

THE IBM PC AT

Powerful hardware with a split personality

Editor's Note: The following is a BYTE product description. It is not a review. We provide this advance look at this new product because we feel it is significant. A complete review will follow in a subsequent issue.

Exactly three years after the introduction of the IBM PC, IBM announced the PC's second upgrade, the second network for its personal computers, and, finally, a reasonable keyboard. The new IBM PC AT (advanced technology) has a number of interesting features: a 6-MHz 80286 microprocessor (with 2 to 3 times increased performance over the PC), a 1.2-megabyte minifloppy-disk drive, an enhanced yet compatible expansion bus, the aforementioned keyboard, and an on/off lock switch. On the software side, IBM announced a new version of IBM PC-DOS (3.0), which has some minor improvements and supports networking but not multitasking. However, in the first quarter of 1985, IBM will release TopView, an operating environment that allows multitasking and costs \$149, and an 80286-based version of XENIX (UNIX System 3) with multitasking and multiuser capabilities.

The prices for these new products are surprisingly competitive. The base price of an IBM PC AT without the 20-megabyte disk drive is \$3995, but a working system in the standard BYTE configuration (two disk drives, 256K bytes of RAM, display, color capability, interfaces, DOS) costs about \$5700. In the standard BYTE configuration, plus a 20-megabyte hard-disk drive, total cost is about \$6700.

BY BYTE STAFF

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THE SYSTEM UNIT

The system unit is about an inch thicker than the PC. Also, the disk drives are half-height and medium beige. Finally, what looks like an ignition key dangles from the front panel (see photo 1).

The most dramatic changes in the system are inside the unit. First is the 80286 microproces-

sor, running at a clock speed of 6 MHz. Like the 8086 microprocessor, the 80286 is a true 16-bit microprocessor with both external and internal data buses 16 bits wide. Also, the 80286 has advanced memory-management capabilities that let it access a virtual memory address space of 1 gigabyte.

The 80286 can run under two modes. Under PC-DOS, the 80286 runs in the "real address" mode, in which it emulates an 8086 similar to the 8088 in the IBM PC. In this mode, the 80286 can access only 640K bytes of system memory directly. In the second mode, under XENIX, the 80286 can directly access up to 16 megabytes of physical memory.

IBM claims that the AT performs 2 to 3 times faster than the PC. We expected a 25 percent increase in speed just due to the difference in clock speed. The true 16-bit data bus usually provides another 40 percent increase in processing speed. In actual tests, we found an increase of 150 percent; that is, the AT is 2½ times faster than the PC.

Minimum system memory is 256K bytes; the maximum is 3 megabytes (using five 512K-byte memory expansion cards).

DISK DRIVES

The AT comes with a new type of floppy-disk drive capable of storing 1.2 megabytes of data. These half-height drives achieve this high density by using special disks, a track density of 96 tpi (tracks per inch) as opposed to 48 tpi on the PC, and 15 sectors per track instead of 9 sectors per track as in PC-DOS 2.0. These drives can read standard 360K-byte disks but have trouble writing to these disks in a way that can be read by ordinary 360K-byte disk drives.

The AT has enough space for two of these drives. Or, for more compatibility with the PC, a regular 360K-byte drive can be installed in place of the second high-capacity floppy-disk drive.

In addition to the two possible floppy-disk drives, an optional 20-megabyte hard-disk drive is available for the AT. Also available is

a half-height version of this drive that lets you install two 20-megabyte drives with one floppy.

OTHER HARDWARE

The expansion bus in the AT (see photo 2) features some compatibility with the PC but also lets the expansion cards have access to the 80286's extra data and address lines. Two connectors are provided for six of the eight slots. One is the standard 62-pin IBM PC expansion slot connector. Just forward of this is another 36-pin connector for the additional lines.

You can use the lock on the AT's front panel to lock the machine off or on. This lock disables the on/off switch along with the keyboard. It also locks the cover on. For example, if you are running a network or a program that requires a long time to execute, you can lock the system on. This disables the keyboard and prevents passersby from interfering with the system.

