm rests, touchpad, keyboard, fan outlet area, and the underside surface with a surface temperature probe. (See Appendix B for details.)
9. Power the computer off, and allow it to return to room temperature.

Measuring surface temperature of the notebook after running Futuremark's 3DMark06 with a browser open

This test requires a wireless network connection, a browser, and a Digi Watchport sensor to ensure a consistent ambient temperature between 24°C and 26°C.

1. Power the computer on.
2. Launch Internet Explorer, and browse to www.msn.com.
3. Launch a second instance of Internet Explorer, and browse to www.yahoo.com.
4. Launch 3DMark06.
5. Click the Change button in the Settings section of the benchmark.
6. Select Loop all selected tests, and click OK.
7. Allow the notebook to run 3DMark06 for 2 hours with both browser windows open.
8. After 2 hours, take an image of the notebook with a FLIR i7 thermal imaging camera, and measure the temperature of the palm rests, touchpad, keyboard, fan outlet area, and the underside surface with a surface temperature probe. (See Appendix B for details.)
9. Power the computer off, and allow it to return to room temperature.

Appendix A – Complete test results

Figure 14 presents the complete Futuremark PCMark Vantage 1.0.2.0, 3DMark06 1.2.0, 3DMark Vantage 1.0.2, and MobileMark 2007 Productivity 2007 test results for both test systems. Higher scores are better. For BAPCo MobileMark 2007 Productivity 2007, we conducted one conditioning run. We then conducted three official runs. For the remaining benchmarks, we conducted three runs.

Test	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Futuremark PCMark Vantage 1.0.2.0		
PCMark Suite - Run 1	5,790	5,687
PCMark Suite - Run 2	5,898	5,674
PCMark Suite - Run 3	5,798	5,691
Memories Suite - Run 1	4,127	3,185
Memories Suite - Run 2	4,072	3,143
Memories Suite - Run 3	4,045	3,186
TV and Movies Suite - Run 1	3,678	3,694
TV and Movies Suite - Run 2	3,681	3,701
TV and Movies Suite - Run 3	3,646	3,575
Gaming Suite - Run 1	5,115	3,311
Gaming Suite - Run 2	4,946	3,309
Gaming Suite - Run 3	5,140	3,306
Music Suite - Run 1	5,554	6,112
Music Suite - Run 2	5,529	6,010
Music Suite - Run 3	5,303	6,256
Communication Suite - Run 1	4,758	4,796
Communication Suite - Run 2	4,594	4,786
Communication Suite - Run 3	4,602	4,757
Productivity Suite - Run 1	4,562	5,126
Productivity Suite - Run 2	4,587	5,141
Productivity Suite - Run 3	4,583	5,180
HDD Test Suite - Run 1	3,339	4,190
HDD Test Suite - Run 2	3,324	4,133
HDD Test Suite - Run 3	3,272	4,155
Futuremark 3DMark06 1.2.0		
3D Mark Score - Run 1	7,500	3,401
SM2.0 Score - Run 1	2,714	1,287
HDR/SM3.0 Score - Run 1	3,364	1,221
CPU Score - Run 1	2,798	2,612
3D Mark Score - Run 2	7,498	3,399
SM2.0 Score - Run 2	2,712	1,287
HDR/SM3.0 Score - Run 2	3,364	1,222
CPU Score - Run 2	2,798	2,590
3D Mark Score - Run 3	7,497	3,404
SM2.0 Score - Run 3	2,714	1,286
HDR/SM3.0 Score - Run 3	3,362	1,225
CPU Score - Run 3	2,794	2,602
Futuremark 3DMark Vantage 1.0.2 Performance Level		
3DMark Score - Run 1	3,474	1,029
GPU Score - Run 1	2,944	800
CPU Score - Run 1	7,566	7,346

