Benchmark tests
Industrial PCs

Date: December 16, 2005

I Version information

Version	Date	Comment	Author
2.0	June, 8 2005	First edition	GIA

Table 1: Version information

II Test location

No.	Company	Street	Postal code	City	Telephone	Contact
1	B&R	B&R Strasse 1	A-5142	Eggelsberg		

Table 2: Test location

III Table of contents

1 What's it all about?

This document is meant to show how the performance of an APC620 matches up to other available systems (including the leading systems).
Programs from various manufacturers were used to determine the results. The selection was made so that the most extensive and clearest representation of the performance is provided in the end.
The setup of information provided was based on a setup used by many popular magazines and web pages (e.g. Techchannel).

Information:

All results provided cannot be interpreted and used as absolute values. They should considered comparison values that can vary slightly depending on the operating system and computer being used.

2 Hardware

The following hardware was used for the benchmark tests:

2.1 Devices being tested

No.	CPU	RAM	VGA controller	Manufacturer
Power Panel (5PP120.1505-37)				
1	Geode SC2200 266 MHz	128 MB SD RAM	Geode SC2200 4MB (Shared)	B&R
IPC2001				
2	AMD 486DX2-66 MHz	8 MB DRAM	Chips & Technologies 65535 1MB	B&R
3	AMD 486DX5-133 MHz	32 MB DRAM	Chips & Technologies 65535 1MB	B&R
IPC5000C				
4	Intel Celeron 3 566 MHz 66 MHz FSB	256 MB SDRAM 100 MHz	Chips & Technologies 69000 2MB	B&R
5	Intel Celeron 3 850 MHz 66 MHz FSB	256 MB SDRAM 100 MHz	Chips & Technologies 69000 2MB	B&R
6	Intel Pentium 3 600 MHz 100 MHz FSB	256 MB SDRAM 100 MHz	Chips & Technologies 69000 2MB	B&R
7	Intel Pentium 3 850 MHz 100 MHz FSB	256 MB SDRAM 100 MHz	ATI Rage Mobility 4MB	B&R
APC680				
8	Intel Celeron 3 850 MHz 100 MHz FSB	256 MB SDRAM 133 MHz	Intel 815E Graphics Controller 32 MB	B&R
9	Intel Pentium 3 1.26 GHz 133 MHz FSB	512 MB SDRAM 133 MHz	Intel 815E Graphics Controller 32 MB	B&R
APC620 with INTEL 815E chipset				
10	Intel Celeron 3 400 MHz 100 MHz FSB	256 MD SDRAM 133 MHz	Intel 82815 Graphics Controller 32 MB	B&R
11	Intel Celeron 3 733 MHz 133 MHz FSB	512 MB SDRAM 133 MHz	Intel 82815 Graphics Controller 32 MB	B&R
12	Intel Celeron 3 1000 MHz 133 MHz FSB	512 MB SDRAM 133 MHz	Intel 82815 Graphics Controller 32 MB	B&R
APC620 with INTEL 855GME chipset				
13	Intel Celeron M 600 MHz 400 MHz FSB	256 MB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
14	Intel Celeron M 1000 MHz 400 MHz FSB	256 MB DDR-SDRAM PC2700 333MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
15	Intel Pentium M 1.1 GHz 400 MHz FSB	1 GB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
16	Intel Pentium M 1.4 GHz 400 MHz FSB	512 MB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
17	Intel Pentium M 1.6 GHz 400 MHz FSB	1 GB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
18	Intel Pentium M 1.8 GHz 400 MHz FSB	512 MB DDR-SDRAM PC2700 333 MHz	Intel 82855 GME Graphic Controller 64 MB	B&R
Other test computers				
19	Intel Pentium 4 2.4 GHz 533 MHz FSB	512 MB DDR-SDRAM 333 MHz	Intel 82865G Graphics Controller 96 MB	HP
20	Intel Pentium 4 2.6 GHz 533 MHz FSB	512 MB DDR-SDRAM 333 MHz	Sapphire ATI Radeon 9600 Atlantis 256 MB DDR	HP

Table 3: Devices being tested

2.2 Hard disks

No.	Name	Storage capacity	Rotary speed / cache	Manufacturer
ICP5000C hard disks				
1	Slide-In HD MHK2060AT	5.6 GB	4200 (rpm) / 512 KB	Fujitsu/B&R
APC620 hard disks				
2	Add-On HD MHT2020AC	20 GB	4200 (rpm) / 2MB	Fujitsu/B&R
3	Add-On HD MHT2030AR	30 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
4	Slide-In HD MHT2020AC	20 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
5	Slide-In HD MHT2030AR	30 GB	4200 (rpm) / 2 MB	Fujitsu/B&R
6	Travelstar	40 GB	7200 (rpm) / 8 MB	Hitachi
Reference hard disk				
7	ST340014A	40 GB	7200 (rpm) / 2 MB	Seagate

Table 4: Hard disks used

3 Software

The following software products were used for the tests:

3.1 Benchmark programs

No.	Name	Manufacturer	WEB link
1	Sandra 2002 Prof	Sisoft	http://www.sisoftware.net/
2	Sandra 2005 SR1 Lite	Sisoft	http://www.sisoftware.net/
3	PC Mark 2002	MadOnion.com Inc.	http://www.futuremark.com/
4	PC Mark04	Futuremark Coperation	http://www.futuremark.com/
5	WinBench99	ZD Net/Ziff-Davis	http://www.zdnet.de/
6	HDTACH V2.70	Simpli Software	http://www.simplisoftware.com/
7	3D Mark 2000	MadOnion.com Inc.	http://www.futuremark.com/
8	3D Mark 2001SE	MadOnion.com Inc.	http://www.futuremark.com/

Table 5: Benchmark programs used and the corresponding WEB links

3.2 Operating system

Windows 98 was used as the operating system for IPC2001 computers.
Microsoft Windows XP Professional SP2 was used for all other computers.

4 Results

4.1 Sisoft Sandra 2002 Prof.

Sisoft Sandra provides many different tests.
For this reason, Sandra has become a very popular benchmark program and is used in nearly all performance tests.

4.1.1 CPU arithmetic

Here, the program determines the maximum number of operations per second. The result is output in MIPS (Million Instructions per Second).
At the same time, the maximum number of floating point operations per second is also determined. The result is shown in MFLOPS (Million Floating Point Operations per Second).

No.	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
VIA CPUs			
	VIA M6000, 600MHz	771[1]	210[1]
	VIA M10000, 1000 MHz	1592[1]	367[1]
Power Panel			
1	Geode 266 MHz, 128 MB RAM	329	202
IPC2001 computer			
2	AMD 486DX2 66 MHz 8 MB DRAM	85	30
3	AMD 486DX5 133 MHz 32 MB DRAM	169	60
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	1513	765
5	Celeron 3 850 MHz, 256 MB SDRAM	2267	1149
6	Pentium 3 600 MHz, 256 MB SDRAM	1614	810
7	Pentium 3 850 MHz, 256 MB SDRAM	2267	1149
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	2283	1147
9	Pentium 3 1.26 GHz, 256 MB SDRAM	3482	1697
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	1086	529
11	Celeron 3 733 MHz, 512 MB SDRAM	2002	976
12	Celeron 3 1 GHz, 256 MB SDRAM	2751	1340
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	2008	1170
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	3533	1948
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	4580	2149
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	4945	2732
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	5363	3124
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	6370	3511

[1] Source: Tolly Group

No.	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	4634	2955
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	5168	3305

Table 6: Results for Sisoft Sandra 2002 Prof. CPU arithmetic

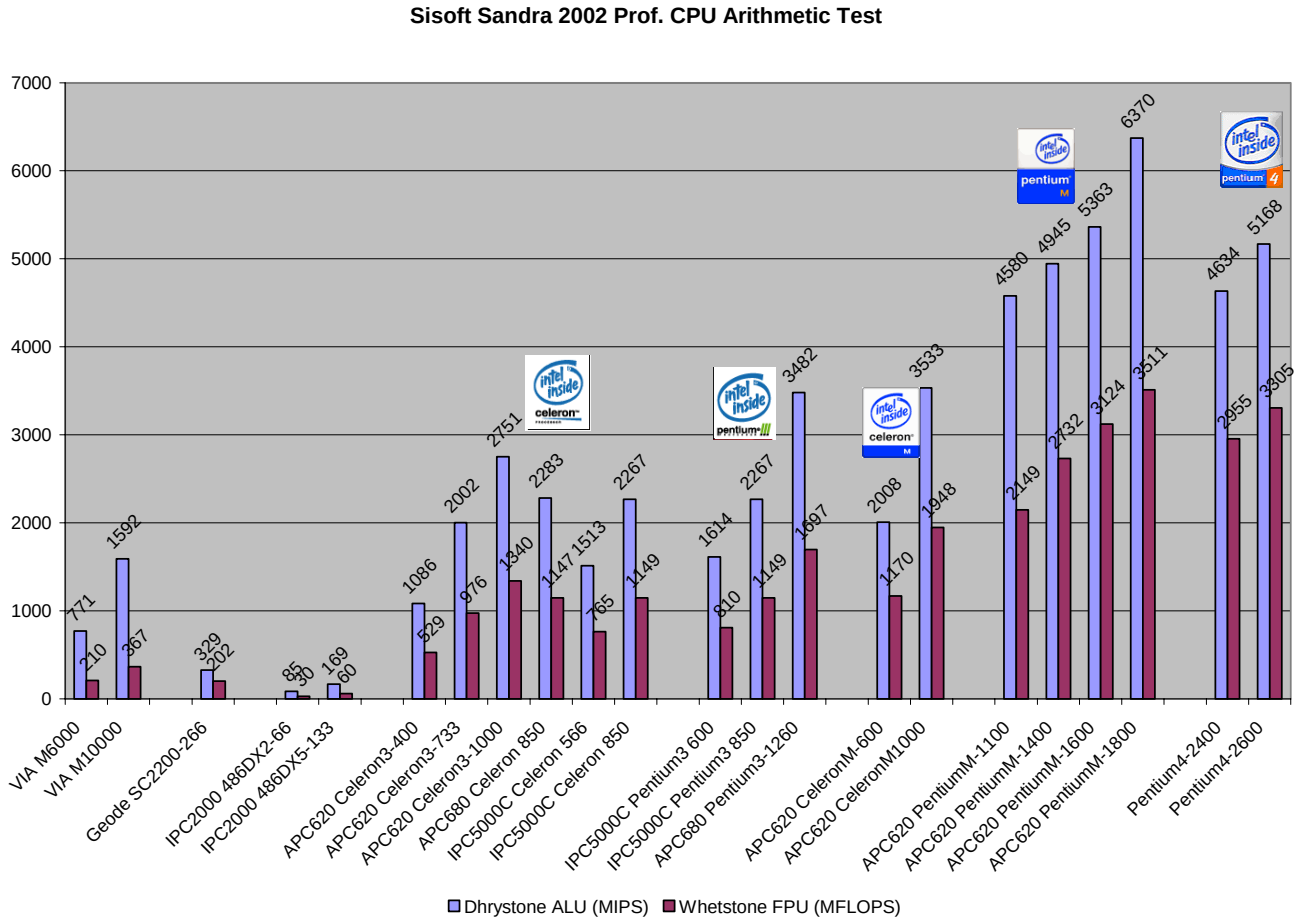

Image 1 - Results for Sisoft Sandra 2002 Prof. CPU arithmetic

4.1.2 CPU multimedia

This test determines the multimedia performance of the CPU. During this test, the speed and performance are checked for the technologies used, such as MMX, SSE, SSE2 (depending on the processor).

