

# CPU Performance: Built-To-Order Systems

## Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to run Futuremark's PCMark05 Professional industry-standard benchmark on two built-to-order Lenovo desktop systems currently available in the United Kingdom (UK):

- Lenovo 3000 J105-PPJJ3UK (with an AMD Sempron 3100+ processor)
- Lenovo 3000 J100-PPCB1UK (with an Intel Celeron D 346 processor)

Our goal in selecting the systems was to find units as close in price and configuration as possible. The vendor could not provide systems with the same operating system in the same price range, so the AMD-based system came with Windows XP Professional and the Intel-based system came with Windows XP Home. Because of this difference, we tested each machine both in its out-of-box operating system and with a Windows XP Professional image we created to confirm that the operating system differences did not unduly affect the results.

The goal of the testing was to gauge the performance that PC buyers in the UK would experience on systems they purchased online from Lenovo-recommended vendors such as [www.hemini.co.uk](http://www.hemini.co.uk), using Futuremark's PCMark05 Professional Version v1.1.0 industry-standard benchmark. Intel identified the test systems and the benchmark. PT purchased and set up the two PCs, and PT executed all tests.

Appendix A provides the purchase price of both systems, and Appendix B details their configurations.

## Test results

Figure 1 presents the median of three runs of the out-of-box PCMark05 Professional CPU Score. We compare the PCMark05 Professional CPU Score median results of the systems in the Comparative result column of Figures 1. We calculate this comparative score by dividing the Intel-based system's score by the AMD-based system's score. Consequently, a comparative result above 1.00 indicates the Intel-based system performed better, and a comparative result below 1.00 indicates the AMD-based system performed better.

TEST	Lenovo 3000 J105-PPJJ3UK AMD Sempron 3100+ 1.8 GHz	Lenovo 3000 J100-PPCB1UK Intel Celeron D 346 3.06 GHz	Comparative result
<b>Futuremark PCMark05 Professional 1.1.0 Out-of-box results</b>			
PCMark05 1.1.0 – CPU Score <sup>(1)</sup>	2620	3389	1.29

**Figure 1: CPU test results of Futuremark's PCMark05 Professional benchmark on the AMD-based Lenovo 3000 J105-PPJJ3UK and the Intel-based Lenovo 3000 J100-PPCB1UK as the machines arrived out-of-box.**

<sup>(1)</sup> On a clean installation of Windows XP Professional SP2, the AMD-based system achieved a CPU Score of 2619 and the Intel-based system achieved a CPU Score of 3479. The Comparative Result was 1.33.

## Test methodology

This section details the methodologies we followed in testing the systems.

**Key finding**

- The Intel-based Lenovo desktop scored 29 percent higher on the PCMark05 CPU Score in its out-of-box configuration than the AMD-based Lenovo desktop.

## Configuration differences

We purchased the built-to-order systems from [www.hemini.co.uk](http://www.hemini.co.uk). We configured the hardware as close as possible while keeping the price as close as possible. We could not avoid the following differences:

- The AMD-based system shipped with Windows XP Professional SP2, while the Intel-based system shipped with Windows XP Home SP2. The vendor did not offer any other operating system options for either system.
- Out-of-the-box, the AMD-based system's Visual Effects were set to Custom with every option selected except for Fade or slide menus into view and Show shadows under menus. The Intel-based system's Visual Effects were set to Let Windows choose what's best for my computer, with every option selected.
- The AMD-based system's Visual Effects on the Windows XP Professional image we created defaulted to Custom with every option selected except for Fade or slide menus into view, Show shadows under menus, and Show translucent selection rectangle. The Intel-based system's Visual Effects on our Windows XP Professional image defaulted to Let Windows choose what's best for my computer with every option selected. We tested with those settings.
- The hard drive controllers in the systems differ. Though both are Serial ATA devices, the AMD-based system uses the VIA VT8237 controller, while the Intel-based system uses the SiS 964 controller.
- The AMD-based system came with the integrated VIA/S3G UniChrome Pro IGP video adapter with 64 MB of shared video RAM. The Intel-based system came with the integrated SiS Mirage Graphics video adapter with 32 MB of shared video RAM.
- The prices differ. (We exclude shipping and tax charges here.) The AMD-based Lenovo 3000 J105-PPJJ3UK cost £315.00, while the Intel-based Lenovo 3000 J100-PPCB1UK cost £345.00.
- While both systems came configured with PC3200 DDR-SDRAM (400MHz), the Intel-based system supports PC4200 DDR-SDRAM (533MHz).

