Special Edition

PC WORLD

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The Comprehensive Guide to IBM Personal Computers and Compatibles

750 Hardware Products for the IBM PC, XT, and PCjr

Annual Hardware Review

Essays by the leaders of the world's most successful hardware companies, including Compaq, Hayes, Seagate, and Tecmar

60 PC Compatibles

Plus
Hard Disks, Printers, Monitors, Networks, and PC-to-Mainframe Communications

PC WORLD

Special Edition

1984 Annual Hardware Review

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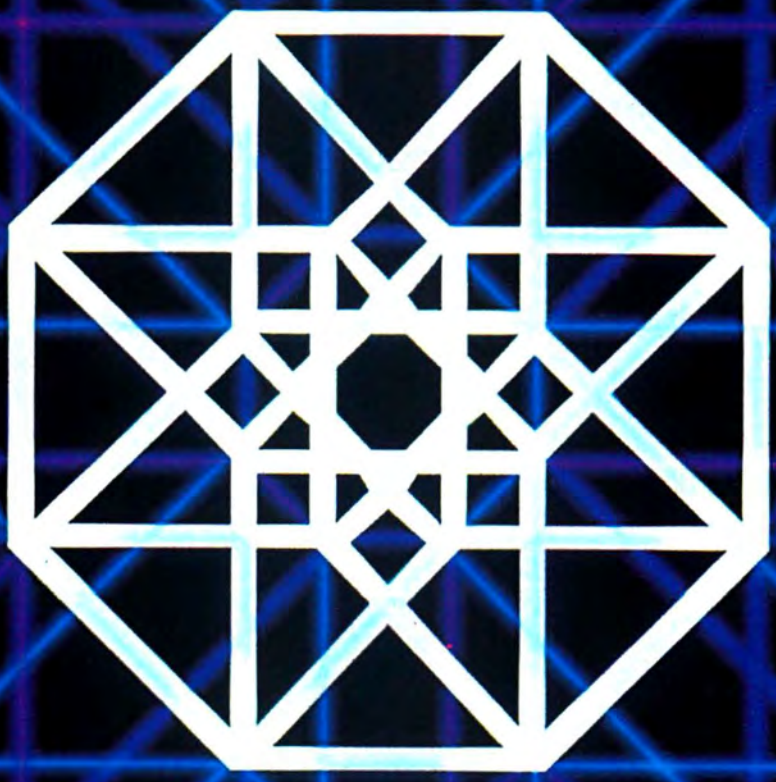
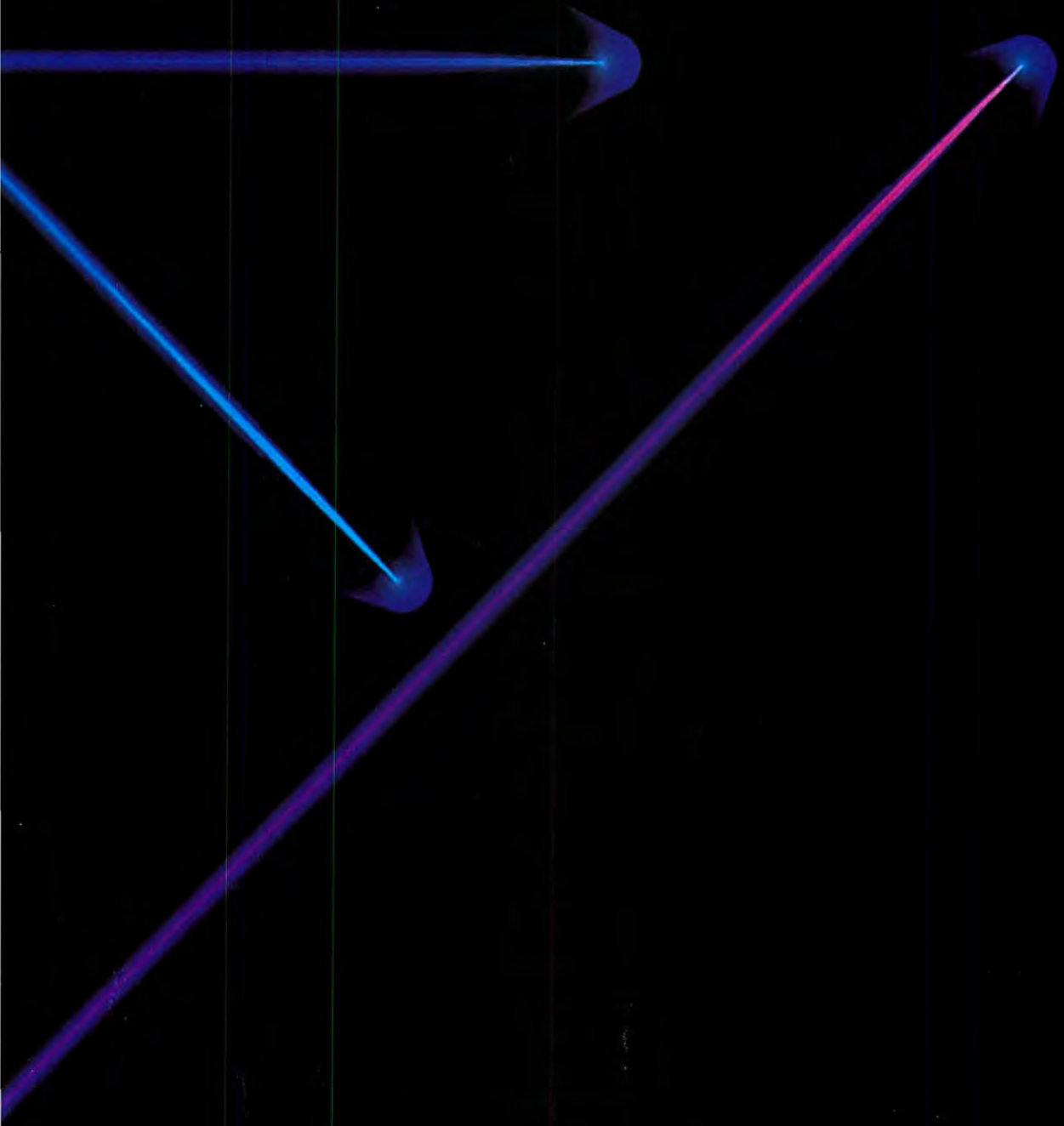


Has Your IBM PC been suffering from lack of communication?



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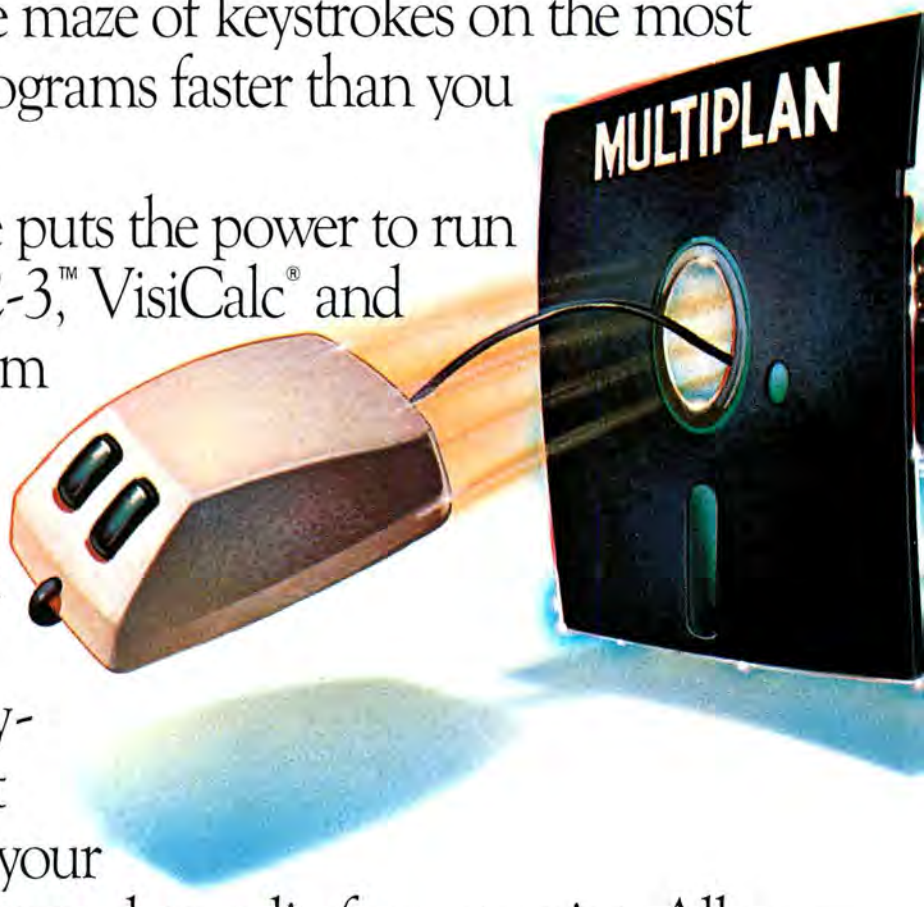

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Microsoft Mouse runs circles around other mice. It is the high performance mouse for the IBM® PC and PC XT. From the company known for high

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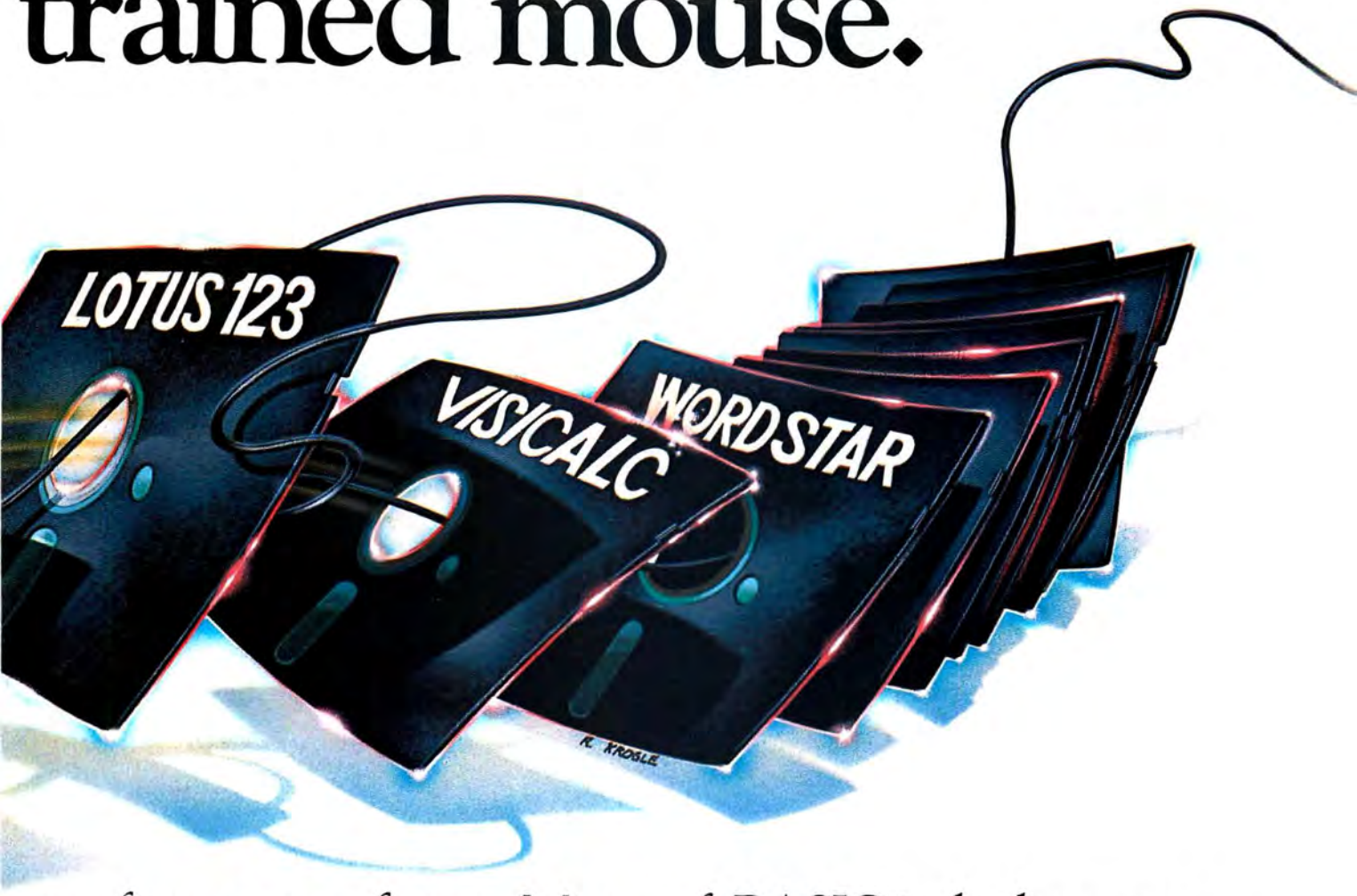

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Our MS™-DOS operating system tells your IBM PC how to think.

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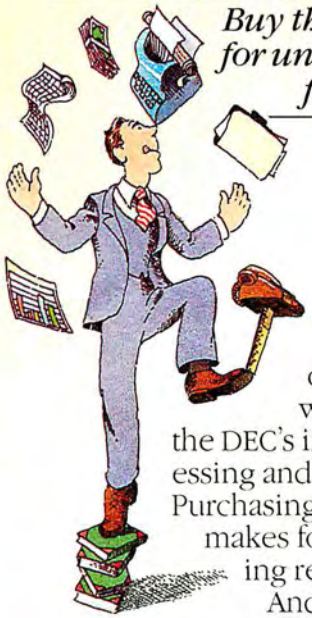

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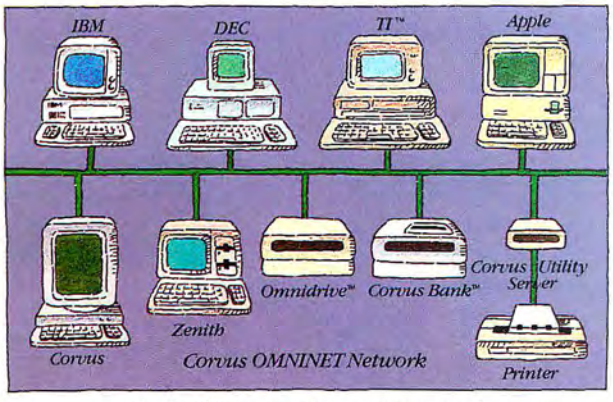

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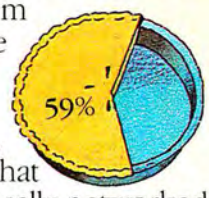

With the result that 3 out of every 5 locally-networked micros in the world are connected to a CORVUS network.*

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Because when it's all said and done, one of the best arguments for going with an OMNINET Network is really very simple.

