AMD Athlon™ 64 Processor Competitive Performance Guide

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About This Document

This document is intended for use by those who are interested in AMD64 technology performance as demonstrated by the AMD Athlon™ 64 processor. The performance of the processor is shown as an average of all of the tests and as averages of compiled data from benchmarks in the following categories:

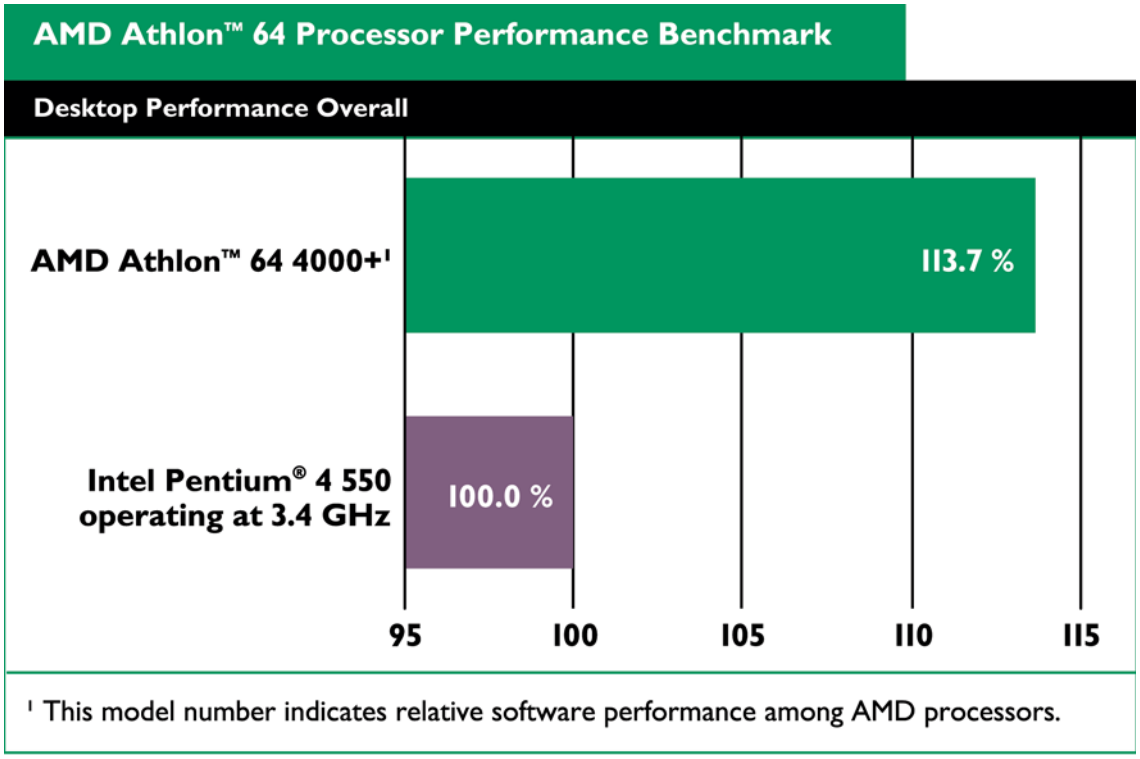
- "Computer Gaming Overall" on page 5
- "Digital Media Overall" on page 14
- "Office Productivity Overall" on page 20

The result of each individual benchmark is shown in a graphical format. The system configurations are also listed in this document. For a detailed benchmarking methodology, including step-by-step procedures on how to duplicate these results, refer to *AMD Processor Performance Evaluation Guide,* order# 30579.

Performance Overall

The AMD Athlon™ 64 processor is the most advanced PC processor available for high-performance desktop PCs. This processor provides leading-edge performance for today's demanding software like digital video, audio, imaging editing, 3D gaming, as well as office applications.

The AMD Athlon 64 processor features AMD64 technology for the coming wave of 64-bit applications.



Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configurations.

While there is no simple way to measure performance that covers every user experience, AMD has compiled an average of all the benchmarks listed, on page 4. This document shows how various AMD Athlon 64 processors perform overall relative to the Intel Pentium® 4 550 processor operating at 3.4 GHz[1].

Overall processor performance is an average of the compiled data from the list of overall benchmark scores from the following tests:

Computer Gaming (all tests performed at 1024x768x32 resolution)

- 3DMark® 2001SE PRO (D3D Hardware T&L) by Futuremark® Corporation
- 3DMark® 2001SE PRO (D3D Software T&L) by Futuremark® Corporation
- 3DMark® 03 Pro (Hardware Vertex Shaders) by Futuremark® Corporation
- 3DMark® 03 Pro (Software Vertex Shaders) by Futuremark® Corporation
- AquaMark3
- Return to Castle Wolfenstein Enemy Territory
- Jedi Knights II Demo
- Quake III Arena Demo2
- Far Cry Cooler01
- Far Cry Pier
- Painkiller
- Doom3
- Crafty
- Splinter Cell (1_1_1)
- Splinter Cell (1_1_2)
- Unreal Tournament 2003 Demo BotMatch
- Unreal Tournament 2003 Demo Flyby

Digital Media

- Ziff Davis Media Inc. Multimedia Content Creation Winstone® 2004 Version 1.0
- BAPCO® SYSmark® 2004 Internet Content Creation
- Dr. DivX
- POV-Ray
- RazorLAME 1.1.5 MP3 Encoder
- Panorama Factory

Office Productivity

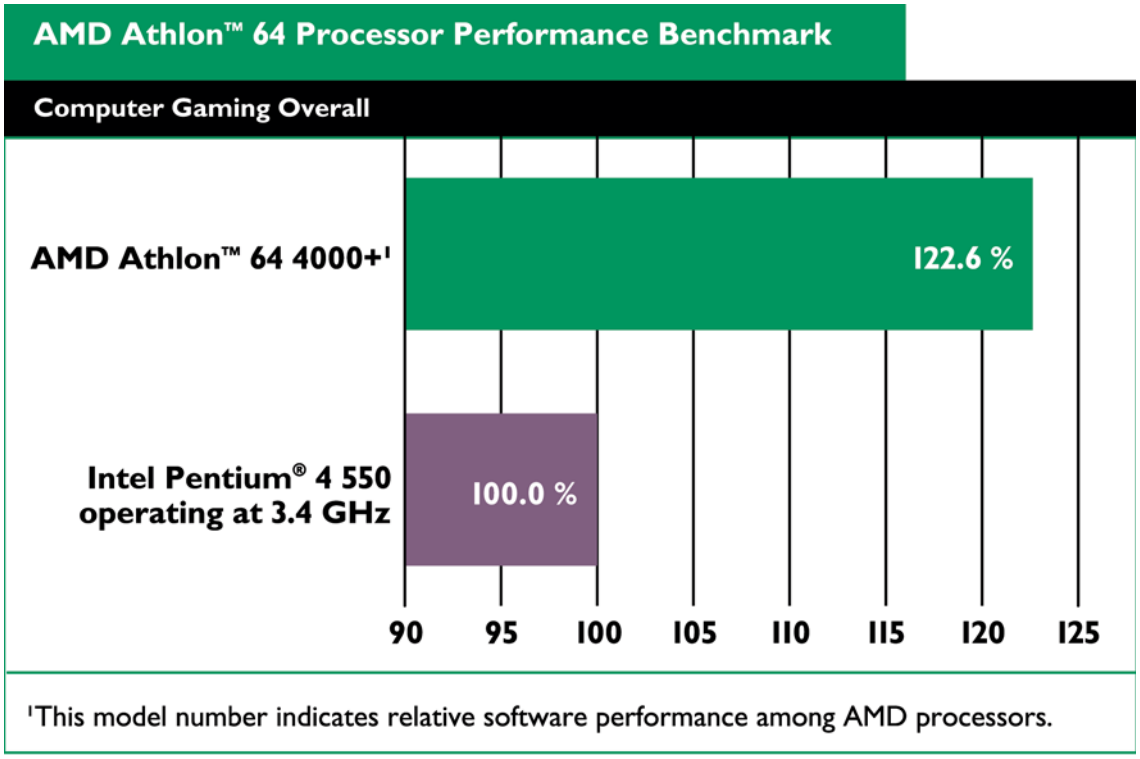
- Ziff Davis Media, Inc. Business Winstone® 2004
- Ziff Davis Media, Inc. Business Winstone® 2004 Version 1.0 Multitasking Tests
- BAPCO® SYSmark® 2004 Office Productivity
- PC Worldbench™ Overall
- WinRAR

1. *The Intel Pentium® 4 550 processor was the highest-performing competitive processor widely available in the market during testing.*

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configurations.

Computer Gaming Overall

The AMD Athlon™ 64 processor's innovative technology enables the ultimate gaming experience. The AMD Athlon 64 processor allows users to escape into a movie-like gaming experience with smooth 3D graphics, rich textures, quick response times, and realistic sound.



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

This benchmark is an average of compiled data from the list of benchmark scores from the following list of tests. All benchmarks normalize the score to the Intel Pentium® 4 550 processor for the following tests (all at 1024x768x32):

3DMark® 2001SE PRO (D3D Hardware T&L) by Futuremark® Corporation

3DMark® 2001SE PRO (D3D Software T&L) by Futuremark® Corporation

3DMark® 03 Pro (Hardware Vertex Shaders) by Futuremark® Corporation

3DMark® 03 Pro (Software Vertex Shaders) by Futuremark® Corporation

AquaMark3

Return to Castle Wolfenstein Enemy Territory

Jedi Knights II Demo

Quake III Arena Demo2

Far Cry Cooler01

Far Cry Pier

Painkiller

Doom3

Crafty

Splinter Cell (1_1_1)

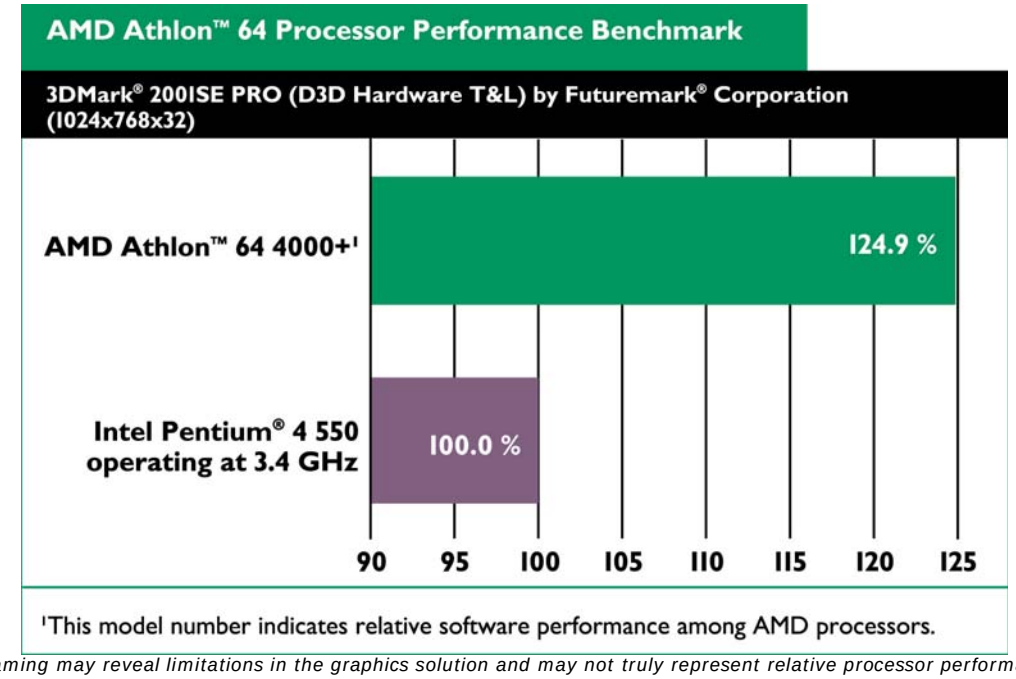
Splinter Cell (1_1_2)

