THE PENTIUM II PROCESSOR

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INTRODUCTION

When the Pentium Pro first surfaced in computer systems, it brandished a number of significant architectural and performance enhancements over the Pentium. For example, the Pentium Pro featured the Dual Independent Bus (DIB) architecture which addressed system bandwidth limitations. It did this with two distinct buses. The Pro had (has) a processor to main memory bus and a processor to L2 cache bus. The processor could access both buses at the same time.

Additionally, the Pentium Pro can execute up to four instructions per clock cycle and features dynamic execution, which incorporates the concept of mixed order and the speculative execution of instructions. The Pentium Pro also has a 12 stage superpipeline (the Pentium has 5) and it employs branch prediction based on both history and knowledge of how each op code is generally used. Well, enough about the Pentium Pro. What's that have to do with anything anyway? You came here to read about the Pentium II and those lightening fast core clock speeds, right?

Meet The Pentium II

So why talk about the Pentium Pro when this article about the Pentium II? Because the Pentium II is nothing more than the new and improved Pentium Pro. Having said that, now it's time to meet the Pentium II. Here are the main features of Intel's latest CPU:

- **Architecture and Internal Logic -** The Pentium II inherits the Pentium Pro superpipeline and DIB architecture. However, the biggest change is in the internal logic. The Pentium II has larger L1 caches and it supports MMX instructions. These 57 new instructions enable 64 bit data words to be treated as two 32 bit, four 16 bit, or eight bit blocks. This permits the same operation to be performed on each bit block simultaneously.

- **Power Requirements and Usage** - Unlike the Pentium Pro, which operates at 3.3 volts, the Pentium II operates at 2.8 volts, thereby enabling it to run at high frequencies without significantly increasing power and cooling requirements. While a 200 MHz Pentium Pro with a 512KB cache consumes about 37.9 watts of power, a 266 MHz Pentium II with a 512 KB cache uses 37.0 watts.

- **Packaging** - The Pentium Pro consists of a multichip module containing two dies. One for the processor core and one for the L2 cache. This module comes in a pin grid array (PGA) package and is inserted into a Socket 8 zero insertion force (ZIF) socket on the motherboard. The Pentium II appears to be radically different at first glance. Conceptually, there are few differences. When you first see the Pentium II, it looks like no other processor you have ever seen. It's huge in fact. That's because it's packaged in what Intel calls the single edge connect (SEC) cartridge that plugs into a connector called Slot 1 on the system motherboard. The Pentium II and its SEC can be seen in the picture below. (Please pardon the quality of the picture. Sometimes things don't always go as planned).

- **The SEC -** The single edge connect cartridge and the Pentium II essentially is a cross between a multichip module and a hybrid using an FR4 (four layer printed circuit board) substrate. The size of the L1 caches have been doubled. The instruction cache and data cache have both been increased to 16 KB, for a grand total of 32 KB. Also, the L2 cache has again been separated from the processor core. The result is six individually packaged devices on the SEC cartridge. They consist of the processor, four standard burst static cache RAMS, and one tag RAM. The L2 cache

chips and the tag RAM are presented in conventional quad flat packages, while the core processor is package as a leadless grid array (LGA).

- **Pins and Layering -** The Pentium Pro's PGA package has 387 pins, while the SEC cartridge uses only 242. This reduction is due to the fact that the SEC contains discrete components, such as termination resistors and capacitors. Additionally, the SEC cartridge in-line pin arrangement enormously improves circuit routing which allows designers to use less expensive four layer boards.

- **Logic and Chip Set -** Currently, the Pentium II logic only allows it to support two processors. This limitation comes from the system chip set however. Such won't always be the case. The original Pentium II's were only available with the 440FX (PMC and DBX chips). Four processor support is now available with the release of the 440 LX chip set. Additionally, the 440FX chip set does not support extended data out (EDO) DRAM, which the 440LX does.

- **Clock Speed -** The far, the Pentium II is available in core speeds of 233 MHz, 266 MHz, and 300 MHz. But this is only the beginning of the new revolution in PC technology. But folks, we haven't seen anything yet.

To see what lies ahead with the Pentium II, it's children to be (Deschutes, Williamette, and the Merced), and the future of PC systems, you may link the my white paper ***The Future of PC Systems***. However, as of this writing, ***The Future of PC Systems*** has not yet been completed.