

First Looks

Hands-on Reviews of the Latest Products

Four 486SXs: Is the Glass Half Empty or Half Full?

Disabled FPU Should Help Bring 486 Price Down

HANDS ON
by Christopher Barr
and Matthew J. Ross

IBM, Advanced Logic Research, American Mitac, and AST Research all have chosen slightly different ways to design their Intel 486SX-based PCs, but there are certain consistencies in performance.

Intel promises the 486SX's performance is two to three times faster than a 33-MHz 386; but that performance time only applies if you're using a 32-bit operating system. A 33-MHz 386 makes more sense for those looking for a machine with optimal performance in today's DOS/Windows 3.0 world, although operating systems like Unix, OS/2 2.0, and Windows 4.0 will ultimately give the 486SX an edge.

If your application requires a coprocessor, you should also stay clear of the 486SX, even with its 487SX upgrade potential. The 486SX is designed for budget-conscious gamblers—those willing to stake the future on a 32-bit operating system, but not willing to stake big bucks for the privilege of being right.

IBM PS/2 Model 90 XP 486

From the outside, the new PS/2 Model 90 XP 486SX is identical to the small-footprint 486DX-based Model 90 IBM unveiled earlier this year. The similarities continue inside these machines; they share the same chassis and basic design: four



32-bit MCA slots, one slot with IBM's Micro Channel video extension, a fifth 64-bit dedicated CPU slot, a CPU daughtercard, and XGA graphics.

A 486SX offering in IBM's product line comes as no surprise, especially since IBM has

so fully embraced the notion of an upgradable CPU card. The backplane design, central to the Model 90 line, facilitates quick production of new systems.

While the overall machine design offers few surprises, the daughtercard houses surprises

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PHOTOGRAPHY: THOM O'CONNOR

aplenty. Uncharacteristically, the board has some wire traces, indicating that the Model 90 SX was probably modified from a standard 486DX. According to IBM, they will be corrected in the next board revision.

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486SX: Upgrade Now and Upgrade Later

by Christopher Barr

Intel is offering the 486SX as a low-cost entry point to 486 computing in the same way that it capitalized on the 386SX to encourage users to migrate from the 286 platform. A key difference between this and the earlier SX is that this time Intel is faced with a strong challenge from AMD's 40-MHz AM386 chip.

Intel's 486DX processor runs at 25 MHz or 33 MHz and has an internal floating-point unit (FPU). The

486SX is really a full 486DX chip with the floating-point unit disabled. According to Intel, disabling the math transistors was the most cost effective, speediest way to modify the 486SDX.

But Intel is hedging its bet on the 486SX. It's not convinced that users will be happy with the chip's lack of a floating-point unit.

The disabled chip sets the stage for Intel's larger plan: For a \$799 list price, Intel offers the 487SX math coprocessor, which is nothing

more than a fully functional 486DX with two differences:

1) Special logic in the chip enables it to override the 486SX; in effect, putting it into a coma.

2) The 487 has an additional pin—it has 161 pins versus the SX's 160—which is used only to send a knock-out punch to the 486SX.

Clearly the SX is a marketing innovation, rather than a technical one.

Intel may lose market
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One of the more pleasant surprises in the desktop we reviewed was the 400MB SCSI hard disk combined with a 512K caching SCSI controller. Formerly available only in the P75 486 portable, this drive is now available as an expensive \$6,400 option to any IBM PC. And, in addition to the base price \$8,345 desktop Model 90 SX, IBM has also announced a tower-based, Model 95.

With prices as high as \$13,000 for the tower Model 95 SX (with the 400MB SCSI drive standard), IBM's implementations of the Intel P23 chip don't come cheaply. The 512K-cached SCSI hard disk controller and fast 400MB hard disk promise high performance, but IBM's 486SX did not distinguish itself from the competition on our benchmark tests. IBM offers no external RAM cache, but its CPU performance under DOS did not suffer when compared with those with external caches.