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PC WORLD

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ELAN™* Extended Local

NETWORKING
- Ethernet
- Electronic mail
- Device sharing
- No dedicated server required
- Floppys not required in single node
- Remote job execution
- File lock out
- Password protection

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- Call Forwarding
- Length Of Call Indicator
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- Message Support - either leave or obtain messages. Receive messages remotely
- The modem board, with a handset, substitutes for a telephone

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- Device sharing
- Remote job execution
- File lock out
- Password protection
- 300 to 1200 baud modems available
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- Access dictating systems on network. Control them by touch-tone decoding
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- Voice annotated text
- Voice messages

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- Transparent keyboard. Speak instead of type

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- Ethernet Link
- Ethernet Companion
- ELAN Software

EXECUTIVE $2995[1]
- Ethernet Link
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- Microphone
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[1]With 1st MATE, 2nd MATE, or 3rd MATE in Station

[2]Option: 1200 Baud Modem

*ELAN (formerly ComNet)

Area Network from TECMAR

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- Control the Pearlcorder X-02 or XR dictating system from keyboard, footpedal, or remote telephone keypad. Dictate to the network from anywhere in the U.S. or Canada.

FOOT PEDAL SUPPORT

- Controls dictating system
- Controls response to voice recognition

SOFTWARE

- Time Management - alerts you to appointments at any station you are logged onto
- Message Management - either electronic mail or voice
- Clock/Calendar - either visual or audible
- Calculator - either visual or audible
- Voice Management - oversees voice mail, voice message and voice annotated text operations

These software packages can be operated through voice recognition with voice output, through the telephone keypad with voice output or through the IBM PC keyboard

NETWORK FOR THE IBM PC

The MANAGER system adds a modem which can turn the PC into a telephone if a separate handset is added. The modem enables the MANAGER to receive unattended voice and data from any telephone in the U.S. or Canada. The MANAGER can accept commands by decoding the tones in the telephone keypad.

The EXECUTIVE is the most complete implementation of ELAN, adding computer recognition of spoken commands. An executive might phone the PC to leave or retrieve messages or request specific information. The PC, in a spoken voice, can request the user's access code or offer a list of options the user can select. The EXECUTIVE can then key in answers or commands with the phone's tone dialing buttons, or may simply speak his response to the computer.

MANAGER $1995[1]

- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)[2]
- ELAN Software

HARDWARE

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Permits communications between computers at extremely high speeds (10 Mbits per second). The transmission mode is through single video coaxial cable with easy-to-use BNC connectors.

ETHERNET COMPANION

Performs the function of voice digitization and voice replay, dictation machine control and foot pedal control. Also contains interface for mouse.

MODEM

103 (300 Baud) $295
212A (1200 Baud) $695

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- Dual tone DTMF receiver (decodes touch tones)
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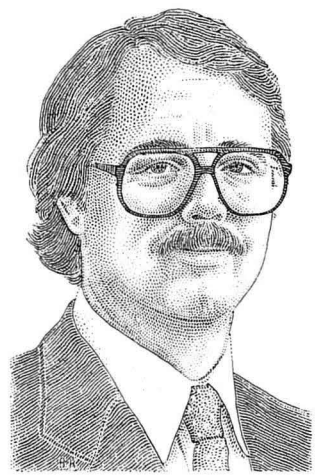
Paranoia and the PC



Recently I was talking to someone about the Macintosh, Apple's new personal computer, and how it compares with the IBM PC. During the course of the conversation, the remark was made that we should "thank God for Apple and the Macintosh; otherwise we'd be stuck with IBM and the IBM Personal Computer." The implication was that IBM, as suggested in Apple's debut commercial, looms over the industry's creative force and limits productivity.

I've given this statement considerable thought and have come to the conclusion that, contrary to some industry viewpoints, the PC is a very innovative product. As reflected in the *Hardware Review,* the PC has indeed advanced the state of the art in personal computing.

Somewhere the notion arose that IBM is not a technology-driven company, that it is not an innovative company, and that if IBM dominated the market, it would drastically constrict the development of new products for personal computing in general. I believe that this issue of the *Hardware Review* disproves that theory in a number of ways.

First, the PC is not strictly an IBM product. As evidenced by the more than 700 products reviewed in this volume, the PC system consists of products from a great many companies—to say nothing of the software that comes from thousands of other sources. The PC is not limited to what IBM thinks a personal computer should be; it is a reflection of a collective vision of personal computing as represented by the contributing manufacturers, engineers, and program authors in the field. Almost everyone involved in personal computing today is developing PC-compatible products.

The history of the PC also characterizes its creative influence on the field. In 1982, when the PC was introduced, the personal computer market was dominated by 8-bit, CP/M-based machines. These computers were typically limited to 64K RAM. IBM introduced a product based on the 8088, an advanced processor chip, and a new operating system. IBM did not lack daring or creativity; otherwise it would have come out with a "me-too," CP/M, 8-bit machine.

The PC has advanced the state of the art more dramatically than any product preceding it. It is estimated that by 1987, close to 10 million PCs will be in use throughout the world. I predict that when historians consider personal computers, they will regard the PC as the Model T of our industry. Others may have reserved this acclaim for the Apple II or Radio Shack's TRS-80, but the distinction clearly belongs to the PC.

IBM has been labeled a standard for so long that some people don't expect it still to be an innovative company. However, the existence of the PC XT, the XT/370, the 3270-PC, the PCjr, and the new IBM Portable PC tends to dissolve IBM's prosaic image. These products indicate that IBM is serious about having a complete family of personal computers. In fact, before 1985 we may well see an IBM lap-size computer.

The PCjr is a good example of IBM's trials and tribulations in the new computer product market. The

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The *Only*
Pure Oak Wood
COMPUTER
FURNITURE
especially designed
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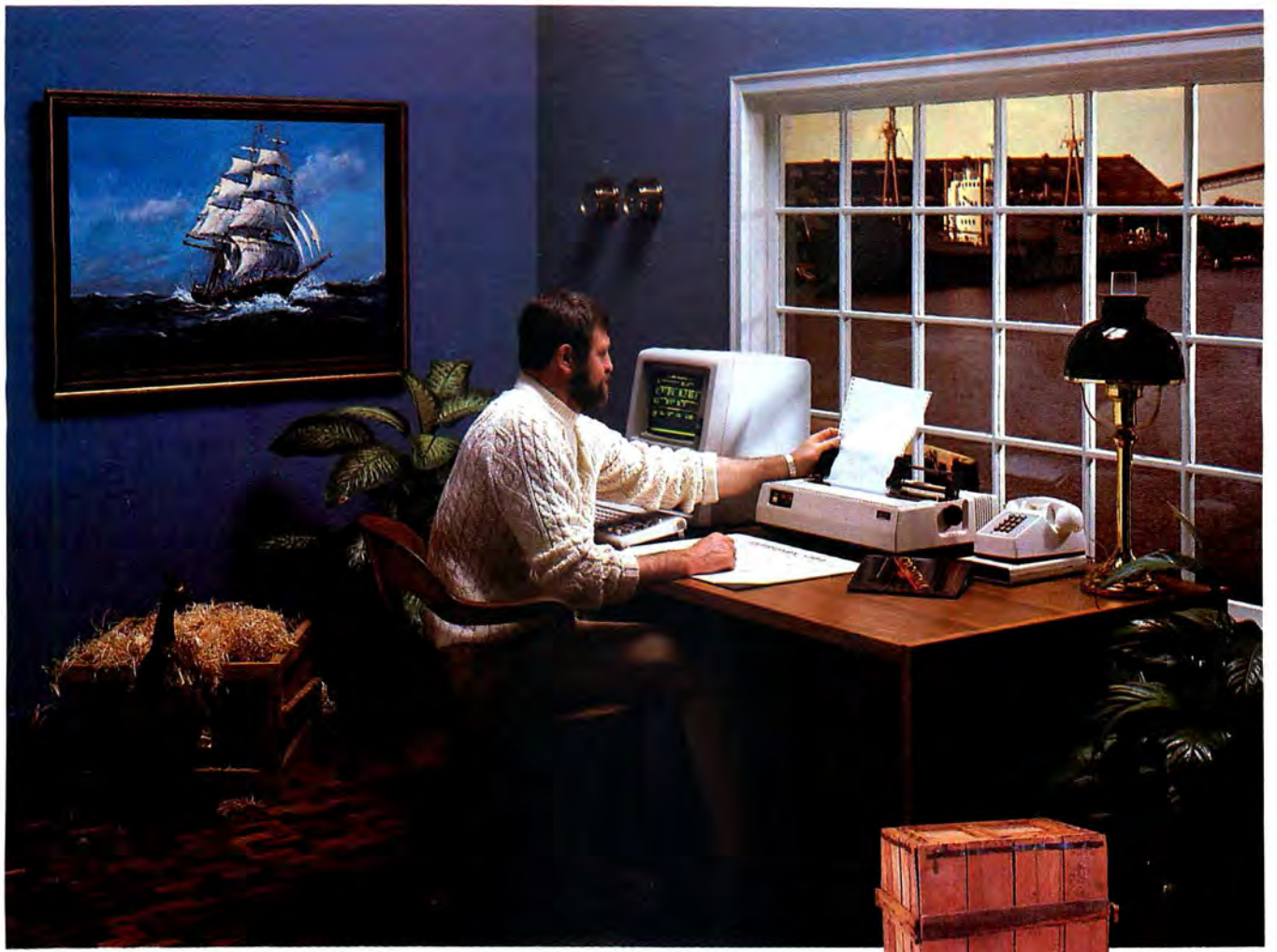
David Bunnell

PCjr's keyboard is the first infrared keyboard for home computers. It is a pioneering vision. Yet the critics disdain its Chiclets-like keys (I myself have been guilty of this) and neglect its original purpose. This keyboard is revolutionary, though, because it eliminates the need for cords and frees you from having to work *in* the immediate vicinity of the screen.

Perhaps IBM knows the consumer marketplace better than any of us anticipated. The bottom line is that IBM does not make personal computers to impress industry gurus; they make personal computers to be used by the public. The acclaim of the PC dramatically demonstrates this.

The success of the PC, however, is governed primarily by factors beyond IBM's control. The satellite companies make IBM the industry standard: *PC World* and its numerous imitators establish a guide to the PC, hundreds of software companies provide the PC with programs, and diverse hardware manufacturers create products for a PC system.

People who worry about an imminent IBM dictatorship, imagining that IBM might introduce its own proprietary operating system or design PCs that are closed to hardware development, are missing the point. Should IBM make the unlikely decision to seal itself off from the rest of the industry, PCs would not continue to be as successful as they are today. To date, IBM has spurred innovation in the marketplace and accelerated the development of the personal computer. I expect that the company will continue to do this because it is such a successful tack to follow. IBM would be crazy to change course in order to fulfill the paranoid prophecies of some of the industry's analysts.



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Circle 272 on reader service card

The PC's Extended Family

Kearney Rietmann

We're proud to present the *PC World Hardware Review,* the companion volume to the *Software Review* that appeared in November 1983. The *Hardware Review* contains 750 hardware products for the IBM PC family, which is made up of the PC, the PC XT, the Portable PC, and PCjr. If you're looking for information about keyboards, monitors, memory and multifunction boards, storage devices, printers, modems, networks, or PC compatibles, the *Hardware Review* is the place to find it.

Computer hardware is somewhat like another high-technology area, commercial jet airliners. Some of today's international travelers have flown from New York to Paris on the supersonic Concorde. Even if you haven't had the experience, you can imagine the difference between a 3½-hour flight across the Atlantic Ocean and a 6- or 7-hour flight. If you're concerned only about arriving at your destination, it doesn't matter which plane you fly on. But if you're interested in efficiency and speed, the plane you choose is important.

The same is true of computers. Any computer hardware configuration can help you accomplish the basic tasks of inputting data, processing it, and returning it in the form known as output. But the efficiency of a hard disk drive or the speed of a processor, a printer, or a modem can be crucial. With the right computer hardware you can fly through your work instead of simply getting the job done.

The Products

The *Hardware Review* is made up of 14 categories. The first category, Computers, describes the IBM personal computer family and 60 PC-compatible computers. These computers range from desktop models to portables and the new lap-size computers. Although the lap-size machines are not all compatible with the PC, we've included them in the *Hardware Review* because they are useful companion computers for the PC.

In Input Devices we've described products such as keyboards, mice, touch screens, and voice input devices. Most PC owners probably use the standard PC keyboard, but if you're interested in trying out new computer applications like drawing pictures or talking to your computer, you may want to consider buying a mouse or a voice recognition device.

Like keyboards, monitors are important in your interaction with computers. A monitor is like a window you look through to view your data and the operations going on inside the computer. Depending on which monitor you choose, you can display information in different ways, such as in color or monochrome, and in 40, 80, or 132 columns across the screen. Among the newest developments in monitor technology are amber characters and a reduction in the

size of the pixels, or dots, appearing on the screen. This reduced "dot pitch" results in crisp images in both text and graphics modes. Another new feature to look for in monitors is the capability to produce both video and computer display, which means that PC text can be overlayed on video images.

In the Storage section you'll find descriptions of hardware that lets you store data electronically. Some of the products in this category are floppy disk drives, hard disk drives, bubble memory boards, and hardware for backing up data. Two recent innovations in storage hardware are removable storage devices that will eventually hold more than a gigabyte of data and bubble memory boards that store large amounts of data in a small space and maintain the data inside the computer even when the power is turned off.

