

# First Looks

Hands-On Reviews of the Latest Products

## IBM PS/2 Models 90 and 95:

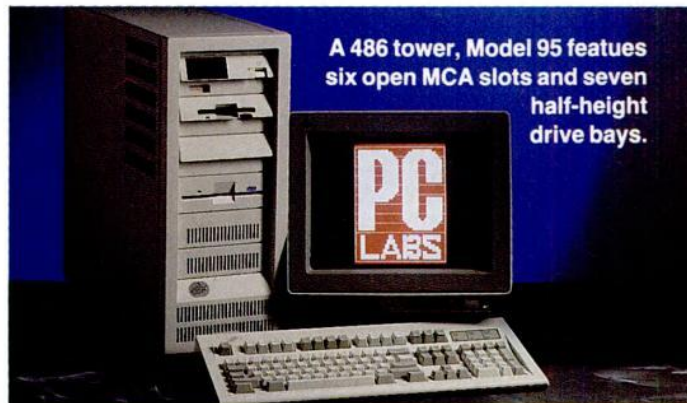
### Upgradable 486 Architecture, XGA Graphics and SCSI Adapter

HANDS ON  
by Winn L. Rosch

IBM's new PS/2s—Model 90 XP 486 and Model 95 XP 486—are not just the top of the IBM line; they promise to be the first of a series of market-topping PCs. Using two almost heretical chassis and systemboard designs, the current incarnations are yeoman 486s—IBM's first computers truly designed for that microprocessor. But thanks to their upgradable architectures, these super siblings are not inherently limited to anything so modest.

From a performance point of view, Models 90 and 95 are hardly trailblazers, but they finally put IBM on a par with the fastest of today's 486s in CPU, disk, and video speed. They are easily good enough to rival any machine on the market today, although at a high cost. The least expensive, a 25-MHz version of the Model 90 with an 80MB hard disk, costs \$12,495. The most expensive, a 33-MHz Model 95 with a 320MB SCSI drive, costs \$17,745.

It's not speed but chassis style that distinguishes the Model 90 from the 95. The former is a desktop package measuring 5.5 by 17.3 by 17 inches (HWD); the latter, a tower measuring 19.5 by 8 by 20.5 inches (HWD). The Model 90 offers four Micro Channel expansion slots, three of which are available for expansion once all the standard equipment is packed inside the chassis. The Model 95 offers eight slots, six of which are available, and each



slot has the capability of holding boards that are somewhat larger than those accepted by previous PS/2 designs.

The Model 90 has three 3.5-inch drive bays (two factory-filled) and one 5.25-inch half-height bay. The Model 95 holds two 3.5-inch bays (one filled) and five 5.25-inch bays (one filled). The 5.25-inch bays can be put to use by IBM's new internal "slim-high" 5.25-inch floppy disk drive, a \$310 option for either system. New setup procedures allow any disk in the system, including the add-in 5.25-inch unit, to boot these machines.

The cabinets of both the Model 90 and Model 95 mark a reverse of IBM's "the future is plastics" philosophy. They are made almost entirely of steel. Only the front bezels and a few internal pieces are plastic moldings. The end result is a pair of machines with great mechanical integrity and interference resistance.

But the most remarkable design change is IBM's abandoning of its traditional single-

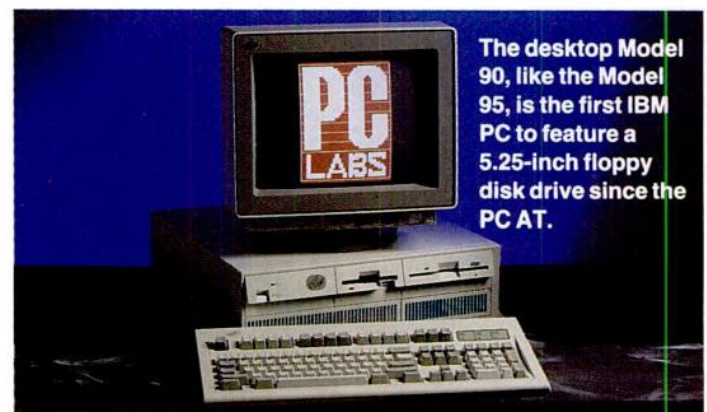
board computer design for a modified passive-backplane. The Micro Channel slots in both machines' are little more than wires linking the expansion connectors together. The systemboard circuitry offers nothing but support—the standard input/output ports (keyboard, mouse, one parallel and one serial in the Model 95, two serial ports in the Model 90), plus video, memory, and floppy disk control circuitry sufficient for two drives.