Two memory boards extend vertically from the motherboard, equipped with a total of 4MB of 70-nanosecond interleaved page-mode memory, up to a maximum of 32MB. IBM admitted that there wasn't space enough to fit a 487 upgrade on the CPU board. IBM will replace the SX chip with a 487 for \$1,345 (available in July), a 25-MHz 486DX for \$2,745, or a 33-MHz for \$4,445.

Other Model 90 SX features include XGA graphics integrated on the motherboard with 512K video memory standard, expandable to 1MB; one external and two internal 3.5-inch drive bays, plus an external bay for IBM's new slimline 5.25-inch floppy disk. As configured, the Model 90 SX offers three free slots for adequate expansion.

The 32-bit processing power of the Intel 486SX, combined with IBM's Micro Channel architecture and plans for OS/2 all come together in the solid, well-built Model 90 SX. At \$9,445,

486SX: Upgrade

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share to AMD's 40-MHz 386. By migrating users to the 486 platform, Intel is playing in an arena where AMD still can't compete.

The 80486DX is a better processor than the 80386, but what about the 486SX? Like the 386SX, it has full 32-bit internal processing, but unlike the 386SX, which

has 16-bit I/O, the 486SX has fast 32-bit I/O.

The memory functions in both versions of the 486 are better integrated than in the 386's: 486DX and SX have on-chip 8K caches that improve memory access times, and a burst mode to read large blocks of data at close to twice the speed of a 386.

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benchmark tests show that machines running the 20-MHz 486SX are slower than both the Compaq 386/33 and the Bell 386/40 (which has the AM386 40-MHz chip).

Unlike the benefits gained by migrating from the 286 to the 386, the 486's refinements over the 386 offer no compelling reason to migrate. Intel claims that a 486 will dramatically outperform a 386 when running software that uses 32-bit instructions; but while Microsoft has such designs in store for Windows and OS/2, it will be at least a year before they're marketed.

If you run CAD software or crunch numbers on worksheets that use floating-point math, then your choice is clear: You need a 486DX machine.

If you plan for the long haul, buy a 486SX as an investment in the future.

And if you're most concerned about getting speed now, go for the MHz.



INTEL GETS SLIGHTLY MORE PRICE-COMPETITIVE

A look at Intel's recent price cuts on PC processors demonstrates that the 486SX is part of a marketing plan, not a technical innovation. The 486SX's price establishes it as a direct competitor to AMD's AM386 chip and an alternative to faster 386s. The higher price for 486DX chips maintains the premium that Intel places on math coprocessing. These prices are for lots of 1,000 on Intel's chip; AMD's is for lots of 100.

	First Quarter 1991	Second Quarter 1991
Intel 486DX/33	\$860	\$667
Intel 486DX/25	\$671	\$588
AMD AM386/40	N/A	\$297
Intel 486SX/20	N/A	\$258
Intel 386DX/33	\$214	\$208

IBM does not offer much added value to justify the price of a system that is meant to be a low-cost entry into the world of 486-based computing. ■

List Price: IBM PS/2 Model 90 XP 486SX, with 4MB RAM, 80MB SCSI hard disk, \$8,345; with VGA, DOS 4.01, \$9,445. IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; 800-IBM-2468.

CIRCLE 712 ON READER SERVICE CARD

ALR Business-VEISA 486ASX

ALR has a history of being one of the first PC manufacturers to support any new Intel processor. That's easy for the company to do, since it has long been committed to upgradable CPU systems. The BusinessVEISA motherboard remains the same regardless of which processor you use because ALR puts the CPU and its support logic on a 32-bit plug-in card.

This time, the company retrofit its BusinessVEISA 486/25 with the slower 20-MHz 486SX processor. We tested the fully loaded Model 150HP, which lists for \$6,195, and comes complete with a high-speed disk subsystem. A stripped-down version, the Model 101, is equipped with only a floppy disk drive and lists for \$2,795.

While the BusinessVEISA 486ASX did not distinguish itself on our tests, you can easily upgrade the unit by purchasing the \$799 Intel 487SX chip and plugging it into the card, or using ALR's \$1,095 486/25 upgrade card.