No.	Test device	Integer (it/s)	Floating Point (it/s)
VIA CPUs			
	VIA M6000, 600MHz	874[2]	1196[2]
	VIA M10000, 1000 MHz	2255[2]	1196[2]
Power Panel			
1	Geode 266 MHz, 128 MB RAM	412	118
IPC2001 computer			
2	AMD 486DX2 66 MHz 8 MB DRAM	22	18
3	AMD 486DX5 133 MHz 32 MB DRAM	44	36
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	3084	3772
5	Celeron 3 850 MHz, 256 MB SDRAM	4628	5661
6	Pentium 3 600 MHz, 256 MB SDRAM	3265	3995
7	Pentium 3 850 MHz, 256 MB SDRAM	4629	5663
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	4621	5654
9	Pentium 3 1.26 GHz, 256 MB SDRAM	6884	8545
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	2147	2665
11	Celeron 3 733 MHz, 512 MB SDRAM	3957	4913
12	Celeron 3 1 GHz, 256 MB SDRAM	4652	6153
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	2662	3839
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	4284	6381
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	4814	7038
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	6009	8951
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	7002	10254
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	7724	11504
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	9386	11608
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	10400	12905

Table 7: Results for Sisoft Sandra 2002 Prof CPU multimedia

[2] Source: Tolly Group

Sisoft Sandra 2002 Prof. CPU Multimedia

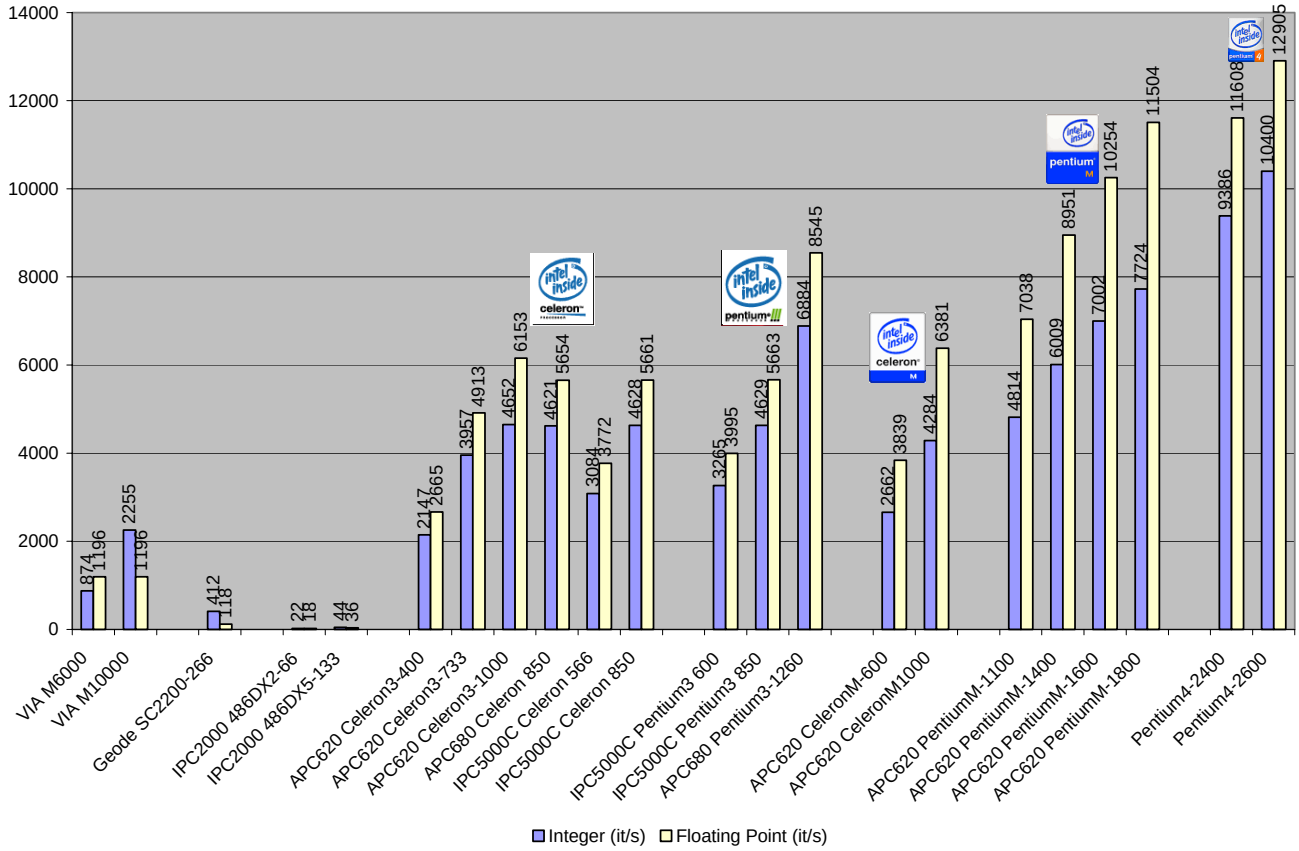

Image 1 – Results for Sisoft Sandra 2002 Prof. CPU multimedia

4.1.3 Memory bandwidth

The performance of the system memory (main memory) is determined here. This is done by transferring a large amount of data. The result is the maximum "memory throughput" in MB/s.

No.	Test device	RAM Bandwidth ALU (MB/s)	RAM Bandwidth FPU (MB/s)
VIA CPUs			
	VIA M6000, 600MHz	215[3]	243[3]
	VIA M10000, 1000 MHz	215[3]	243[3]
Power Panel			
1	Geode 266 MHz, 128 MB RAM	101	95
IPC2001 Rechner			
2	AMD 486DX2 66 MHz 8 MB DRAM	29	30
3	AMD 486DX5 133 MHz 32 MB DRAM	35	37
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	429	455
5	Celeron 3 850 MHz, 256 MB SDRAM	428	428
6	Pentium 3 600 MHz, 256 MB SDRAM	427	428
7	Pentium 3 850 MHz, 256 MB SDRAM	558	428
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	584	570
9	Pentium 3 1.26 GHz, 256 MB SDRAM	762	752
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	409	401
11	Celeron 3 733 MHz, 512 MB SDRAM	675	664
12	Celeron 3 1 GHz, 256 MB SDRAM	650	646
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1326	1340
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1395	1401
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	1353	1372
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	1396	1401
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	1439	1411
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	1601	1600
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	1973	1948
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	3201	3206

Table 8: Results for Sisoft Sandra 2002 Prof CPU memory bandwidth

[3] Source: Tolly Group

Sisoft Sandra 2002 Prof. Memory Bandwidth

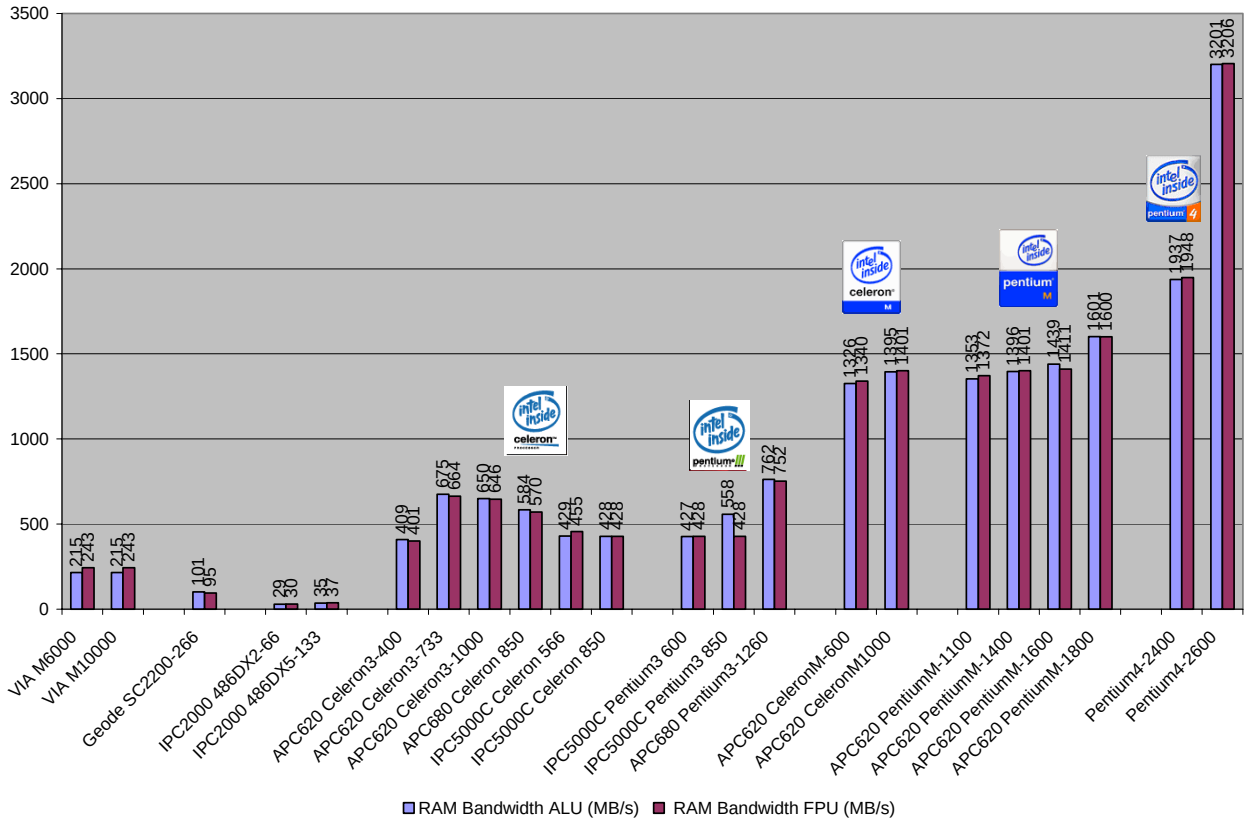

Image 2 – Results for Sisoft Sandra 2002 Prof memory bandwidth

4.2 Sisoft Sandra 2005 SR1

Sisoft Sandra 2005 is the most current version of Sandra and supports the newest technologies (such as SSE3).

4.2.1 CPU arithmetic

Here, the program determines the maximum number of operations per second. The result is output in MIPS (Million Instructions per Second).
At the same time, the maximum number of floating point operations per second is also determined. The result is shown in MFLOPS (Million Floating Point Operations per Second).

No.	Test device	Dhrystone ALU (MIPS)	Whetstone FPU (MFLOPS)
Power Panel			
1	Geode 266 MHz, 128 MB RAM	407	170
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	1928	743
5	Celeron 3 850 MHz, 256 MB SDRAM	2896	1122
6	Pentium 3 600 MHz, 256 MB SDRAM	2019	788
7	Pentium 3 850 MHz, 256 MB SDRAM	2913	1128
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	2901	1119
9	Pentium 3 1.26 GHz, 256 MB SDRAM	4348	1731
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	1344	536
11	Celeron 3 733 MHz, 512 MB SDRAM	2483	989
12	Celeron 3 1 GHz, 256 MB SDRAM	3432	1367
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	2481	1064
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	4304	1776
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	4580	1532
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	6035	1947
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	6566	2844
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	7758	3204
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	6325	3212
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	7044	3577