Test	Acer Aspire TimelineX 4820TG	ASUS U45Jc
3D Mark Score - Run 2	3,465	1,035
GPU Score - Run 2	2,939	804
CPU Score - Run 2	7,485	7,404
3D Mark Score - Run 3	3,466	1,031
GPU Score - Run 3	2,936	801
CPU Score - Run 3	7,561	7,396
Futuremark 3DMark Vantage 1.0.2 Performance Level with Post Processing disabled		
GPU Score - Run 1	9,366	3,011
GPU Score - Run 2	9,338	2,993
GPU Score - Run 3	9,331	3,020
BAPCo MobileMark 2007 Productivity 2007		
MobileMark 2007 - Productivity 2007 - Performance Qualification score - Run 1	217	218
MobileMark 2007 - Productivity 2007 - Performance Qualification score - Run 2	216	226
MobileMark 2007 - Productivity 2007 - Performance Qualification score - Run 3	217	227
MobileMark 2007 - Productivity 2007 - Battery Life score (minutes) - Run 1	512	529
MobileMark 2007 - Productivity 2007 - Battery Life score (minutes) - Run 2	502	545
MobileMark 2007 - Productivity 2007 - Battery Life score (minutes) - Run 3	502	543

Figure 14: Complete benchmark scores for the Acer Aspire TimelineX 4820TG and ASUS U45Jc notebook systems we tested.

Appendix B – Schematic of the notebook for temperature readings

Figure 15 presents a schematic of the notebook systems that shows the points where we measured the surface temperature. For underside surface temperature, we present the highest temperature found on the underside of each notebook.