Appendix A provides complete cost information for both systems, and Appendix B details their configurations.

## Initial setup

When the systems arrived, we unpacked and set up each one. They came with identical keyboards and mice. We did not purchase monitors with the systems, so we used identical MAG Innvision 786N monitors from our test stock. We went through the following process with each PC the first time we booted it:

1. Pressed Next at the Welcome to Microsoft Windows screen.
2. Selected United Kingdom, English (United Kingdom) and United Kingdom Extended keyboard. Pressed Next.
3. Selected Yes, I accept to the Microsoft End User License Agreement and the Lenovo License Agreement. Pressed Next.
4. Selected Not right now to automatic updates, because our goal was to test each PC as it came out of the box. Pressed Next.
5. Named each computer with its model (AMD-PPJJ3UK, Intel-PPCB1UK).
6. Left each computer description blank. Pressed Next.
7. On the AMD-based system we left Administrator password blank and pressed Next. We did not receive this option during the setup of the Intel-based system.
8. Pressed Skip at the How will this computer connect to the Internet screen.
9. Selected No, not at this time to registering with Lenovo. Pressed Next.
10. Selected No, not at this time to registering with Microsoft. Pressed Next.
11. Entered User in the Your name field. Pressed Next.
12. Pressed Finish.
13. Rebooted the system.
14. At the Rescue and Recovery screen, pressed OK.
15. Rebooted the system.
16. At the Norton Internet Security 2005 screen, pressed OK.
17. Selected I accept the License Agreement and pressed Next.

18. Pressed Register Later.
19. Pressed Next at the Subscription screen.
20. Accepted the defaults, and pressed Finish at the Next Steps screen.
21. Pressed Next at the LiveUpdate screen.
22. Ignored the message that said, LiveUpdate could not retrieve the update list, and pressed Finish, because our goal was to test each PC as it came out of the box.
23. Rebooted the system.
24. At the Norton AntiVirus Definition Alert dialog selected Notify me again in 14 day(s) and unchecked Enable automatic LiveUpdate and pressed OK.

We used Symantec's Ghost product to capture an exact image of the hard disk directly to the internal CD-RW/DVD-ROM drive of each system.

## Windows XP Professional SP2 setup

Because the systems arrived with two different versions of Windows XP, after testing them in their out-of-box state we installed on each one a clean version of Windows XP Professional Service Pack 2 with updated drivers and Windows Updates and re-ran the tests. We went through the following process with each PC for installing Windows XP Professional:

1. Installed Windows XP Professional.
  - Booted to a Windows XP Professional CD.
  - Pressed Enter at the Welcome to Setup screen.
  - Pressed F8 at the EULA screen.
  - Selected the C: partition, and pressed Enter.
  - Pressed C to continue setup on the partition selected.
  - Selected Format the partition using the NTFS file system (Quick), and pressed Enter.
  - Pressed F to format the selected partition.
  - Pressed Next at the Regional and Language Options screen.
  - Entered a user name into the Name field, left Organization blank, and pressed Next.
  - Entered the Windows XP Professional product key, and pressed Next.
  - Entered a Computer name, and pressed Next.
  - Entered the correct date, time, and time zone area, and pressed Next.
  - Selected Typical settings, and pressed Next.
  - Selected Make this computer a member of the following workgroup, left the default workgroup, and pressed Next.
  - Pressed OK to have Windows automatically adjust the screen resolution.
  - Pressed OK at the can you see this text at this resolution dialog box.
  - Pressed Next at the Welcome to Microsoft Windows screen.
  - Selected Yes, this computer will connect through a local area network or home network, and pressed Next.
  - Selected Yes, I want to activate Windows over the Internet now, and pressed Next.
  - Selected No, not at this time to the registering with Microsoft question, and pressed Next.
  - Entered User into the Your name field, and pressed Next.
  - Pressed Finish at the Thank you screen.
2. Installed Windows XP Service Pack 2.
  - Pressed Continue at the Service Pack 2 splash screen.
  - Pressed Install Now.
  - Pressed Next at the Windows XP Service Pack 2 Setup Wizard.
  - Selected I agree to the License Agreement, and pressed Next.
  - Pressed Next at the Select Options screen.
  - Pressed Finish to restart the computer.
  - Selected Help protect my PC by turning on Automatic Updates now, and pressed Next, because that is what a typical home user would do.
  - Selected Change the way Security Center alerts me at the Windows Security Center screen.