Two kinds of products are listed in the Memory Expansion and Multifunction Boards category. Memory, which you purchase as memory chips on an expansion board to be installed inside the PC, increases the processing power of your computer. The greater the memory, the larger the programs you can run and the more data you can manipulate. The new product to watch for is 256-kilobyte (K) memory chips. 256K chips will undoubtedly replace 64K chips, enabling you to put large amounts of memory on memory boards. Some memory board manufacturers are even designing 64K boards that will accept 256K chips once they become available.

Multifunction boards, as the name implies, carry out several PC operations at once. With multifunction boards you can add memory, add a clock to keep track of the time and date of transactions, and attach printers, plotters, modems, joysticks, or other peripherals. One good reason to install multifunction boards in your PC is that they use the limited expansion space inside the computer efficiently. Instead of filling up an expansion slot with a board for one function, you can combine several functions on a single board and save slots for adding capabilities that require separate boards.

The next category is Graphics Boards. The graphics board your computer holds determines the type of screen images your monitor displays. A graphics board works with a monitor to produce color or monochrome images, whether they are text characters or graphics such as charts or graphs. The new trend in graphics is toward boards that produce very fine resolution and as many as 4096 different colors.

For sending information back and forth between computers, three types of products are available, each described in its own section: Modems, PC-to-Mainframe Communications, and Networks. A modem uses standard telephone lines to transfer information from one computer to another. When information is

transmitted, the modem converts a computer's digital signals to analog signals that can be carried over phone lines. When receiving information, the modem converts the telephone's analog signals to digital signals. The newest modems dial and answer telephone calls automatically and provide security features, which ensure that only authorized persons gain access to the computer. Manufacturers are producing modems with increasingly high data transfer speeds—modems that transmit at 2400 bits per second are now available.

PC-to-mainframe boards enable the PC to function as one of the terminals in a mainframe computer system. With this communications capability you gain access to the libraries of information stored on mainframe computers.

For organizations with many computers located in one building, local area networks are useful communications systems. Networks, which link computers with a cable, allow a number of computers to share resources such as hard disk drives, printers, programs, and data bases. Most networks link only PCs, but with some networks, PCs, PC compatibles, other personal computers, and mainframe computers can be connected to share hardware, software, and information.

The largest category in the *Hardware Review* is Printers and Plotters, which includes 150 products. Printers and plotters let you put the information from your computer in paper form. All printers print text, and some produce both text and graphics. High-quality graphics, however, come from plotters, which use pens to draw images, often in color.

The prices of printers have fallen dramatically. Two years ago a letter quality printer cost at least $2000. Today you can buy one for $600 to $800. And like other hardware operation speeds, printer speeds are increasing; the quickest letter quality printers now print up to 80 characters per second (cps), dot matrix printers produce 400 cps, and the fastest printers, line printers, spill out lines of text at the astonishing speed of 2000 lines per minute.

Of all the products in the *Hardware Review,* the Special Purpose hardware is the most original. Ranging from power supplies and surge protectors to voice synthesizers, processors like the Intel 8087 coprocessor and the Motorola 68000, and cameras that attach to the PC to take photographs of screen images, these devices point to new directions in computing with the PC. The special purpose products enable you to use the PC's expansion capability for purposes as ordinary as controlling disk drives and as unusual as directing the scientific instruments in a laboratory or the machinery in an automated factory.

Expert Overviews

Each of the categories in the *Hardware Review* begins with an essay that delineates the purpose and character of the products in that category. The essays are written by the leaders of companies that have played an important role in developing hardware for the PC. Following the essays are short introductions that tell you specifically the kind of products you'll find in the category.

The individual product reports in a category state the name of each product and the manufacturer's name, address, and telephone number. The text of the report describes the product's purpose and features, which should help you decide whether you want to investigate the product further. The product's price and minimum system requirements are given at the end of the description. Obvious requirements, such as PC-DOS, are left out.

The third part of a report is comments from readers who have used the hardware. These remarks, which reflect the readers' opinions and not those of *PC World,* are one of the most interesting features of the *Hardware Review.*

At the end of the volume are the Product and Manufacturer Indexes. If you already know the name of a product, look it up in the Product Index. Or if you're familiar with a particular manufacturer and want to know more about the product line, check the Manufacturer Index.

Computer hardware and software run in cooperation—neither one is of use without the other. You'll probably purchase software many times, adding to your collection the way you add books to your library. Because of the cost of most computers, printers, disk drives, or networks, and because most computer hardware is built to last a long time, you'll buy hardware less often than software. In fact, you may make some hardware purchases only once. Careful research and shopping are the keys to making the right choice. We hope the *Hardware Review* helps you on the way to fast, efficient, and enjoyable computing.

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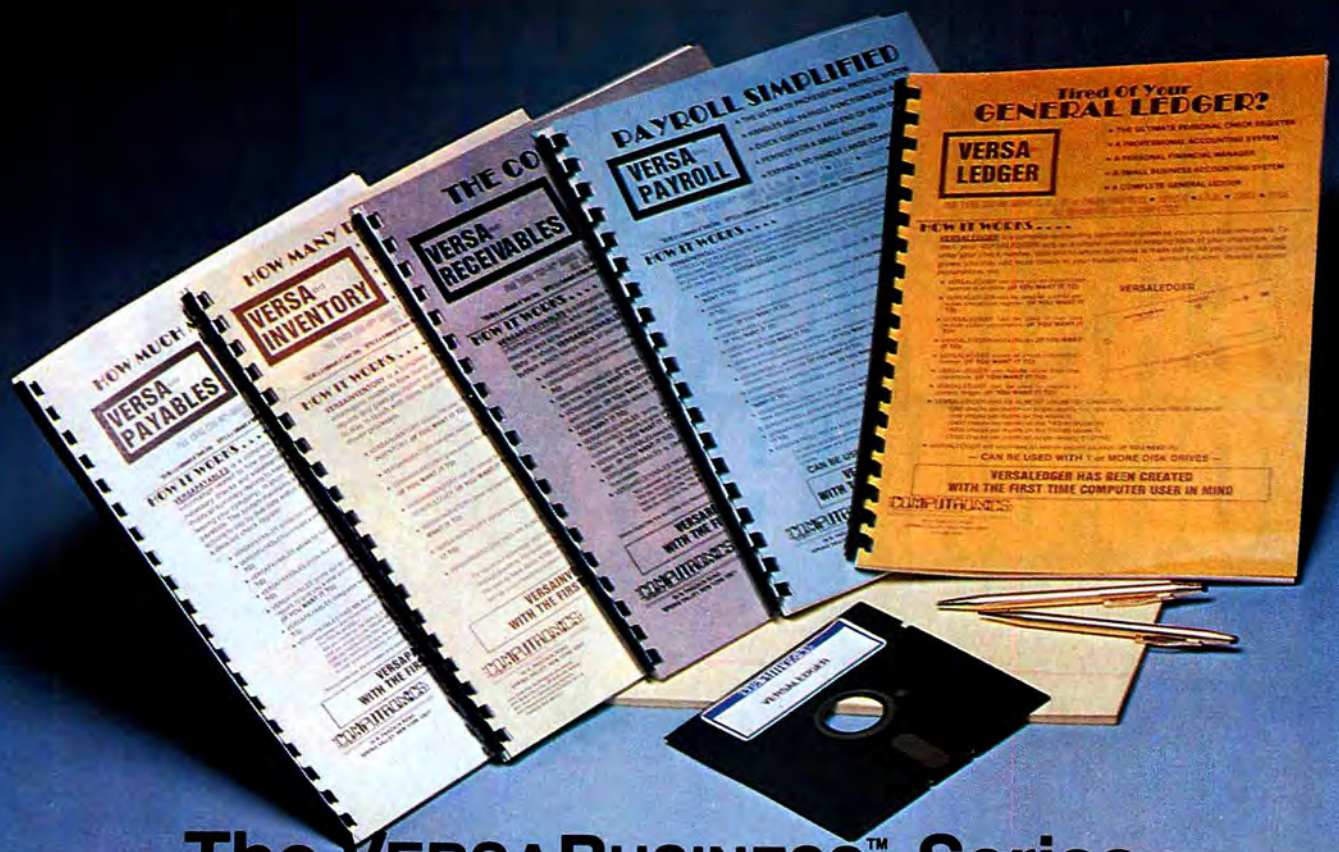

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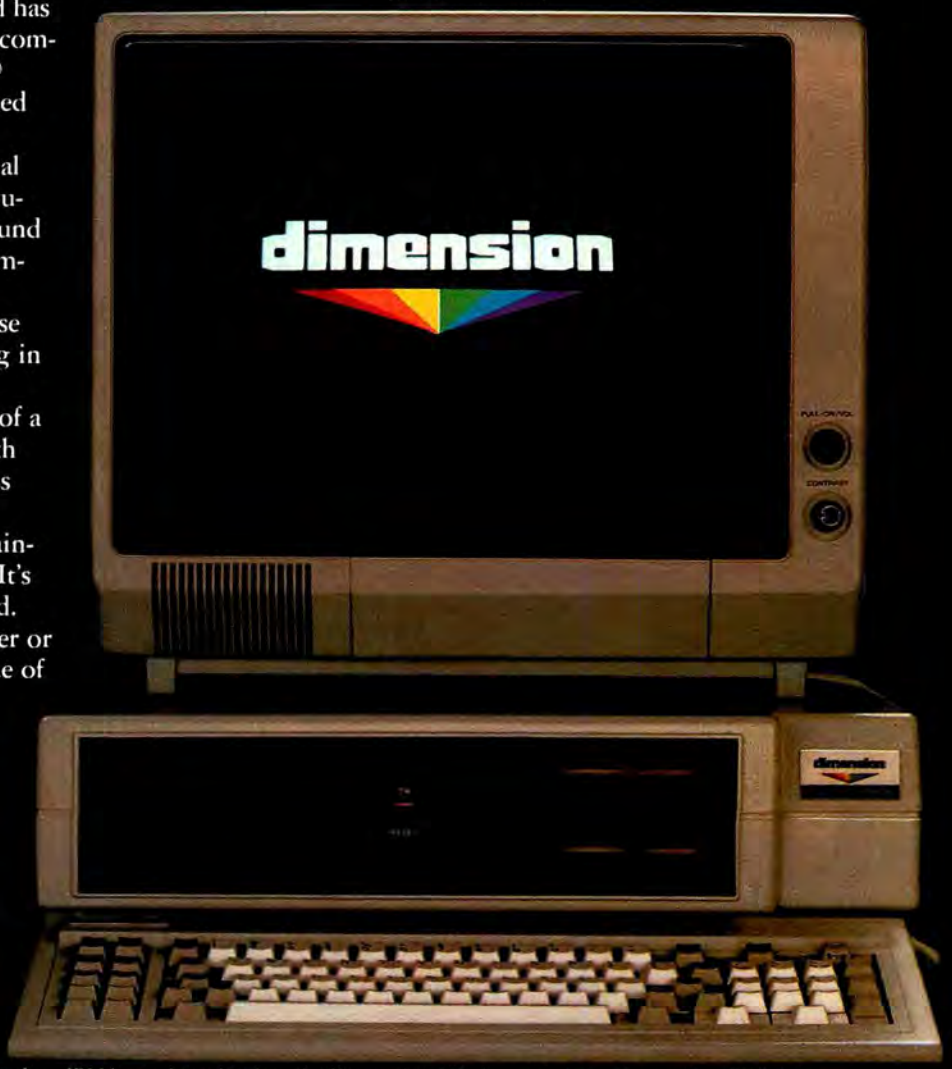

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Computers

Rod Canion

As new models of personal computers are introduced, there is a danger that they won't be able to share information because they don't share a common design. But the IBM PC has established an unofficial standard that other computer manufacturers are following. Manufacturers accept the PC standard because they benefit from making computers that work with other computers and with software and hardware that conform to the PC standard.

Not all computers are equally compatible with the PC. The "PC standard" is actually a set of standards that apply to the PC's operating system, software, and hardware. Other personal computers may follow some standards and not others. The standards a computer follows determine the types of PC software and hardware products it can use. The most compatible computers work with the PC operating system, use most PC software, perform the functions of the PC's ROM, have the PC keyboard layout, and work with most hardware designed for the PC.

To choose the right compatible computer, judge the computer's degree of compatibility and look for features beyond those of the PC. Evaluating software compatibility will help you determine how many programs you can run on the computer and whether data can be transferred from one computer to another. If a computer reads and writes data to a 5¼-inch PC-DOS disk, you will be able to transfer data files between that computer and a PC. To discover how much PC-standard software a computer can run, find out whether

the computer runs commercial software designed specifically for the PC, or only special versions of PC programs that have been adapted to work with the computer's version of MS-DOS. The best way to ensure that software works on a compatible is to thoroughly test programs on computers you are thinking of buying.

Computers that run PC software are not necessarily able to use PC hardware. If you want hardware compatibility, find out if a computer has expansion slots compatible with the PC's. Make sure that memory expansion or multifunction boards fit and work properly. Find out whether a hard disk drive can be attached to the computer if there is a possibility you will need one. Other PC peripherals you want to add, such as printers, need to work with the computer.

Another important question in choosing a compatible is whether or not it has capabilities that the PC doesn't have. Added features are a major consideration in purchasing a compatible computer because they may give you more computing power for your money. Many compatibles come with parallel ports, serial ports, expanded memory, software, and other features not included with a PC.

Some manufacturers offer a dual-mode display that produces both text and graphics similar to those produced by the PC. In contrast, when you purchase a PC, you must buy one board to enable the PC to display the IBM Monochrome Monitor's high-resolution text and another board if you want the PC to display graphics.

Portability is another quality that compatible manufacturers offer. Portable computer configurations vary widely because it is more difficult to design a portable with room for many features than it is to design such a full-size desktop computer. Many portables have few or no expansion slots and so have limited expansion capabilities.

