Application Note 116
Performance Rating the Cyrix M II-300 Processor

Cyrix®
A National Semiconductor Company

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Megahertz and Performance

In the past, performance of a processor has been measured in megahertz (MHz). The MHz rating simply refers to the clock speed of the processor. If the clock speed is increased, the performance increases for the *same* type of processor.

For different types of processor architectures, clock speed is not a good indicator of comparative performance. For example, one could imagine two processors operating in parallel as one device, and an other device with only a single processor. With both operating at same clock speed, their performance would be markedly different.

The best way to compare processors is to directly measure their performance. In a real world situation, this can be done by running the same popular business programs on all processors under test. To ensure consistency, an application benchmark program should be used that runs these programs using a fixed script. The script should model the steps a typical user would use in the real world. As the benchmark runs, it should navigate through several types of applications, exercising the computer-system components for about an hour. In Cyrix's opinion, an excellent program for performing this type of application benchmark testing is Winstone 98 as it conforms to the criteria mentioned above.

Examples of Different Processor Architectures

The table below lists current Intel and Cyrix processors and their different architectural features.

ARCHITECTURAL FEATURE	M II	PENTIUM II	PENTIUM W/ MMX	CELERON
MMX Instruction Set	X	X	X	X
Superscalar	X	X	X	X
Superpipelining	X	X		X
Register Renaming	X	X		X
Data Dependency Removal	X	X		X
Multi-Branch Prediction	X	X		X
Speculative Execution	X	X		X
Out-of-Order Completion	X	X		X
80-Bit FPU	X	X	X	X
Primary L1 Cache Size (Bytes)	64 K	32 K	32 K	32 K
Secondary L2 Cache Size (Bytes)	On motherboard (512 K Typical)	512 K	On motherboard (512 K Typical)	0 K

M II AND PENTIUM PROCESSORS ARCHITECTURAL FEATURES

Synthetic Benchmarks

Synthetic benchmark programs are small programs found in popular utility programs. These benchmark programs are called “synthetic” in that they merely loop through an arbitrary set of instructions and do not accurately indicate real world performance. Depending on the instructions chosen, they can be very misleading.

The Cyrix Performance Rating

A “Performance Rating” has been defined so one can compare Cyrix processors with Intel® and AMD® processors . The performance rating is part of the name for a Cyrix Processor. For example, a Cyrix M II -300 processor has a performance rating of 300.

The performance rating for a Cyrix processor indicates that a Cyrix processor will perform within 2% of a benchmark processor with a particular MHz rating. A 1.5% variation in tests scores results when Winstone 98 testing is repeated.

Benchmark Processor for the M II Processor

The Pentium II 300 MHz processor was chosen to establish the performance rating for the M II processor as this processor is a best seller in the desktop CPU market and it achieves the best Winstone 98 overall scores. Other 300 MHz processors were also tested including the AMD K6, and Celeron 300.

Ziff Davis® Business Winstone 98

Winstone 98® uses actual application programs such as Microsoft Excel or Corel Draw. While running the benchmark program, the application programs are driven by a script which attempts to model the way users actually operate their systems. As the benchmark runs, it navigates through several applications, exercising the computer-system components by applying the same sequences that a user would use.

Business Winstone® 98 is a widely recognized application-based benchmark program that measures real desktop computer performance. This benchmark operates in a Windows® 95 environment and uses scripts from applications that simulate tasks performed by the typical user. A higher score indicates that it takes less time to perform the application. Business Winstone 98 runs nine of the most popular desktop applications spanning five software categories:

Browsers

- Netscape Navigator® 3.01

Publishing

- CorelDRAW!™ 7
- Microsoft® PowerPoint® 97

Spreadsheet and Databases

- Microsoft® Access 97
- Microsoft® Excel® 97
- Lotus® 1-2-3® 97
- Corel® Quattro Pro 7

Business Task Switching

- Task Switching 1 for Word/Excel
- Task Switching 2 for WordPerfect/CorelDRAW!

Word Processing

- Microsoft® Word 97
- Corel® WordPerfect 7

Methodology

The Performance Ratings were determined by the testing performed in Cyrix's performance laboratory in Richardson, Texas using Business Winstone 98 benchmark software. Comparable systems were used to compare the M II processor and the Pentium processors. To isolate the performance impact of the processor all variables other than the processor were held constant during testing. One exception was made where the Pentium II and Celeron processor required a different motherboard.

Processors Tested

The Cyrix, AMD® and Intel processors tested are listed in the table below.