The keyboard itself looks perfect. It features oversized Return and Shift keys (see photo 3), and the dreaded Backslash key has been moved up next to the Backspace key. It also has indicator lights for Caps Lock, Num Lock, and Scroll Lock. The keyboard feels and sounds exactly like that of the PC. Also, the keyboard has a long cord that lets you put the system unit on the floor rather than on your desk.

We really like this keyboard, but we have used at least one word processor program (XyWrite II Plus) that does not work with the Caps Lock indicator light. Unfortunately, this keyboard *cannot* be used with the PC.

The AT has serial and parallel interfaces on combination serial/parallel expansion cards. Each card has one serial and one parallel interface. You can use up to two cards in the system. The parallel interface uses a female DB-25 connector, just like the PC, but the serial interface uses a male DB-9 connector. This means you have to buy a special DB-9/DB-25 cable. The reason for this strange connector is probably because the card did not have enough room for another DB-25 connector.

Despite the many rumors, the AT uses the same display adapter cards as the PC. However, these cards fit only in slots 1 or 7.

And IBM finally knows what time it is. The AT has a clock/calendar chip with a small bank of CMOS (complementary metal-oxide semiconductor) RAM powered by a battery. The 50 bytes of CMOS RAM store information such as how much memory is installed and what kind of drives are available. This eliminates the need for DIP switches on the motherboard. In

(continued)

Specifications: IBM PC AT

MANUFACTURER

IBM Entry Systems Division
POB 1328
Boca Raton, FL 33432
(800) 447-4700

PROCESSOR

16/16-bit Intel 80286, 6-MHz clock rate

MEMORY

256K bytes to 3 megabytes

DISK DRIVES

One 5¼-inch 1.2-megabyte floppy drive
Optional 20-megabyte hard disk
Optional 5¼-inch 360K-byte drive

OPERATING SYSTEM

IBM PC-DOS 3.0
Available soon: DOS 3.1 and XENIX

SOFTWARE

IBM PC BASIC 3.0

PRICE

With 1.2-megabyte disk drive \$3995
Above with monochrome display, color graphics card, interfaces, second disk drive, and DOS . . \$5469
With 1.2-megabyte drive, 20-megabyte hard-disk drive, interfaces, and 512K bytes of memory . . \$5795
Above with monochrome display, color graphics card, and DOS \$6694



Photo 1: The IBM PC AT with a 20-megabyte hard-disk drive. This unit is equipped with an IBM monochrome monitor and a second, 360K-byte floppy-disk drive. Note the switch lock on the front panel.

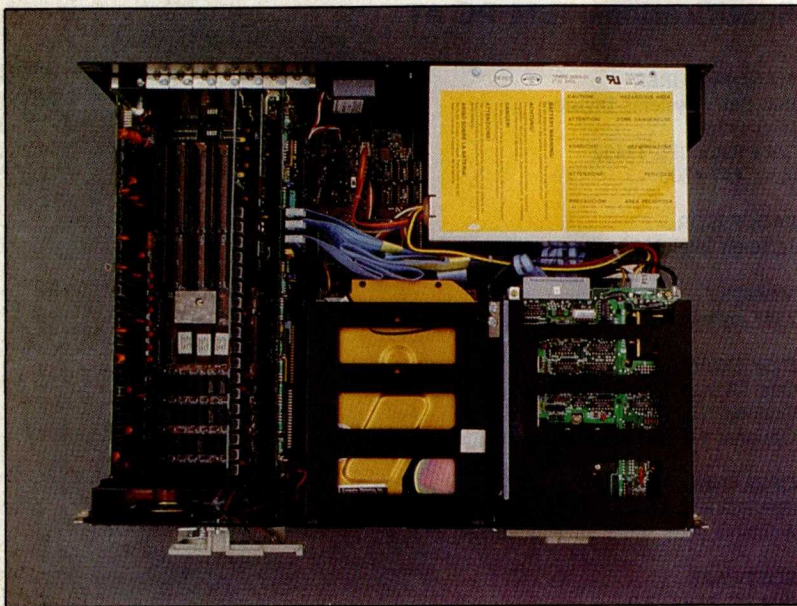


Photo 2: Inside the IBM PC AT. The expansion bus is at the left. Note the connectors for extra address and data lines. A 20-megabyte hard disk is in the lower middle. The power supply is in the upper right. **Photo 3:** Close-ups of the IBM PC AT keyboard. Note the proper position of the Shift key (left). Also note the indicator lights in the upper right and the large size of the Return (Enter) key (right).