Over 1 million PCs and compatible computers have been purchased, and thousands of programs have been written for these computers. In 1984 people will buy 1 or 2 million additional PCs and compatibles, and hundreds of new programs will be written. Another set of standards may replace the PC's in the future, but judging by the vitality of PC sales, that future is a long way off.

Rod Canion is president of COMPAQ Computer Corp.

Since IBM introduced the IBM PC in 1981, compatible computers that use the same hardware and software have proliferated. Though copyright law forbids manufacturers of compatibles to duplicate the PC's read-only memory (ROM), the compatibles nonetheless run most programs designed for the PC, and many provide more features and better performance per dollar than the PC.

Like the PC, many compatibles are desktop computers designed to be set up and left in one place. Some compatibles, such as the COMPAQ, are "portable," meaning you can fold them into a sewing-machine-size package and carry them for short distances. They are too heavy to carry far. A few PC compatibles are truly portable—they are small, lightweight machines you can carry around like a briefcase.

Most compatible computers have 5¼-inch floppy disk drives, but a few use 3½-inch drives, and some come with one floppy and one hard disk drive. The majority of PC compatibles come with monochrome monitors, but some can be purchased with color monitors and even flat-panel display screens. Compatibles come equipped with different amounts of memory, from 64 kilobytes (K) to 512K, and the maximum amounts of memory with which they can be configured also vary.

Some compatibles, particularly the portables, which must fit all electronic components into as small a space as possible, have little or no extra room for add-on expansion boards. Most desktop and transportable PC look-alikes, however, accept one or more expansion boards. Finally, though the majority of these computers use the same processor chip found in the PC, the Intel 8088, a few use Intel's 8086 or 80186 or the faster version of the 8088, increasing computing speed and power. Some compatibles also use the Zilog Z-80A processor in conjunction with one of the Intel chips. The Z-80A runs CP/M-based software, giving you access to programs that cannot be used with Microsoft's disk operating system (MS-DOS).

In the context of computers, the word *compatible* refers to a wide spectrum of configurations. The following reports should help you choose a computer that provides the best combination of features with the degree of compatibility that you require.

IBM PC

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4770, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM PC provides a keyboard and a system unit containing one 5¼-inch 360K disk drive, an Intel 8088 processor, 64K RAM, five full-length expansion board slots, and room for an additional floppy or hard disk drive. Separately sold options include monochrome and color monitors, a monochrome video board, a color graphics board, and an additional floppy disk drive. List price: $2104.

"I have worked with minicomputers for years and have owned several personal computers. The PC is the best. It is simple, easy, and does what it claims to do." Bill Barrett, Joliet, Illinois

"The processor meets my needs for speed and capacity but the keyboard's layout and touch are not familiar to the IBM Selectric-trained work force." Tom Thurmond, Vacaville, California

IBM PC XT

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4770, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM PC XT is a desktop computer for the office that is similar to the IBM PC but includes a 10-megabyte hard disk drive. The PC XT has one 5¼-inch, double-sided, 360K floppy disk drive; six full-length and two half-length expansion slots; 128K RAM expandable to 256K; a 130-watt power supply; a serial port; a hard disk controller; and a floppy disk controller. List price: $4995.

IBM XT/370

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4770, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM XT/370 is a personal computer that performs like the IBM System 370 mainframe computer managed by IBM's VM/CMS operating system. The XT/370 provides access to mainframe compilers, interpreters, editors, text processors, and other program development and documentation tools. The computer also doubles as an IBM 3277 Model 2 display terminal that connects users with mainframe computers. The XT/370 uses two Motorola 68000 processors and one Intel 8087 coprocessor and has 768K RAM and 3277-2 emulation circuitry.

Included with the system unit are the 83-key IBM PC keyboard, one 5¼-inch double-sided floppy disk drive, a disk controller, and three programs that integrate the XT/370's operations into data processing networks. The XT/370 is available in two versions: the Model 568 and the Model 588. The Model 588 has a 10-megabyte (M) hard disk drive; the Model 568 comes with an IBM 5161 expansion unit that allows the attachment of two 10M hard disk drives. List price: Model 588 $8995, Model 568 $6720.

IBM 3270-PC

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4770, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM 3270-PC can execute four mainframe computer applications, acting as if it were four 3270 terminals; two notepad tasks; and one PC-DOS 2.00 task at one time. The computer uses an extended-function IBM 5171 keyboard and a high-resolution IBM 5272 color monitor. The 3270-PC can be configured with 256K to 320K RAM, auxiliary storage ranging from one double-sided disk drive to a 10-megabyte (M) hard disk drive, and an optional parallel port.

The computer comes with the 5151/5272 display board, which supports either the 5151 monochrome monitor or the high-resolution 5272 color monitor. The 3270-PC also includes the 3270 board, which uses coaxial cable to connect the 3270-PC to either a 3274 display controller or to the 4300 series display/printer adapters. The system unit's power supply and eight-slot motherboard are almost identical to the IBM PC XT's. The 5171 keyboard has 122 keys, in contrast to the 83 keys on the IBM PC. The 3270-PC uses most PC add-on hardware except the monochrome display board, the color graphics board, and the PC keyboard.

The 3270-PC is available in three models: the Model 2 includes the system unit with 256K memory, one double-sided disk drive and a disk controller, a 5151/5272 display board, a 3270-PC keyboard control function and clock/calendar board, and a 3270 board. The Model 4 includes Model 2 features and a second double-sided disk drive, 64K of extra memory expansion, and a parallel port. The Model 6 has Model 2 features and one 10M hard disk, a disk controller, 64K of extra memory expansion, and a parallel port. List price: Model 2 $4290, Model 4 $5319, Model 6 $7180.

IBM PCjr

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4770, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The PCjr features 64K RAM, 64K ROM, an Intel 8088 processor, three expansion slots, a serial port, a parallel port, an audio socket, a cassette tape recorder socket, and three connectors for monitors. The PCjr has a remote control keyboard that communicates with the system unit without a cord connection. The computer uses ROM cartridges instead of floppy disks to load and run software. An enhanced version of the PCjr includes all the features of the regular model plus a half-height, double-sided disk drive, 128K RAM, and an internal modem. List price: $669, enhanced PCjr $1269.

IBM Portable PC

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

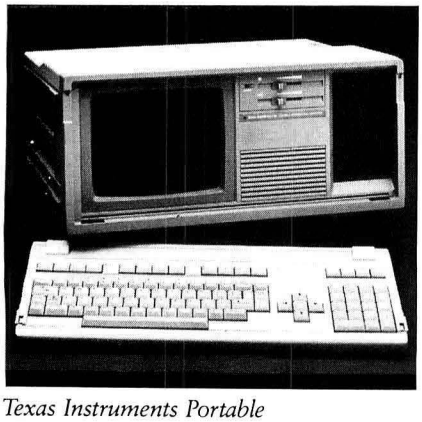
The IBM Portable PC has a 9-inch amber monitor, one 5¼-inch disk drive, an 83-key keyboard, a serial port, and 256K RAM (expandable to 512K on the motherboard). The computer measures 20 by 17 by 8 inches and weighs 30 pounds. The Portable PC uses DOS 2.10 and comes with 40K of BASIC in ROM. The disk controller and display boards occupy two long slots in the computer, leaving one long slot and four short slots for expansion. An 8088 processor powers the Portable PC, and a socket is provided for the 8087 math coprocessor. The power supply switches voltage for international use. A second disk drive is sold separately. List price: $2795.

Gavilan Mobile Computer

Gavilan Computer Corporation
P.O. Box 5004
Campbell, CA 95008
800/528-6050 ext. 1191, 408/379-8000

The Gavilan Mobile Computer is a 9-pound portable computer with an integrated 300-bits-per-second automatic dialing and answering modem. The computer has an 8-line by 66-character bit-mapped display, a full-size keyboard with a typewriter layout and ten function keys, a 3-inch floppy disk drive, and a flat touch panel used for cursor control, option selection, and touch commands. The Gavilan also includes 80K of memory, expandable to 128K.

A 5-pound detachable printer and a portable second disk drive are sold separately. The printer produces subscript, superscript, and proportional spacing, and it prints 50 characters per second bidirectionally. Gavilan's integrated software includes word processing, communications, mail, spreadsheet, and forms processing programs. The computer and the printer are powered by rechargeable battery packs. List price: computer $3995, printer $985.



Texas Instruments Portable

North Star DIMENSION

North Star Computers, Inc.
14440 Catalina St.
San Leandro, CA 94577
415/357-8500

The North Star DIMENSION supports up to 12 work stations, each running a different application. The DIMENSION is based on the Intel 80186 processor, and it has 13 expansion slots. Each work station requires an 8088-2 processor board that connects to the network. The DIMENSION's operating system is compatible with PC-DOS 2.00 and has electronic mail capability.

The DIMENSION has one floppy disk drive, one 15- or 30-megabyte (M) hard disk drive, and space for a second hard disk with tape backup. The computer comes with 256K RAM, which can be expanded to .5M. Each work station board includes 128K RAM, which is also expandable to .5M, and a serial port for connecting a printer or a mouse. List price: central module with 512K RAM, 15M hard disk, two attached work stations $7000; 30M configuration $8000; for each additional attached work station $1500.

Radio Shack TRS-80 Model 100 Portable Computer

Radio Shack/Tandy Corporation
1500 One Tandy Center
Fort Worth, TX 76102
817/390-3700

The Radio Shack TRS-80 Model 100 is a lap-size portable computer that weighs 3.9 pounds and is powered by four AA-size batteries or an optional AC power adapter. The computer comes with a built-in 300-bits-per-second automatic dialing and answering modem, a clock/calendar, four applications programs, and 8K RAM, expandable to 32K. The TRS-80 Model 100 uses a Z-80 processor, and it has CMOS memory chips that provide nonvolatile memory. Data is downloaded to an IBM PC by modem or coaxial cable through an included serial port.

The computer has a full-size, typewriter-style keyboard and comes with a parallel port. The liquid crystal display shows up to 8 lines with 40 characters per line. A low-battery indicator light warns you when the batteries, which provide 20 hours of power, are down to about 15 minutes of operating time. List price: 8K RAM version $799, 24K version $999, 8K memory upgrade blocks $135 each.

Texas Instruments Professional Computer

Texas Instruments
Data Systems Group
P.O. Box 402430, H-642
Dallas, TX 75240
800/527-3500

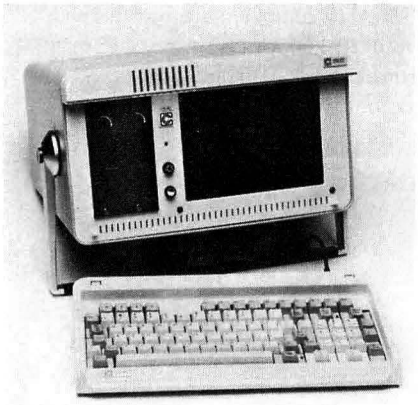
The Texas Instruments Professional Computer is a desktop computer that comes with 64K RAM, a monitor, and one 320K disk drive. The Professional can be configured with a second floppy disk drive or one 5- or 10-megabyte hard disk. The computer has five expansion slots and a sixth slot that accommodates a short memory expansion board that holds up to 256K. Both the monochrome and color monitors provide a resolution of 720 by 300 pixels in eight colors or monochrome shades. The computer comes with 8K ROM that can be expanded to 32K. List price: $2595.

Texas Instruments Portable Professional Computer

Texas Instruments
Data Systems Group
P.O. Box 402430, H-689
Dallas, TX 75240
800/527-3500

The Texas Instruments (TI) Portable Professional Computer shares the features of the desktop TI Professional and uses all software and hardware available for the larger unit. The portable unit is available with a 9-inch color or monochrome monitor. The computer comes with 64K RAM

expandable to 768K, five expansion slots, and one half-height floppy disk drive with space for an additional 10-megabyte hard disk drive. Both the color and the monochrome monitors have a 25-line by 80-column format and a resolution of 720 by 300 pixels. The TI Portable can drive an external 12-inch monochrome or 13-inch color monitor. List price: with monochrome monitor $2395, with color monitor $2965.



Colby PC

ACT Apricot

ACT Ltd.
3375 Scott Blvd. #336
Santa Clara, CA 95051
408/727-8639

The ACT Apricot is a transportable computer that uses 3½-inch disk drives but reads IBM PC data files. The computer comes with a communications program so that data can be transferred to a PC by means of a modem or a direct connection. The compact system unit and keyboard assemble to form a single briefcase-like unit. The small monitor must be carried separately.

The Apricot keyboard has a built-in liquid crystal display that shows programmable function key values. The central processor is an 8086, and space is available on the motherboard for an 8087 coprocessor. The computer comes with 256K RAM; a maximum of 768K can be installed. The Apricot provides high-resolution 800- by 400-pixel monochrome display capability. It comes with one parallel and one serial port. List price: $3190.

CAD Counsel Protean

CAD Counsel
231 E. Lemon
Monrovia, CA 91016
213/359-6091

The CAD Counsel Protean is a desktop computer with specialized graphics capability for computer-aided design. The system includes a digitizing tablet, a 31-color graphics board, and a color monitor capable of displaying 16 colors at once. The computer is intended for engineers and designers; it includes software for creating and manipulating circles, arcs, and other shapes. The Protean comes with 256K RAM that can be expanded to 900K. The system includes 12 expansion slots, a clock, one parallel port, two serial ports, and two floppy disk drives. A 21-megabyte hard disk can be connected. List price: $7300.

Canon AS-100

Canon USA Inc.
One Canon Plaza, Lake Success
Long Island, NY 11042
516/488-6700

The Canon AS-100 is a desktop computer that reads data formatted under Canon's version of MS-DOS; it cannot read IBM PC-formatted disks. The computer comes with 128K RAM, two disk drives, a parallel port, and a serial port. The AS-100 is available with either a color monitor or a monochrome monitor. With either monitor the computer provides 640- by 400-pixel resolution; in color mode it can display eight colors at once. The computer comes with *WordStar*. List price: monochrome $3995, color $4695.