PROCESSORS TESTED

PROCESSOR TYPE	CORE FREQUENCY	BUS FREQUENCY
Intel Pentium II	300 MHz	66 MHz
Cyrix M II-300	225 MHz	75 MHz
Cyrix M II-300	233 MHz	66 MHz
AMD K6-300	300 MHz	66 MHz
Intel Celeron	300 MHz	66 MHz

HARDWARE CONFIGURATION

Motherboard	M II	ASUS SP97-VX
	AMD K6	ASUS SP97-VX
	Pentium II	Asus P2L97
	Celeron	Asus P2L97
L2 Cache		512 KByte Synchronous Burst Note: Celeron does not support L2
Disk Drive		Quantum Fireball IDE ST32A011, 4.3G
Graphics Card		Diamond Viper V330, 4M VRAM, Driver Release 4.10.01.0125
Memory		32 MB SDRAM

OPERATING SYSTEM CONFIGURATION

Operating System	Windows 95 OSR2 (FAT 32)
Virtual Memory Settings	Default (32-bit)
Disk Compression	Not Installed
Virtual Memory	Maximum 32 MBytes, Minimum 32 MBytes
Video Resolution	1024 x 768 x 256 Resolution 75 Hz Refresh Rate

Note: All settings are default settings unless otherwise stated.

Benchmark Procedure

The following steps were used to obtain a benchmark number for each processor using Ziff-Davis's Business Winstone 98 benchmark program. Identical systems were used to compare the M II and the Pentium processors, except that the Pentium II and Celeron processors required different motherboards due to their external bus form factors.

Platform Setup

1. The PC computer is assembled and configured as previously indicated.

2. The hard drive is formatted to remove all files including previous operating system or configuration files.

3. Windows 95 is installed and setup according to the parameters listed in the operating system configuration table listed on the previous page.

4. Business Winstone 98 benchmarking software is installed.

5. The hard drive is defragmented using Windows 95 defrag utility.

Benchmark Testing

1. Run Business Winstone 98 benchmark program and record results.

2. The hard drive is defragmented.

3. Exit windows and power down.

4. Reboot PC computer.

5. Repeat steps 1-4 above twice.

6. Average results. Multiply score by 0.98 to provide 2% testing margin.
Note: Testing variation typically averages 1.5%.

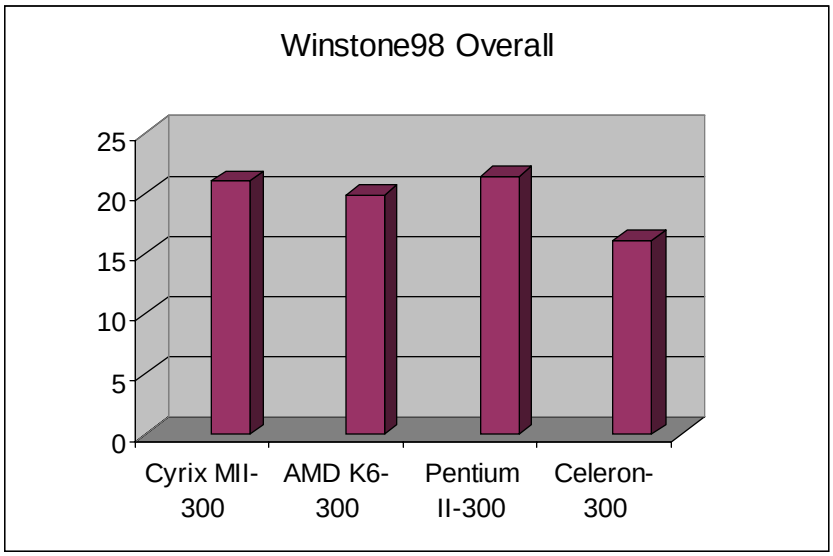
Benchmark Testing Results

The following Business Winstone 98 scores were obtained for the Pentium II and Celeron processors. Larger numbers mean higher performance. The scores were adjusted downwards by two percent to reflect the minimum acceptable range.