fact, the only real switch on the motherboard is a poorly labeled slide switch that tells the system what type of display is attached.

PC-DOS 3.0

An enhanced version of the PC-DOS operating system drives the IBM PC AT. Labeled version 3.0, it provides a software upgrade path within the PC product line while accommodating the hardware differences of the AT's architecture. The new DOS runs on IBM PCs and XT's and the PCjr as well as the AT.

The first time you use PC-DOS 3.0, you must run a startup routine. The routine defines the system's hardware—how many disk drives are installed, how much memory is installed, etc., and this information is stored in the above-mentioned CMOS RAM. This setup information is referenced each time you turn on the computer.

PC-DOS 3.0 supports the high-capacity (1.2-megabyte) floppy disks as well as the standard single- and double-sided floppies and one or

two fixed disks. These disks can be used in a variety of combinations.

The high-density floppies can store 600K bytes of information per side on 80 tracks, with 15 sectors per track. Four enhanced PC-DOS 3.0 commands, Format, Backup, and Diskcomp/Diskcopy, provide support for this new class of floppy disk.

Enhancements to Backup also permit selective backup in three categories: backup of files modified since the last backup, addition of new files to a backup disk, and backup of files modified after a certain date.

Perhaps the most significant new command is Device, which permits the installation of virtual disks. Virtual disks, often called RAM disks, can number up to 24 in PC-DOS 3.0. In IBM PC ATs with extended memory, it is possible to locate virtual disks above the 1-megabyte boundary.

Version 3.0 of PC-DOS comes with three manuals and a quick reference card. The *User's Guide* is an introduction to PC-DOS written for the novice user and covers the basics of the operating system with simple text and color graphics. An *Applications Setup Guide* prompts you through the process of porting existing PC-DOS applications over to version 3.0. The DOS reference manual is a standard three-ring, loose-leaf binder with documentation similar to previous versions. A technical reference for software developers is available at extra cost.

BASIC, TOPVIEW, AND XENIX

Version 3.0 of BASIC incorporates several extensions.

The SHELL statement loads and executes a program file (called a child process) that can be run from the system level from BASIC. If the file executed is a .BAT file ending in EXIT, control is returned to BASIC. There is a wide variety of conditions under which SHELL might cause the system to crash, including accessing the DMA controller, interrupt controller, I/O (input/output) latch, or counter timer from a child process, or altering any file opened from BASIC from a child process.

The ENVIRON\$ function returns information on BASIC's environment table (position in DOS directory). The ENVIRON statement modifies BASIC's environment table.

TopView is a separate software package that contains what we expected to find in PC-DOS 3.0. It will be released in the first quarter of 1985. TopView is an interesting multitasking environment with windowing capability. The demonstration we saw of TopView showed that you can use it with a mouse to set up windows that can execute applications concurrently.

At \$149, this package will compete against Digital Research's Concurrent PC-DOS (Concurrent CP/M-86 version 3.1 with PC-DOS emulation), which is similar in features and price. However, Concurrent PC-DOS can also run CP/M-86 applications.

As is the case with TopView, we have not yet received XENIX for this system (release date is also set for the first quarter of 1985), but we have seen a demonstration. It is limited to three users (because of the AT's two-serial-port limitation). Also, it has a nice user shell that looks very much like Multiplan. In fact, as of this writing, Multiplan is the only application program that IBM has for XENIX.