Colby PC

Colby Computer
849 Independence Ave.
Mountain View, CA 94043
415/968-1410

The Colby PC kit is a shell for IBM PC components that transforms the PC into a portable computer. The kit consists of an internally wired magnesium case complete with a power supply and a 9-inch monochrome 640- by 200-pixel resolution display. The case is designed to hold the PC's motherboard, expansion boards, disk drives, and keyboard. List price: $899.

HeadStart 512

Intertec
2300 Broad River Rd.
Columbia, SC 29210
803/798-9100

The HeadStart 512 is a 25-pound desktop computer that runs MS-DOS and C/PM-80 software. The computer is equipped with both an 8086 and a Z-80 processor and comes with 512K RAM that can be expanded to 1 megabyte. The computer has one 3½-inch disk drive and accommodates a 5¼-inch drive. A disk controller, one parallel port, and two serial ports are also included. The HeadStart 512 generates a resolution of 924 by 240 pixels on a monochrome display. List price: $3495.

Polo

Polo Microsystems, Inc.
2570 El Camino Real W
Mountain View, CA 94040
415/948-2990

The Polo is a desktop computer with two processors: the 80188 and the Z-80. The computer has a keyboard with built-in game and mouse adapters and 12 function keys. The system includes a 120-characters-per-second printer, a 12-inch color monitor, and a Bell 103 modem. The computer comes with two serial ports and 128K RAM that can be expanded to 768K on the motherboard. Several programs come with the Polo, including MS-DOS 2.11, BASIC, *Multiplan*, *pfs:Write*, *pfs:Graph*, *pfs:File*, and *pfs:Report*. List price: $3995.

Radio Shack TRS-80 2000

Tandy Corporation/Radio Shack
1800 One Tandy Center
Fort Worth, TX 76102
817/390-3731

The TRS-80 2000 is a desktop computer that uses an 80186 processor and can read but cannot write to IBM PC data disks. The computer can write to PC data disks copied to the TRS-80 2000's DOS format. Some programs that run on the TRS-80 2000 (such as Open Systems' accounting software) must be copied to the TRS-80 2000 format, and others require that BASIC.EXE be copied to the system's disk. The computer comes with 128K RAM that can be expanded to 768K, one parallel port, and one serial port. A 10-megabyte hard disk drive and a mouse can be connected to the computer. List price: $2999.

Colby PC 3.2

Colby Computer
849 Independence Ave.
Mountain View, CA 94043
415/968-1410

The Colby PC 3.2 is intended for people who want to purchase a prepackaged computer and are not concerned with 100-percent IBM PC compatibility. Its components include a motherboard, a half-height disk drive, a disk controller, a keyboard, and a battery pack. The Colby PC 3.2 comes with 128K RAM, four expansion slots, one parallel port, and one serial port. The computer can be expanded to 640K RAM and supports a 10-megabyte hard disk. List price: $2495.

Columbia MPC

Columbia Data Products
9150 Rumsey Rd.
Columbia, MD 21045
301/992-3400

The Columbia MPC is a desktop computer that uses IBM PC hardware and software. The computer comes with 128K RAM and eight expansion slots. Monochrome display resolution is 640 by 200 pixels; color display resolution is 320 by 200 pixels. The machine is available with two floppy disk drives or with one floppy disk drive and one 10-megabyte (M) hard disk drive. The MPC comes with two serial ports, one parallel port, a disk controller, and a video controller. The package also includes Perfect Software products and either MS-DOS 1.25 or CP/M-86. List price: $3620, with 10M hard disk drive $4995.

"The hardware is excellent overall, but one disk drive failed shortly after purchase. Replacement under warranty by Bell & Howell was fast and competent." Dave Halliburton, Monrovia, Maryland

Columbia VP

Columbia Data Products
9150 Rumsey Rd.
Columbia, MD 21045
301/992-3400

The Columbia VP is the portable version of the Columbia MPC desktop computer. It uses IBM PC hardware and runs PC software. Besides being portable, the VP differs from the MPC by having one expansion slot instead of eight and a 9-inch rather than a 12-inch monochrome monitor. The VP comes with two floppy disk drives but cannot hold an internal hard disk as can the MPC. List price: $2995.

"After scrutinizing PC-compatible portables at length I have judged the Columbia VP as having the best performance for the price." Theodore Dzik, Long Branch, New Jersey

"The Columbia VP is a terrific machine. The cabinet is all metal, unlike some competing portables, and the computer runs all of the IBM software I've tried." Nick McGrath, Aspen, Colorado

Corona PC and Portable PC

Corona Data Systems
31324 Via Colinas #110
Westlake Village, CA 91361
213/707-0672

The Corona PC is a desktop computer; the Portable PC is the 28-pound portable version. Both computers run some but not all IBM PC software. Each machine comes with 128K RAM that can be expanded to 512K. The computers are available with one or two floppy disk drives; a 10-megabyte hard disk is an option for the desktop version.

COMPAQ-Plus

COMPAQ and COMPAQ-Plus

COMPAQ Computer Corp.
12330 Perry Rd.
Houston, TX 77070
713/370-7040

The COMPAQ is a portable computer that uses IBM PC hardware and runs PC software. The 28-pound computer comes with 128K RAM, which can be expanded to 640K, and one floppy disk drive. A second floppy disk drive and a hard disk upgrade kit are also available. The COMPAQ comes with a 9-inch monochrome monitor that has 640- by 200-pixel resolution. The computer has five expansion slots and one parallel port. The COMPAQ-Plus, another version of the computer, has an internal 10-megabyte hard disk. List price: COMPAQ $2995, COMPAQ-Plus $4995, second floppy disk drive $545, hard disk upgrade kit $2500.

Each computer has high-resolution 640- by 325-pixel monochrome graphics and a 16- by 13-pixel character matrix. Color graphics have a resolution of 640 by 200 pixels. Sixteen colors can be displayed at once with a color monitor. Both computers have four expansion slots, one parallel port, and one serial port. List price: Corona PC with one floppy disk drive $2545, with two floppy disk drives $2945, with one floppy disk drive and a hard disk $4495; Portable PC with one floppy disk drive $2595, with two floppy disk drives $2995.

Digigraphic EXTRA Model 70

Digigraphic Systems Corporation
10273 Yellow Circle Dr.
Minnetonka, MN 55343
612/935-9111

The EXTRA Model 70 is a computer with ten expansion slots for installing 16- and 32-bit processors and up to 640K RAM. The system has a 250-watt power supply adequate for heavy consumption hardware accessories. The computer can be con-

nected to a hard disk with up to 79 megabytes (M) of storage. The EXTRA Model 70 comes with an Intel 8088 processor, 256K RAM, two floppy disk drives, one 5M hard disk drive, and one removable 5M hard disk drive. One parallel port and three serial ports are included. List price: $5995.

JONOS 2150i

JONOS International Inc.
1835 Dawns Way
Fullerton, CA 92631
714/999-6661

The JONOS 2150i is a 31-pound portable computer designed for industrial and military professionals. The computer has a steel shell to protect it from rough use. The base model comes with two 322K 3½-inch disk drives and two 640K or 1.2-megabyte (M) 5¼-inch disk drives. It also includes a 9-inch monitor, two serial ports, one parallel port, a clock/calendar, and four expansion slots. The 2150i comes with 64K RAM that can be expanded to 1M. List price: $3695.

Leading Edge PC

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
617/828-8150

The Leading Edge PC is a desktop computer with seven expansion slots. The computer comes with 128K RAM that is expandable to 640K. Software provided with the computer includes *Leading Edge Word Processor, Multiplan,* MS-DOS 2.10, and GW BASIC. The computer uses 5¼-inch disk drives and comes with one parallel port, one serial port, a clock, a disk controller, and a video controller. List price: $2895.

Corona Portable PC

Logical LX-T

Logical Business Machines
1294 Hammerwood Ave.
Sunnyvale, CA 94086
408/744-1290

The Logical LX-T is a desktop computer that is compatible with the IBM PC XT and comes with a 10-megabyte (M) hard disk drive. The computer is intended for business use and program development. It comes with one 5¼-inch floppy disk drive and can be upgraded to a 60M hard disk drive. The LX-T has 192K RAM and can hold up to 1M. The system includes a programming language that allows users to develop and modify programs using a set of English verbs and nouns. The computer also includes a 12-inch amber monitor, one parallel port, two serial ports, five expansion slots, a video controller, and a 165-watt power supply. List price: $5985.

Stearns Desktop

Stearns Computer Systems
10901 Bren Rd. E
Minneapolis, MN 55440
612/936-2000

The Stearns Desktop is a computer that runs IBM PC software. The Desktop functions as a multitasking stand-alone computer or as a work station in the ICS local area network. The computer is based on the 8086 processor and comes with 128K RAM. It can be expanded to 896K RAM but has only one PC-compatible expansion slot. The system can use the IBM 3270 protocol, and a 5-, 10-, or 20-megabyte hard disk drive can be attached. The computer comes with a 200-watt power supply and one serial port. List price: $2945.

Tava PC

Tava Corporation
16861 Armstrong
Irvine, CA 92714
714/261-0200

The Tava PC is a desktop computer that runs IBM PC software. The computer comes with 128K (expandable to 640K), two 320K floppy disk drives, five expansion slots, power-on diagnostics, one parallel port, and two serial ports. The system is available only with monochrome display capability. A 10-megabyte hard disk drive can be attached. List price: $1995.

Toshiba T-300

Toshiba America, Inc.
2441 Michelle Dr.
Tustin, CA 92680
714/730-5000

The Toshiba T-300 is a desktop computer that comes with a 20-inch-wide keyboard designed for word processing and spreadsheet programs. The keyboard has separate cursor keys and a 16-key numeric keypad. The computer comes with 192K RAM (expandable to 512K), two 640K disk drives, and a 12-inch monochrome monitor. The system's monochrome graphics and 16-color graphics have a resolution of 640 by 500 pixels. The T-300 comes with MS-DOS 2.10, TBASIC-16, *MultiMate,* and *Multiplan.* List price: $2795.

Stearns Desktop

Wyse WY-1000

Wyse Technology
3040 N. First St.
San Jose, CA 95134
408/946-3075

The Wyse WY-1000 is a desktop computer designed to occupy a minimum amount of desk space. The system uses the 80186 processor and produces high-resolution, bit-mapped graphics on a pedestal-mounted 14-inch screen. The computer comes with 128K RAM that can be expanded to 768K

on the motherboard. The WY-1000 uses 362K floppy disk drives and can be fitted with a 10-megabyte hard disk drive in place of one floppy disk drive. One parallel port and four serial ports come with the computer. List price: $3090.

Micro Craft Dimension

Micro Craft Corporation
4747 Irving Blvd. #241
Dallas, TX 75247
214/630-2562
The Dimension is a desktop computer that uses the Motorola MC68000L8 32-bit processor, which can address 16.7 megabytes RAM. The system is normally configured with 128K RAM and becomes compatible with the IBM PC upon the addition of an 8086 processor on an expansion board. The computer comes with one parallel port, one serial port, and a clock. The Dimension is compatible with the TRS-80 and Apple, Osborne, Kaypro, and other personal computers. Operating systems that run on the computer include MS-DOS, UNIX, UCSD p-System, and CP/M-86. An MS-DOS emulator board is sold separately. List price: $3995, MS-DOS emulator board $495.

Eagle PC Plus

IMP-12

Electro Design Inc.
690 Rancheros Dr.
San Marcos, CA 92069
619/471-0680
The IMP-12 is a desktop computer that uses IBM PC hardware and software. The computer comes with 6, 12, or 18 expansion slots. It is configured by connecting the power supply and adding a processor and expansion boards. A disk controller, a color graphics board, one parallel port, and two serial ports are included. The color graphics board provides 600- by 440-pixel resolution in 16 colors. List price: $4044.

FX-20

Future Computers Ltd.
654 Bair Island Rd. #302
Redwood City, CA 94063
415/369-2855
The FX-20 is a desktop computer that works with MS-DOS but does not read IBM PC disks. The computer has 800K floppy disk drives, three serial ports, a disk controller, and an interface to the company's proprietary local area network. The FX-20 comes with *WordStar* and *Spellbinder.* It also comes with 128K but has only one expansion slot. List price: $2995.

Pied Piper

STM Electronics
530 Middlefield Rd. #250
Menlo Park, CA 94025
415/326-6226
The Pied Piper is a 17-pound portable computer with telecommunications capability. The computer is based on the Intel 80186 processor and comes with a 16-line liquid crystal display, a 1200-bits-per-second modem, and a 40-column thermal printer. The Pied Piper also includes two 800K disk drives, one parallel port, and two serial ports. The computer comes with 256K RAM that can be expanded to 512K on the motherboard. The computer is compatible with the IBM PC's color and monochrome graphics. List price: $3000.

Eagle PC Spirit XL

PC Traveler

Strategic Technologies, Inc.
7001 Peachtree Industrial Blvd., Bldg. 3
Norcross, GA 30071
404/441-8070
The PC Traveler is a briefcase-size portable computer with two 80186 processors that make program execution nearly ten times faster than on the IBM PC. The 26-pound Traveler works with MS-DOS and reads and writes PC data disks. A 9-inch plasma display shows monochrome graphics with a resolution of 512 by 256 pixels. The computer comes with 128K RAM that can be expanded to 1 megabyte (M). The PC Traveler includes a 6.2M removable cartridge drive or two 360K floppy disk drives, a built-in printer, a 200-watt power supply, one parallel port, and one serial port. Options include a 300- to 1200-bits-per-second internal modem and a terminal emulation board. List price: $4495.

Visual Commuter

Visual Computer Inc.
135 Maple St.
Marlboro, MA 01752
617/480-0000
The Visual Commuter is a briefcase-size portable computer with a 16-line liquid crystal display. The computer also attaches to monochrome monitors, color monitors, and televisions, and it provides bit-mapped and color graphics. The 16-pound Commuter comes with 128K RAM that can be expanded to 1 megabyte, one 360K disk drive, a dual disk controller, one serial port, and one parallel port. The computer runs IBM PC software. List price: $1995.