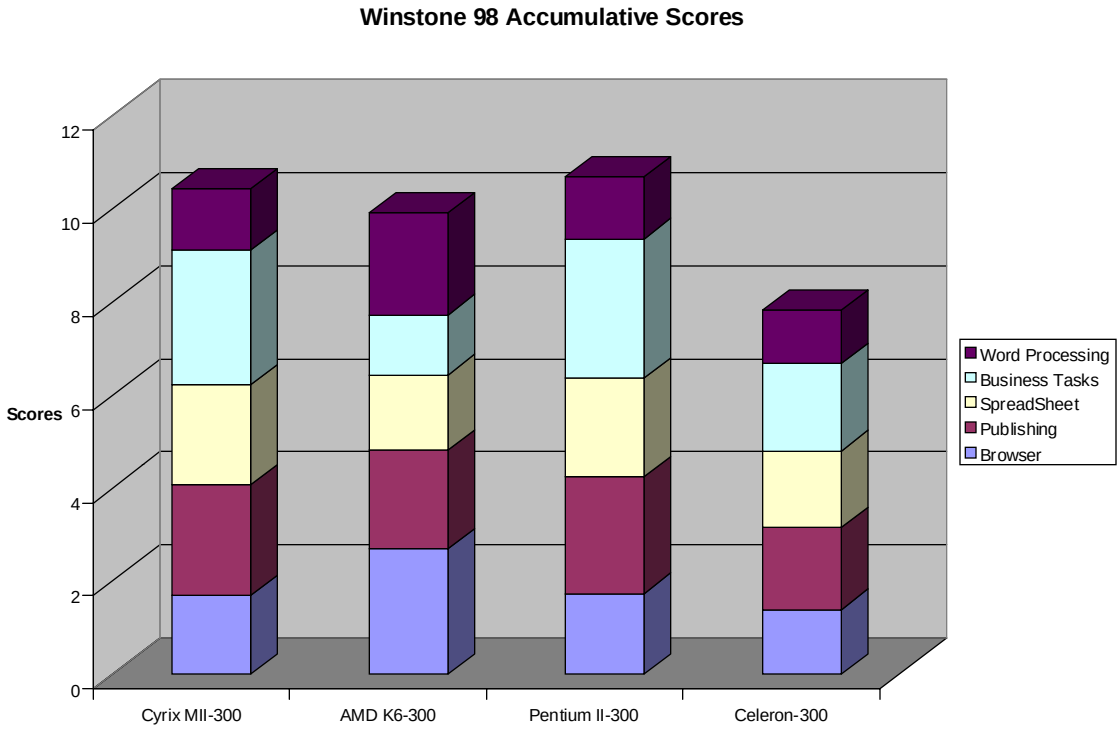
BENCHMARK TESTING RESULTS

PROCESSOR TYPE	CORE FREQUENCY	BUS FREQUENCY	SCORES
Intel Celeron	300 MHz	66 MHz	16.1
Intel Pentium II	300 MHz	66 MHz	**21.4**
Cyrix M II-300	225 MHz	75 MHz	**21.0**
Cyrix M II-300	233 MHz	66 MHz	**21.0**
AMD K6-300	300 MHz	66 MHz	19.9

Both Cyrix M II processors operating at 225 MHz and 233 MHz were found to be very close (within 2%) of Intel processors operating at 300 MHz. Also both Cyrix M II processors exceeded the scores of the Celeron-300 and AMD K6-300 by significant margins. This data is shown in the graphs below.



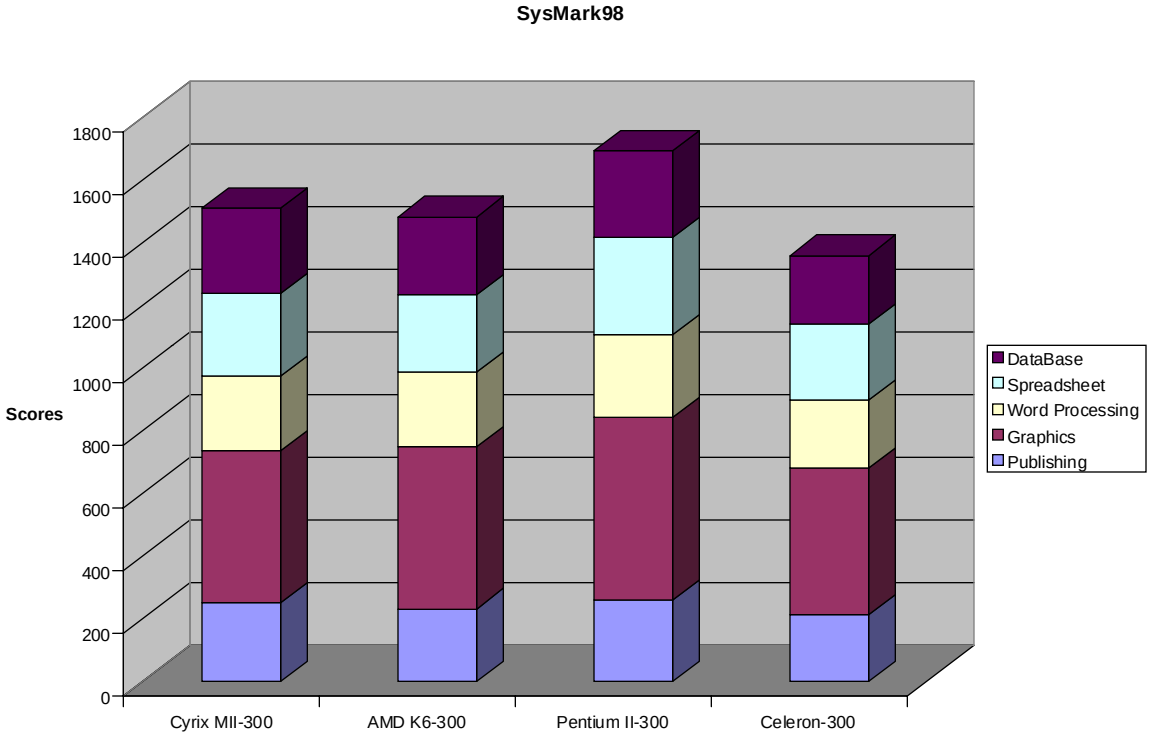
The Winstone98 Overall graph on the previous page is reproduced here to show individual scores.



Note: The accumutive scores in this graph differ from those in the Winstone98 Overall graph. The Winstone98 Overall scores are based on *weighted* individual scores.

SysMark Scores

Another application benchmark program is SysMark developed by BAPCo. Although this program was not selected as the basis for the M II Processor performance rating, it clearly indicates that the Cyrix M II processor has a higher BAPCo performance than either the AMD K6-300 or the Celeron-300.



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