Table 9: Results for Sisoft Sandra 2005 SR1. CPU arithmetic

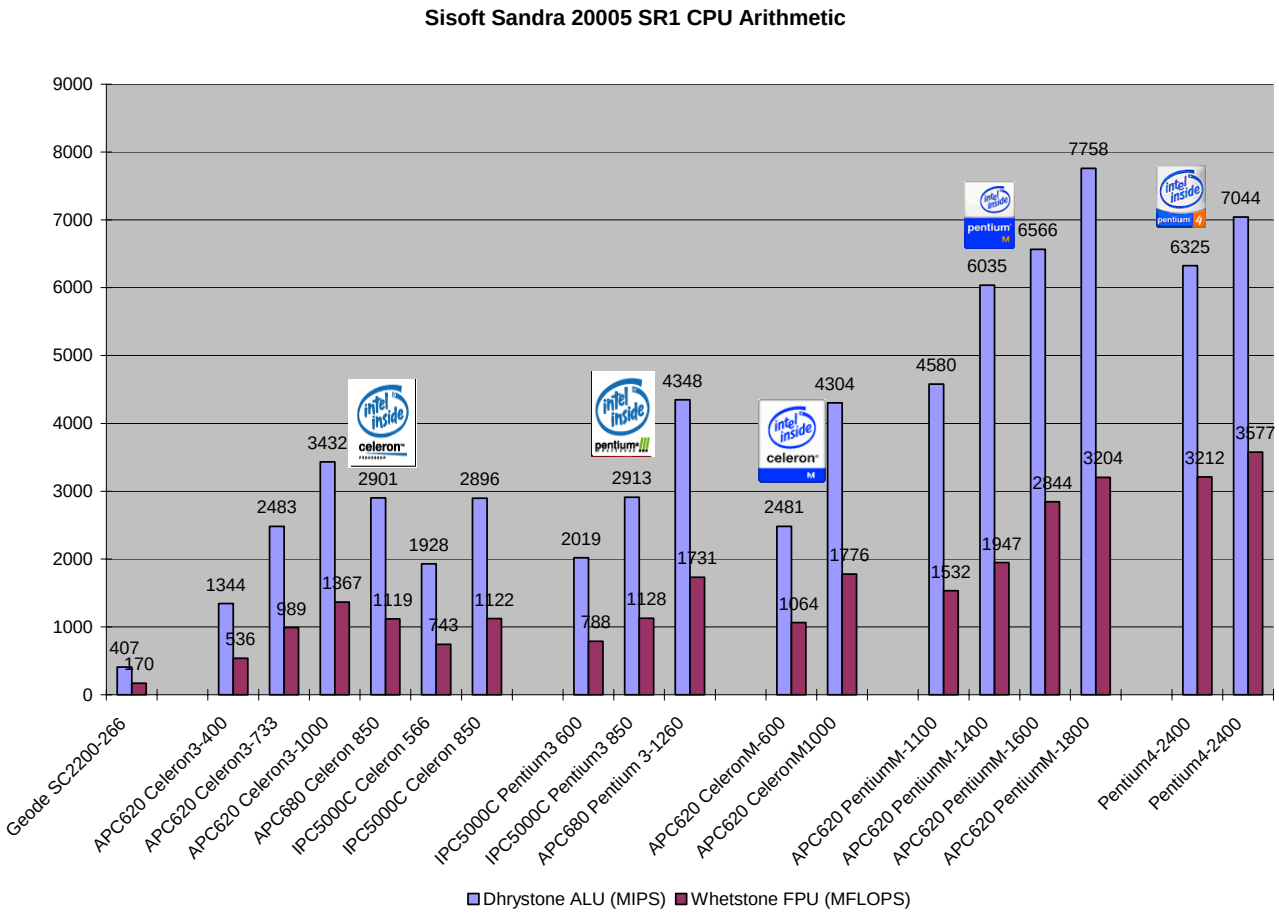

Image 3 – Results for Sisoft Sandra 2005 SR1. CPU arithmetic

Information:

IPC2001 computers are not included in this test because Sisoft Sandra 2005 SR1 is not supported by Windows 98.

4.2.2 CPU multimedia

This test determines the multimedia performance of the CPU. During this test, the speed and performance are checked for the technologies used, such as MMX, SSE, SSE2, SSE3 (depending on the processor).

No.	Test device	Integer (it/s)	Floating Point (it/s)
Power Panel			
1	Geode 266 MHz, 128 MB RAM	733	156
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	4621	5820
5	Celeron 3 850 MHz, 256 MB SDRAM	6959	8755
6	Pentium 3 600 MHz, 256 MB SDRAM	4910	6159
7	Pentium 3 850 MHz, 256 MB SDRAM	6985	8789
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	6978	8788
9	Pentium 3 1.26 GHz, 256 MB SDRAM	11053	13311
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	3419	4118
11	Celeron 3 733 MHz, 512 MB SDRAM	6314	7601
12	Celeron 3 1 GHz, 256 MB SDRAM	8721	10502
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	5696	6258
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	9523	10490
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	10475	11522
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	13349	14707
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	15228	16755
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	17159	18904
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	14676	18351
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	16464	20635

Table 10: Results for Sisoft Sandra 2005 SR1. CPU multimedia

Sisoft Sandra 2005 SR1 CPU Multimedia

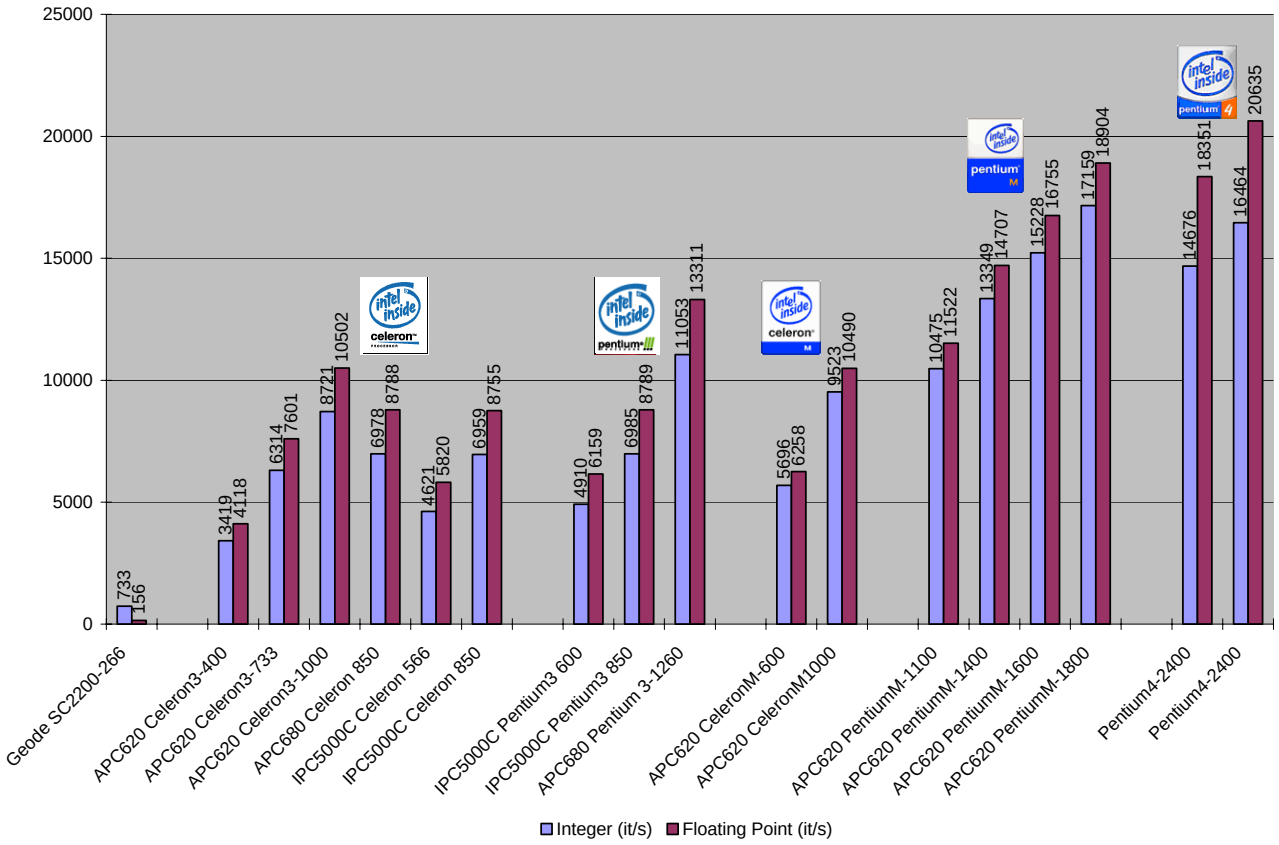

Image 4 – Results for Sisoft Sandra 2005 SR1. CPU multimedia

Information:

IPC2001 computers are not included in this test because Sisoft Sandra 2005 SR1 is not supported by Windows 98.

4.2.3 Memory bandwidth

The performance of the system memory (main memory) is determined here. This is done by transferring a large amount of data. The result is the maximum "memory throughput" in MB/s.

No.	Test device	RAM Bandwidth ALU (MB/s)	RAM Bandwidth FPU (MB/s)
Power Panel			
1	Geode 266 MHz, 128 MB RAM	96	92
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	425	449
5	Celeron 3 850 MHz, 256 MB SDRAM	558	428
6	Pentium 3 600 MHz, 256 MB SDRAM	503	428
7	Pentium 3 850 MHz, 256 MB SDRAM	428	429
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	585	570
9	Pentium 3 1.26 GHz, 256 MB SDRAM	753	742
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	407	401
11	Celeron 3 733 MHz, 512 MB SDRAM	610	601
12	Celeron 3 1 GHz, 256 MB SDRAM	700	694
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1761	1761
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1751	1754
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	1713	1705
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	1824	1820
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	1942	1949
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	1977	1977
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	1983	1987
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	3204	3211

Table 11: Results for Sisoft Sandra 2005 SR1. CPU memory bandwidth

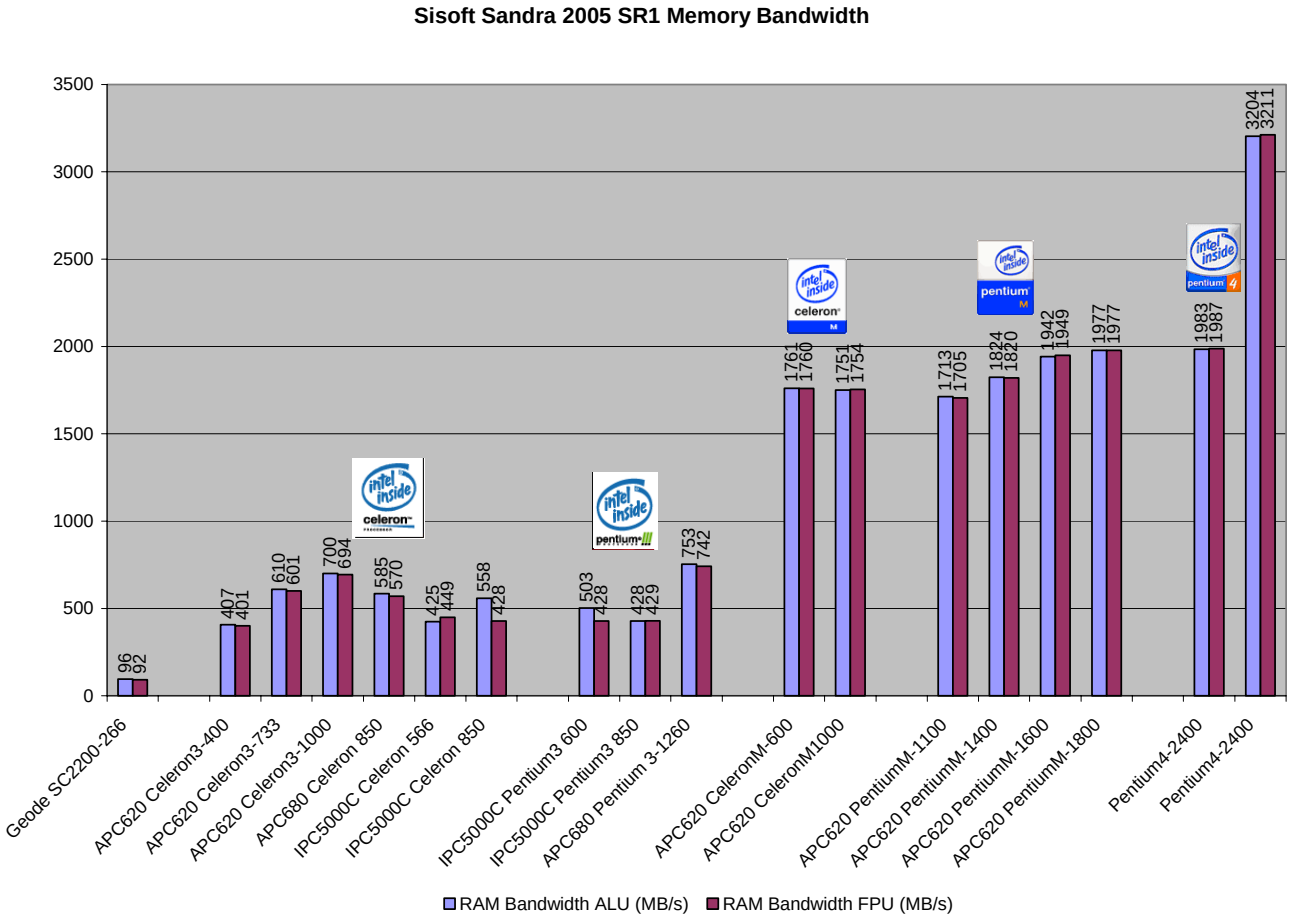

Image 5 – Results for Sisoft Sandra 2005 SR1. Memory bandwidth

Information:

IPC2001 computers are not included in this test because Sisoft Sandra 2005 SR1 is not supported by Windows 98.