Unreal Tournament 2003 Demo BotMatch

Unreal Tournament 2003 Demo Flyby

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

3DMark® 2001SE PRO (D3D Hardware T&L) by Futuremark® Corporation



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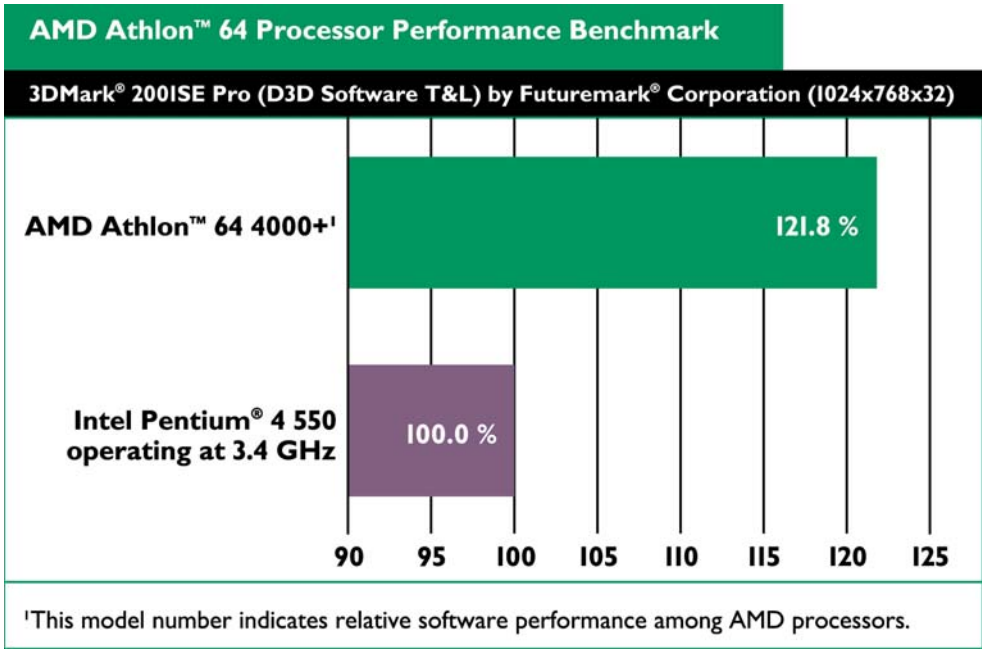
3DMark® 2001SE PRO (D3D Software T&L) by Futuremark® Corporation



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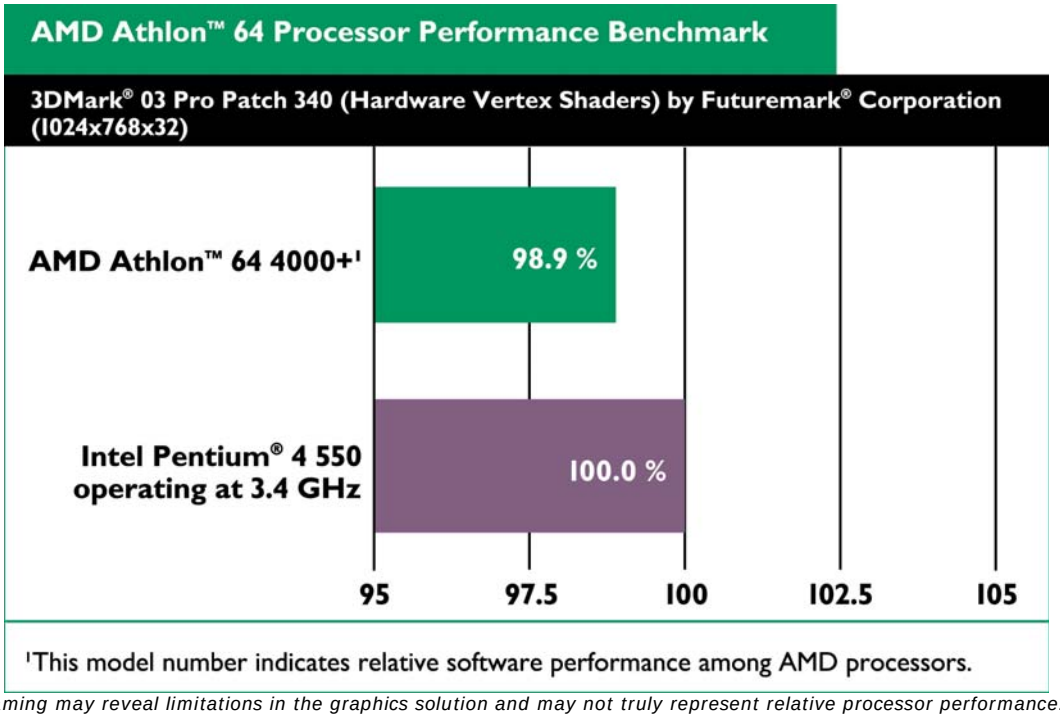
3DMark® 03 Pro (Hardware Vertex Shaders) by Futuremark® Corporation



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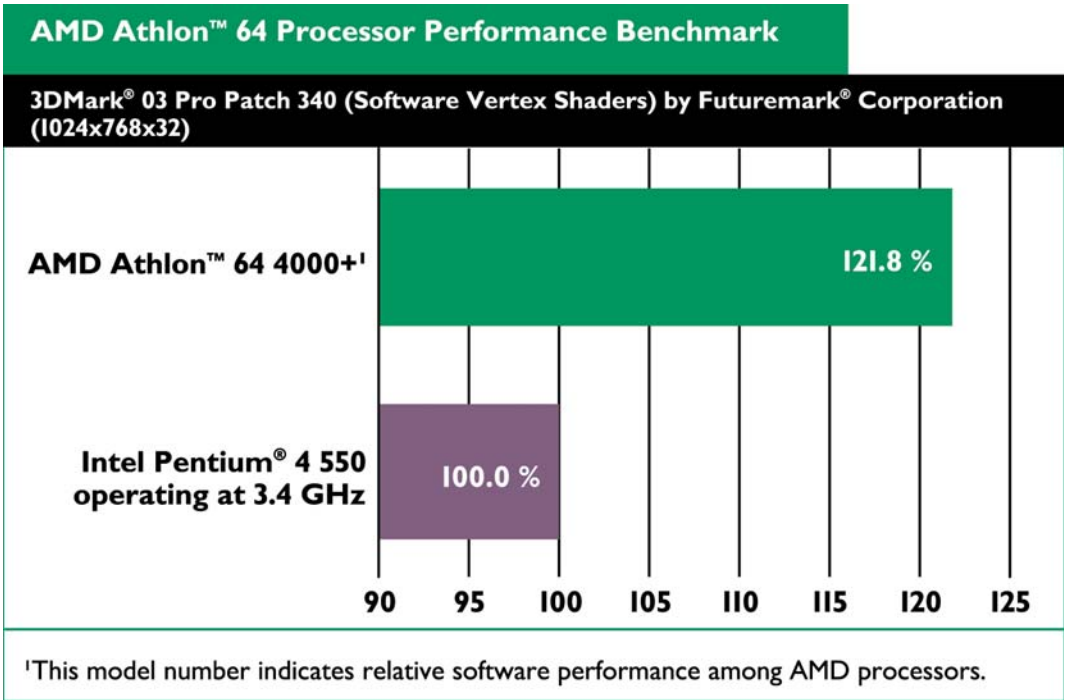
3DMark® 03 Pro (Software Vertex Shaders) by Futuremark® Corporation



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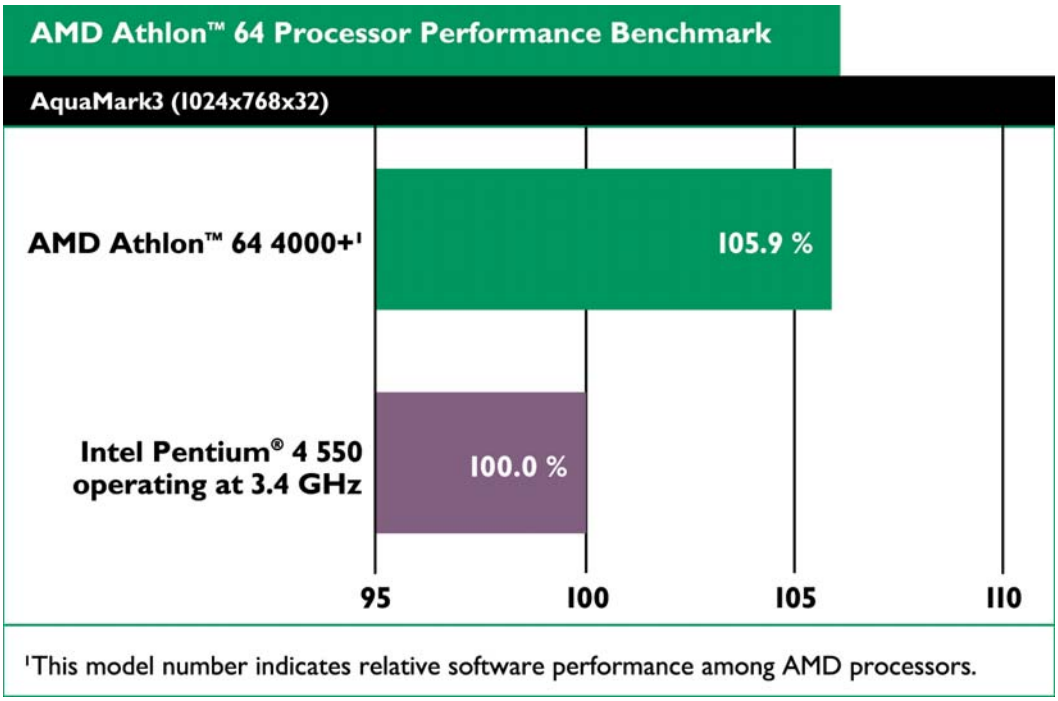
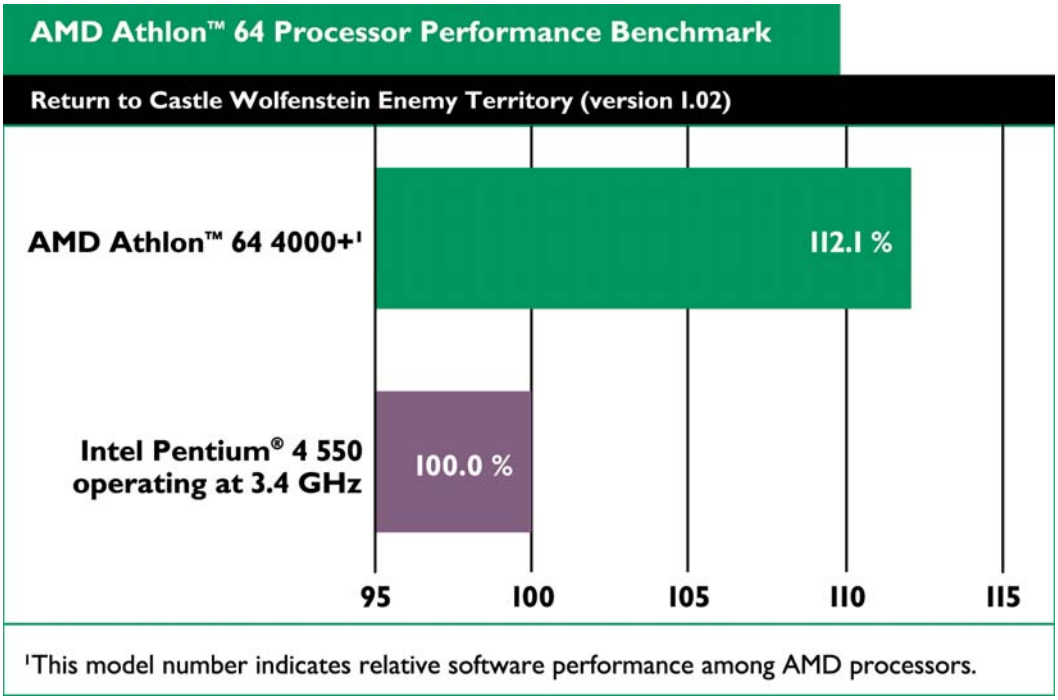
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