The important stuff—the microprocessor, its associated circuitry, and the Micro Chan-

nel bus logic—are all held on a single proprietary expansion board that IBM calls the Processor Complex. IBM currently offers one of two processor complexes in the new PS/2s—a 25-MHz 486 or a 33-MHz 486. Upgrading from the slower to the faster board costs \$2,500.

To enhance the performance of those admittedly quick microprocessors further, you can attach a 256K RAM cache to the processor complex as a daughtercard. Without that \$1,995 add-in, either processor com-

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## PS/2

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plex relies only on the internal 8K cache of the 486 microprocessor.

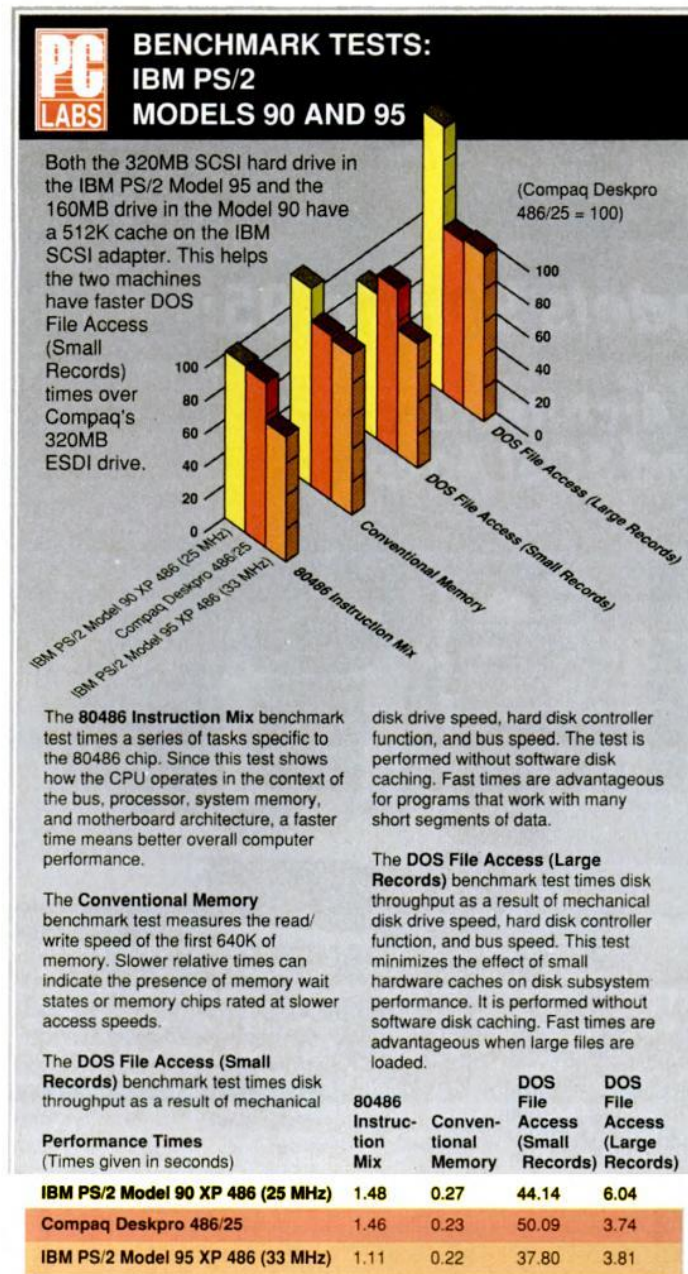
Standard memory in either of the new PS/2s is four megabytes. According to IBM, all of this is installed as SIMMs in eight system board SIMM sockets. While that's indeed true for the Model 95, the Model 90 comes equipped with two proprietary memory daughtercards to hold the SIMM sockets and installed memory modules.

Both systems are equipped from the factory with 70-nanosecond proprietary SIMMs (they will also accommodate 80- and 85-nanosecond SIMMs but with slower overall performance). Either system will automatically configure itself for any mix of 1-, 2-, 4-, or 8MB SIMMs (when the last become available) provided the modules are added in pairs to satisfy the requirements of memory interleaving.

The processor complex connects with the systemboard and memory through a 64-bit interface using a new Micro Channel connection that runs almost the full length of the processor complex. To cope with the inordinate insertion force required by this connector, plastic levers are provided on the board for forcing it into its socket.