4.3 PCMark2002

PCMark2002 is a current benchmark that has many users and is therefore very good for comparing PC systems. It supports both new and older processors and, for this reason, provides a very good overview of the performance of various systems.
PCMark2002 tests the following system components:

- The CPU => both Integer and FPU
- Memory subsystems => main memory, L1 & L2 cache
- Graphics card => graphics card memory and AGP bus
- Hard drive
- Microsoft Windows XP GUI (Graphic User Interface)
- Video performance and quality
- Laptop battery (if PC Mark is being used on a laptop)

No.	Test device	CPU (points)	Memory (points)
VIA CPUs			
	VIA M6000, 600MHz	584[4]	677[4]
	VIA M10000, 1000 MHz	1119[4]	869[4]
Power Panel			
1	Geode 266 MHz, 128 MB RAM	284	354
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	1480	737
5	Celeron 3 850 MHz, 256 MB SDRAM	2142	1045
6	Pentium 3 600 MHz, 256 MB SDRAM	1649	991
7	Pentium 3 850 MHz, 256 MB SDRAM	2256	1145
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	1992	958
9	Pentium 3 1.26 GHz, 256 MB SDRAM	3892	2036
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	1227	762
11	Celeron 3 733 MHz, 512 MB SDRAM	2225	1126
12	Celeron 3 1 GHz, 256 MB SDRAM	2968	1187
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1964	2593
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	3314	3201
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	3572	3710
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	4705	4694
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	5246	4727
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	6070	6121
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	5772	4849
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	6519	6678

Table 12: Results for PCMark2002

[4] Source: Tolly Group

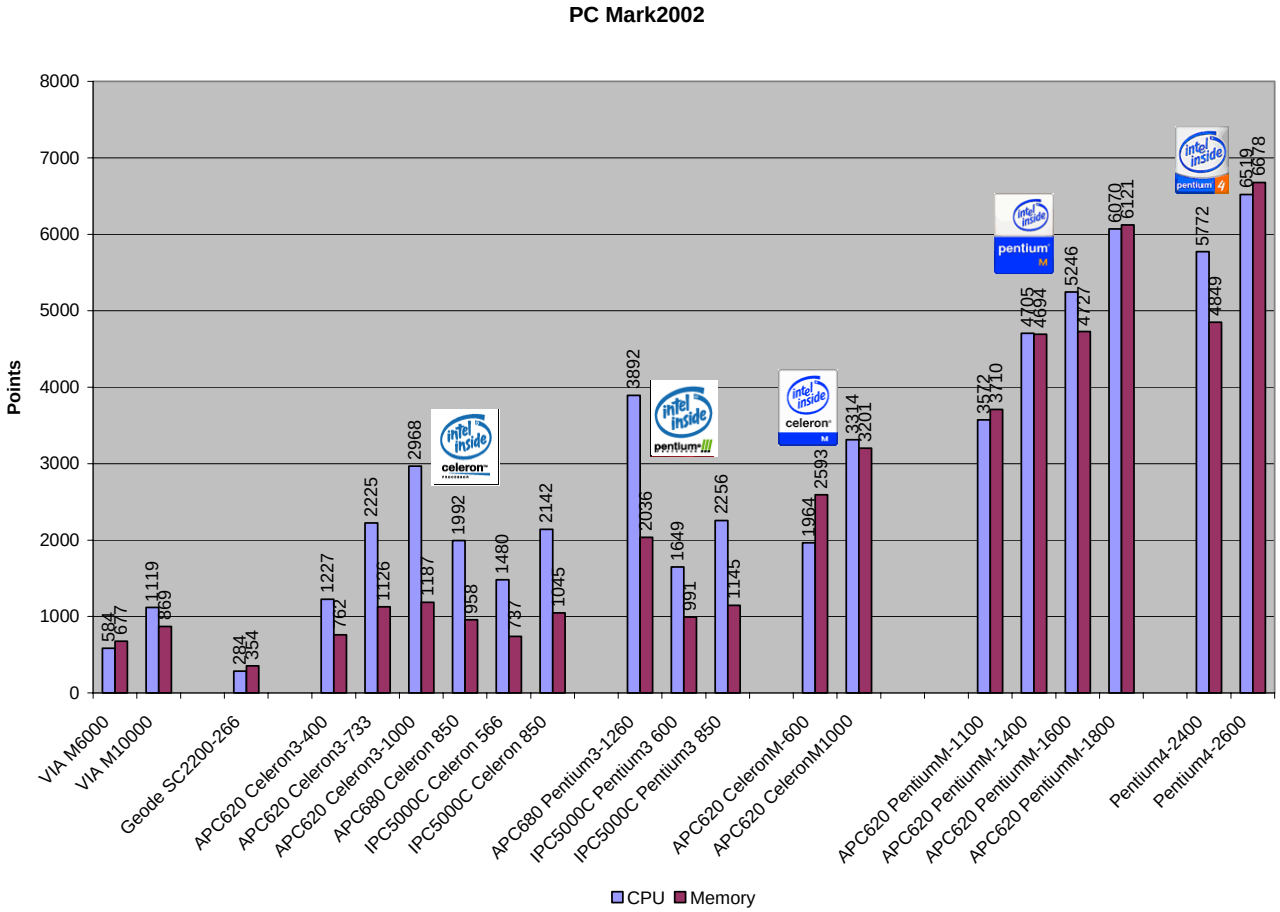

Image 6 – Results for PCMark2002

Information:

IPC2001 computers are not included in this test because PC Mark 2002 requires at least a CPU with MMX technology.

4.4 PCMark04

PCMark04 is a benchmark from the newest generation. This program tests and supports the newest technologies (e.g. HT, SSE3) and takes the system to the limit of its performance.
The test criteria for PCMark04 are similar to the ones for PCMark2002.
All components tested with PCMark2002 are also tested with PCMar2004, however PCMark2004 determines the results with the help of coding and decoding processes for the individual media codecs (e.g. DivX, WMV Codec, etc.)
The manufacturer explicitly states that the test results from PCMark2002 and PCMar04 are not (!!!) comparable!
In addition, all systems can no longer be tested with this program.

The system must meet the following requirements (and others):

- Intel or AMD processor > 1 GHz
- At least 128 MB RAM
- Full DirectX 7 compatible graphics card
- Windows Media Player 9.0 + MS Encoder 9.0
- Microsoft Internet Explorer 6

No.	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	Not supported
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	Not supported
5	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
6	Pentium 3 600 MHz, 256 MB SDRAM	Not supported
7	Pentium 3 850 MHz, 256 MB SDRAM	Not supported
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
9	Pentium 3 1.26 GHz, 256 MB SDRAM	Not supported
APC620 with INTEL 815 E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	Not supported
11	Celeron 3 733 MHz, 512 MB SDRAM	Not supported
12	Celeron 3 1000 MHz, 256 MB SDRAM	Not supported
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1326
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1826
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	1961
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	2461
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	2640
18	Pentium M 1,8 GHz, 512 MB DDR-SDRAM	2993
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	2608
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	3452

Table 13: Results for PCMark04

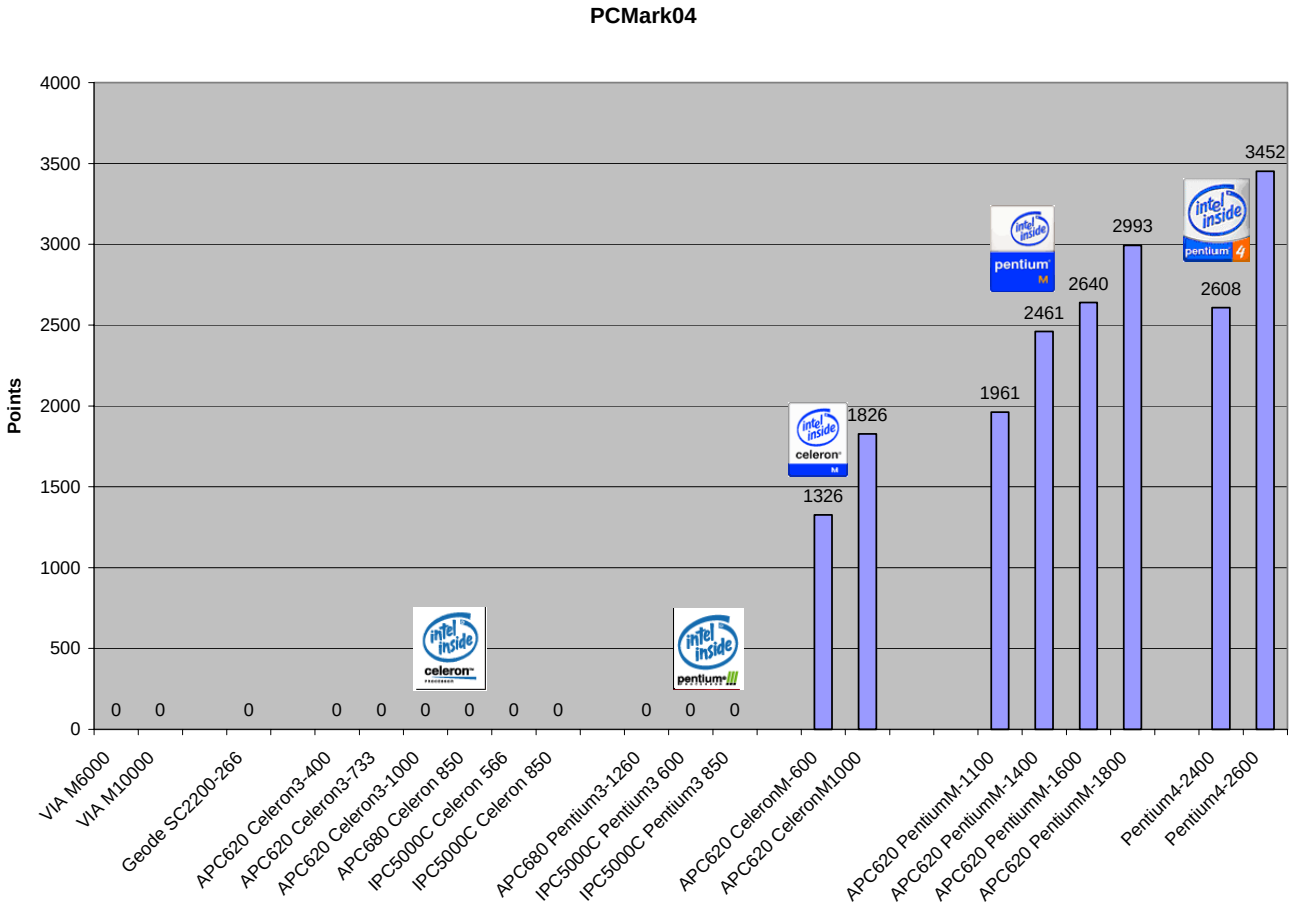

Image 7 – Results for PCMark04

Information:

PCMark04 requires a graphics card that is fully DirectX7 compatible. This requirement is only met by the APC620 computers with an Intel 855GME chipset.
Therefore there are no test results for Power Panel, IPC2001, IPC5000C, APC680 and APC620 (with Intel 815 E).

4.5 Winbench99

WinBench99 was developed together with ZD Net. However, the development was stopped in the middle of 2000.
Up to that point, WinBench was an important tool for comparing the performance measurements of PC systems. WinBench99 offers many subprograms that analyze certain aspects of the systems.
This program was used to create comparison values for "older" systems.

4.5.1 CPUMark99

CPUMark99 is a test that determines the computing power of the CPU. All arithmetic units on the CPU. As a result, the program calculates a number of points that can be used for further comparison.