The 486ASX is a full-height small-footprint model with an updated motherboard design. The unit has nine expansion slots: two 16-bit ISA, four 32-bit EISA, and three 32-bit proprietary ALR slots for the processor, external RAM cache, and additional memory. There are a total of four storage bays,

enough to load two half-height and two 3.5-inch drives. The motherboard contains an IDE interface and floppy disk interface, and can address up to two of each device.

The ALR BusinessVEISA 486ASX is a solid machine. The 32-bit EISA bus takes advantage of the 32-bit data path of the 386DX and 486 processors, and ALR's upgradable architecture scheme is one way for users to plan against future obsolescence. ■

List Price: BusinessVEISA 486ASX Model 150HP with 5MB RAM, 150MB ESDI hard disk, 32-bit ESDI cache controller with 1MB cache, 1.2MB and 1.44MB floppy disks, Super VGA adapter with 1MB RAM, Super VGA monitor, 64K SRAM cache, \$6,195. Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 800-444-44LR, 714-581-6770.

CIRCLE 707 ON READER SERVICE CARD

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Mitac 4270E

American Mitac, the second largest Taiwanese PC manufacturer behind Acer, has built its reputation by doing things conservatively, using solid components and following industry trends. Suddenly Mitac is taking the lead by offering a stripped-down version of its 486SX at \$2,995. The 4MB RAM, 100MB hard disk, VGA system sent to PC Magazine Labs costs a bit more: \$4,515.

Since Mitac's 486SX machine uses the same small-footprint EISA motherboard as its 25-MHz 486, it cannot house both the 486SX and the 487 chip on the systemboard simultaneously. Coprocessor support is limited to a Weitek 4167, but an authorized Mitac representative can remove the 486SX chip and replace it with a 487 chip.

The 4270E features an external 64K write-back processor cache, expandable to 128K or 256K of SRAM—which may be overkill. In our testing, the external cache didn't improve performance over the machines which rely solely on the 486SX CPU's internal 8K cache.

The Mitac we tested featured a Conner 100MB IDE hard disk and five EISA 32-bit expansion slots. One of these slots is occupied by a Super VGA card offering 800 by 600 resolution in its standard 256K memory configuration. A proprietary 32-bit slot holds the system's memory card populated with four standard 1MB SIMMs; maximum system memory is 64MB.

The Mitac 4270E offers solid, conservative construction. As the lowest entry point to 486SX EISA computing, it's worth a look if you don't need a coprocessor.

List Price: Mitac 4270E with 4MB RAM, 100MB hard disk, VGA with low-radiation monitor, DOS 4.01, \$4,515. American Mitac Corp., 410 E. Plumeria Dr., San Jose, CA 95134; 800-648-2287, 408-432-1160.

CIRCLE 713 ON READER SERVICE CARD

AST Premium II 486SX/20

AST Research offers yet another flavor to the 486SX stew. Like ALR and Mitac, its has a sub-\$3,000 price tag on its totally stripped system. Like ALR and IBM, the AST 486SX resides on a CPU daughtercard, with no external memory caching—but the similarities end there.

Unlike the other SXs, AST uses its own 32-bit Cupid architecture in the AST Premium II 486SX/20, in addition to its standard Industry Standard Architecture (ISA) in its Premium II 486SX/20. The unit features six expansion slots: one 8-bit, and five 16-bit ISA. (Other machines reviewed here support either 32-bit EISA or MCA I/O.)

Three of AST's ISA slots can support a 32-bit AST Cupid card; it is here that the CPU/

memory card resides. The CPU board holds up to 16MB of RAM, with 80MB maximum expansion through two additional Cupid memory cards.

Like IBM, AST did not implement an external memory cache. Still, the Premium II performed admirably. Using 70-nanosecond 1MB SIMMs in a proprietary 64-bit wide memory bus, accessing 64 bits of memory at a time, and using a page-mode architecture to support line fill and the Intel 486 burst mode, this proprietary structure shows that an external cache is not necessary for DOS application. There is a socket for the 487SX, but Weitek support is unavailable, and AST does not intend to offer a 486DX version in this AT-bus-based machine.