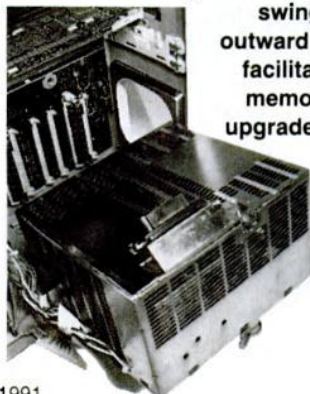
For mass storage, IBM supplies its 32-bit bus-mastering SCSI host adapter and a matching SCSI hard disk. Three capacities are available for different system models: an 80, a 160, and a 320. The Model 90 also features two connectors for IDE drives that are currently unexploited. Although *PC Magazine's* BIOS-based benchmark test speeds are obscured by the SCSI interface, DOS testing shows the drives approach the speeds claimed by IBM—as fast as a 12.5-ms. average access time for the 320MB drive.

Neither of the new machines exploits the full potentials of SCSI or Micro Channel technology, however. The IBM hard disk host adapter lacks the fea-



tures of the new SCSI-2 standard, and the Micro Channel slots lack the streaming data mode and multiplexed data transfers that are part of the so-called Micro Channel/2 specifications.

**The Model 95's power supply swings outward to facilitate memory upgrades.**



All standard expansion slots in the two machines do, however, offer a full 32-bit interface. One slot in the Model 90 and two in the 95 (one available) include the Micro Channel video extension.

In both the Model 90 and 95, the standard video system is IBM's new Extended Graphics Array or XGA (see sidebar). Backwardly compatible with VGA at the hardware level and the 8514/A software interface (but not hardware), XGA can put images with resolution up to 1,024 by 768 pixels in up to 256 colors on interlaced monitors equivalent to IBM's 8514 or 8515. While the XGA circuitry is part of the Model 90 system-

board, in the Model 95 it is packaged as a Micro Channel expansion board—the XGA Display Adapter/A—and sells for a list price of \$1,095. Standard XGA memory is 512K, which allows 16 colors at full resolution. Getting the full spectrum requires an additional 512K, for which IBM charges \$350.

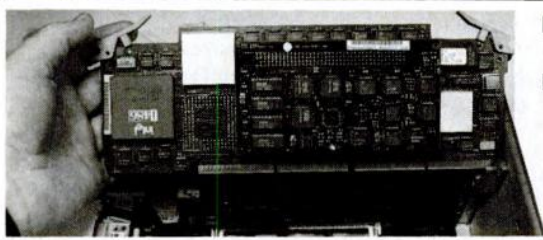
Because of its automatic monitor-sensing abilities, XGA will work with color or monochrome VGA monitors as well as high-resolution displays, automatically adjusting its palette and resolution to match. The most remarkable part about XGA in the Models 90 and 95 is that it operates as a bus master, handling the overhead of memory transfers itself. The result is that XGA display times don't vary much with microprocessor speed.

Another innovation in the Models 90 and 95 is that the serial and parallel ports of the systems operate as direct memory access (DMA) devices. These relieve the system microprocessor of memory management overhead. Consequently, they can achieve higher speeds while allowing better overall system performance during their operation. For example, IBM's supported serial port speeds now range from 300 to 345,600 bits per second, up from the 19,200-bps maximum of previous PS/2.

Although the advanced bus-mastering and DMA features of the new machines may not benefit DOS-based systems, they should help improve the performance of IBM's slimmed-down OS/2, Version 1.3, which was announced at the same time as the Models 90 and 95. Both a Standard Edition and Extended Edition of OS/2 1.3 (which each include the graphics-based Presentation Manager front end) are able to run in as little as 2MB of RAM.

In the Models 90 and 95, IBM has subtly reworked much of the original PS/2 design. While both machines use a software configuration scheme similar to that of earlier PS/2s, the necessary code is not contained on a special Reference Diskette. Instead, it is hidden on a 3MB reserved area of the system's

## First Looks



In a break from tradition, all Micro Channel intelligence resides on IBM's Processor Complex.

principal hard disk, along with diagnostics and even part of the system BIOS. While this is the functional equivalent of putting setup code in the system ROM, it offers more storage and allows for relatively thorough and user-friendly setup procedures. The configuration firmware/software, and the system BIOS, can be easily updated since no ROM swaps are necessary.

The individual parts of the machines are fascinating, but the overall approach of the systems is even more intriguing. The power platform design will allow IBM to update these systems to higher-performance microprocessors—say, 50-MHz 486s or 586s. The sturdy steel cases won't have much trouble passing government muster. Moreover, because the bus control logic is on the processor complex, IBM can add all the advanced Micro Channel features it left out this time around when it needs to eke more speed from the bus. Not only will the ability to swap processor complexes help preserve some investment in the new PS/2s as

technology changes, it could also help IBM become more of a leader in the PC horsepower race, a role it hasn't held since the AT was introduced more than half a decade ago. ■

**IBM PS/2 Model 90 XP 486, PS/2 Model 95 XP 486**

IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; (800) IBM-2468.