Top View

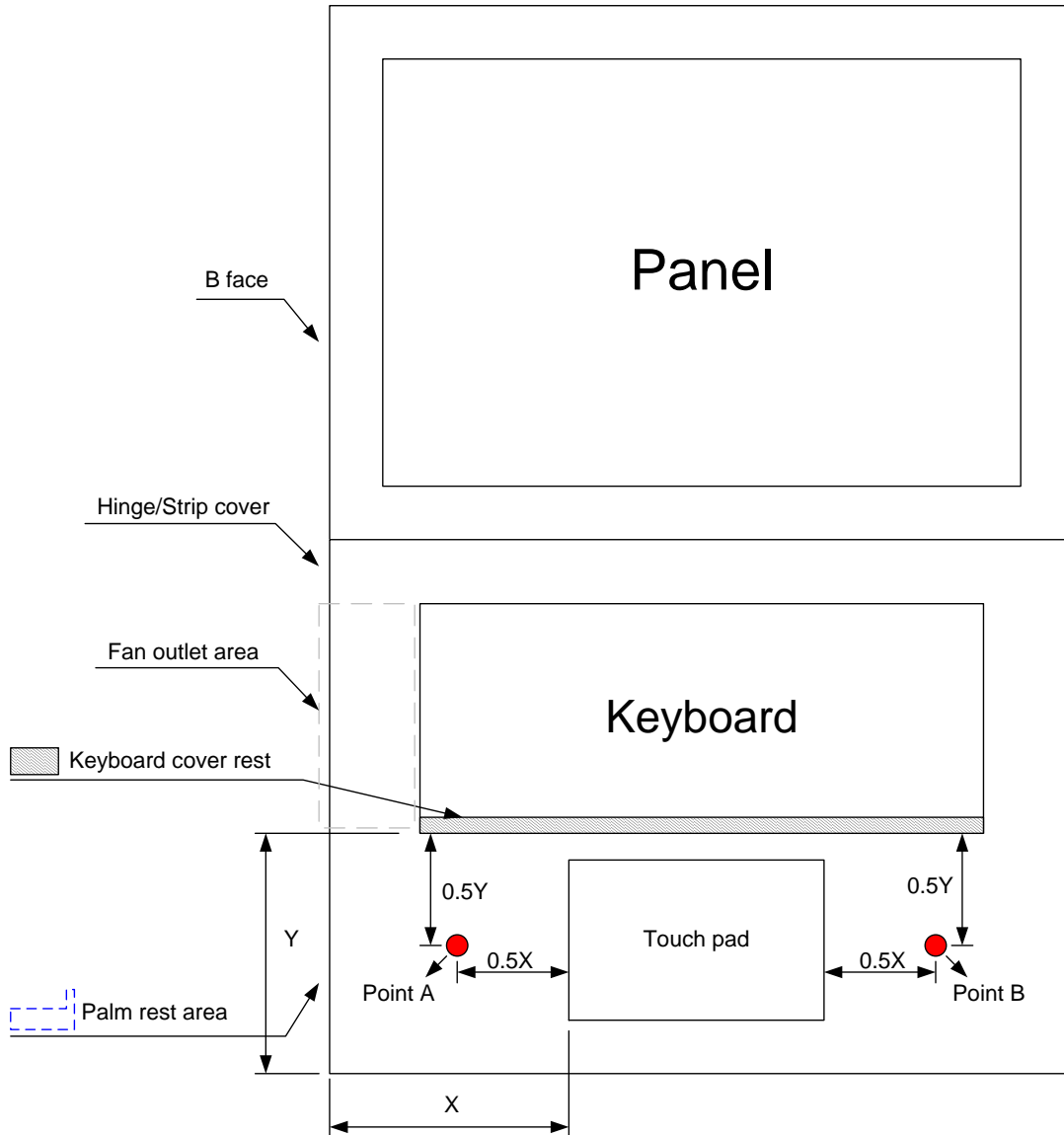




Figure 15: Points where we measured the surface temperature on the notebook.

Appendix C – Test system configuration information

Figure 16 provides detailed configuration information about the test system.

System	Acer Aspire TimelineX 4820TG	ASUS U45Jc
		
General		
Number of processor packages	1	1
Number of cores per processor	2	2
Number of hardware threads per core	4	4
System power management policy	Balanced	Power4 Gear Entertainment
Processor power-saving option	Enhanced Intel SpeedStep® Technology	Enhanced Intel SpeedStep Technology
System dimensions (inches)	Length: 13-1/2 Width: 9-5/8 Height when closed: 1 front, 1-3/16 middle, 1-1/4 back Height when open: 3/4 front, 7/8 middle, 9-7/8 back	Length: 13-1/4 Width: 9-5/8 Height when closed: 1-3/32 front, 1-3/16 middle, 1-1/4 back Height when open: 7/8 front, 15/16 middle, 10 back
System weight	4 lbs. 9 oz.	4 lbs. 11 oz.
CPU		
Vendor	Intel	Intel
Name	Core i5	Core i5
Model number	450M	450M
Stepping	K0	K0
Socket type and number of pins	Socket 1156 LGA	Socket 1156 LGA
Core frequency (GHz)	2.40	2.40
Bus frequency	4.8 GT/s (DMI)	4.8 GT/s (DMI)
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache	256 KB + 256 KB (per core)	256 KB + 256 KB (per core)
L3 cache	3 MB (shared)	3 MB (shared)
Platform		
Vendor	Acer	ASUS
Motherboard model number	ZQ1B	U45JC
Motherboard chipset	Intel HM55	Intel HM55
BIOS name and version	Insyde v1.15 (06/04/2010)	American Megatrends U45JC.203 (05/10/2010)
Memory module(s)		
Vendor and model number	Samsung M471B5673FH0-CH9	Kingston ASU1333D3S9DR8/2G