AquaMark3



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

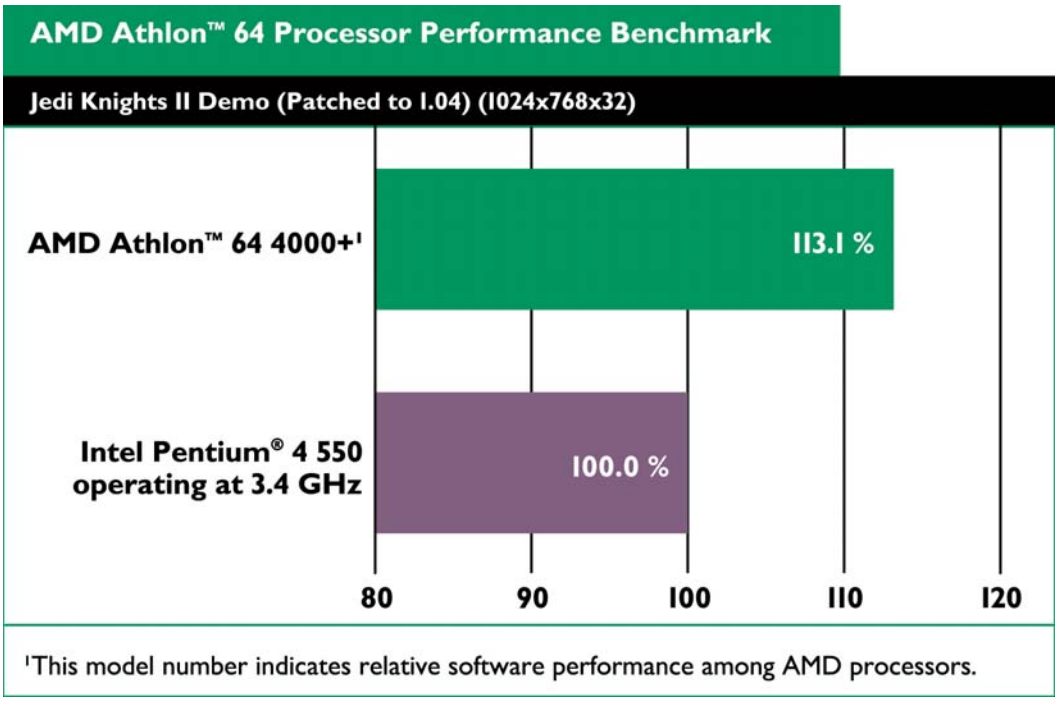
Return to Castle Wolfenstein Enemy Territory



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

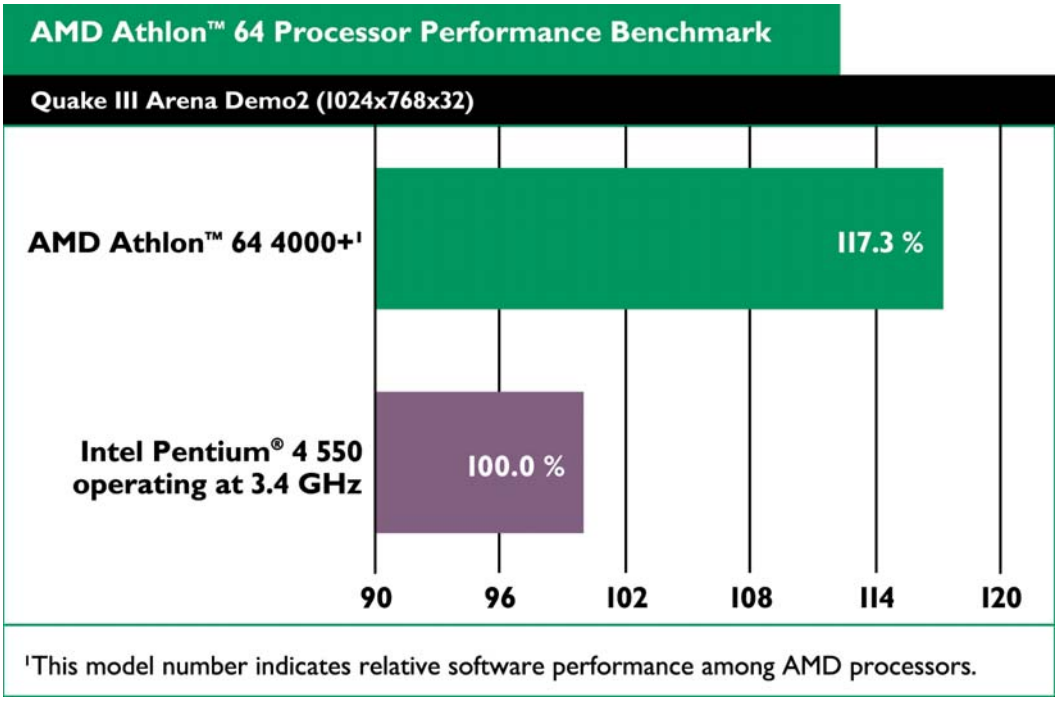
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Jedi Knights II Demo



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

Quake III Arena Demo2



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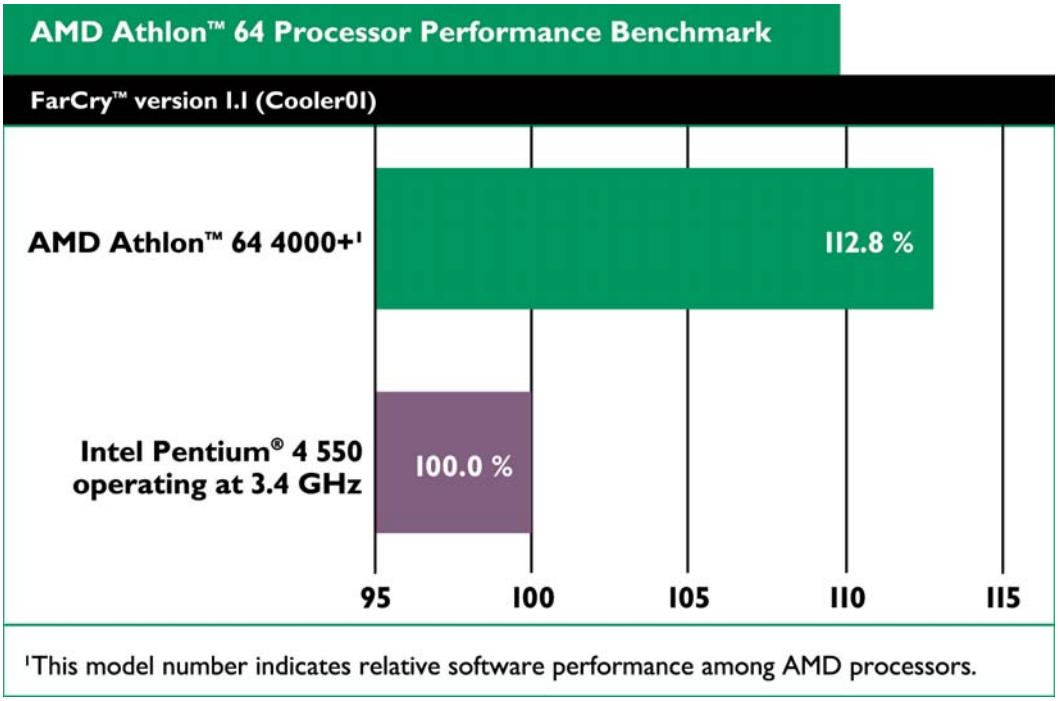
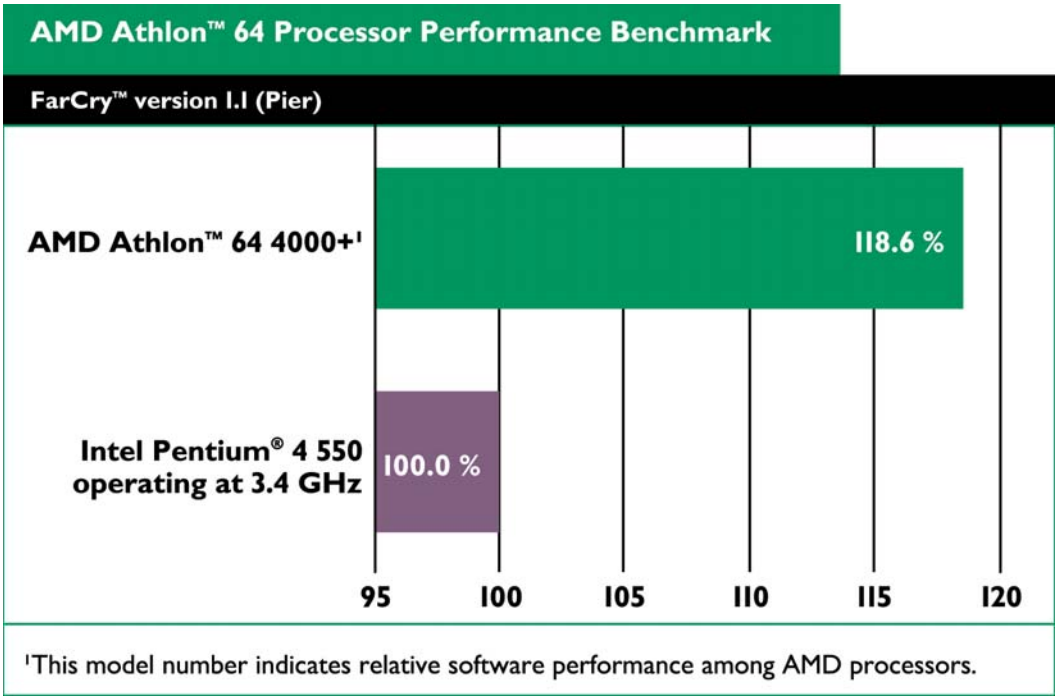
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Far Cry Cooler01