- Unchecked the boxes found beside Firewall, Automatic Updates, and Virus Protection Alert Settings, and pressed OK.
3. Downloaded and installed the following Critical Windows Updates:
    - Security Update for Windows XP (KB913446)
    - Windows Malicious Software Removal Tool-February 2006 (KB890830)
    - Security Update for Windows Media Player Plug-in (KB911564)
    - Security Update for Windows Media Player 9 (KB911565)
    - Security Update for Windows XP (KB911927)
    - Security Update for Windows XP (KB912919)
    - Security Update for Windows XP (KB908519)
    - Cumulative Security Update for Internet Explorer for Windows XP (KB905915)
    - Security Update for Windows XP (KB904706)
    - Update for Windows XP (KB910437)
    - Security Update for Windows XP (KB896424)
    - Security Update for Windows XP (KB900725)
    - Security Update for Windows XP (KB905749)
    - Security Update for Windows XP (KB905414)
    - Security Update for Windows XP (KB901017)
    - Security Update for Windows XP (KB899589)
    - Security Update for Windows XP (KB902400)
    - Update for Windows XP (KB894391)
    - Security Update for Windows XP (KB896423)
    - Security Update for Windows XP (KB899587)
    - Security Update for Windows XP (KB899591)
    - Security Update for Windows XP (KB893756)
    - Security Update for Windows XP (KB896358)
    - Security Update for Windows XP (KB890859)
    - Security Update for Windows XP (KB901214)
    - Security Update for Windows XP (KB896428)
    - Security Update for Windows XP (KB896422)
    - Security Update for Windows XP (KB890046)
    - Security Update for Windows XP (KB885250)
    - Security Update for Windows XP (KB885835)
    - Update for Windows XP (KB887742)
    - Security Update for Windows XP (KB888113)
    - Security Update for Windows XP (KB891781)
    - Security Update for Windows Messenger (KB887472)
    - Security Update for Windows XP (KB888302)
    - Security Update for Windows XP (KB885836)
    - Critical Update for Windows XP (KB886185)
    - Security Update for Windows XP (KB873339)
    - Windows Genuine Advantage Validation Tool (KB892130)
    - Update for Windows XP (KB898461)
    - Microsoft Windows Installer 3.1
  4. For the AMD-based system we downloaded and installed the following chipset, Ethernet, and video drivers from <http://www.viaarena.com/default.aspx?PageID=2>:
    - VIA HyperionPro v.504A
    - VIA IDE Accelerator v.121
    - VT6107\_VT8231\_VT8233\_VT8235\_VT8237\_VT8251v43FVIA
    - K8M800\_16944444\_XP\_wiShld\_logod
  5. For the Intel-based system we downloaded and installed the latest chipset and video drivers from <http://www.sis.com/download/>:
    - r204a

- raid303
  - agp119a
  - uvga3\_372
6. For the Intel-based system we downloaded the latest Ethernet drivers from <http://www.realtek.com.tw/downloads/downloads1-3.aspx?series=16&Software=True>:
    - rtlsetup-rtlnic(639)(0220)
  7. Because both systems use Realtek AC'97 audio, we downloaded and installed the latest audio driver (WDM\_A384) from <http://www.realtek.com.tw/downloads/dlac97-2.aspx?lineid=5&famid=12&series=8&Software=True>:
  8. We set each system's resolution to 1024 x 768 x 32-bit color at a refresh rate of 60 Hz.