PC INCOMPATIBILITY

IBM states that the following PC hardware products will not work with the AT: the standard PC keyboard, the parallel-printer adapter card, the 64K to 256K-byte memory cards, the asynchronous communications (serial port) card, and the expansion unit. We have not yet tested any of the numerous third-party expansion cards, but we are not optimistic.

As for software, IBM states that the following programs (among others) will not run: BPI Systems Accounting (1.0); Peachtree Accounting (1.0); EasyWriter (1.0); pfs:File and Report (1.0); VisiCalc (1.0 and 1.1); and BASIC (1.X and 2.X). We were disappointed to find that Microsoft's Flight Simulator would not work. Most other programs that we have tried (WordStar, Lotus 1-2-3, Multiplan, PeachText) do work.

Technically, IBM states that the AT might not be able to run PC programs that include memory-specific commands such as POKE; programming loops to control timing; back-to-back I/O commands to the same port (because of insufficient recovery time); the PUSH SP command (this command on the AT pushes the current stack pointer, while the PC pushes the new stack pointer); and the divide-error exception (the AT pushes the address of the instruction causing the interrupt, while the PC pushes the next instruction's address).

CONCLUSIONS

All testing we have done with the AT to date has involved only the real address mode (under DOS 3.0). Under this mode, we have found that the AT provides an increase of 2½ times the processing speed of the PC. We have no indication of how it will perform under XENIX in the multiuser environment.

The AT might be of interest in data-acquisition applications. The system comes with 16 interrupt levels and 7 channels of DMA. The DMA controller operates at 3 MHz, which is

relatively fast. DMA channels 0 through 3 support 8-bit transfers throughout the system's 16-megabyte physical address space in 64K-byte blocks. Channels 5 to 7 support 16-bit transfers in 128K-byte blocks. Channel 4 cascades channels 0 to 3 to the 80286. IBM has documented the AT's DMA controller in the *Technical Reference Manual*. The PC and XT are a little too slow to keep up with the output of most high-speed data-acquisition systems, so the AT might find a home in these applications.

The IBM PC AT is an impressive machine, but the most important reason for its existence has yet to arrive—a powerful multiuser operating system such as UNIX. When XENIX is available, we'll be able to give a more complete evaluation of this system. For now, the AT represents a solution for applications that are taxing the PC and XT to their limits. ■

THE IBM PC NETWORK

BY GEORGE BOND

IBM's entry into the microcomputer local-area network field probably will have an impact similar to that of the original IBM PC on the personal computer field—big.

The company introduced a local-area network (LAN) for PCs and an emulation program to give PCs access to mainframes. The IBM PC Network Program is the LAN. It is designed to connect PC-family machines, except for the PCjr and PC Expansion Unit, to each other. The IBM PC Network SNA 3270 Emulation Program is meant to provide System/370 mainframe applications to PCs on the PC network using IBM 3270 or SDLC (synchronous data-link control) communications protocols. The LAN is scheduled for release in the first quarter of 1985, and the emulation program by midyear 1985.

The PC Network uses standard broadband hardware components and is designed for user installation. It transmits data at 2 megabits per second using carrier-sense multiple-access/collision-detect (CSMA/CD) protocol. The physical network consists of an IBM PC Network Translator Unit (\$595), IBM PC Network Adapters (\$695), and IBM PC Network Cabling Components. As many as 72 nodes can be attached within a 1000-foot radius of the translator unit.

The network adapter unit (made by Sytek), which looks like a regular add-in board for the PC, includes an Intel 80188 microprocessor and an 82586 communications controller among its circuitry. The Network Translator Unit is composed of a frequency translator, a directional tap, and an eight-way splitter.

IBM's vision of the future appears to be just that—vision. It is giving strong hints that its goal is to combine video with voice and computer data transmission, a prime AT&T objective, on the PC LAN. The LAN uses standard RG-11 coaxial cable, a broadband cable found in cable television installations. IBM notes in one of the printed announcements relating to the AT introductions that the cabling system and the IBM PC Network media have the "inherent capability to transmit voice, video (using additional vendor equipment), and data." In another piece of introductory literature, IBM notes that the 75-ohm coax is "CATV compatible."

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