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

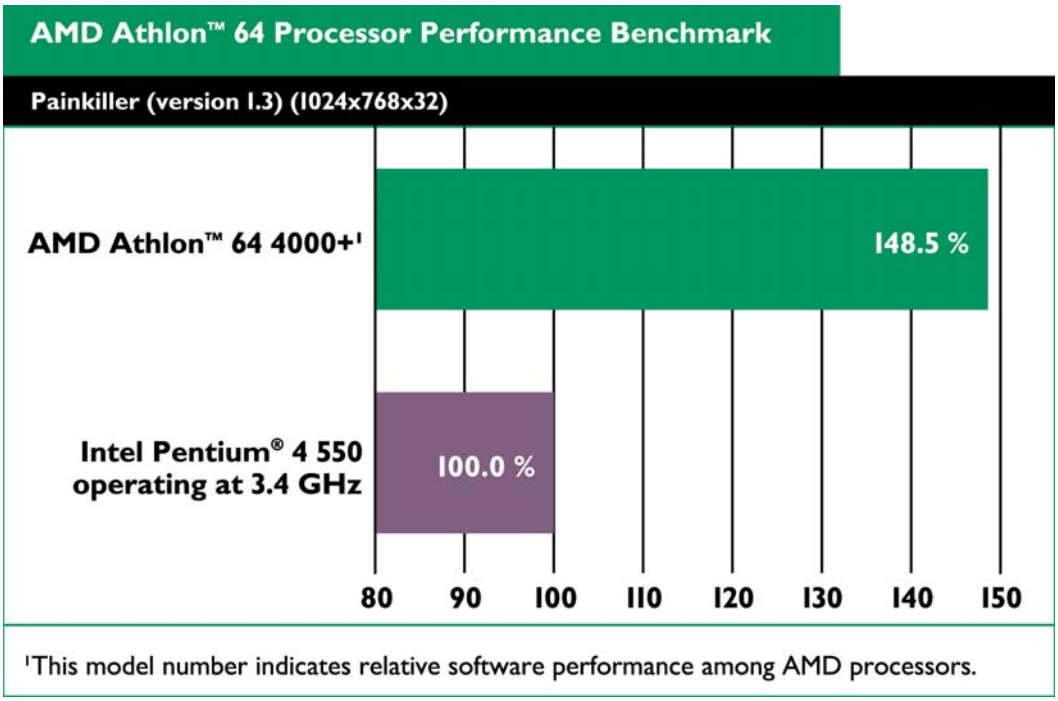
Far Cry Pier



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

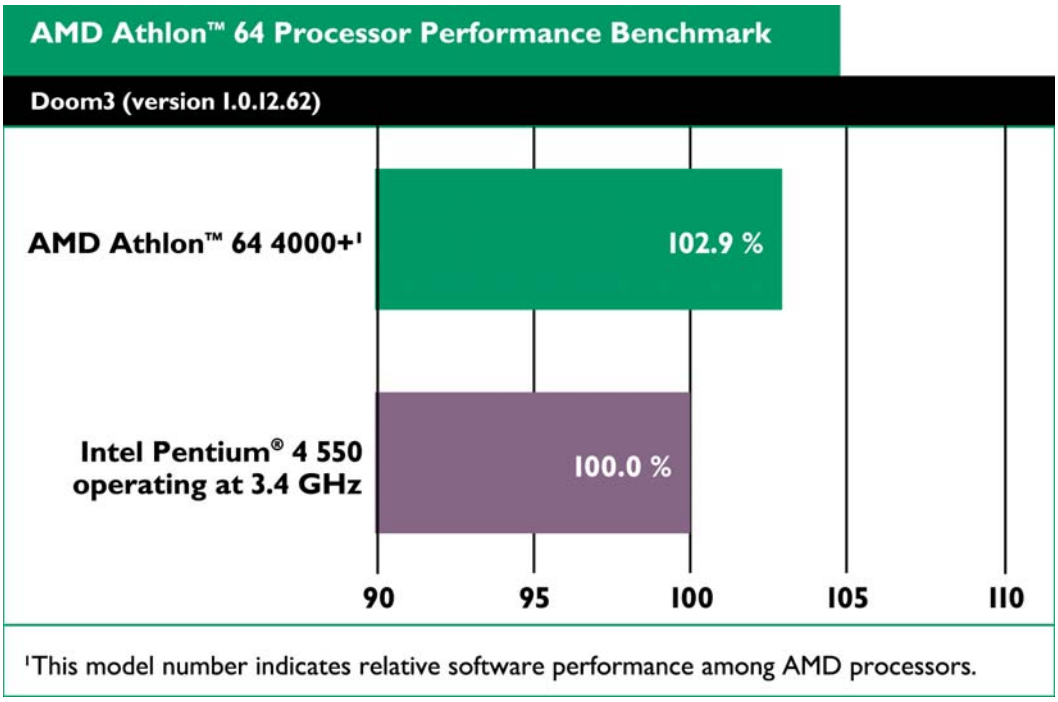
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Painkiller



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

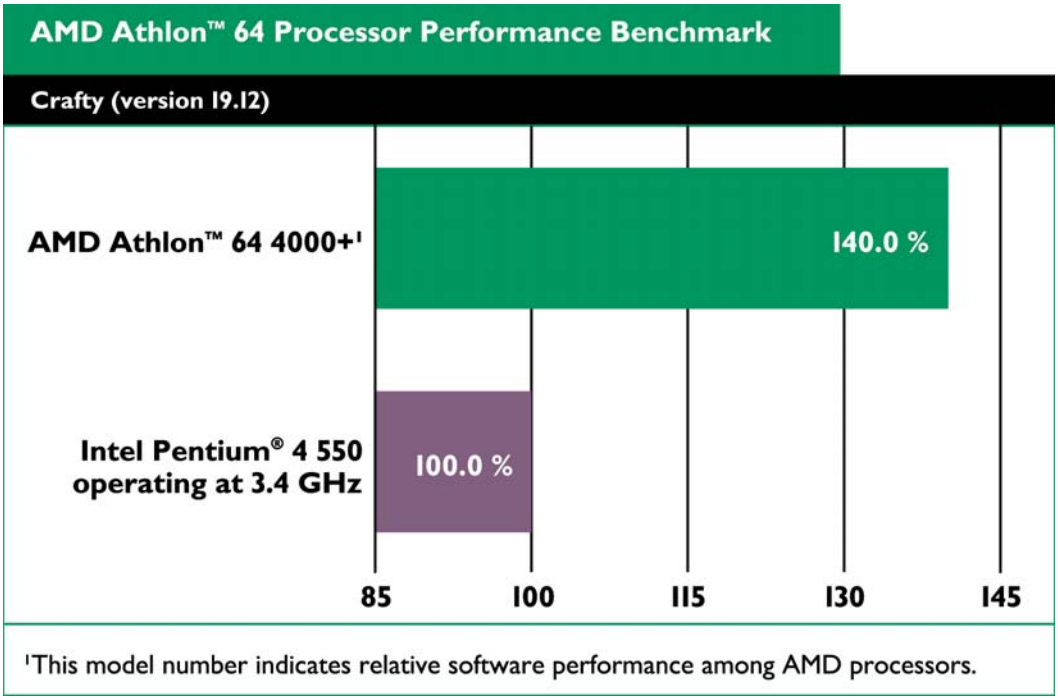
Doom3



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

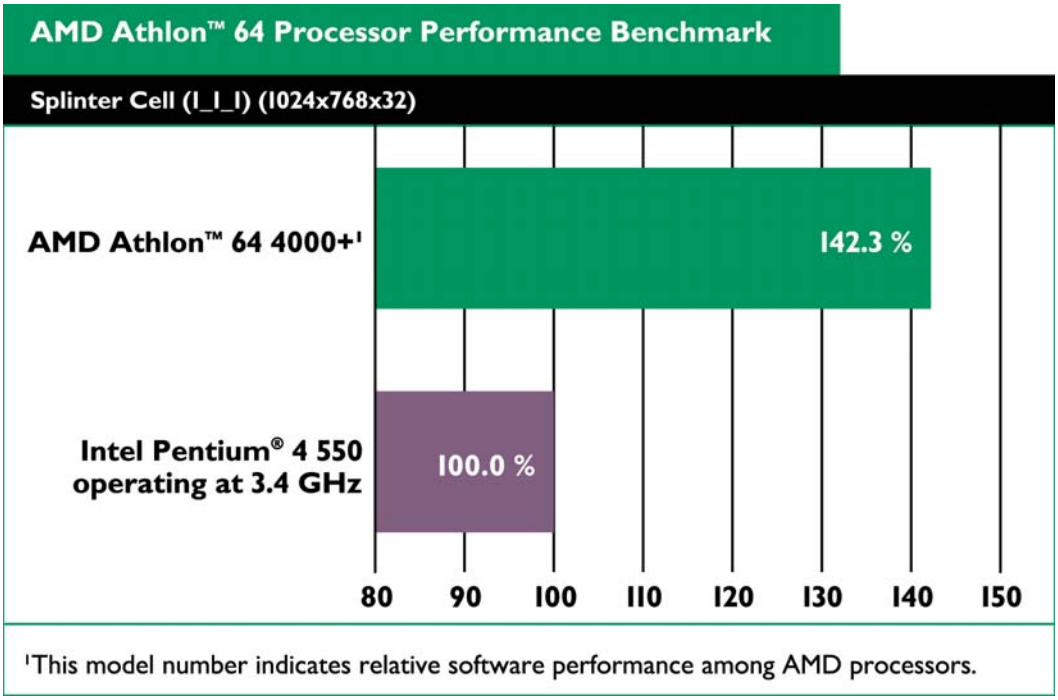
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Crafty



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

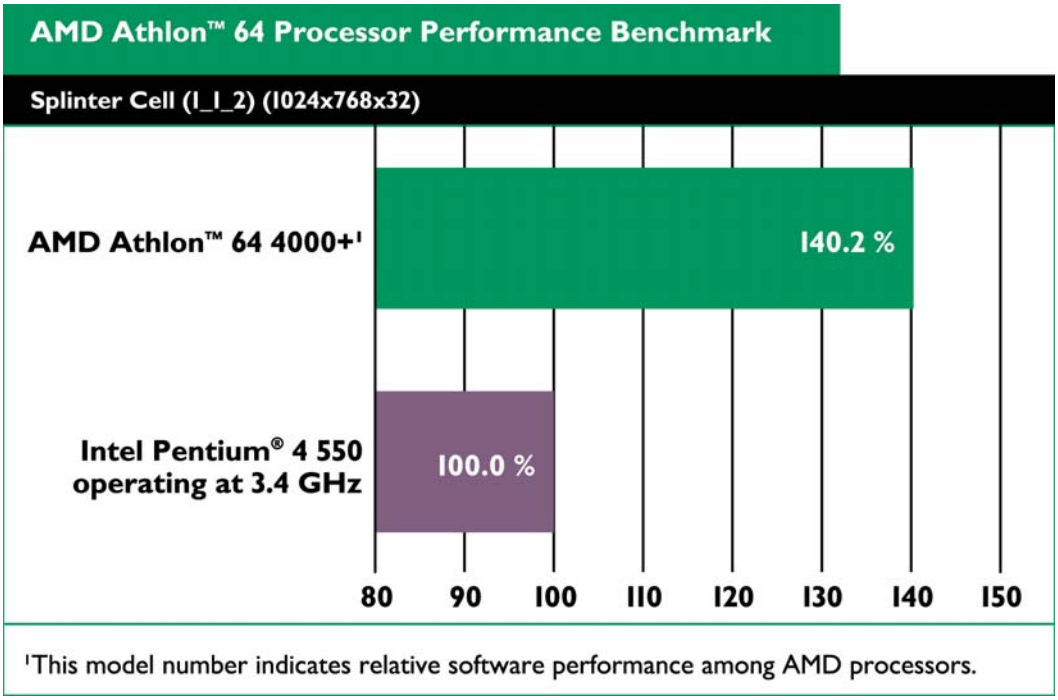
Splinter Cell (1_1_1)



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

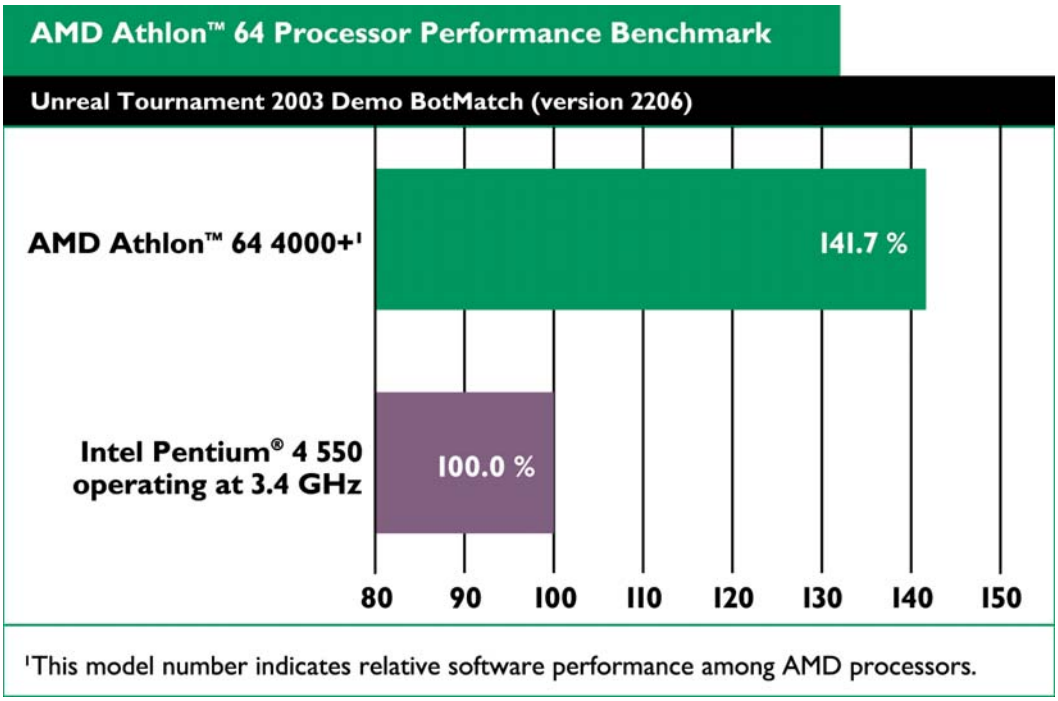
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Splinter Cell (1_1_2)