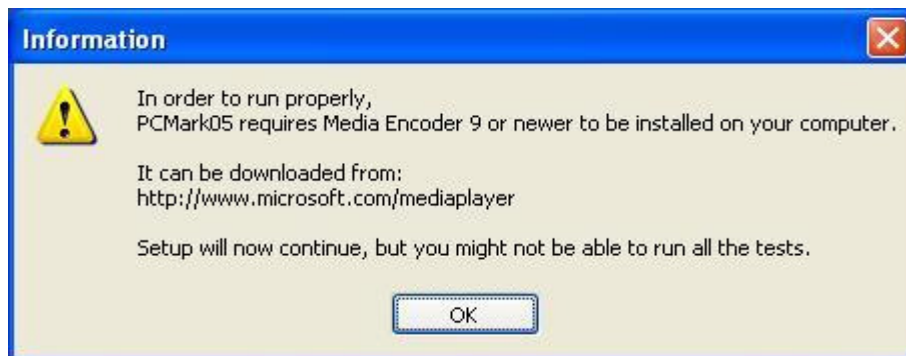
We used Symantec's Ghost product to capture an exact image of the hard disk directly to the internal CD-RW/DVD-ROM drive of each system.

Each time we ran a new set of tests on a machine, we used the Ghost image CD to return that machine to one of the above configurations. After re-imaging, we installed the software necessary to run the benchmark.

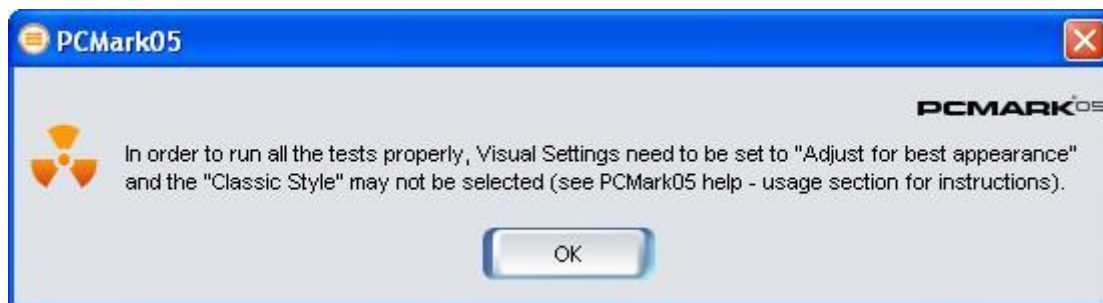
We rebooted before running each test.

### ***Futuremark PCMark05 Professional***

PCMark05 Professional produced the following errors when we installed it on both systems as they came out-of-the-box:



**Figure 2: Windows Media Encoder 9 requirement message that appears during PCMark05 Professional installation.**



**Figure 3: Visual Settings requirement message that appears on the AMD-based Lenovo 3000 desktop system when running PCMark05 Professional.**

To meet these Windows Media Encoder 9 requirements, we downloaded and installed Windows Media Encoder 9 from Microsoft's Web site before we installed PCMark05 Professional.

When we then launched PCMark05 Professional on the AMD-based system, we received an error concerning the system's Visual Effects settings. We fixed this error by changing the Visual Effects to Adjust for best appearance after finding the solution in the PCMark05 Professional FAQ section <http://service.futuremark.com/support/pcmark05.jsp>. To keep the systems consistent, we also adjusted the Intel-based system to reflect this change even though the error did not occur on that system.