Xerox 1810/1850

Xerox Corporation
Xerox Square
Rochester, NY 14644
203/965-7500

The Xerox 1810/1850 is a portable system made up of two computers that use a total of three processors. The 1810 is a briefcase-size portable that uses an 8-bit processor, a microcassette storage device, and a liquid crystal display. The 1810 is outfitted with telephone, serial, parallel, data line, television, composite video, and speaker ports. It weighs 5 pounds, and software is available in ROM cartridges. The 1850 serves as a base station unit that contains both the Z-80 and 8088 processors and two 250K disk drives. The 1850 weighs 15 pounds, accepts up to 512K RAM, and comes with a built-in modem. List price: $2495.

Eagle PC-2

Eagle Computer, Inc.
983 University Ave.
Los Gatos, CA 95030
408/395-5005

The Eagle PC-2 is a desktop computer that uses IBM PC hardware and runs IBM PC software. Space in the bottom of the cabinet allows users to retract the 24-function-key keyboard. The computer provides monochrome graphics with a resolution of 720 by 352 pixels. The system includes 128K RAM, two disk drives, and three expansion slots. The PC-2 also comes with *EagleWriter*, the company's word processing program, and *EagleCalc*, a spreadsheet program. List price: $3495.

Eagle PC Plus

Eagle Computer, Inc.
983 University Ave.
Los Gatos, CA 95030
408/395-5005

The Eagle PC Plus is a desktop computer that runs IBM PC software and uses IBM PC hardware. The PC Plus comes with one floppy disk drive and 128K RAM that can be expanded to 640K on the motherboard. The computer has four expansion slots and comes with a disk controller, two serial ports, and one parallel port. The PC Plus-2, another version of the computer, has a second floppy disk drive; the PC Plus XL comes with a 10-megabyte hard disk drive. List price: PC Plus $2395, PC Plus-2 $2795, PC Plus XL $4295.

Eagle PC Spirit

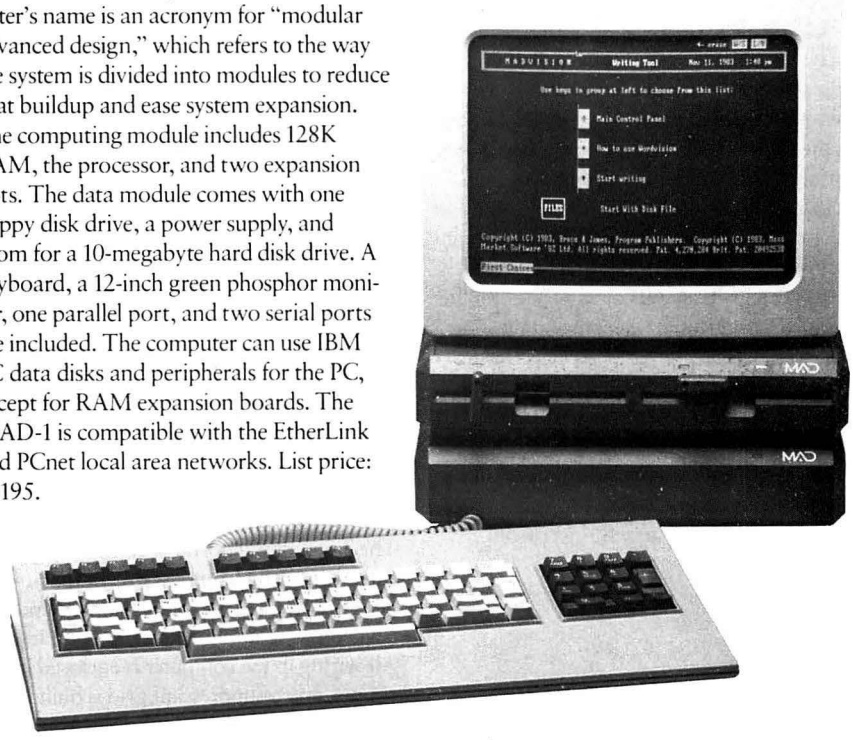
Eagle Computer, Inc.
983 University Ave.
Los Gatos, CA 95030
408/395-5005

The Eagle PC Spirit is a 32-pound portable computer that runs IBM PC software and uses IBM PC hardware. The computer comes with four expansion slots and 128K RAM that can be expanded to 640K on the motherboard. A 9-inch monochrome monitor has a resolution of 640 by 200 pixels. The PC Spirit runs color graphics software. Colors appear as gradations of shade on the monochrome screen. The computer has two serial ports, one parallel port, a disk controller, and a video controller. The PC Spirit XL is a version of the computer that comes with a 10-megabyte hard disk drive in place of the second floppy disk drive. List price: PC Spirit $3295, PC Spirit XL $4795.

MAD-1

MAD Computer, Inc.
3350 Scott Blvd., Bldg. 13
Santa Clara, CA 95051
408/980-0840

The MAD-1 is a desktop computer that uses the Intel 80186 processor. The computer's name is an acronym for "modular advanced design," which refers to the way the system is divided into modules to reduce heat buildup and ease system expansion. The computing module includes 128K RAM, the processor, and two expansion slots. The data module comes with one floppy disk drive, a power supply, and room for a 10-megabyte hard disk drive. A keyboard, a 12-inch green phosphor monitor, one parallel port, and two serial ports are included. The computer can use IBM PC data disks and peripherals for the PC, except for RAM expansion boards. The MAD-1 is compatible with the EtherLink and PCnet local area networks. List price: $4195.



MAD-1

Olivetti PC

Docutel-Olivetti Corporation
P.O. Box 222306
Dallas, TX 75222
214/438-1818

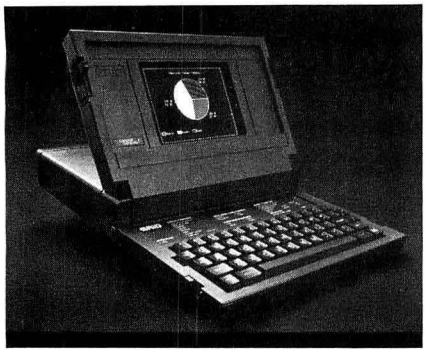
The Olivetti PC is a desktop computer that comes with 128K RAM, which can be expanded to 512K on the motherboard. The computer has two 320K disk drives, one serial port, one parallel port, and four expansion slots. The system can be configured with a 10-megabyte hard disk drive. Software that comes with the Olivetti PC includes MS-DOS, GW BASIC, *PC Tutor*, *WordStar* and five other MicroPro programs, and a disk emulator. List price: $3295.

OmegaMite

Compucorp
2211 Michigan Ave.
Santa Monica, CA 90404
213/829-7453

The OmegaMite is a computer that functions as a desktop OmegaNet work station. The computer has a Z-80 processor as well as an 80188 processor and comes with 64K RAM that can be expanded to 512K. The

OmegaMite's 9-inch monochrome monitor is not mounted internally like most portable computers' monitors. The monitor has a resolution of 800 by 305 pixels. OmegaMite weighs 25 pounds and is smaller than a regular desktop computer. The computer comes with one 320K disk drive and three serial ports. Separately priced options include a 300-bits-per-second modem and an extra disk drive. List price: $2995.



GRiD Compass

NEC PC-8801A

NEC Home Electronics, Inc.
Personal Computer Division
1401 Estes Ave.
Elk Grove Village, IL 60007
312/228-5900

The PC-8801A is a desktop computer that uses an 8-bit Z-80 processor and works with the CP/M operating system. The computer works with MS-DOS when an 8086 processor board is added. The system includes 640- by 400-pixel monochrome and color graphics and permits text and graphics overlays. When using three screens, users can generate 60 colors. The computer comes with 128K RAM, one parallel port, one serial port, and a clock/calendar. Included with the PC-8801A are *WordStar, MailMerge, Multiplan,* N80 and N88 BASIC, and CP/M software. Custom versions of *dBASE II* and *Friday!* are available. Voice synthesis and voice recognition boards are sold separately. List price: $3092.

GRiD Compass

GRiD Systems Corp.
2535 Garcia Ave.
Mountain View, CA 94043
800/222-4743

The Compass is a 10-pound portable computer that has a lightweight magnesium case. Model 1100 comes with 256K RAM and 384K of bubble memory that retains data when the power is turned off. The flat panel electroluminescent display is bit-mapped and folds out to provide a 24-line by 80-column text display with a resolution of 320 by 240 pixels. The Compass runs MS-DOS software and reads IBM PC data disks when an optional 360K floppy disk drive expansion unit is attached. Another optional expansion unit holds a 10-megabyte (M) hard disk drive and a 360K floppy disk drive. Versions of *WordStar, 1-2-3, Multiplan, dBASE II, Condor DBMS,* and other software applications are available for the Compass.

The Compass has two processors: the Intel 8086 and the Intel 8087 coprocessor. A clock/calendar and three ports are included: an RS-232C serial, an RS-422 serial, and an IEEE-488. AC voltage requirements can be adjusted to adapt to different power sources, and a battery backup is sold separately.

Two other versions of the Compass are available. Model 1101 comes with a 1200-bits-per-second (bps) modem that can be set for 300 bps. The modem has auto-dial and auto-answer capabilities. Model 1109 comes with the modem and 512K RAM based on 256K RAM chips. List price: Model 1100 $5995, Model 1101 $6795, Model 1109 $7995, floppy disk drive unit $1195, combination 10M hard disk and floppy disk drive $4100.

GRiD Tempest

GRiD Systems Corp.
2535 Garcia Ave.
Mountain View, CA 94043
800/222-4743

The Tempest is a portable computer identical to the GRiD Compass except that it is designed to meet the anti-espionage and ruggedness requirements of the military. All wiring in the computer is enclosed in copper, and a suppressant grid is built into the screen display to prohibit electromagnetic transmissions from being detected at a distance by espionage equipment. Internal hardware is encased in plastic to protect against moisture. The Tempest has 512K RAM and 384K of bubble memory but does not have a modem. List price: $12,495.

Chameleon

Seequa Computer Corporation
Telegraph Rd.
Odenton, MD 21113
301/672-3600

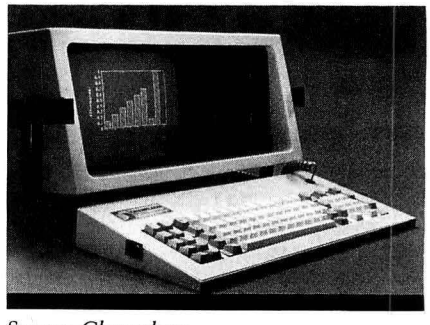
The Chameleon is a 28-pound portable computer that uses the 8088 and the Z-80 processors, which provide the capability to run CP/M and MS-DOS software. The Chameleon comes with 128K RAM, expandable to 704K, and includes two 160K drives. The computer also comes with a 9-inch monochrome monitor with a resolution of 640 by 200 pixels. Also included are two serial ports and one parallel port. The Chameleon can use boards designed for the IBM PC and runs PC software. Software provided includes MS-DOS 1.25, MBASIC-86, and the Perfect Software applications package. List price: $1995.

"Manufacturer and dealer support for the Chameleon are excellent. But the carrying handle is sharp-edged steel that hurts your hands." Bob Kemp, San Diego, California

People

Olympia USA Inc.
Box 22
Somerville, NJ 08876
201/722-7000

The People is a desktop computer based on the Intel 8086 processor. The computer has a 12-inch monitor with 128K of memory dedicated to screen display. The People has



Seequa Chameleon

640- by 475-pixel resolution in monochrome and color and has two types of displays: character and bit-mapped modes. It comes with 128K RAM that can be expanded to 512K on the motherboard, one parallel port, one serial port, and four expansion slots. A 10-megabyte hard disk drive is sold separately. List price: $3595.

Sharp PC-5000

Sharp Electronics Corp.
10 Sharp Plaza
Paramus, NJ 07652
201/265-5600

The Sharp PC-5000 is a 9-pound briefcase-size computer that has an 8-line liquid crystal display. The computer comes with 192K ROM, of which 64K is removable; 128K RAM, expandable to 256K; and 128K of bubble memory. The PC-5000 is based on the Intel 8088 processor and works with MS-DOS. IBM PC data disks can be used, and versions of PC software are available on disk or bubble cartridge. The computer comes with MS-DOS 2.00, GW BASIC, *SuperWriter,* and *SuperCalc.* A separately sold printer fits behind the keyboard to provide portable printing capability. Other options include a battery pack and a modem. List price: $1995.

Hyperion

Bytec-Comterm, Inc.
8 Colonnade Rd.
Ottawa, Ontario
K2E 7M6 Canada
613/226-7255

The Hyperion is an 18-pound portable computer that works with MS-DOS. The computer has a built-in 7-inch monitor that displays yellow characters on a black background with 640- by 250-pixel resolution. The Hyperion comes with one or two double-sided disk drives, color graphics capability, one parallel port, and one serial port. The computer also includes an internal modem and a clock/calendar. List price: $3195.

"Many people ask if the Hyperion's 7-inch amber screen is not too small. It isn't, because screen characters are the same size as the characters you find on a printed page. The screen quality is excellent and the amber screen color isn't tiring, even after 10-hour days." C. J. Tylko, Montreal, Quebec, Canada

Synco PC-1600

Synco PC 1600: The Foundation Series

Articulate Computers
2925 College Ave., Bldg. A-3
Costa Mesa, CA 92626
714/546-8205

Synco PC 1600 is a desktop computer that comes with 128K RAM (expandable to 246K) and 40K ROM. The computer has two disk drives, a parallel port, a serial port, five expansion slots, a Key Tronic keyboard, and a speaker. Synco PC 1600 also comes with a color graphics board that displays RGB graphics with a resolution of 320 by 200 pixels and composite graphics with 640- by 200-pixel resolution. The system board uses the 8088 processor and has a socket for the 8087 coprocessor. MS-DOS 2.00 and GW BASIC are included. List price: $2295.

Panasonic Sr. Partner

Panasonic
One Panasonic Way
Secaucus, NJ 07094
201/348-7182

The Panasonic Sr. Partner is a 28-pound portable computer with a built-in thermal graphics printer that prints text, spreadsheets, and bar charts. The computer can use boards designed for the IBM PC and runs PC software. It comes with 128K RAM that can be expanded to 512K on the motherboard. The Sr. Partner displays monochrome graphics with a resolution of 640 by 200 pixels on a 9-inch monitor. An RGB adapter permits the attachment of a color monitor for color graphics with a resolution of 320 by 200 pixels. Software packages included with the Sr. Partner are *WordStar, VisiCalc, pfs:File, pfs:Graph, pfs:Report,* MS-DOS, and GW BASIC. The computer comes with one parallel port, one serial port, and one expansion slot. List price: $2495.