3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

Unreal Tournament 2003 Demo BotMatch



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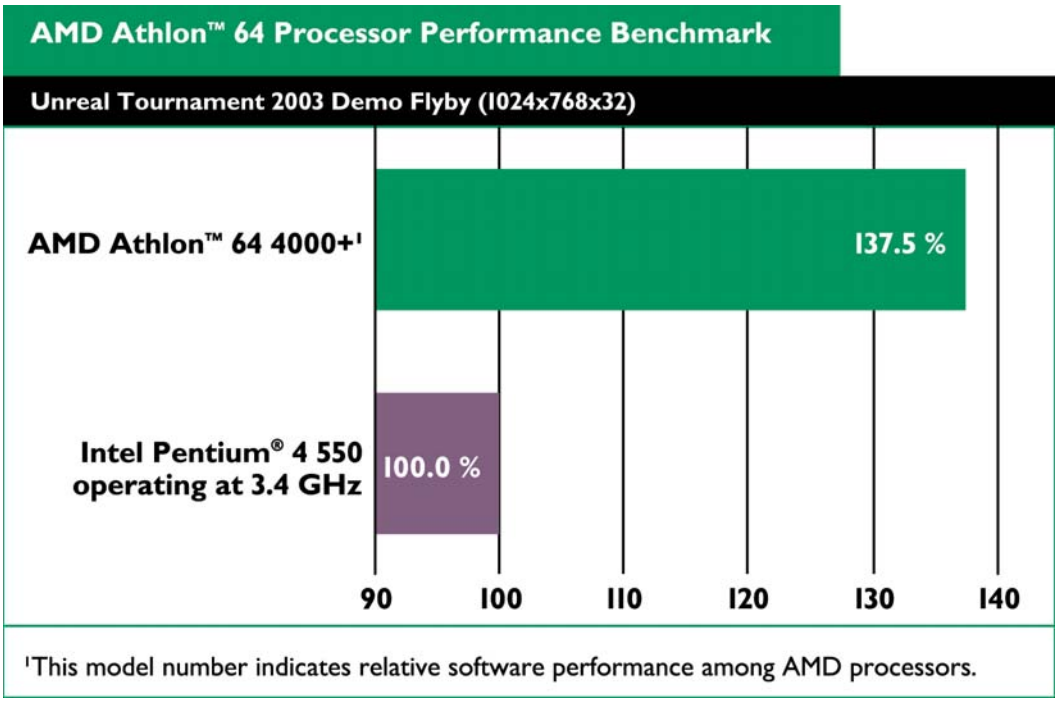
Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Unreal Tournament 2003 Demo Flyby



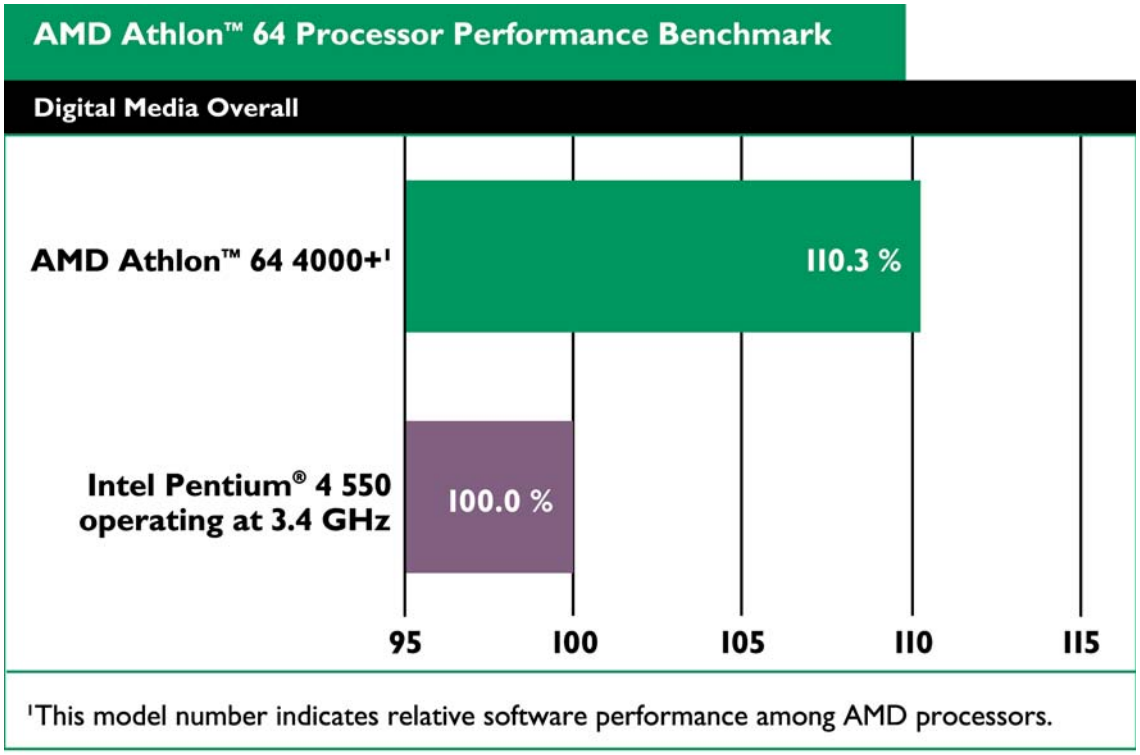
3D gaming may reveal limitations in the graphics solution and may not truly represent relative processor performance.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Digital Media Overall

Digital Media Overall Results

With a revolutionary processor design and support for both 3DNow!™ Professional technology and SSE2 instructions, the AMD Athlon™ 64 processor provides outstanding performance for multimedia applications. Compose, edit, and encode digital audio, video, and image files quickly and smoothly so you can save time and produce outstanding work.



This benchmark is an average of compiled data from the list of benchmark scores from the following list of tests. The score is normalized to the Intel Pentium® 4 550 processor.

Ziff Davis Media Inc. Multimedia Content Creation Winstone® 2004 Version 1.0

BAPCO® SYSmark® 2004 Internet Content Creation

Dr. DivX

POV-Ray

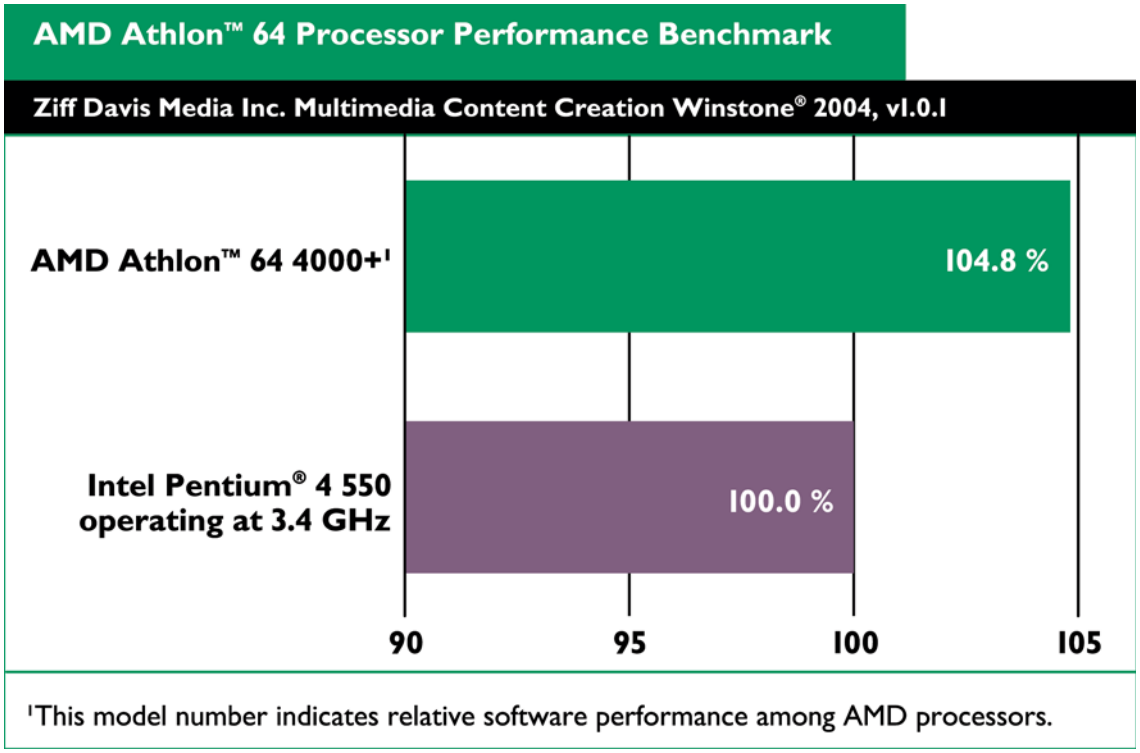
RazorLAME 1.1.5 MP3 Encoder

Panorama Factory

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Ziff Davis Media Inc. Multimedia Content Creation Winstone® 2004 Version 1.0

Multimedia Content Creation Winstone® is a system-level, application-based benchmark that measures a PC's overall performance when running top, Windows® operating system-based multimedia content creation applications.



The score is normalized to the Intel Pentium® 4 550 processor. Multimedia Content Creation Winstone 2004 version 1.0 uses the following applications:

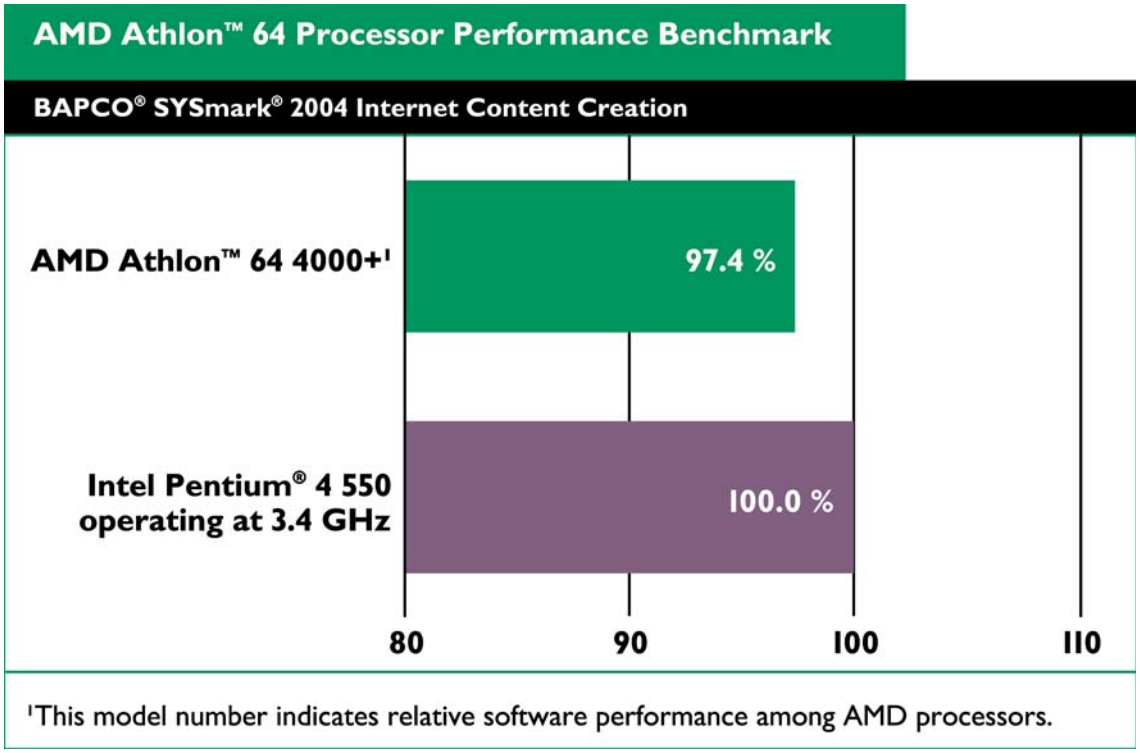
- Adobe® Photoshop® 7.0.1
- Adobe Premiere 6.50
- Macromedia Director MX 9.0
- Macromedia Dreamweaver MX 6.1
- Microsoft® Windows® Media Encoder 9 Version 9.00.00.2980
- NewTek's LightWave 3D 7.5b
- Steinberg WaveLab 4.0f

Multimedia Content Creation Winstone 2004 is a single large test that runs the listed applications through a series of scripted activities and returns a single score.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

BAPCO® SYSmark® 2004 Internet Content Creation

SYSmark® 2004 is an application-based benchmark.