The system's video resides on the motherboard: 256K of memory provides 16-bit, 800 by 600 Super VGA graphics.

Three external drive bays, plus two more internal drives offer plentiful expansion options. Our evaluation unit has a 3.5-inch floppy disk, 200MB Seagate IDE hard disk, and a manually switchable 145-watt power supply.

AST's 486SX raises an important question; Does an ISA-based version of the new Intel CPU makes sense if you're looking to benefit from future 32-bit architecture? Probably not. Apart from that, the AST Premium II 486SX/20 is solidly built. Its 487 chip socket offers the easiest upgrade—one that end users can perform.

List Price: AST Premium II 486SX/20, with 4MB RAM, 200MB hard disk, VGA, DOS 4.01, \$4,395. AST Research Inc., P.O. Box 19658, 16215 Alton Pkwy., Irvine, CA 92713-9658; 714-727-4141.

CIRCLE 714 ON READER SERVICE CARD



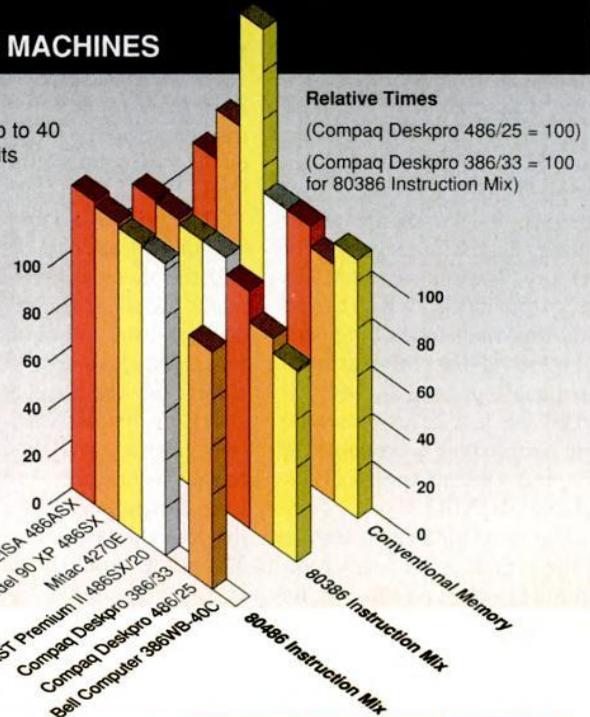
BENCHMARK TESTS: THE FIRST FOUR 486SX MACHINES

Intel claims that its new 20-MHz 486SX is up to 40 percent faster than a 33-MHz 80386 due to its 32-bit CPU core, 8K internal cache, integrated MMU (memory management unit) with paging, and more efficient one-cycle 32-bit instruction processing. However, even though our tests use 32-bit instructions, the faster operating speeds of the 33-MHz 386 and the 40-MHz AM386 propel these chips past the 486SX. That's because DOS's 8-bit addressing limitations cause overhead as instructions are sent in 8-bit segments and must be converted into 32 bits and then back to 8-bit segments.

The four 486SX machines tested here performed nearly the same. The Mitac 4270E's slower memory performance is due to 80-nanosecond page-mode memory that is not interleaved. The 486SX's internal cache compensates for this, so overall performance on our tests is not affected.

■ The **80486 and 80386 Instruction Mix** benchmark tests time a series of tasks specific to the processor. These tests show how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture.

■ The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at slower access speeds.



Performance Times (seconds)	80486 Instruction Mix	80386 Instruction Mix	Conventional Memory
ALR BusinessVEISA 486ASX	1.87	1.83	0.25
IBM PS/2 Model 90 XP 486SX	1.84	1.81	0.30
Mitac 4270E	1.81	1.78	0.41
AST Premium II 486SX/20	1.80	1.78	0.25
Compaq Deskpro 386/33	N/A	1.66	0.25
Compaq Deskpro 486/25	1.46	1.44	0.23
Bell Computer 386WB-40C	N/A	1.34	0.25

N/A—Not applicable: A 386 machine cannot run the 80486 Instruction Mix test.