No.	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	7.08
IPC2001 computer		
2	AMD 486DX2 66MHz, 8MB DRAM	3.21
3	AMD 486DX5 133 MHz, 32 MB DRAM	4.19
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	43.6
5	Celeron 3 850 MHz, 256 MB SDRAM	64.7
6	Pentium 3 600 MHz, 256 MB SDRAM	56.9
7	Pentium 3 850 MHz, 256 MB SDRAM	76.1
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	57.2
9	Pentium 3 1.26 GHz, 256 MB SDRAM	112
APC620 with INTEL 815 E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	37.3
11	Celeron 3 733 MHz, 512 MB SDRAM	64.1
12	Celeron 3 1000 MHz, 256 MB SDRAM	85.8
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	66.4
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	111
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	127
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	171
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	184
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	220
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	Not supported
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	Not supported

Table 14: Results for WinBench99 CPUMark99

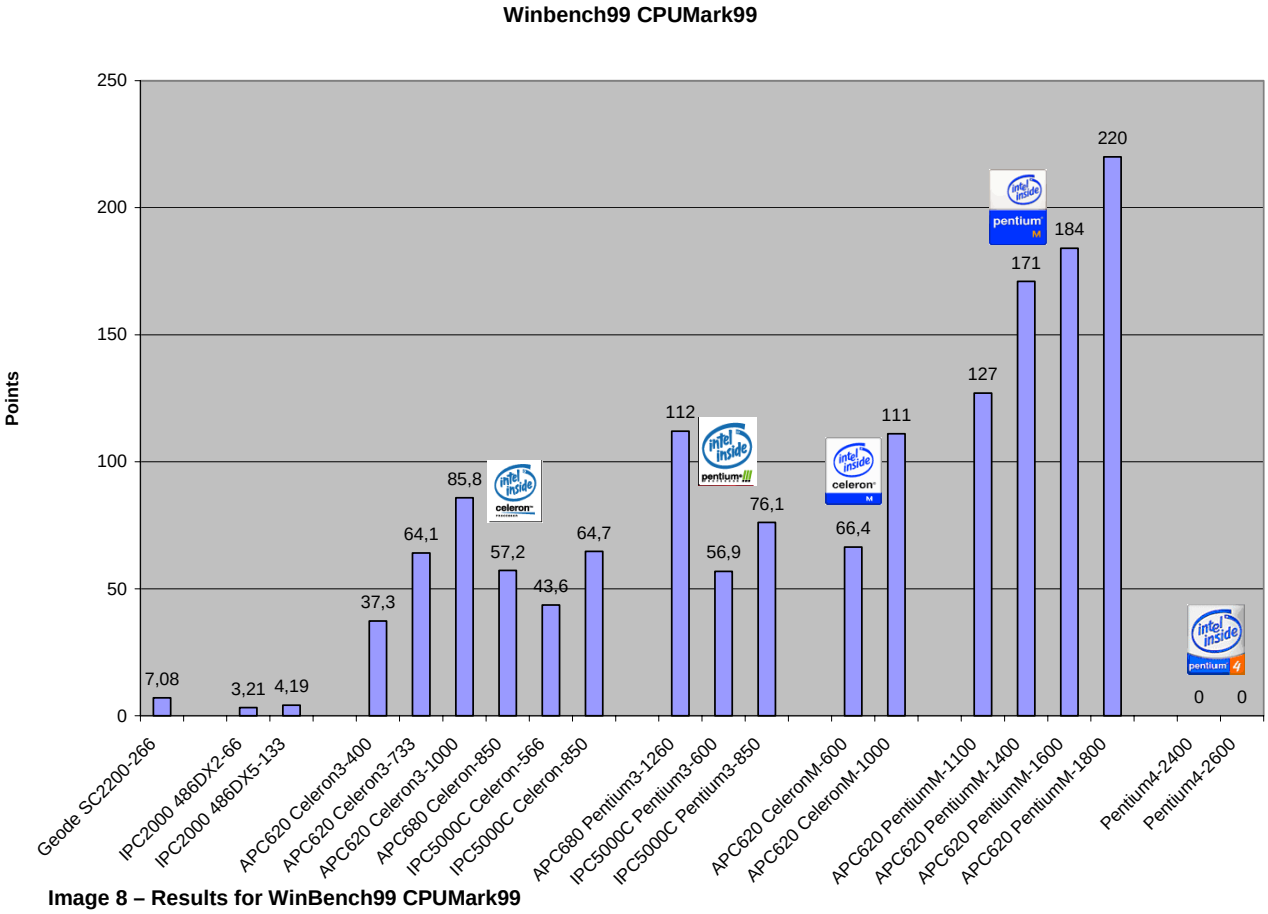

Image 8 – Results for WinBench99 CPUMark99

Information:

Winbench99 could not be executed on Pentium 4 systems because the program had a problem with the CPU frequency.

4.5.2 FPUWinMark

As a special feature, FPUWinMark tests the FPU of the CPU being used. The speed and computing power, among other things, are determined. As a test result, the program calculates a number of points that can be used for further comparison.

No.	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	488
IPC2001 computer		
2	AMD 486DX2 66MHz, 8MB DRAM	93.5
3	AMD 486DX5 133 MHz, 32 MB DRAM	180
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	3000
5	Celeron 3 850 MHz, 256 MB SDRAM	4410
6	Pentium 3 600 MHz, 256 MB SDRAM	3190
7	Pentium 3 850 MHz, 256 MB SDRAM	4510
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	4510
9	Pentium 3 1.26 GHz, 256 MB SDRAM	6890
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	2160
11	Celeron 3 733 MHz, 512 MB SDRAM	3950
12	Celeron 3 1000 MHz, 256 MB SDRAM	5430
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	3310
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	5590
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	6100
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	7830
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	8870
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	10100
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	Not supported
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	Not supported

Table 15: Results for WinBench99 FPUWinMark

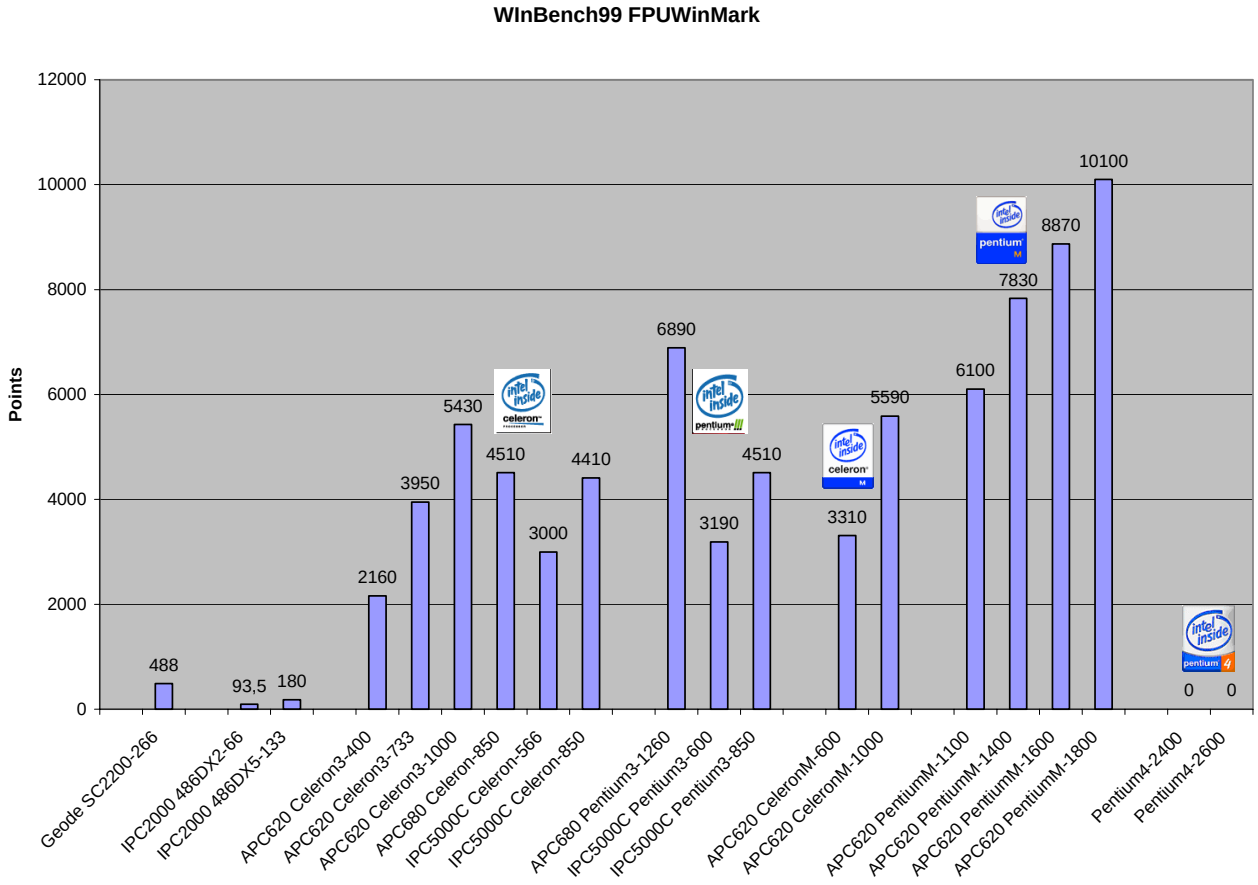

Image 9 – Results for WinBench99 FPUWinMark

Information:

Winbench99 could not be executed on Pentium 4 systems because the program had a problem with the CPU frequency.

4.5.3 Direct Draw

With this test, the system is continually checked to determine how fast and how correct moving 2D/3D graphics are animated. All supported resolutions and color depths are determined and tested.
The frames per second are measured. The maximum value reached is recorded at the end of the test report.

No.	Test device	Direct Draw resolution 640x480	Direct Draw resolution 800x600
Power Panel			
1	Geode 266 MHz, 128 MB RAM	38,8	38,3
IPC2001 computer			
2	AMD 486DX2 66 MHz 8 MB DRAM	11,2	9,3
3	AMD 486DX5 133 MHz 32 MB DRAM	12,9	10,3
IPC5000C computer			
4	Celeron 3 566 MHz, 256 MB SDRAM	84,5	83
5	Celeron 3 850 MHz, 256 MB SDRAM	85,2	84,1
6	Pentium 3 600 MHz, 256 MB SDRAM	85,4	83,7
7	Pentium 3 850 MHz, 256 MB SDRAM	141	138
APC680 with INTEL 815E chipset			
8	Celeron 3 850 MHz, 256 MB SDRAM	273	265
9	Pentium 3 1.26 GHz, 256 MB SDRAM	292	288
APC620 with INTEL 815E chipset			
10	Celeron 3 400 MHz, 256 MB SDRAM	268	256
11	Celeron 3 733 MHz, 512 MB SDRAM	354	338
12	Celeron 3 1 GHz, 256 MB SDRAM	359	345
APC620 with INTEL 855GME chipset			
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	542	538
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	946	900
15	Pentium M 1.1 GHz, 1GB DDR-SDRAM	1190	1200
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	1290	1290
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	1439	1411
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	1410	1390
Other test computers			
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	Not supported	Not supported
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	Not supported	Not supported

Table 16: Results for WinBench99 Direct Draw

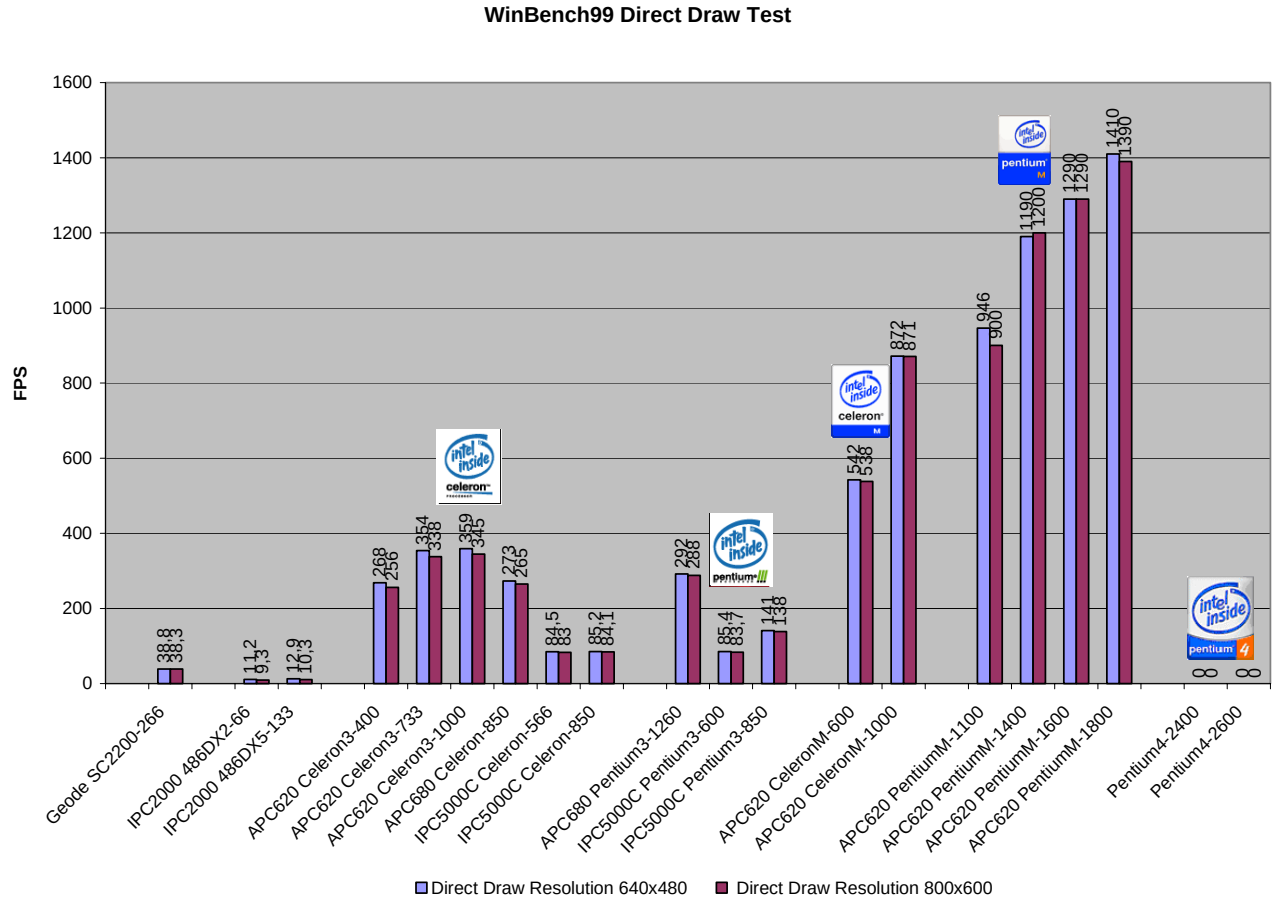

Image 10 – Results for WinBench99 Direct Draw

Information:

Winbench99 could not be executed on Pentium 4 systems because the program had a problem with the CPU frequency.