**List Price:** PS/2 Model 90 XP 486: with 25-MHz 486 microprocessor, 4MB RAM, 80MB SCSI hard disk, 1.44MB floppy disk drive, XGA display subsystem, one parallel and two serial ports, \$12,495; with 160MB SCSI hard disk, \$13,095; with 33-MHz 486 microprocessor, 320MB SCSI hard disk, \$16,695.

CIRCLE 714 ON READER SERVICE CARD

**List Price:** PS/2 Model 95 XP 486: with 25-MHz 486 microprocessor, 4MB RAM, 160MB SCSI hard disk, 1.44MB floppy disk drive, XGA output, one parallel and one serial port, \$14,145; with 320MB hard disk, \$16,095; with 33-MHz 486 microprocessor, \$17,745.

CIRCLE 715 ON READER SERVICE CARD

## A New Breed of Notebook: The Psion 20-Hour MC 600

HANDS ON  
by Mitt Jones

If being different were all that mattered, the \$2,995 Psion MC 600 would deserve untold accolades. This 80C86-based 8-MHz notebook laptop gets lots of gold stars for its 20-hour battery life but poor marks for overall usability.

The secret behind the battery life is simple: The machine omits display backlighting, uses

lower-power, solid-state storage, and comes with a rigorous set of power conservation capabilities, including a utility that automatically shuts down the processor for short periods of time between operations. The conservation sounds fine on paper, but in reality the MC 600 suffers from technology limitations and poor implementation of some features.

The MC 600 weighs only 5.2 pounds, including the bat-

## READY OR NOT, IT'S XGA

by M. David Stone

Arguably the most interesting aspect of IBM's new 486 systems is XGA, or Extended Graphics Array. XGA is two chips (graphics coprocessor and display controller) that offer three mutually exclusive modes of operation: a VGA hardware emulation, an enhanced 132-column VGA text mode, and a native XGA mode.

The XGA resolutions are equivalent to VGA and 8514/A, but go beyond them by offering 256 colors at 1,024-by-768 resolution, and 65,536 (16-bits per pixel) colors at 640-by-480 resolution. According to IBM, the native mode also offers performance improvements of up to 90 percent in DOS, and 50 percent in *Windows* over other PS/2 VGAs.

In extended graphics mode the XGA's capabilities allow it to act as a bus master and utilize system memory for graphics. It can also read from system memory, so for example, it would read raster fonts for screen display. Unlike the 8514/A's I/O mapped drawing control registers, the XGA uses memory mapped registers. These may cause conflicts with memory managers but provide quick register access.

The kicker is that although the XGA's VGA emulation mode is hardware-compatible with VGA registers, the

XGA's native mode is neither VGA nor 8514/A hardware-compatible. The XGA comes with its own adapter interface to remain compatible with programs written to the 8514/A AI (Adapter Interface) in DOS, but that doesn't include many programs.

To offset the lack of hardware compatibility, IBM supplies XGA drivers for *Windows*, Release 2.x and 3.0, for *AutoCAD*, and for *Presentation Manager* in OS/2 1.2 and 1.3. There is no XGA AI driver for OS/2 programs that don't run through PM, but the number of such programs is vanishingly small. The 65,536 color mode at 640 by 480 is currently available only for programs that write directly to the XGA hardware, though IBM says that drivers for this mode are coming.

What does the XGA standard mean in the marketplace? Clearly IBM's intention is for the XGA to eventually supersede both VGA and the 8514/A, but this may be an IBM-centric goal. IBM's implementation of XGA is strictly for the MCA bus. Other manufacturers will no doubt reproduce XGA for ISA and EISA buses. But XGA is currently an interlaced standard at 1,024 by 768, thus subject to flicker. In contrast, you can already buy non-IBM 8514/A-compatible cards with 1,024 by 768 noninterlaced resolution. ■

tery pack. Connectors include a parallel port, mini-din connectors for the provided proprietary serial cable, an optional external CGA monitor cable, and a proprietary port for an external floppy disk drive. A proprietary expansion compartment allows installation of a modem or second serial port.

The machine boots from its 1MB battery-backed RAM disk, which is configured as drive C:\. As long as the system's primary battery pack or backup lithium battery remains

charged, the contents of the RAM disk will be preserved. A second, smaller nonvolatile drive, comprising 256K of Flash memory, holds DOS 3.22, *LapLink III*, and the MC 600 utilities.

For removable storage, the machine accommodates as many as four proprietary solid-state storage cards simultaneously. These optional cards come in three varieties: Flash EEPROM, rewritable RAM disk cards, and read-only mem-

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