We performed the following steps to run this benchmark:

#### **Out-of-box: Setup**

1. Reset the system to the base test image.
2. Download and install Windows Media Encoder 9 with default settings from: <http://www.microsoft.com/windows/windowsmedia/9series/encoder/default.aspx>.
  - a. Press Next at the Welcome to the Microsoft Windows Media Encoder 9 Series Setup Wizard.
  - b. Select I accept the terms in the License Agreement, and press Next.
  - c. Press Next at the Installation Folder screen.
  - d. Press Install at the Ready to Install screen.
  - e. Press Finish at the Completing the Windows Media Encoder 9 Series Setup Wizard.
3. Reboot the system.
4. Purchase and install PCMark05 Professional v1.1.0 with setup defaults.
  - a. Press Next at the Welcome to the InstallShield Wizard for PCMark05 (version 1.1.0) screen.
  - b. Select I accept the terms of the license agreement, and press Next.
  - c. Press Next at the Choose Destination Location screen.
  - d. Press Install at the Ready to Install the Program screen.
  - e. Press Yes at the Question dialog that appears asking to install portions of DirectX 9.0c.
  - f. Select I accept the agreement, and press Next.
  - g. Press Next at the DirectX 9.0 Runtime Install screen.
  - h. Press Finish at the Installation Complete screen.
  - i. Enter the registration code, and press Next.
  - j. Press OK at the Congratulations dialog that appears.
  - k. Uncheck View the Readme, and press Finish at the InstallShield Wizard Complete screen.
5. Change the Visual Effects to Adjust for best appearance.
  - a. Press Start.
  - b. Press Run.
  - c. Type sysdm.cpl, and press OK.
  - d. Select the Advanced tab.
  - e. Under the Performance section select Settings.
  - f. Select the Visual Effects tab.
  - g. Select the radio button that says Adjust for best appearance.
  - h. Press Apply and exit.
6. Reboot the system.

#### **Out-of-box: Running the test**

1. Reboot the system.
2. Launch PCMark05 Professional.
3. Under Tests, press Select.
4. Press Select All to check all tests available.
5. Press OK.
6. Press the Run PCMark button to run the tests.
7. Record the results.
8. Repeat two times.

PCMark05 Professional produced the following errors when we installed it on both systems with the Windows XP Professional image we created:

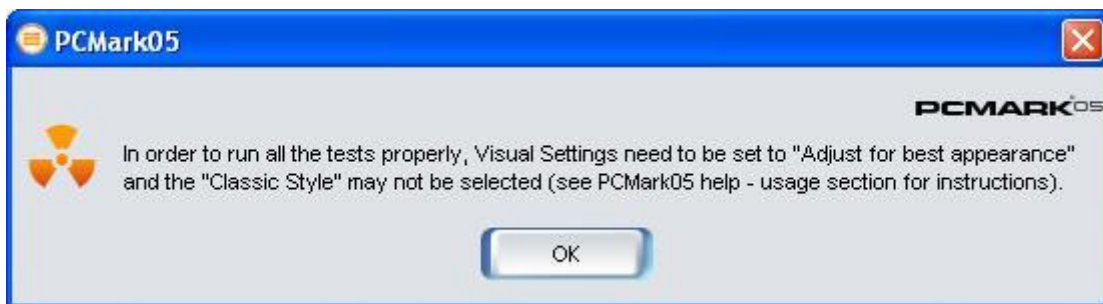




**Figure 4: Windows Media Encoder 9 requirement message that appears during PCMark05 Professional installation.**



**Figure 5: Windows Media Player 10 requirement message that appears during PCMark05 Professional installation.**



**Figure 6: Visual Settings requirement message that appears on the AMD-based Lenovo 3000 desktop system when running PCMark05 Professional.**

To meet these Windows Media Encoder 9 requirements, we downloaded and installed Windows Media Encoder 9 from Microsoft's Web site before we installed PCMark05 Professional.

When we then launched PCMark05 Professional on the AMD-based system, we received an error concerning the system's Visual Effects settings. We fixed this error by changing the Visual Effects to Adjust for best appearance after finding the solution in the PCMark05 Professional FAQ section <http://service.futuremark.com/support/pcmark05.jsp>. To keep the systems consistent, we also adjusted the Intel-based system to reflect this change even though the error did not occur on that system.