System	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Type	PC3-10600	PC3-10600
Speed (MHz)	1,333	1,333
Speed running in the system (MHz)	1,066	1,100
Timing/Latency (tCL-tRCD-tRP-tRASmin)	7-7-7-20	7-7-7-20
Size (MB)	2,048	2,048
Number of memory module(s)	1 x 2 GB	1 x 2 GB
Chip organization (single-sided/double-sided)	Double-sided	Double-sided
Channel (single/dual)	Single	Single
Hard disk		
Vendor and model number	Western Digital WD5000BEVT-22A0RT0	Seagate ST9500420AS
Number of disks in system	1	1
Size (GB)	500	500
Buffer size (MB)	8	16
RPM	5,400	7,200
Type	SATA-300	SATA-300
Controller	Intel 5 Series SATA AHCI Controller	Intel 5 Series SATA AHCI Controller
Driver	Intel 9.6.0.1014 (03/03/2010)	Intel 9.5.6.1001 (12/17/2009)
Operating system		
Name	Windows 7 Home Premium 64-bit	Windows 7 Home Premium 64-bit
Build number	7600	7,600
Service Pack	N/A	N/A
File system	NTFS	NTFS
Kernel	ACPI x64-based PC	ACPI x64-based PC
Language	English	English
Microsoft DirectX version	11	11
Graphics 1		
Vendor and model number	ATI™ Mobility Radeon™ HD 5650	NVIDIA® GeForce® 310M
Type	Discrete	Discrete
Chipset	ATI Mobility Radeon HD 5650	GeForce 310M
BIOS version	BR34809.010	70.18.5D.00.11
Total available graphics memory (MB)	1,659	1,718
Dedicated video memory (MB)	1,024	1,024
System video memory (MB)	0	0
Shared system memory (MB)	635	694
Resolution	1,366 x 768 x 32-bit	1,366 x 768 x 32-bit
Driver	ATI 8.713.3.3000 (04/20/2010)	NVIDIA 8.16.11.8964 (03/27/2010)

System	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Graphics 2		
Vendor and model number	Intel HD Graphics	Intel HD Graphics
Type	Integrated	Integrated
Chipset	Intel HD Graphics	Intel HD Graphics
BIOS version	2014.0	1930.0
Total available graphics memory (MB)	763	758
Dedicated video memory (MB)	128	64
System video memory (MB)	0	0
Shared system memory (MB)	635	694
Resolution	1,366 x 768 x 32-bit	1,366 x 768 x 32-bit
Driver	ATI 8.713.3.3000 (04/20/2010)	Intel 8.15.10.2119 (04/21/2010)
Sound card/subsystem		
Vendor and model number	Realtek High Definition Audio	Realtek High Definition Audio
Driver	Realtek 6.0.1.6096 (04/23/2010)	Realtek 6.0.1.6098 (04/27/2010)
Ethernet		
Vendor and model number	Atheros® AR8151 PCI-E Gigabit	Atheros AR8131 PCI-E Gigabit
Driver	Atheros 1.0.0.23 (12/22/2009)	Atheros 1.0.0.27 (03/04/2010)
Wireless		
Vendor and model number	Broadcom® 802.11n Network Adapter	Atheros AR9285 Wireless
Driver	Broadcom 5.60.350.6 (03/22/2010)	Atheros 8.0.0.316 (03/02/2010)
Modem		
Vendor and model number	N/A	N/A
Driver	N/A	N/A
Optical drive(s)		
Vendor and model number	TSSTcorp TS-U633F	LG GGU10N
Type	DVD-RW	DVD-RW
USB ports		
Number	4	3
Type	2.0	2.0
Other	DisplayPort, Media card reader	DisplayPort, Media card reader
IEEE 1394 ports		
Number	0	0
Monitor		
LCD type	HD LED LCD	HD LED LCD
Screen size (inches)	14.0	14.0
Refresh rate (Hz)	60	60

System	Acer Aspire TimelineX 4820TG	ASUS U45Jc
Battery		
Type	Acer AS10B5E lithium-ion	ASUS A42-UL50 lithium-ion
Size (length x width x height)	10-5/8" x 2" x 7/8"	10-3/4" x 2" x 1-1/8"
Rated capacity	6200 mAh x 10.8V (67Wh)	5800 mAh x 14.4V (84Wh)
Weight (oz.)	11	14

Figure 16: Configuration information for the test notebooks.

About Principled Technologies

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help you assess how it will fare against its competition, its performance, whether it's ready to go to market, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.



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