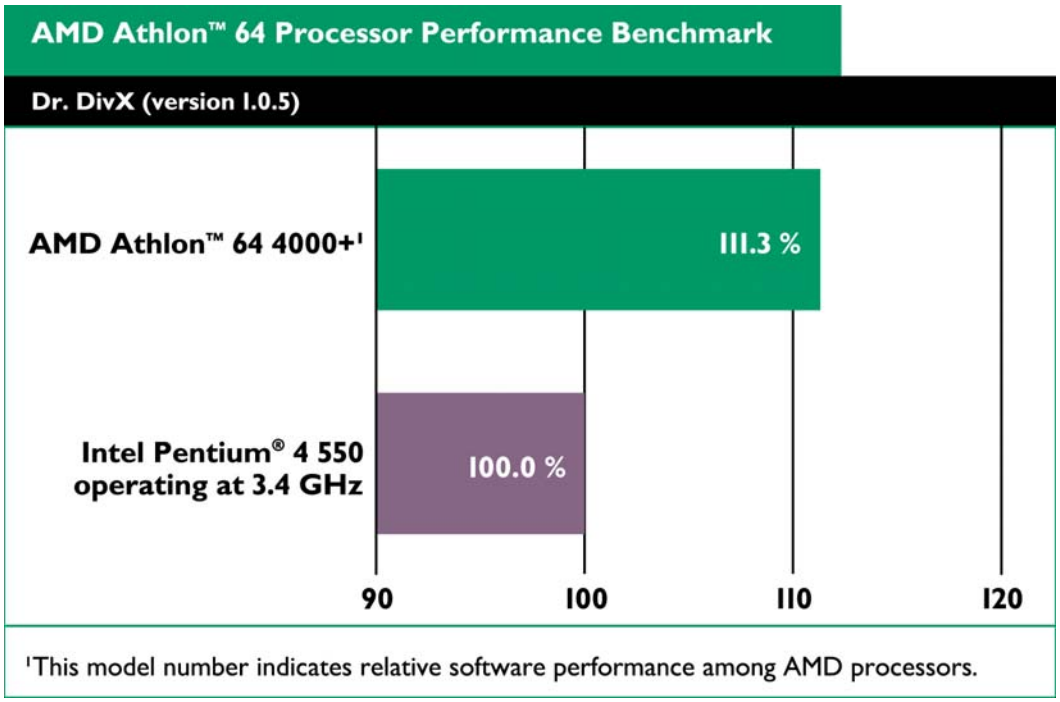
This benchmark incorporates the following Internet Content Creation applications. The score is normalized to the Intel Pentium® 4 550 processor.

- Adobe® After Effects 5.5
- Adobe Photoshop 7.01
- Adobe Premiere 6.5
- Discrete 3ds max 5.1
- Network Associates McAfee VirusScan 7.0
- WinZip Computing WinZip 8.1
- Macromedia Dreamweaver MX
- Macromedia Flash MX
- Windows® Media Encoder 9 Series

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Dr. DivX

Dr. DivX converts video to a MPEG-4-based format. The test is a measure of the time required to convert a video file to MPEG-4 format.

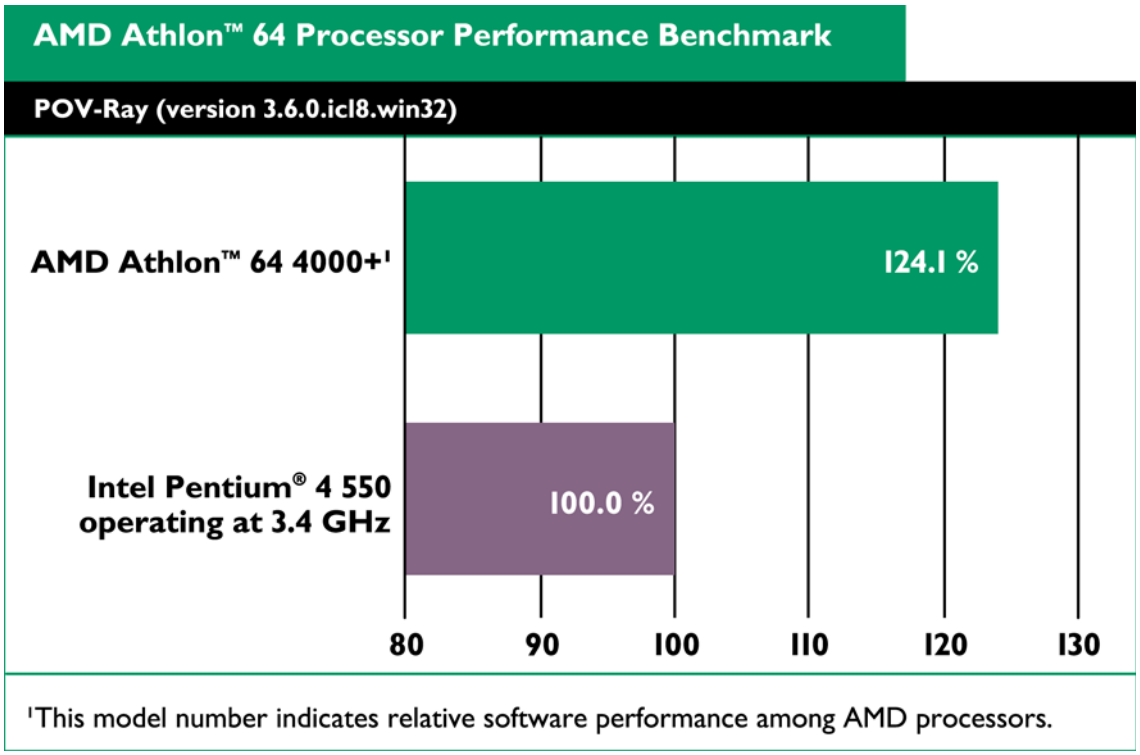


The score is normalized to the the Intel Pentium® 4 550 processor.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

POV-Ray

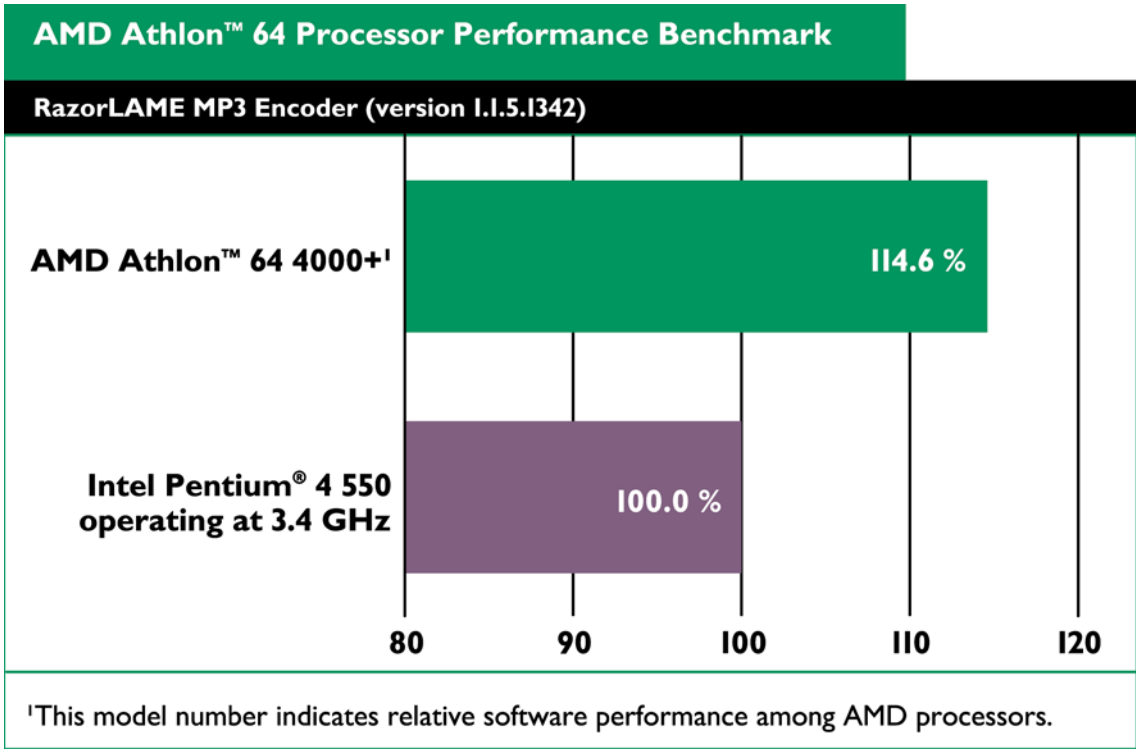
This benchmark uses POV-Ray to create three-dimensional photo-realistic images using a rendering technique called ray-tracing. The test is a measure of pixels per second generated while creating a standard benchmark image.



The score is normalized to the Intel Pentium® 4 550 processor.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

RazorLAME 1.1.5 MP3 Encoder

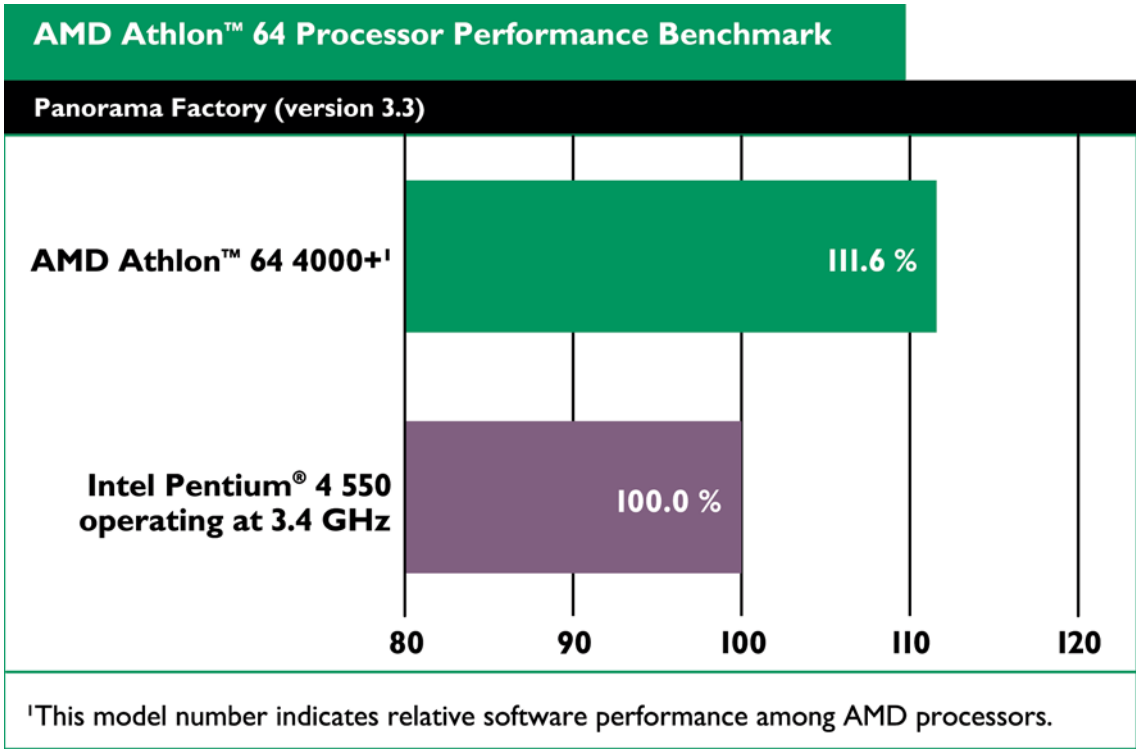


The score is normalized to the Intel Pentium® 4 550 processor. This benchmark is the compiled data from the RazorLAME version 1.1.5 MP3 benchmark scores.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Panorama Factory

Panorama Factory is a digital photo-editing application that creates panoramic photos and 360° photographs.