We performed the following steps to run this benchmark:

### **XP Professional: Setup**

1. Reset the system to the base test image.
2. Download and install Windows Media Encoder 9 with default settings from:  
<http://www.microsoft.com/windows/windowsmedia/9series/encoder/default.aspx>.
  - a. Press Next at the Welcome to the Microsoft Windows Media Encoder 9 Series Setup Wizard.
  - b. Select I accept the terms in the License Agreement, and press Next.
  - c. Press Next at the Installation Folder screen.
  - d. Press Install at the Ready to Install screen.
  - e. Press Finish at the Completing the Windows Media Encoder 9 Series Setup Wizard.
3. Download and install Windows Media Player 10 with default settings from:  
<http://www.microsoft.com/windows/windowsmedia/default.msp>
  - a. Press I Accept at the License Agreement screen.
  - b. Press Next at the Welcome to Windows Media Player 10 screen.
  - c. Accept the defaults at the Privacy Options screen and press Next.
  - d. Press Finish.
  - e. Close Windows Media Player 10.
4. Reboot the system.
5. Purchase and install PCMark05 Professional v1.1.0 with setup defaults.
  - a. Press Next at the Welcome to the InstallShield Wizard for PCMark05 (version 1.1.0) screen.
  - b. Select I accept the terms of the license agreement, and press Next.
  - c. Press Next at the Choose Destination Location screen.
  - d. Press Install at the Ready to Install the Program screen.
  - e. Press Yes at the Question dialog that appears asking to install portions of DirectX 9.0c.
  - f. Select I accept the agreement, and press Next.
  - g. Press Next at the DirectX 9.0 Runtime Install screen.
  - h. Press Finish at the Installation Complete screen.
  - i. Enter the registration code, and press Next.
  - j. Press OK at the Congratulations dialog that appears.
  - k. Uncheck View the Readme, and press Finish at the InstallShield Wizard Complete screen.
6. Change the Visual Effects to Adjust for best appearance.
  - a. Press Start.
  - b. Press Run.
  - c. Type sysdm.cpl and press OK.
  - d. Select the Advanced tab.
  - e. Under the Performance section press Settings.
  - f. Select the Visual Effects tab.
  - g. Select the radio button that says Adjust for best appearance.
  - h. Press Apply and exit.
7. Reboot the system.

#### **XP Professional: Running the test**

1. Same as above.

We report the benchmark's CPU Score.



## Appendix A: Test system price and purchase information

We purchased the two Lenovo desktop systems on March 2, 2006 via [www.hemini.co.uk](http://www.hemini.co.uk).

Figure 7 below presents the SKU and price information for the desktops.

System	Lenovo 3000 J105-PPJJ3UK	Lenovo 3000 J100-PPCB1UK
Processor	AMD Sempron 3100+	Intel Celeron D 346
Processor frequency	1.8 GHz	3.06 GHz
Unit price (£)	315.00	345.00
VAT (£)	22.31	24.44
Shipping (£) <sup>(1)</sup>	137.50	137.50
Total we paid (£)	474.81	506.94

**Figure 7: Purchase information for the two Lenovo desktops.**

Notes:

<sup>(1)</sup> We assigned each system one half of the total shipping charge we paid for this order.

## Appendix B: Test system configuration information

This appendix provides detailed configuration information about both test systems in both configurations.