OSM-PC

OSM Computer Corp.
655 Clyde Ave.
Mountain View, CA 94043
415/961-8680

The OSM-PC is a desktop computer that can be expanded to provide up to 20 megabytes (M) of hard disk storage with tape backup. The computer comes with the 8088 processor, 128K (expandable to 512K), a serial port, a parallel port, two 320K disk drives, and five expansion slots.

An optional 12-inch monochrome monitor displays 25 lines with 80 characters per line. An optional 14-inch color monitor offers four-color resolution of 320 by 200 pixels and two-color resolution of 640 by 200 pixels. The OSM-PC includes the MS-DOS 2.10 operating system. List price: $2495, with 10M hard disk $4295, with 20M hard disk $5595, with 10M hard disk and 20M tape backup $6795, monochrome monitor and monochrome display board $480, color monitor and color graphics board $1130.

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Otrona Attache 8:16

Otrona Advanced Systems Corp.
4725 Walnut St.
Boulder, CO 80301
303/444-8100

The Attache 8:16 is a 20-pound portable computer. The 8:16 runs MS-DOS software in addition to CP/M 2.2 software because the computer has both an 8086 and a Z-80 processor. Many CP/M and MS-DOS data files can be swapped between the two operating systems on the 8:16. The 8:16 comes with 256K RAM, which cannot be expanded, and two 320K disk drives. The computer has a 5½-inch monochrome monitor that displays graphics with 640- by 250-pixel resolution. Software provided includes *Charton II* (a graphics program), *Valet* (a time management system), CP/M, and MS-DOS. The computer also comes with two serial ports, a clock/calendar, and a disk controller. List price: $3495.

Pronto Series 16

Pronto Computers, Inc.
3730 Skypark Dr.
Torrance, CA 90505
213/539-6400

The Pronto Series 16 is based on the 80186 processor and works with MS-DOS 2.10. The computer is available in portable and desktop versions. It comes with 128K RAM that can be expanded to 1 megabyte (M), and one 800K floppy disk drive. The computer also has one parallel port, two serial ports, and a clock. Configurations with a second floppy disk drive, a 5.6M hard disk drive, system security ROM, a programmable character set, and high-resolution monochrome and color graphics are available. List price: $3200.

Sperry PC

Sperry Corporation
P.O. Box 500
Blue Bell, PA 19424
215/542-4459

The Sperry PC is a desktop computer that uses IBM PC software. The computer also emulates Sperry UNISCOPE and IBM 3270 terminals when interface boards are added. The Sperry PC comes with 128K RAM and is expandable to 640K. The computer also includes seven expansion slots, a pedestal-mounted 12-inch monochrome monitor, one serial port, and a clock/calendar. It can be connected to a 10-megabyte hard disk drive and uses half-height floppy disk drives. List price: $3119.

TeleVideo TPC-II

TeleVideo Systems, Inc.
1170 Morse Ave.
Sunnyvale, CA 94086
408/538-1780

The TeleVideo TPC-II is a 30-pound portable computer that can use boards designed for the IBM PC and runs most PC software. The computer comes with 128K RAM expandable to 640K, one expansion slot, one parallel port, and one serial port. TeleVideo Systems also produces two desktop computers, the TS-1605 and the 10-megabyte TS-1605H, whose hardware is compatible with the TPC-II. List price: TPC-II $2995, TS-1605 $2995, TS-1605H $4995.

Gazelle II

Seattle Computer
1114 Industry Dr.
Seattle, WA 98188
206/575-1830

The Gazelle II is a desktop computer based on the Intel 8086 processor. The Gazelle is housed in a single cabinet and includes 256K RAM, expandable to 1 megabyte (M); two double-sided, double-density, 8-inch disk drives; and room for a 15.7M hard disk drive. The system uses an 18-slot S-100 board; IBM PC expansion boards cannot be used. Software provided with the system includes MS-DOS, *Flash Disk* (a disk emulator), and *Flash Print* (a print-buffering utility). List price: $6995.

Poppy

Durango Systems Inc.
3003 N. First St.
San Jose, CA 95134
408/946-5000

The Poppy is a desktop computer that comes with a 14-inch swiveling monochrome monitor and 128K RAM, expandable to 512K. The Poppy runs IBM PC software using MS-DOS. The basic system comes with two double-sided disk drives, six expansion slots, one parallel port, and one serial port. A 10.3-megabyte hard disk drive is available. A multiuser version of the Poppy called the Poppy II is also available. The Poppy II comes with either a Concurrent CP/M-86, an MBOS/5, or a XENIX operating system and has 256K RAM. List price: $4395, Poppy II $9975.

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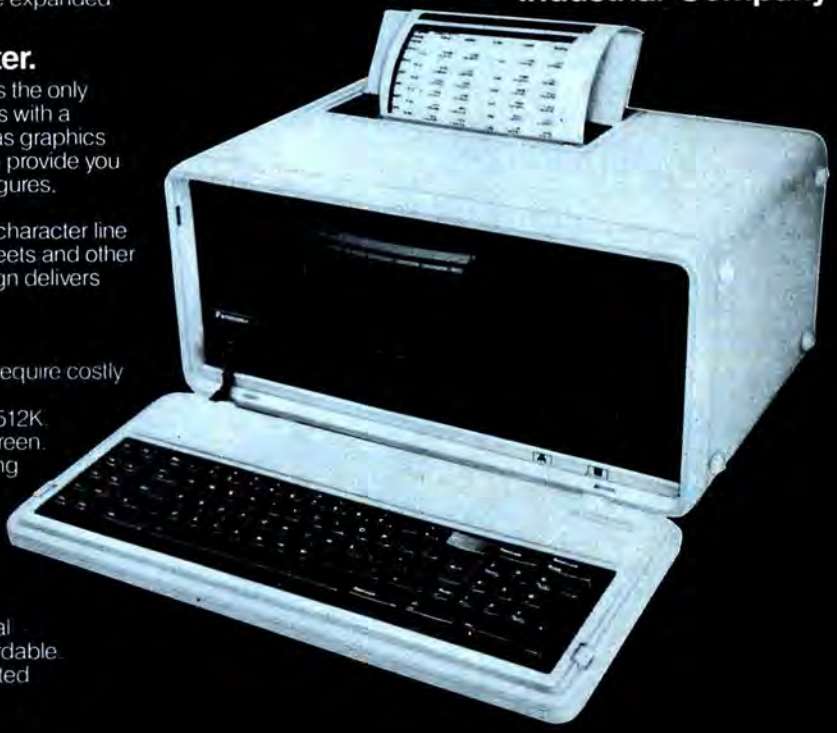

*Software price subject to change.

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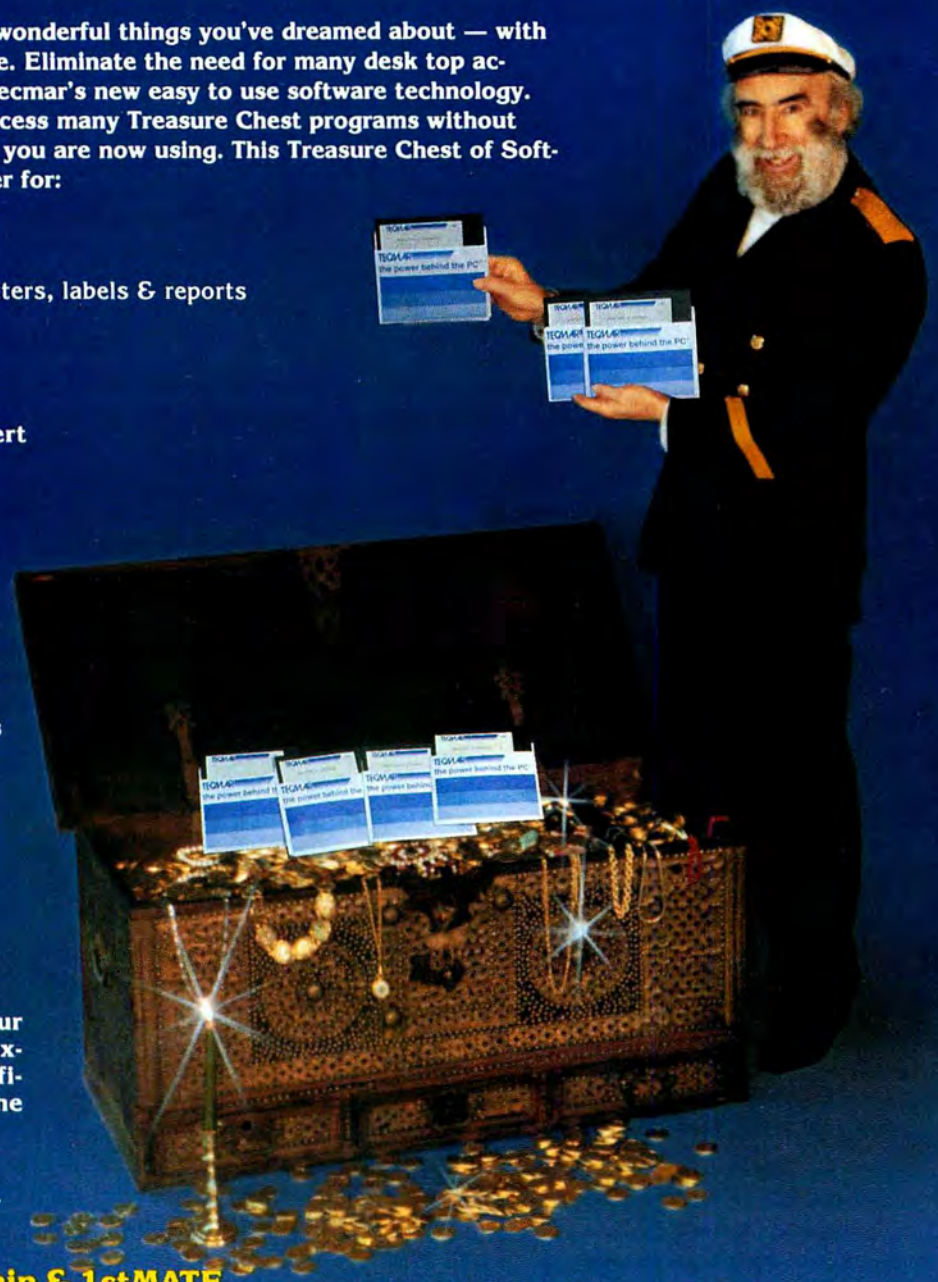

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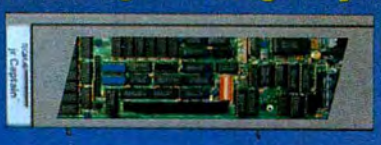

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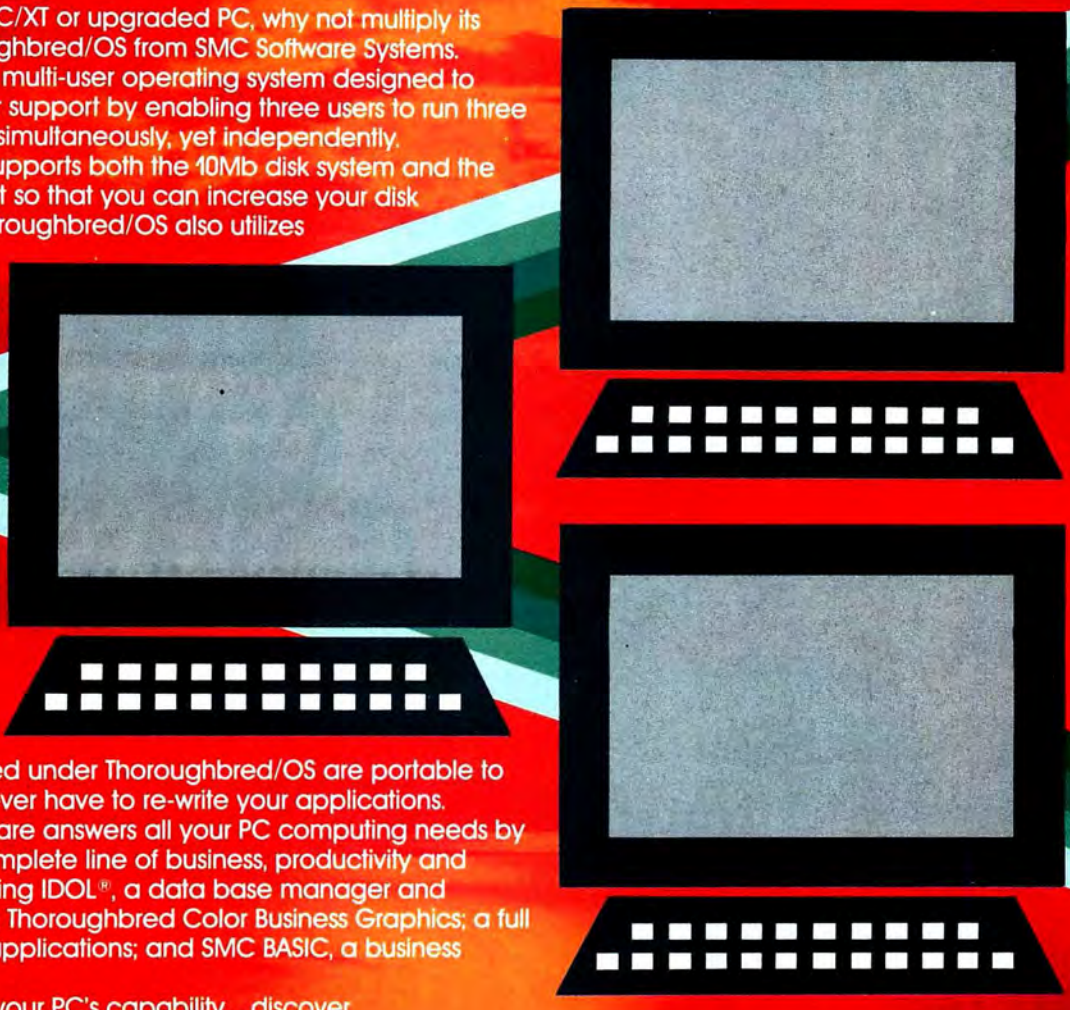

Thoroughbred/OS also includes a BASIC interpreter to further increase its cost efficiency. All applications developed under Thoroughbred/OS are portable to UNIX™, thus you will never have to re-write your applications.