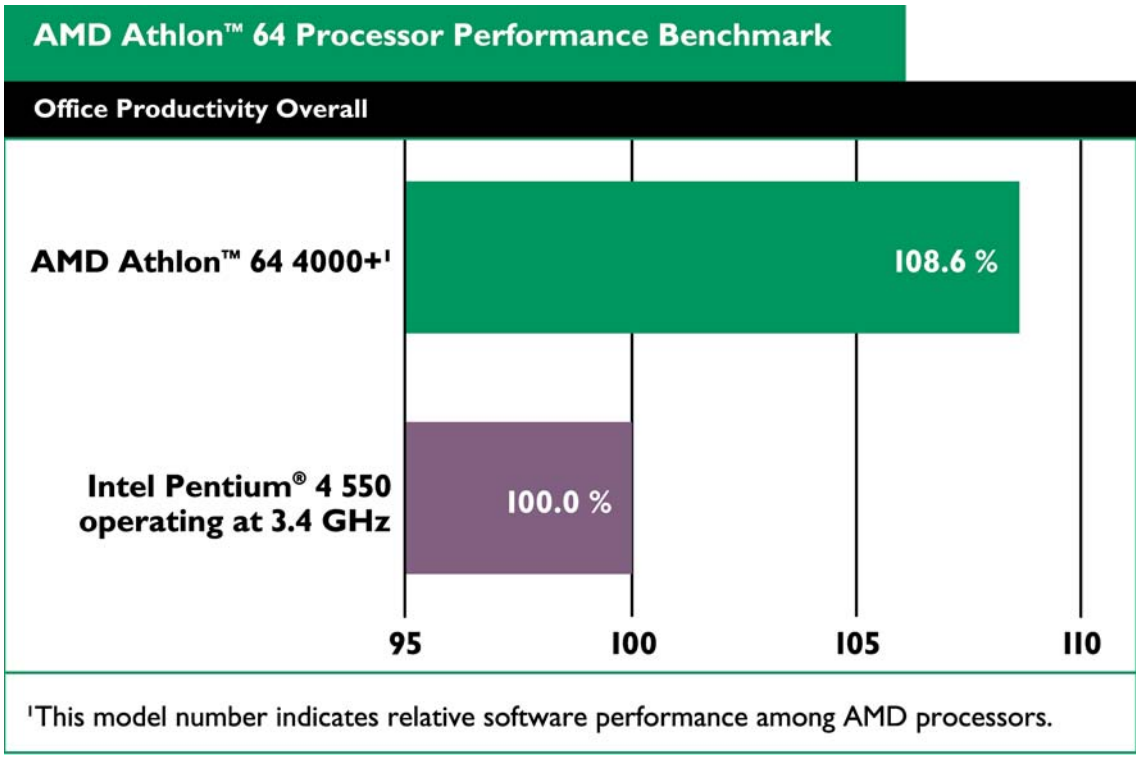


The score is normalized to the Intel Pentium® 4 550 processor. The benchmark is a measure of the time required to stitch together a set of photos into a panorama.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Office Productivity Overall

The AMD Athlon™ 64 processor effortlessly runs multiple applications at the same time which helps to minimize work stoppage and interruptions. It allows you to operate your system more efficiently and helps improve overall productivity.



The score is normalized to the Intel Pentium® 4 550 processor score. This benchmark is an average of compiled data from the list of benchmark scores from the following list of tests:

Ziff Davis Media, Inc. Business Winstone® 2004

Ziff Davis Media, Inc. Business Winstone® 2004 Version 1.0 Multitasking Tests

BAPCO® SYSmark® 2004 Office Productivity

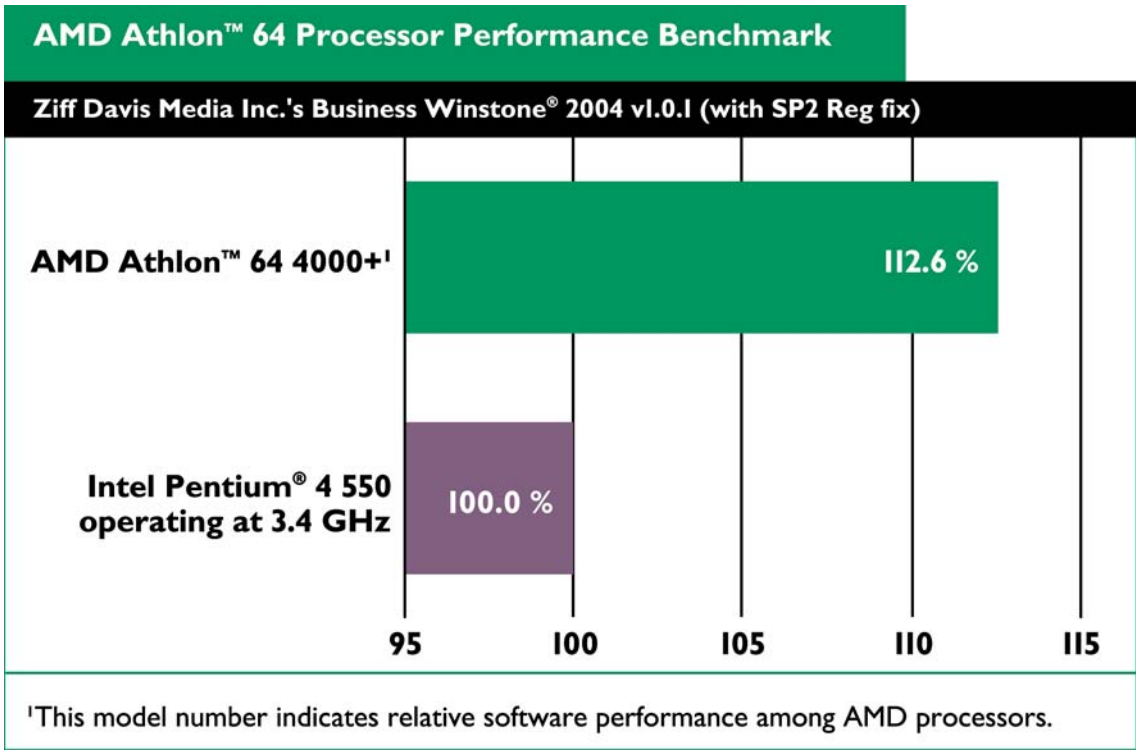
PC Worldbench™ Overall

WinRAR

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Ziff Davis Media, Inc. Business Winstone® 2004

Business Winstone® is a system-level, application-based benchmark that measures overall PC performance when running today's top-selling Windows® operating system-based applications. Business Winstone does not mimic what these packages do; it runs real applications through a series of scripted activities and uses the time a PC takes to complete those activities to produce its performance scores.



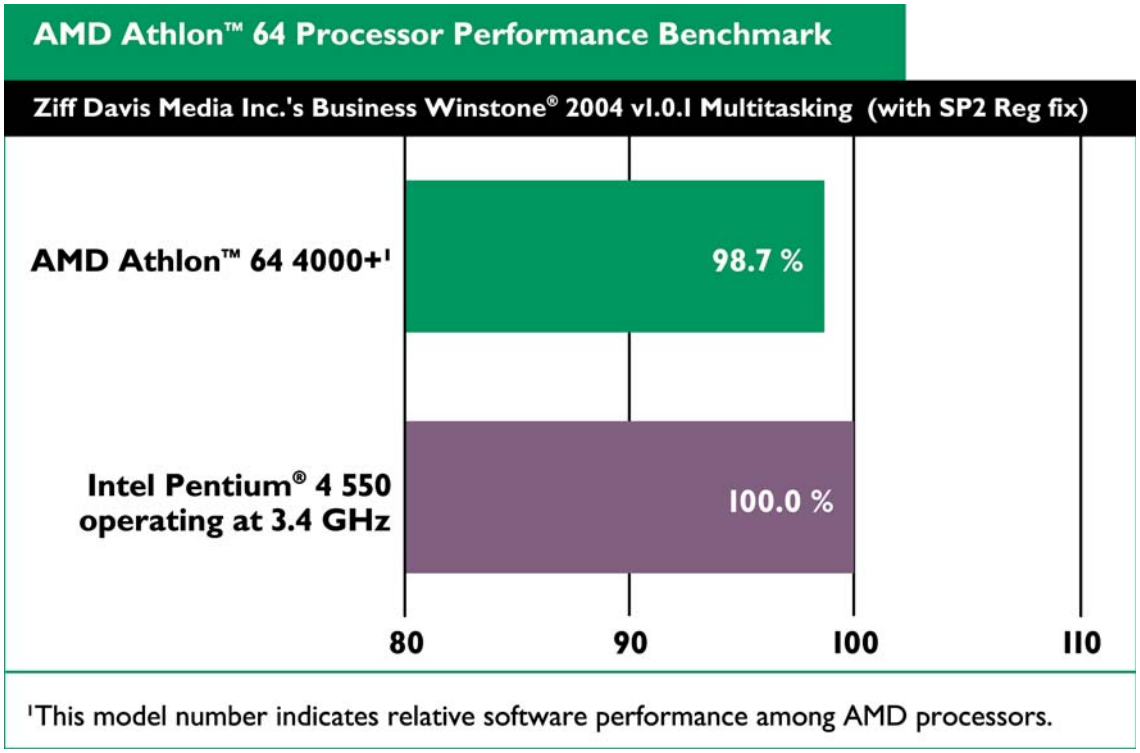
The score is normalized to the Intel Pentium® 4 550 processor score. The Business Winstone benchmark uses the following applications:

- Microsoft® Internet Explorer 6
- Microsoft Outlook 2002 SP-2
- Microsoft Project 2002
- Microsoft Access 2002 SP-2
- Microsoft PowerPoint 2002 SP-2
- Microsoft Excel 2002 SP-2
- Microsoft FrontPage 2002 SP-2
- Microsoft Word 2002 SP-2
- Norton AntiVirus Professional Edition 2003
- WinZip 8.1 SR-1

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Ziff Davis Media, Inc. Business Winstone® 2004 Version 1.0 Multitasking Tests

Business Winstone® Multitasking test uses the same applications as Business Winstone, but runs some of the applications in the background while doing work in the foreground. If you're the type of person who runs a virus check in the background while using office applications in the foreground, you'll want to check out this test.