<b>SYSTEM: OUT-OF-BOX CONFIGURATION</b>	<b>Lenovo 3000 J105-PPJJ3UK</b>	<b>Lenovo 3000 J100-PPCB1UK</b>
<b>General</b>		
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P1C1L / UP	1P1C1L / UP
Number of physical processors	1	1
Single/Dual Core processors	Single	Single
Processor HT Status	NA	NA
System power management policy	Lenovo Custom power policy	Lenovo Custom power policy
<b>CPU</b>		
Vendor	AMD	Intel
Name	Sempron	Celeron D
Model number	3100+	346
Stepping	2	1
Socket type and number of pins	Socket 754	LGA775
Core frequency (GHz)	1.8	3.06
Front-side bus frequency	1600MHz HyperTransport Technology	533MHz
L1 Cache	64KB + 64KB	16KB + 12Kμops
L2 Cache	256KB	256KB
<b>Platform</b>		
Vendor	Lenovo	Lenovo
Motherboard model number	K8M800-M3	GA-8S661FXM-775
Motherboard chipset	VIA ID0204	SiS 661FX
Motherboard revision number	00	11
System/motherboard serial number	LY02TPV	LY02P3A
Bios name and version	Lenovo 43KT18AUS	Lenovo 40KT19A
BIOS settings	Setup default	Setup default
<b>Memory module(s)</b>		
Vendor and model number	Mosel V826664K24SCIW-D3	Hyundai Electronics HYMD564646CP8JD43
Type	DDR PC3200	DDR PC3200
Speed (MHz)	200	200
Speed running in the system (MHz)	400	400
Timing/Latency (tCL-tRCD-tRP-tRASmin)	3-3-3-8	3-3-3-8
Size	512 MB	512MB
Number of memory module(s)	1	1
Chip organization (Single-sided, Double-sided)	Double-sided	Single-sided
Channel (Single/Dual)	Single	Single

<b>Hard disk</b>		
Vendor and model number	Western Digital WD800JD-08LSA0	Western Digital WD800JD-08LSA0
Size	80 GB	80 GB
Buffer Size	8 MB	8 MB
RPM	7200	7200
Type	Serial ATA 150 MB/s	Serial ATA 150 MB/s
Controller	VIA VT8237	SiS 964
Driver	Microsoft 5.1.2600.2180	Microsoft 5.1.2600.2180
<b>Operating system</b>		
Name	Windows XP Professional	Windows XP Home
Build number	2600	2600
Service pack	2	2
File system	NTFS	NTFS
Kernel	ACPI Uniprocessor PC	ACPI Uniprocessor PC
Language	UK English	UK English
Microsoft DirectX version	DirectX 9.0c	DirectX 9.0c
<b>Graphics</b>		
Vendor and model number	VIA/S3G UniChrome Pro IGP	SiS Mirage Graphics
Type (P=PCI Express, A=AGP 8X, I=Integrated)	I	I
Chipset	VIA/S3G UniChrome Pro IGP	SiS 661FX
BIOS version	98.F0.00.55	2.43.00
Memory size	64 MB shared	32 MB shared
Resolution	1024 x 768 x 32-bit color	1024 x 768 x 32-bit color
Driver	VIA/S3G 6.14.10.241	SiS 6.14.10.3673
<b>Sound card/subsystem</b>		
Vendor and model number	Realtek AC'97 Audio for VIA Audio Controller	Realtek AC'97 Audio
Type (P=PCI, I=Integrated)	I	I
Driver	Realtek 5.10.0.5950	Realtek 5.10.0.5950
<b>Ethernet</b>		
Vendor and model number	VIA Rhine II	Realtek RTL8139
Type (P=PCI, I=Integrated)	I	I
Driver	VIA 3.54.0.439	Microsoft 5.398.613.2003
<b>Optical drive(s)</b>		
Vendor and model number	TSSTcorp TS-H492C	TSSTcorp TS-H492C
Type (CD-ROM, CD-RW, DVD-ROM, DVD-W)	CD-RW/DVD-ROM	CD-RW/DVD-ROM
<b>USB ports</b>		
Number	6	6
Type	USB 2.0	USB 2.0
<b>Monitor</b>		
CRT/LCD type (P=Plug & Play, T=TFT, R=Reflective)	CRT / P	CRT / P
CRT/LCD refresh rate	60 Hz	60 Hz
Other information	MAG Innovision Model 786N	MAG Innovision Model 786N

