

440FX Cuts Cost of Pentium Pro Systems

Reduced Cost and Complexity Brings Pro to \$2,500 Business Desktops

by Peter N. Glaskowsky

Intel today announced the 440FX PCIset, its second Pentium Pro chip set, intended for high-performance desktop PCs and entry-level servers. It brings the key features of Intel's 430HX Pentium chip set (see [1002MSB.PDF](#))—including EDO support, concurrent PCI, and USB—to Pentium Pro systems while offering lower cost and a smaller footprint than Intel's original Pentium Pro chip set.

As Figure 1 shows, the new set consists of three chips: the 82441FX, the 82442FX, and the previously announced 82371SB ISA bridge, which is also part of the 430HX and 430VX chip sets. All are in 208-pin PQFP packages.

Dual-processor configurations also require the new 82093AA APIC interrupt controller. This device is also used with the 430HX (but not 430VX) to support dual-processor Pentium systems.

Although some Pentium chip sets, like the 430HX, support dual processors, few such systems have been shipped. Because these systems typically share one L2 cache on a common system bus, dual-processor Pentium systems have poor scalability. Each processor requires more than half of the bus bandwidth, on average, so adding a second processor produces much less than a 2× increase in system performance.

By providing each processor with its own L2 cache (and cache bus), Pentium Pro is designed to work efficiently with two or more processors in the system. The split-transaction Pentium Pro bus also helps reduce bus utilization by eliminating most unused bus cycles.

Given the dual-processor support even in the 440FX, which will be Intel's mass-market Pentium Pro chip set for 1996, we expect these systems to play a more prominent role in the P6 generation.

The 82441 PCI and Memory Controller (PMC) includes a PCI 2.1-compliant host bridge and a DRAM controller. It supports up to 1G of noninterleaved fast-page mode (FPM), EDO, or burst EDO DRAM, with parity and ECC options. EDO DRAM without interleaving achieves the

same performance as two-way interleaved FPM DRAM on Intel's earlier 450KX/450GX chip sets (see sidebar at end of [091501.PDF](#)), which do not support EDO memory.

The 82442FX Data Bus Accelerator (DBX) fully supports the Pentium Pro's split-transaction bus, allowing read-around-write operations, and it can also perform write-burst combining for CPU writes to the PCI bus.

Performance is slightly enhanced over Intel's previous Pentium Pro chip set due to the more efficient PCI implementation. The cost of building a Pentium Pro system is significantly reduced, in part because of the lower price for the chip set. In addition, the 440FX can be implemented on four-layer motherboards and consumes less board area than the eight-chip 450GX/KX, further reducing cost.

The 440FX falls short of the expandability of the 450GX/KX, which will remain available. The 450GX supports up to four Pentium Pro CPUs, up to 4G of four-way interleaved DRAM, and two PCI buses. This makes the GX a better choice for high-end server configurations.

Combined with \$500 Pentium Pro processors (see [1006MSB.PDF](#)), the 440FX should enable a system price of \$2,500 or less, representing a very good value compared with high-end Pentium systems for buyers running Windows NT. These lower prices will broaden Pentium Pro's appeal in the mainstream business PC market, where NT has seen the most acceptance. Because of the aggressive pricing, chip-set support, and motherboard support, we project Intel will sell 3 million Pentium Pro processors in 1996, well ahead of the early Pentium ramp rate. ■

Price & Availability

The 440FX chip set, consisting of the 82441FX, the 82442FX, and the 82371SB, is priced at \$82 in 10,000-unit quantities. For dual-processor configurations, the chip set adds the 82093AA APIC, for a total price of \$92. For more information, contact Intel (Santa Clara, Calif.) at 916.356.3104 or access the Web at www.intel.com.

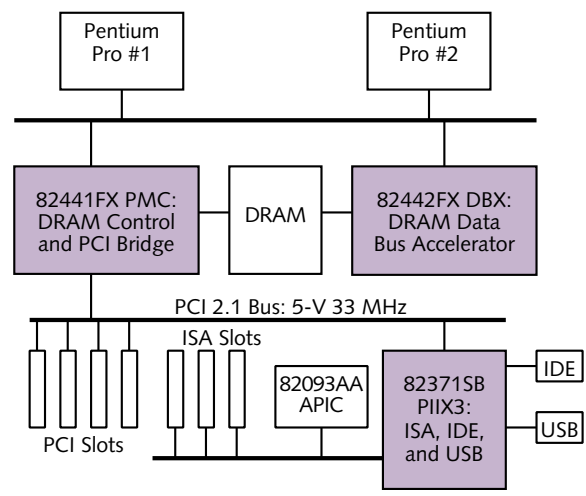


Figure 1. Block diagram of a Pentium Pro system using the 440FX. Shaded blocks are standard 440FX components. The second Pentium Pro is optional and requires the addition of an 82093AA I/O APIC.