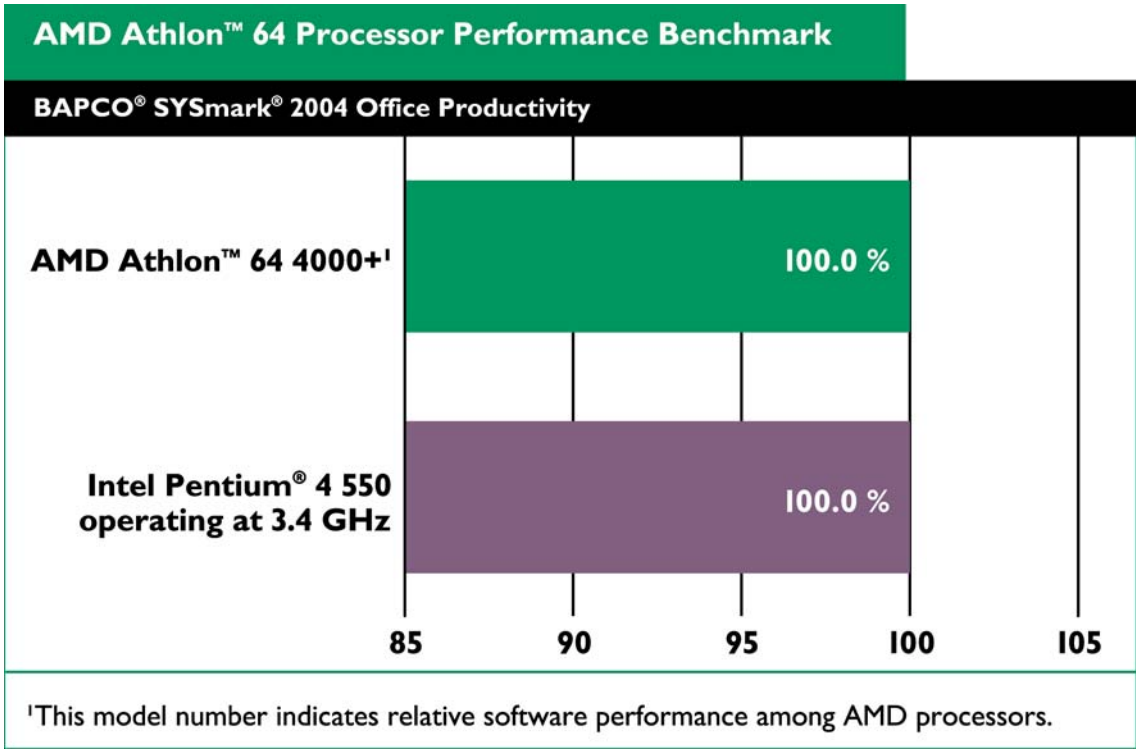
The score is normalized to the Intel Pentium® 4 550 processor score. The Business Winstone Multitasking benchmark uses the following applications:

- Microsoft® Internet Explorer 6
- Microsoft Outlook 2002 SP-2
- Microsoft Project 2002
- Microsoft Access 2002 SP-2
- Microsoft PowerPoint 2002 SP-2
- Microsoft Excel 2002 SP-2
- Microsoft FrontPage 2002 SP-2
- Microsoft Word 2002 SP-2
- Norton AntiVirus Professional Edition 2003
- WinZip 8.1 SR-1

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

BAPCO® SYSmark® 2004 Office Productivity

The BAPCO® SYSmark® 2004 is an application-based benchmark.



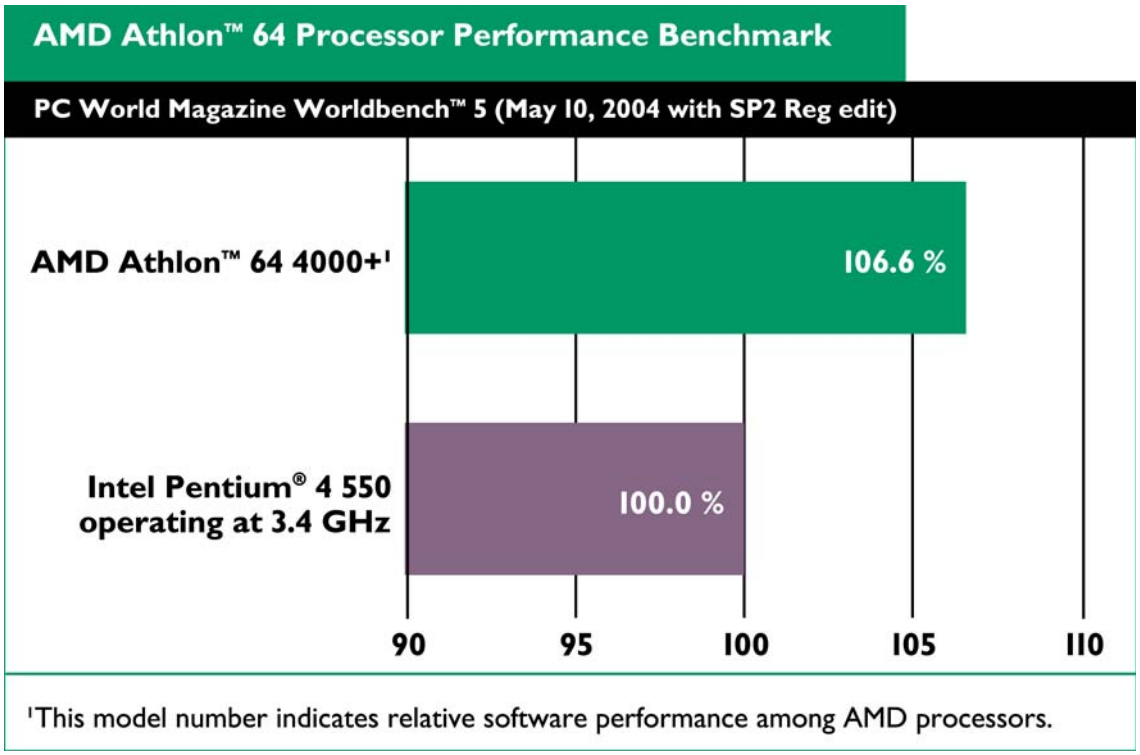
The score is normalized to the Intel Pentium® 4 550 processor score. The BAPCO SYSmark benchmark uses the following applications.

- Adobe® Acrobat® 5.0.5
- Microsoft® Access 2002
- Microsoft Excel 2002
- Microsoft Internet Explorer 6
- Microsoft Outlook 2002
- Microsoft PowerPoint 2002
- Microsoft Word 2002
- Network Associates McAfee VirusScan 7.0
- ScanSoft Dragon Naturally Speaking 6 Preferred
- WinZip Computing WinZip 8.1

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

PC Worldbench™ Overall

PC World Magazine Worldbench™ is an office productivity benchmark developed by PC World magazine.



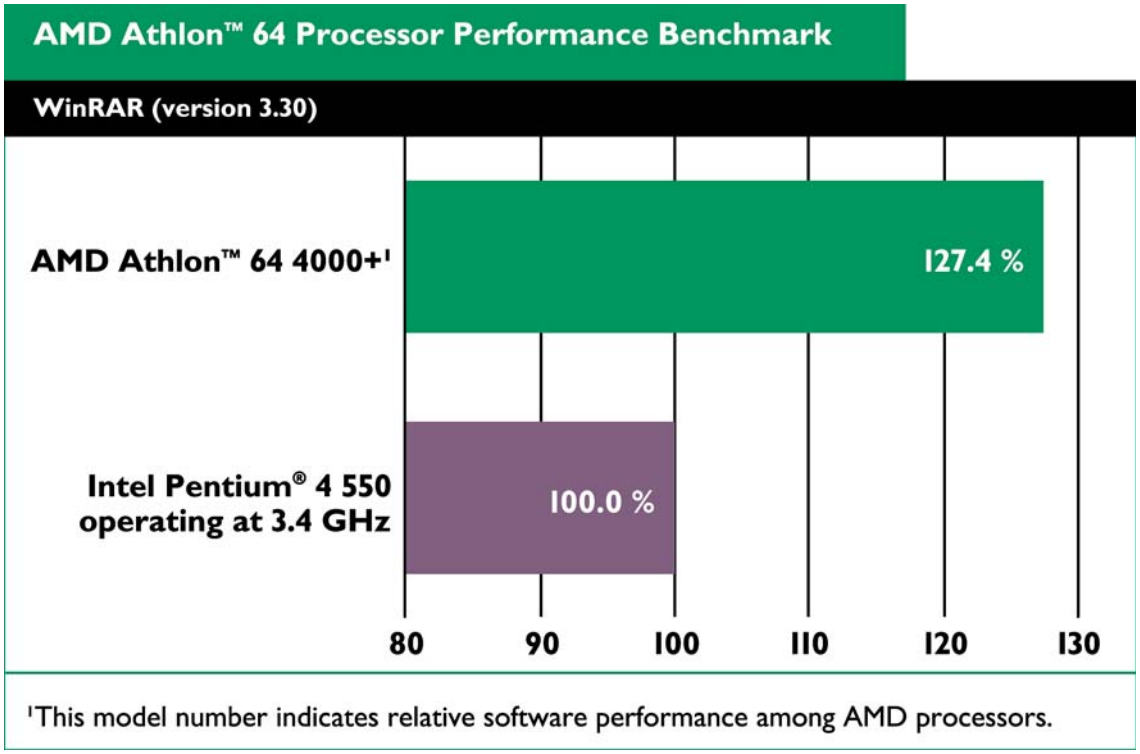
The score is normalized to the Intel Pentium® 4 550 processor score. PC Worldbench uses the following applications:

- ACD Systems ACDSee PowerPack 5.0
- Adobe® Photoshop® 7.0.1
- Adobe Premiere 6.5
- Ahead Software Nero Express 6.0.0.3
- Discreet 3ds max 5.1 (DirectX)
- Discreet 3ds max 5.1 (OpenGL)
- Microsoft® Office XP with SP-2
- Microsoft Windows Media Encoder 9.0
- Mozilla 1.4
- Musicmatch Jukebox 7.10
- Roxio VideoWave Movie Creator 1.5
- WinZip Computing WinZip 8.1

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

WinRAR

WinRAR is archive management software. WinRAR may be used to backup data and to reduce the size of e-mail attachments, to decompress RAR, ZIP, and other files downloaded from Internet, and to create new archives in RAR and ZIP file format.



The score is normalized to the the Intel Pentium® 4 550 processor score. This benchmark is the compiled data from the WinRAR benchmark scores.

Refer to Table 1 on page 25 and Table 2 on page 26 for benchmark system configuration.

Benchmark System Configuration

This section describes the configurations AMD used to perform the benchmarks. Table 1 and Table 2 on page 26 represent the system configurations used for this document.

Table 1. AMD Athlon™ 64 4000+ Processor System Configuration

Component		Manufacturer and Model Description
Operating System		Microsoft® Windows® XP Professional, RTM, Service Pack 1a installed, Build 2600, DirectX 9.0C
Hardware	**Processor**	AMD Athlon™ 64 4000+ processor[1]
	Motherboard	MSIMS-6702 NEO, BIOS A6702VMS v3.0 7/6/04
	Chipset	VIA K8T800
	RAM memory	1 GB DDR SDRAM total (qty (2) 512 MB DIMM Module CMX512-3500XLPro)
	Hard drive	Qty (2) Western Digital Raptor WD360GD, 36.0 GB, SATA Raid 0 10,000 RPM (NTFS used to format the hard disk). Drives are configured in a Raid 0 configuration.
	Video Card	NVIDIA GeForce 6800 Ultra, 256MB DDR3
	Audio	RealTek AC'97 Audio
	LAN	RealTek RTL8169/8110 Family Gigabit Ethernet NIC (integrated on motherboard)
Drivers	**AGP**	AGP Miniport VIA CPU to AGP2.0/AGP3.0 Controller, v5.1.0.3442 7/2/2003
	SATA	Promise Technologies, v1.0.0.13, 2/10/2004
	Video	NVIDIA v6.1.7.7, 7/15/2004, 1024x768, 85 Hz refresh rate
	Audio	RealTek v5.10.0.5420, 12/12/2003
	LAN	RealTek v5.612.413.2004, 2/10/2004

[1] *This model number indicates relative software performance among AMD processors.*

Table 2. Intel Pentium® 4 550 Processor System Configuration

Component		Manufacturer and Model Description
Operating System		Microsoft® Windows® XP Professional, RTM, Service Pack 2 installed, Build 2600, DirectX 9.0C
Hardware	**Processor**	Intel Pentium® 4 550 processor (Hyperthreading enabled)
	Motherboard	Intel 925XCV, BIOS CV92510A.86A.0218
	Chipset	925X chipset
	RAM memory	1 GB DDR SDRAM total (qty (2) 512 MB DIMM Module Corsair CMX512-3500LL)
	Hard drive	Qty (2) Western Digital Raptor WD360GD, 36.0 GB, SATA Raid 0 10,000 RPM (NTFS used to format the hard disk). Drives are configured in a Raid 0 configuration.
	Video Card	NVIDIA GeForce 6800 Ultra, 256MB DDR3
	Audio	RealTek AC'97 Audio
	LAN	Marvell Yukon 88E8050 PCI-E ASF
Drivers	**AGP**	Intel 82801FB/FBM PCI Express Root Port 2660, v 6.0.0.1013 4/1/2004
	SATA	Intel 82801FR SATA Raid Controller, v4.0.0.6211, 3/23/2004
	Video	NVIDIA v6.1.7.7, 7/15/2004, 1024x768, 85 Hz refresh rate
	Audio	RealTek v5.612.413.2004, 2/10/2004
	LAN	Marvell v7.14.1.3, 6/16/2004

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