**Figure 8: Out-of-box system configuration information for both test systems.**

<b>SYSTEM: XP PROFESSIONAL CONFIGURATION</b>	<b>Lenovo 3000 J105- PPJJ3UK</b>	<b>Lenovo 3000 J100- PPCB1UK</b>
<b>General</b>		
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P1C1L / UP	1P1C1L / UP
Number of physical processors	1	1
Single/Dual Core processors	Single	Single
Processor HT Status	NA	NA
System power management policy	Home/Office Desk	Home/Office Desk
<b>CPU</b>		
Vendor	AMD	Intel
Name	Sempron	Celeron D
Model number	3100+	346
Stepping	2	1
Socket type and number of pins	Socket 754	LGA775
Core frequency (GHz)	1.8	3.06
Front-side bus frequency	1600MHz HyperTransport Technology	533MHz
L1 Cache	64KB + 64KB	16KB + 12Kμops
L2 Cache	256KB	256KB
<b>Platform</b>		
Vendor	Lenovo	Lenovo
Motherboard model number	K8M800-M3	GA-8S661FXM-775
Motherboard chipset	VIA ID0204	SiS 661FX
Motherboard revision number	00	11
System/motherboard serial number	LY02TPV	LY02P3A
Bios name and version	Lenovo 43KT18AUS	Lenovo 40KT19A
BIOS settings	Setup default	Setup default
<b>Memory module(s)</b>		
Vendor and model number	Mosel V826664K24SCIW-D3	Hyundai Electronics HYMD564646CP8JD43
Type	DDR PC3200	DDR PC3200
Speed (MHz)	200	200
Speed running in the system (MHz)	400	400
Timing/Latency (tCL-tRCD-tRP-tRASmin)	3-3-3-8	3-3-3-8
Size	512 MB	512MB
Number of memory module(s)	1	1
Chip organization (Single-sided, Double-sided)	Double-sided	Single-sided
Channel (Single/Dual)	Single	Single
<b>Hard disk</b>		
Vendor and model number	Western Digital WD800JD-08LSA0	Western Digital WD800JD-08LSA0
Size	80 GB	80 GB
Buffer Size	8 MB	8 MB

RPM	7200	7200
Type	Serial ATA 150 MB/s	Serial ATA 150 MB/s
Controller	VIA VT8237	SiS 964
Driver	VIA 5.1.2600.121	SiS 5.1.1039.2041
<b>Operating system</b>		
Name	Windows XP Professional	Windows XP Professional
Build number	2600	2600
Service pack	2	2
File system	NTFS	NTFS
Kernel	ACPI Uniprocessor PC	ACPI Uniprocessor PC
Language	US English	US English
Microsoft DirectX version	DirectX 9.0c	DirectX 9.0c
<b>Graphics</b>		
Vendor and model number	VIA/S3G UniChrome Pro IGP	SiS Mirage Graphics
Type (P=PCI Express, A=AGP 8X, I=Integrated)	I	I
Chipset	VIA/S3G UniChrome Pro IGP	SiS 661FX
BIOS version	98.F0.00.55	2.43.00
Memory size	64 MB shared	32 MB shared
Resolution	1024 x 768 x 32-bit color	1024 x 768 x 32-bit color
Driver	VIA/S3G 6.14.10.275	SiS 6.14.10.3720
<b>Sound card/subsystem</b>		
Vendor and model number	Realtek AC'97 Audio for VIA Audio Controller	Realtek AC'97 Audio
Type (P=PCI, I=Integrated)	I	I
Driver	Realtek 5.10.0.6030	Realtek 5.10.0.6030
<b>Ethernet</b>		
Vendor and model number	VIA Rhine II	Realtek RTL8139
Type (P=PCI, I=Integrated)	I	I
Driver	VIA 3.54.0.439	Realtek 5.639.118.2006
<b>Optical drive(s)</b>		
Vendor and model number	TSSTcorp TS-H492C	TSSTcorp TS-H492C
Type (CD-ROM, CD-RW, DVD-ROM, DVD-W)	CD-RW/DVD-ROM	CD-RW/DVD-ROM
<b>USB ports</b>		
Number	6	6
Type	USB 2.0	USB 2.0
<b>Monitor</b>		
CRT/LCD type (P=Plug & Play, T=TFT, R=Reflective)	CRT / P	CRT / P
CRT/LCD refresh rate	60 Hz	60 Hz
Other information	MAG Innovision Model 786N	MAG Innovision Model 786N

Figure 9: XP Professional system configuration information for both test systems.



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