4.5.4 Disk Inspection Test

During this test, the speed of the memory media being used (hard disk, CF, etc.) is determined. When doing this, the program writes a large amount of data to the memory and determines the data transfer rates in the individual sectors. The transfer rates reached are shown in a diagram during the test. The final result contains the maximum and the minimum data transfer rate as well as the average access time

No.	Test device	Data rate - start (MB/s)	Data rate - end (MB/s)	Access time (ms)
ICP5000C hard disks				
1	5.6 GB Fujitsu Slide-In (4200 rpm)	15.3	9.3	20.6
APC620 hard disks				
2	20 GB Fujitsu ADD ON (4200 rpm)	20.4	17.9	16
3	30 GB Fujitsu ADD ON (4200 rpm)	24.9	13.2	20
4	20 GB Fujitsu Slide-In (4200 rpm)	20.3	14	18.8
5	30 GB Fujitsu Slide-In (4200 rpm)	24.9	13.3	19.6
6	40 GB Hitachi Travelstar (7200 rpm)	60.3	31.2	13.2
Reference HDD				
7	40 GB Seagate ST340014A (7200 rpm)	Not supported	Not supported	Not supported

Table 17: Results for WinBench99 Disk Inspection Test

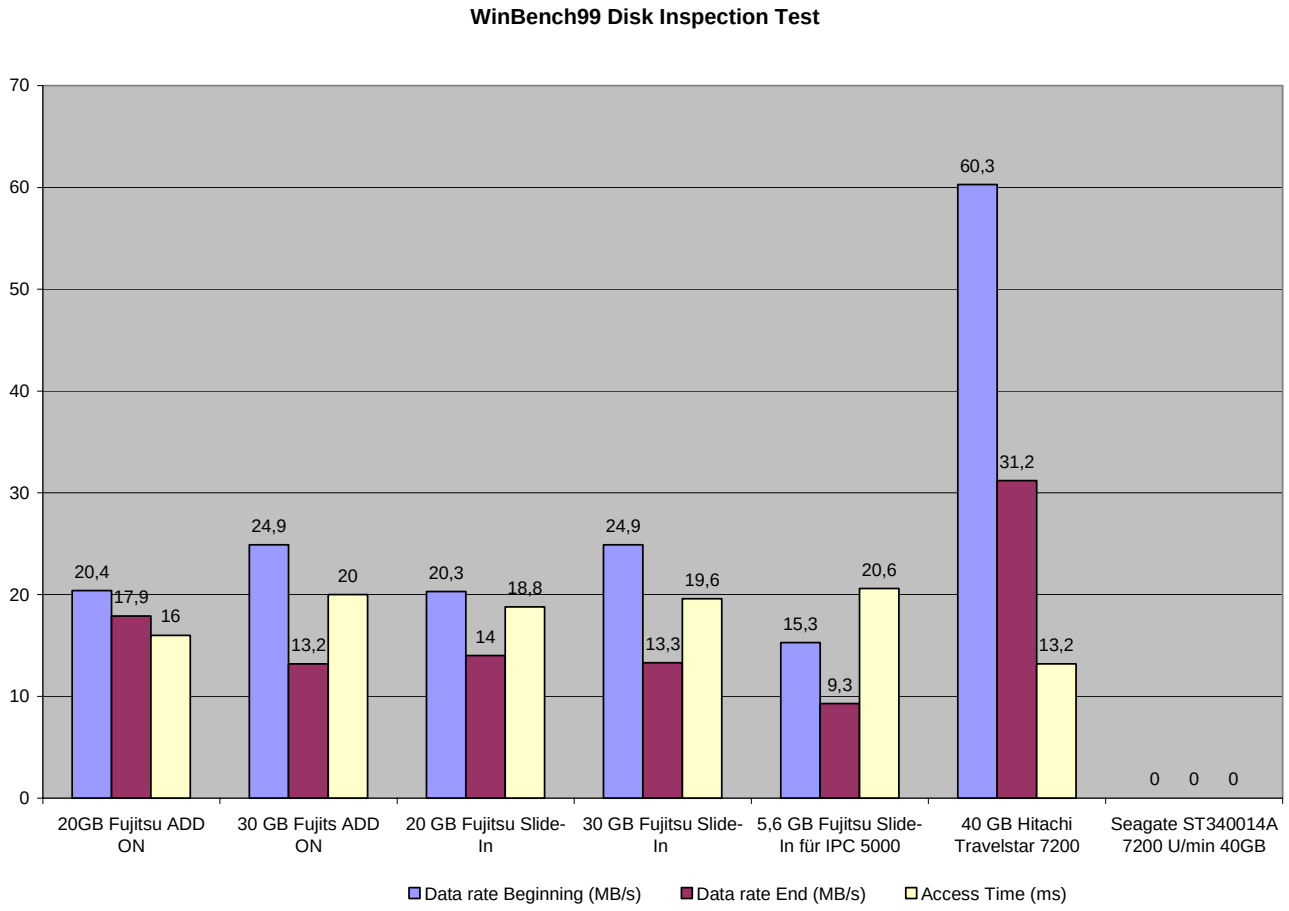

Image 11 – Results for WinBench99 Disc Inspection Test

Information:

There are no results for the reference HDD because WinBench99 had a problem with the CPU frequency for the computer. Therefore the test could not be completed.

4.5.5 High End Disk WinMark99

This test determines the performance of the memory media under certain conditions. The program simulates individual applications (e.g. Frontpage98, VisualC++ 5.0, etc.) and determines the maximum data transfer rate in the individual environments.
As test result, the program provides the average of the data transfer rates achieved. These values can be used for comparison.

No.	Test device	KBytes/s
ICP5000C hard disks		
1	5.6 GB Fujitsu Slide-In (4200 rpm)	5640
APC620 hard disks		
2	20 GB Fujitsu ADD ON (4200 rpm)	10400
3	30 GB Fujitsu ADD ON (4200 rpm)	12400
4	20 GB Fujitsu Slide-In (4200 rpm)	12400
5	30 GB Fujitsu Slide-In (4200 rpm)	13400
6	40 GB Hitachi Travelstar (7200 rpm)	22200
Reference HDD		
7	40 GB Seagate ST340014A (7200 rpm)	Not supported

Table 18: Results for WinBench99 High End Disk WinMark99

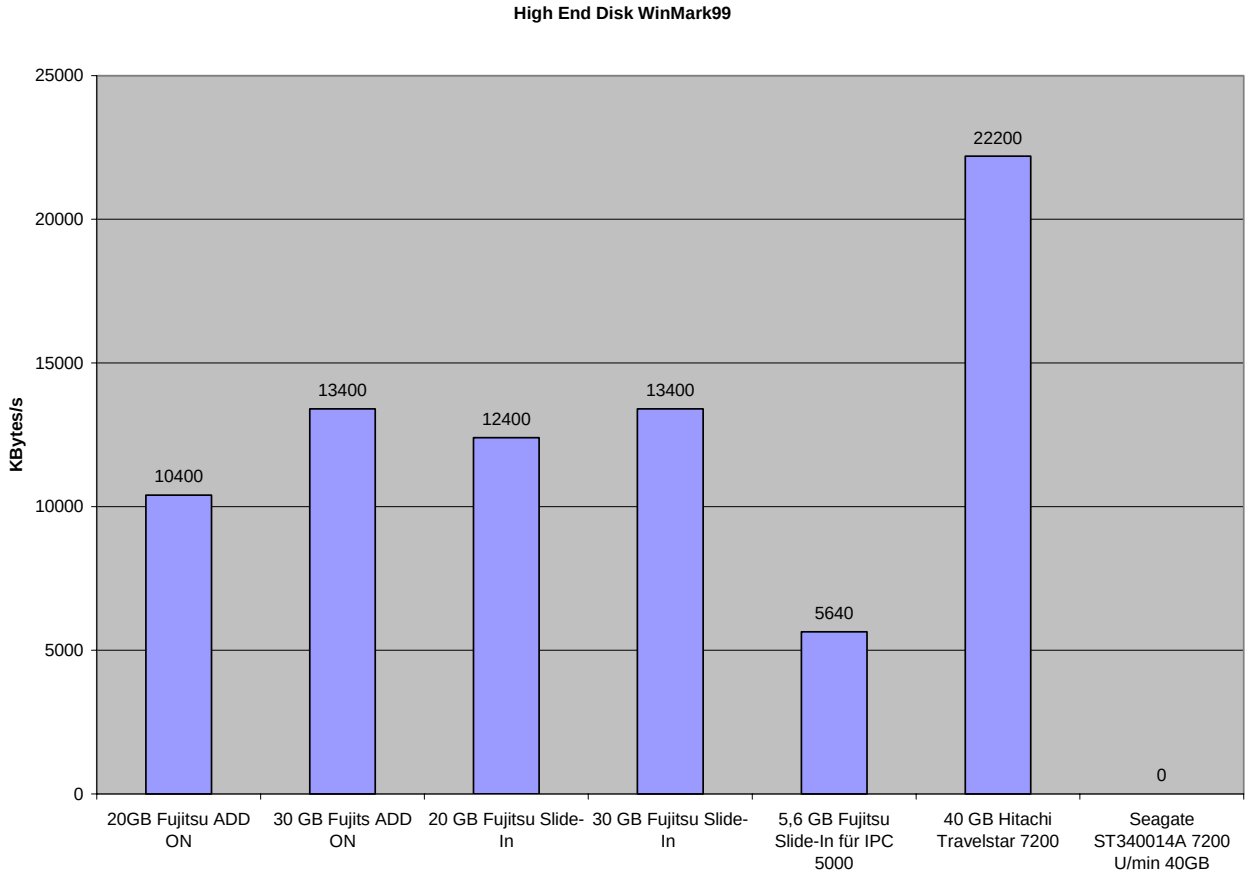

Image 12 – Results for WinBench99 High End Disk WinMark99

Information:

There are no results for the reference HDD because WinBench99 had a problem with the CPU frequency for the computer. Therefore the test could not be completed.

4.5.6 Business Disk WinMark99

During this test, the memory media is tested especially for the performance for office and business application. As a result, an average data rate is determined that can be used for comparison.

No.	Test device	KBytes/s
ICP5000C hard disks		
1	5.6 GB Fujitsu Slide-In (4200 rpm)	1730
APC620 hard disks		
2	20 GB Fujitsu ADD ON (4200 rpm)	3370
3	30 GB Fujitsu ADD ON (4200 rpm)	3370
4	20 GB Fujitsu Slide-In (4200 rpm)	3920
5	30 GB Fujitsu Slide-In (4200 rpm)	3920
6	40 GB Hitachi Travelstar (7200 rpm)	4800
Reference HDD		
7	40 GB Seagate ST340014A (7200 rpm)	Not supported

Table 19: Results for WinBench99 Business Disk Winmark99

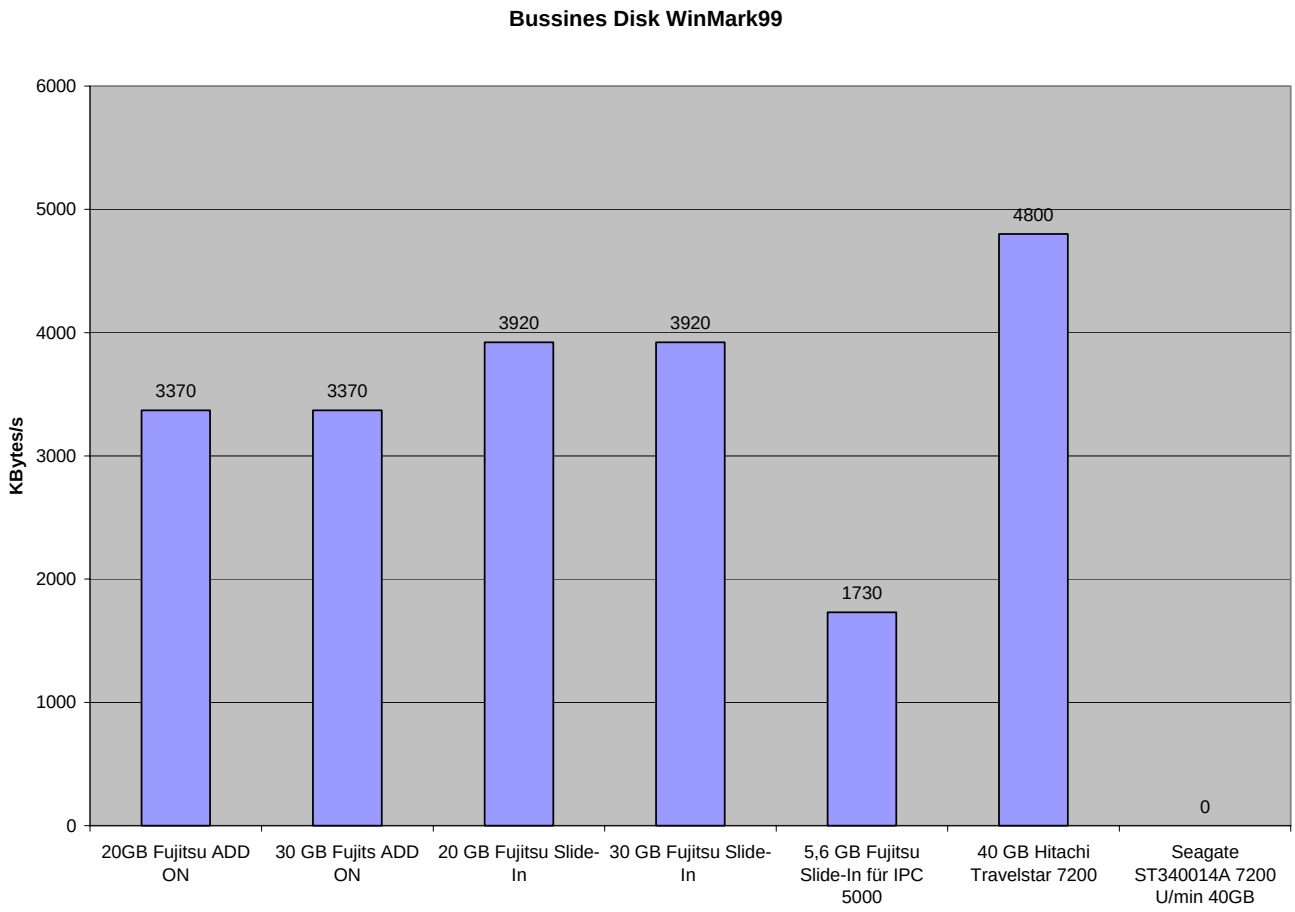

Image 13 – Results for WinBench99 Business Disk WinMark99

Information:

There are no results for the reference HDD because WinBench99 had a problem with the CPU frequency for the computer. Therefore the test could not be completed.

4.6 HDTACH Version 2.70

HDTACH is a tool that can be used to determine the data transfer rate of memory media (e.g. hard disk). When doing this, the data is read from the media and the maximum, minimum and average data rate is output as the result.

4.6.1 HDTACH read speed

No.	Test device	Maximum data rate (MB/s)	Average data rate (MB/s)	Minimum data rate (MB/s)
ICP5000C hard disks				
1	5.6 GB Fujitsu Slide-In (4200 rpm)	16	12.4	2.3
APC620 hard disks				
2	20 GB Fujitsu ADD ON (4200 rpm)	20.6	17.5	13.5
3	30 GB Fujitsu ADD ON (4200 rpm)	26	20.4	12.1
4	20 GB Fujitsu Slide-In (4200 rpm)	20.6	17.6	13.3
5	30 GB Fujitsu Slide-In (4200 rpm)	26	20.3	12.1
6	40 GB Hitachi Travelstar (7200 rpm)	39.9	34.5	26.7
Reference HDD				
7	40 GB Seagate ST340014A (7200 rpm)	62.2	47.1	30.4

Table 20: Results for HDTACH 2.70 read speed

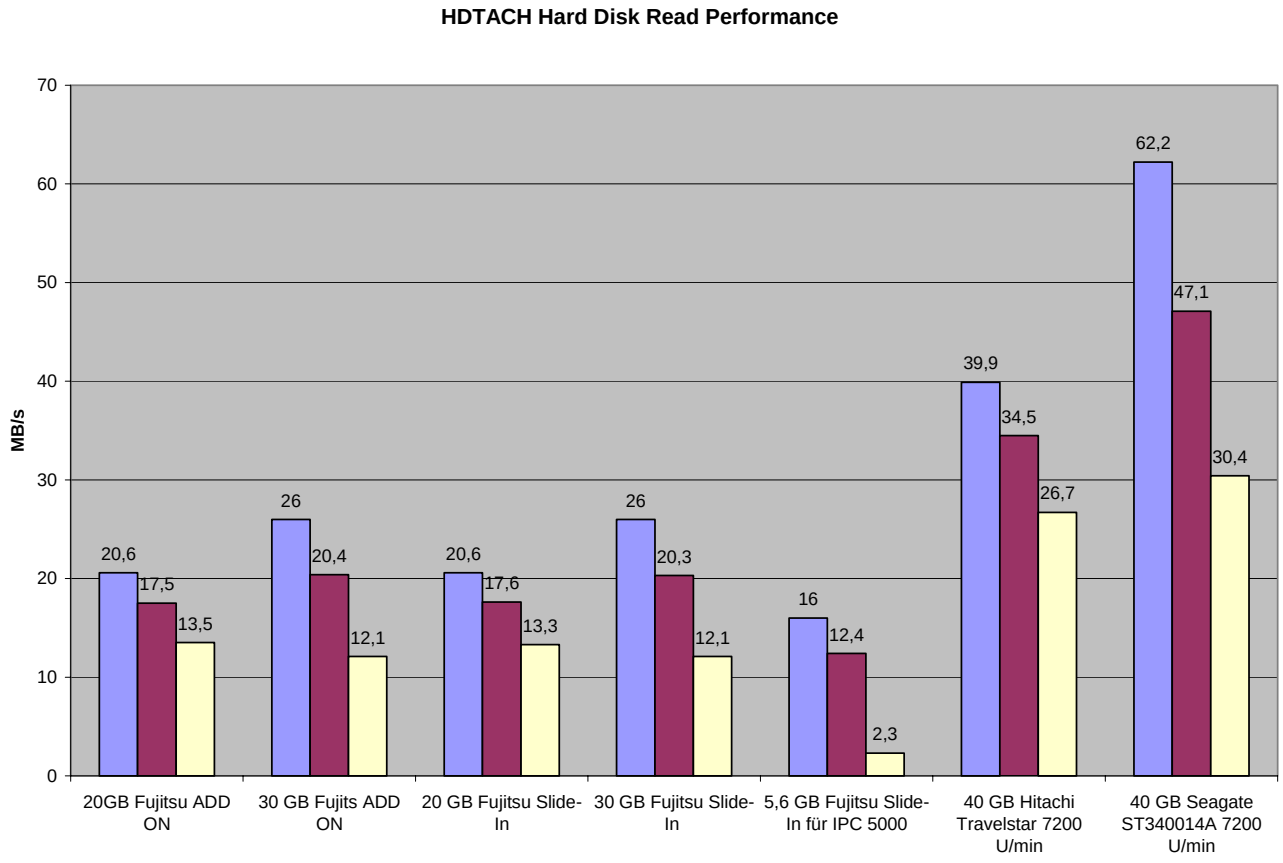

Image 14 – Results for HDTACH read speed

4.6.2 HDTACH access time measurement

No.	Test device	Access time (ms)
ICP5000C hard disks		
1	5.6 GB Fujitsu Slide-In (4200 rpm)	20.4
APC620 hard disks		
2	20 GB Fujitsu ADD ON (4200 rpm)	18.3
3	30 GB Fujitsu ADD ON (4200 rpm)	19.9
4	20 GB Fujitsu Slide-In (4200 rpm)	18.4
5	30 GB Fujitsu Slide-In (4200 rpm)	18.5
6	40 GB Hitachi Travelstar (7200 rpm)	16.7
Reference HDD		
7	40 GB Seagate ST340014A (7200 rpm)	12.5

Table 21: Results for HDTACH access time measurement

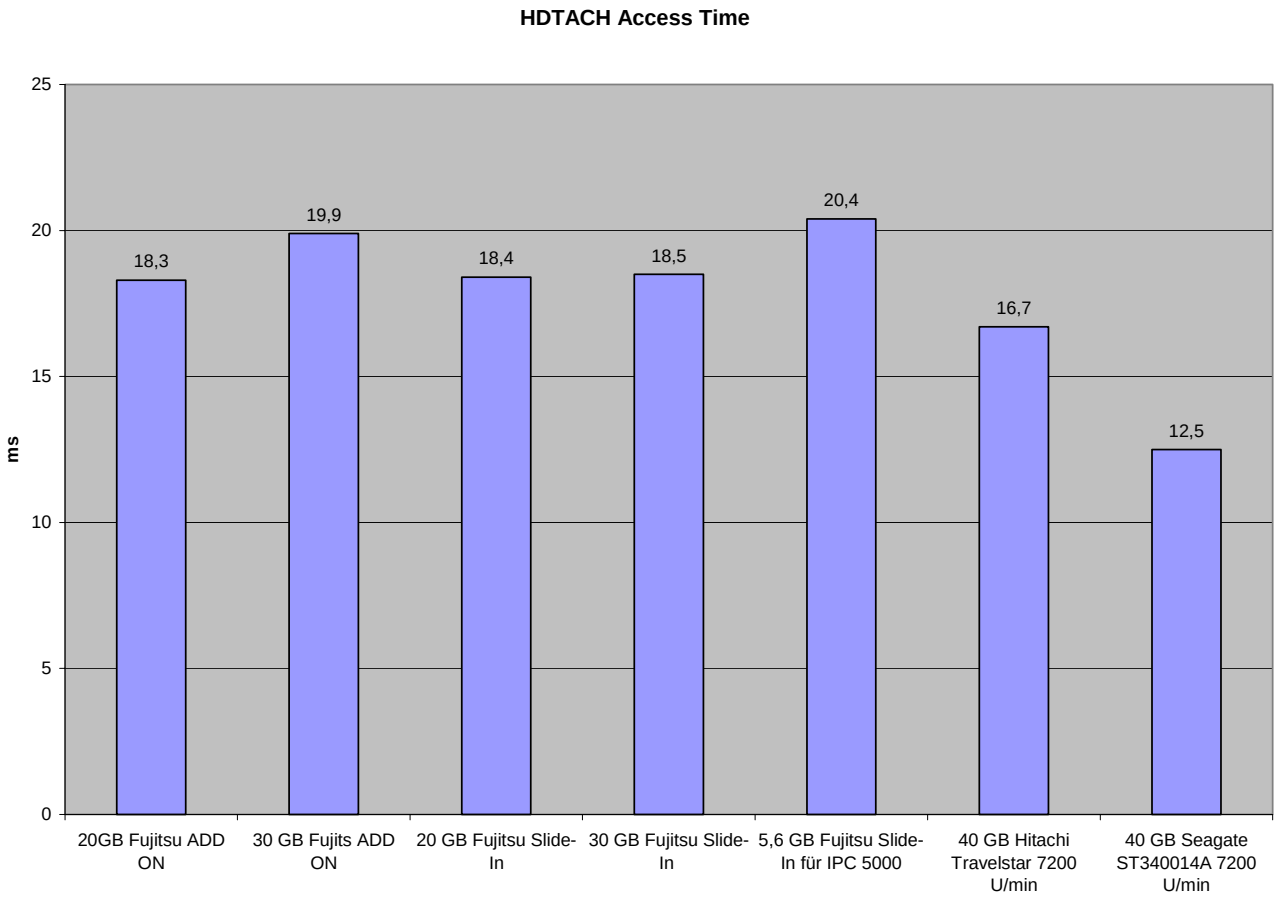

Image 15 – Results for HDTACH access time measurement

4.7 3D Mark 2000

Originally, 3D Mark 2000 (like all later 3D Mark versions) was a benchmark that specialized on the performance of 3D games on PC systems.
However, this benchmark generally provides a very good representation of the 3D performance of a system.
For this reason, the 3D Mark line was also included in this performance test.
3D Mark 2000 does not have any special requirements (except for MMX technology) and supports a wide range of systems. This makes it possible to compare many systems and system types

No.	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	Not supported
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	Not supported
5	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
6	Pentium 3 600 MHz, 256 MB SDRAM	Not supported
7	Pentium 3 850 MHz, 256 MB SDRAM	737
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	773
9	Pentium 3 1.26 GHz, 256 MB SDRAM	851
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	739
11	Celeron 3 733 MHz, 512 MB SDRAM	790
12	Celeron 3 1000 MHz, 256 MB SDRAM	796
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	3622
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	4013
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	4467
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	4520
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	4610
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	4768
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	4674
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	11364

Table 22: Results for 3D Mark 2000

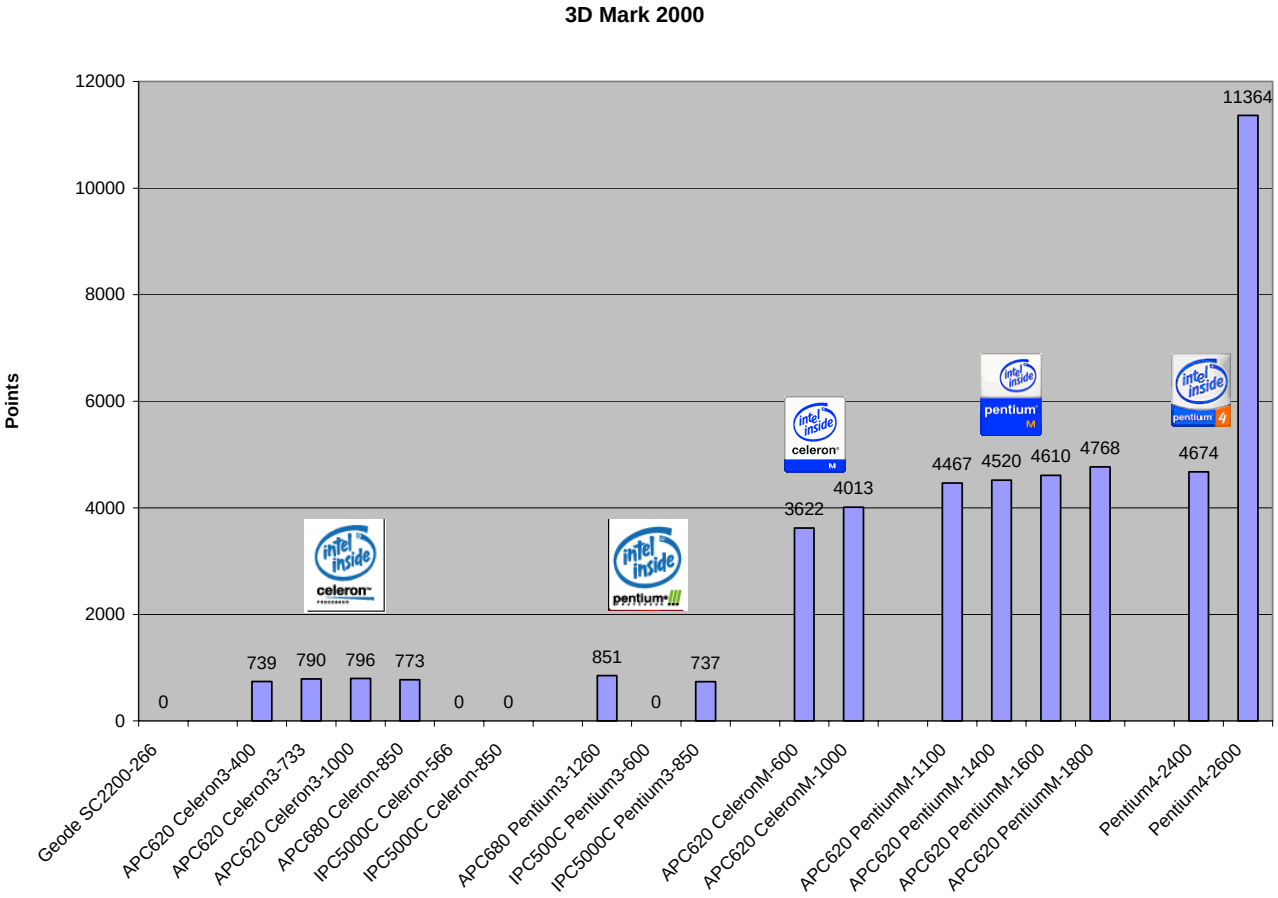

Image 16 – Results for 3D Mark 2000

Information:

On computers without test results, the graphics controller does not meet the minimum requirements.

4.8 3D Mark 2001SE

3D Mark2001 SE is a further development of 3D Mark 2000 and supports newer technologies (SSE2) and processors (P4, etc.). The test specializes on these new technologies and therefore the benchmark cannot be used for all systems.
The results achieved provide a good comparison of the 3D performance as compared to current systems (systems with Pentium 4, Pentium M, AMD AthlonXP, etc.).

No.	Test device	Points
Power Panel		
1	Geode 266 MHz, 128 MB RAM	Not supported
IPC5000C computer		
4	Celeron 3 566 MHz, 256 MB SDRAM	Not supported
5	Celeron 3 850 MHz, 256 MB SDRAM	Not supported
6	Pentium 3 600 MHz, 256 MB SDRAM	Not supported
7	Pentium 3 850 MHz, 256 MB SDRAM	Not supported
APC680 computer		
8	Celeron 3 850 MHz, 256 MB SDRAM	503
9	Pentium 3 1.26 GHz, 256 MB SDRAM	651
APC620 with INTEL 815E chipset		
10	Celeron 3 400 MHz, 256 MB SDRAM	438
11	Celeron 3 733 MHz, 512 MB SDRAM	557
12	Celeron 3 1000 MHz, 256 MB SDRAM	565
APC620 with INTEL 855GME chipset		
13	Celeron M 600 MHz, 256 MB DDR-SDRAM	1627
14	Celeron M 1 GHz, 256 MB DDR-SDRAM	1731
15	Pentium M 1.1 GHz, 1 GB DDR-SDRAM	1947
16	Pentium M 1.4 GHz, 512 MB DDR-SDRAM	2120
17	Pentium M 1.6 GHz, 1GB DDR-SDRAM	2250
18	Pentium M 1.8 GHz, 512 MB DDR-SDRAM	2383
Other test computers		
19	Pentium 4 2.4 GHz, 512 MB DDR-SDRAM	2225
20	Pentium 4 2.6 GHz, 512 MB DDR-SDRAM	9389

Table 23: Results for 3D Mark 2001SE

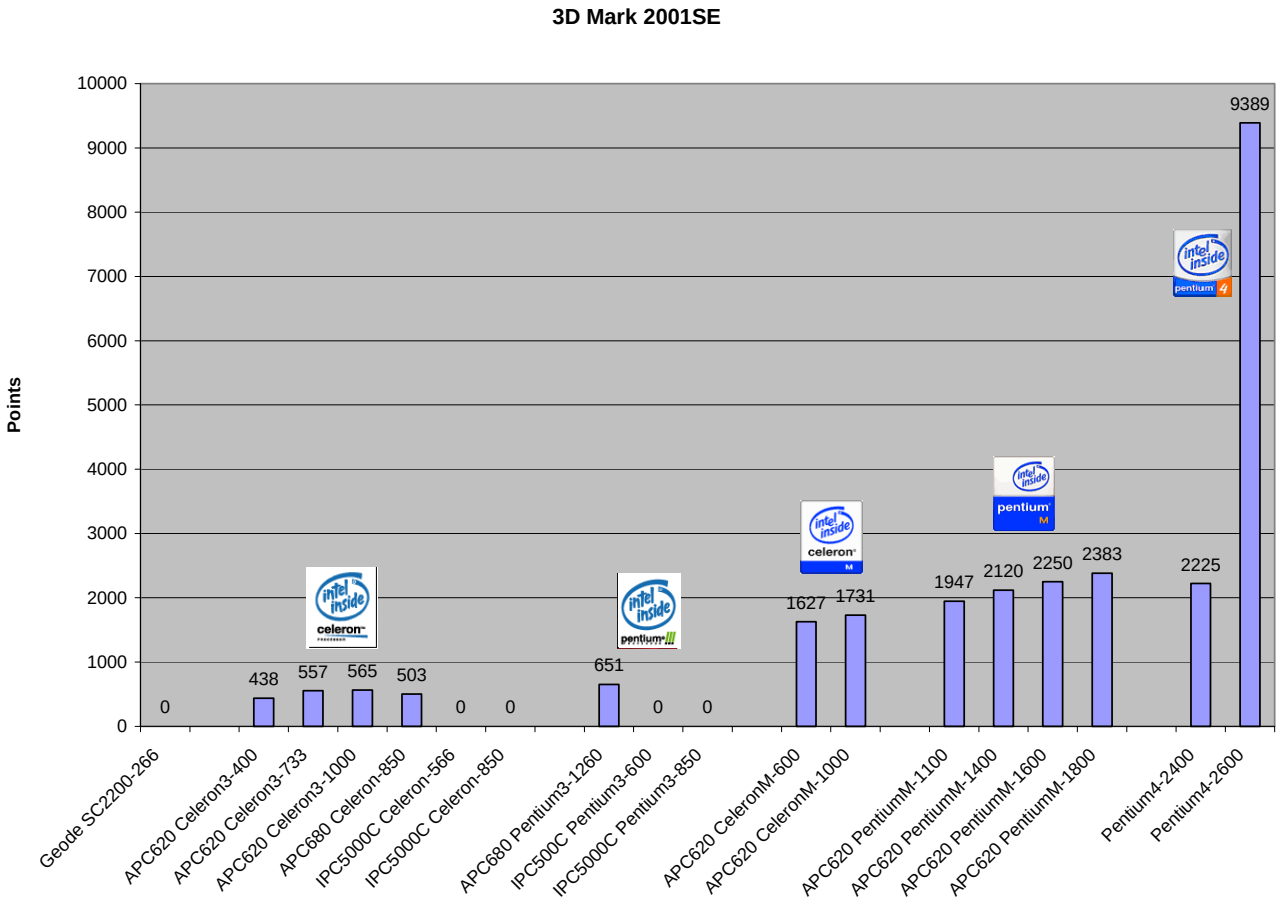

Image 17 – Results for 3D Mark 2001SE

Information:

On computers without test results, the graphics controller does not meet the minimum requirements.

5 Conclusion

The tests provided a clear picture of the industrial PCs' performance.
APC620 with Celeron M and Pentium M processors stood out considerably.

APC620 computers with these processors offer high computing performance allowing excellent handling of complex tasks.
When comparing this computer with desktop PCs that are equipped with Intel Pentium 4 processors, it becomes evident that they (especially the Pentium M processors) easily match up to the Pentium 4.
It is also apparent that the computing power is further increased (for both the Pentium M and the Pentium 4) when using the latest programs, which optimally support these processors.
It is generally the case that these groups of APCs (with Celeron M and Pentium M processors) are now the successors to the IPC5000C and offer considerably higher computing power.

After comparing the computing power of the APC620 (with Intel 815E chipset) with that of an IPC5000C, it appears that these two computers are equal. The APC620 has only minor performance advantages over the IPC5000C series. However, this series could be seen as a high-performance successor to the IPC2001 series.

The IPC2001 series is considerably outdated and has difficulty meeting the demands of the latest programs. This performance deficit is the result of the technological state of the processors (486er).

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