Thoroughbred Software answers all your PC computing needs by providing the most complete line of business, productivity and system software including IDOL®, a data base manager and application generator; Thoroughbred Color Business Graphics; a full range of accounting applications; and SMC BASIC, a business BASIC interpreter.

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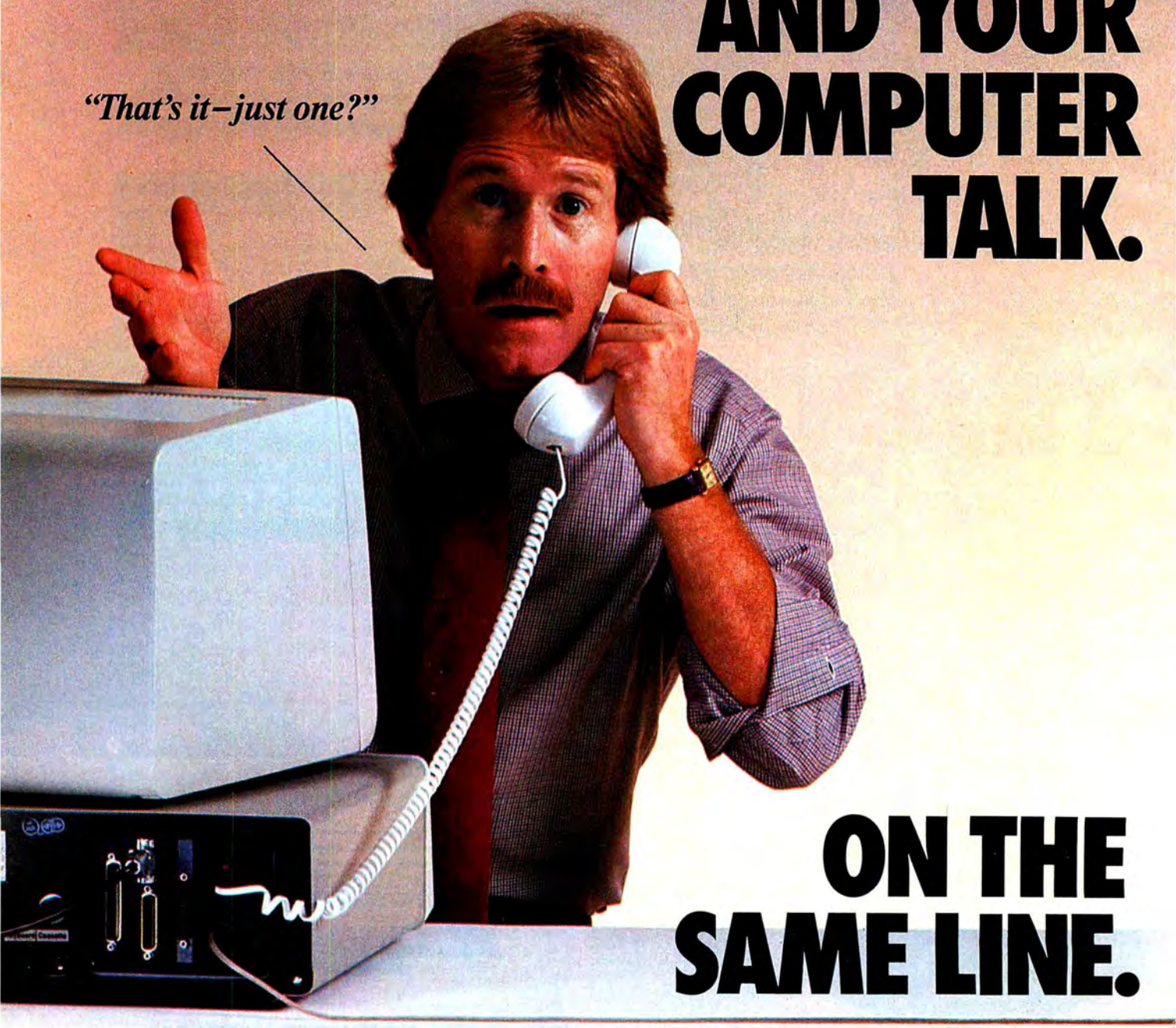
Circle 524 on reader service card

THERE'S ONLY ONE PC/XT MODEM DESIGNED TO LET BOTH YOU AND YOUR COMPUTER TALK.



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Only the PC:IntelliModem™ lets you switch repeatedly between voice and data communications.

Any old modem will let computers talk. But to move from talking or listening to sending and receiving data—at the touch of a single button—there's only one modem that's smart enough. The 1200-baud PC:IntelliModem from Bizcomp.

Let's say you want to transfer some files, and you want to talk to the person receiving them, both before and after the transfer. With other modems, you'd have to hang up, re-dial, or plug and unplug a bunch of cables. Not very convenient, especially if you use your phone a lot, and you have only one line.

With the PC:IntelliModem, you just plug your regular handset into the back of your IBM PC/XT. That's it. You're now ready to make connections with computers—and people—much faster and more conveniently. It's like getting a modem *and a telephone* for the price of a modem alone.

The ultimate status seeker.

The PC:IntelliModem also monitors your telephone line's status more closely than other modems. It listens to the line much like you do, and detects signals for dial tone, ringing, busy and voice—some of which other modems completely ignore. It then automatically takes the appropriate action, so there's less chance of error in making a connection. And since the PC:IntelliModem gives *you* a constant indication of what's going on, you always know how your call is progressing.

Make sure your modem has all these PC:IntelliModem features

Integrated Voice/Data
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- Programmable telephone handset jack

Status Reporting
- Line status detection (dial tone, busy, ringing, voice answer, modem answer, incoming call)
- Audio monitor
- Programmable LED

PC:IntelliCom Software Included
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- Auto-dial, auto-repeat dial, auto-answer
- Link to another number if busy
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- Data capture to diskette
- Programmable auto log-on sequences

Compatible with Crosstalk™/PC-Talk III™

Receive Sensitivity: -50 dBm

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A soft touch to operate.

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All software tasks are activated by pressing function keys, which are clearly labeled on the screen. That means you can go from talking to someone, to transferring data, and back to talking again—all with single keystrokes.

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Even though the PC:IntelliModem is hidden inside your PC or XT, you should see how it works. So go to your dealer and ask for a demo. Also ask about our 2-year warranty, free NewsNet™ connect time and our modest $499 price.

Or contact:
Bizcomp,
532 Weddell Drive,
Sunnyvale, CA 94089;
408/745-1616.

You'll find there's only one modem that does it all, including voice communications: the PC:IntelliModem.

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The New Business Professional Plotter from Hewlett-Packard— The 6-Pen HP 7475A

Today, business professionals are becoming more aware of the vital importance of business graphics to their success. Tomorrow, they may be asking for your recommendation. Here's some important information that will help you. Tell them...

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Standards unsurpassed in the plotter business

The technical standards of the HP 7475A have no equal for producing quality graphics. With a resolution of one-thousandth-of-an-inch, curved lines are smooth, not jagged, and straight lines are *consistently* straight. Its exceptional repeatability (the ability of a pen to return *precisely* to a given point), assures that intersecting lines and circular shapes will meet *exactly.*

Compatible with almost any personal computer in your office and supported on today's most popular graphics software packages

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Company _____

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Phone Number ( ) _____

My computer is _____

Send to: Hewlett-Packard, 16399 W. Bernardo Drive,
San Diego, CA 92127
Attn: Marketing Communications

11304 PW6

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Input

Mark Tiddens

Typing on a keyboard is no longer the only way to enter information into a computer. An array of input devices is now available, including keyboards, joysticks, track balls, light pens, touch screens, digitizing pads, touchpads, mice, bar code readers, optical character readers, and voice recognition devices.

An input device translates user input into digital signals that control the computer. Because input devices are one of the most important links between people and computers, they should be comfortable and easy to use. There are several kinds of input devices, and people have different ideas about which devices are fastest, most practical, and best suited for specific purposes.

Keyboards are the most commonly used input device. They are the best tool for entering large amounts of text and data. Many computers use "full-travel" keyboards, which have keys that can be pressed at least .15 inch to simulate the familiar touch of a typewriter. When you press a key on most full-travel keyboards, a change in resistance or a sound lets you know when you have pressed it far enough to make a connection.

Most often joysticks and track balls are used for computer games, because these devices enable you to position the cursor or a game symbol, such as a laser gun, with a single wrist movement. A joystick is a flexible handle mounted on a base. To position the cursor, you push the handle in the direction you want the cursor to move. A track ball is a free-spinning ball mounted in a base. You move the cursor by spinning the ball with the palm of your hand.

Light pens and touch screens take advantage of the natural tendency of human beings to point at objects they want. You press different areas of a touch

Caps Lock
0 Ins
. Del
Prt Sc *
1 End
2 ↓
3 PgDn
4 ←
5
6 →
8 ↑
9 PgUp
Home
+
-

screen to make choices that control the computer. Light pens allow you to point at images on the display more precisely than your finger can press a touch screen. Because it is tiring to constantly raise and lower your arm, neither device is appropriate for prolonged data input.

You can also use digitizing pads and touchpads, which are placed on a flat surface rather than on the screen, to control a cursor. Touchpads are sensitive to the touch of your fingers; you press on the pad to move the cursor or make selections. A digitizing pad is a flat plate on which you move a stylus to control the cursor. Digitizing pads allow you to position the cursor with great precision to produce the detail needed in applications such as computer-aided design. Digitizing pads can be covered with overlays, much like stencils, to help you guide the stylus in relation to the images on the computer screen.

A mouse is an input device that moves the cursor as you move the mouse across your desk. The device contains buttons that you press to make selections. Mice have become popular because they are fast, easy to use, and work well with software that allows users to point with the cursor to text or images on the screen to select commands.

There are two main types of mice: mechanical and optical. Mechanical mice, which are the most common, measure movement and direction with a calibrated ball that rolls over a flat surface. Optical mice use a light sensor to read lines on a grid pad. Mechanical mice permit more freedom of movement than optical mice because the grid-oriented mice must be moved relative to the direction of the lines on the grid pad.

Bar code readers and optical character readers change written or coded information to a digital form that a computer can interpret. A bar code is a small rectangular patch made up of parallel lines of varying thicknesses. (You frequently see bar codes on supermarket products.) A bar code wand is passed over the code to read the information into a computer.

Optical character readers allow computers to interpret written text by transforming printed material into digital form. Optical character readers are expensive, but they are practical for applications in which documents must be entered into a computer. The legal profession, for example, finds them very useful.

With so many input devices to choose from, deciding which suits you best may be confusing. Consider first the tasks you want to accomplish. If more than one input device is suitable for a task, test each to see which is most comfortable for you. A keyboard is often the best all-purpose input device, but if you intend to play many games, for instance, you might want to add a joystick to your system. Finally, make sure that the product you buy works effectively with the software you want to use. Many products are little more than expensive cursor-positioning devices because the software being used has not been designed to accept the device's selection commands.

As computers become more powerful, new methods of entering data will be developed. A computer's effectiveness depends not only on its processing power but also on the efficiency with which people can use that power. A computer or an application without a suitable input device is like a fast racehorse with a poorly fitted saddle; if you can't stay on top, it doesn't matter how fast it runs.

Mark Tiddens is the corporate marketing manager of Key Tronic Corporation, a keyboard manufacturer based in Spokane, Washington.

Voice Recognition

Ron Stephens

Voice recognition products enable you to operate computers by talking to them. With voice recognition, computers can recognize and respond to spoken sounds. Harnessing human speech makes computers easier to use and puts them to work in new ways. Your hands are freed from keyboards, mice, or touch screens to operate machinery, perform surgery, and perhaps even wash dishes while your voice interacts with the computer.

Voice recognition systems employ different methods to interpret and respond to natural speech. One method is "speaker dependent recognition," which requires each person speaking to the computer to train it. By pronouncing words, the speaker builds a vocabulary that the computer recognizes when that person speaks. The computer can be trained to recognize and execute commands such as "run," "save," and "list."

Theoretically, any number of words can be included in a voice recognition system's vocabulary, but each word the computer stores takes up memory. At present most voice recognition boards have the capacity to store about 255 words.

To recognize and respond to spoken words, a system must search through its vocabulary to match the sounds it receives. The more words the system checks, the more time the search takes. A search for one word requires 180 milliseconds plus 2 milliseconds for each word in the vocabulary.

Voice recognition systems with "speaker independent recognition" can be used by different people without being trained by each individual. Speaker independent recognition is useful in situations such as telephone ordering, in which people with different accents enter data into the same computer. To implement this voice recognition technique, manufacturers must create sound templates, which are stored digital portraits of words. Because the procedure for creating templates is time-consuming, the number of words understood by speaker independent recognition systems is limited.

Another voice recognition technique is "speaker verification." Speaker verification systems identify a speaker's voice pattern rather than individual words. Because a person's voice is as individual as his or her fingerprint, speaker verification has potential as a security method.

A recent advance in voice recognition technology is "continuous speaker dependent recognition." Systems using this method accept continuous phrases, rather than requiring a pause between each word. A continuous speaker dependent recognition system detects words that belong to its vocabulary even when they are embedded in a string of unknown words.

Voice recognition technology was first applied in manufacturing and scientific environments where workers were too occupied to look at a computer

screen or use a keyboard. Voice recognition input devices have also proved beneficial in business applications such as word processing. Although entering large amounts of text is best accomplished with a keyboard, voice commands work well for tasks such as setting margins and tabs and inserting page breaks. Voice input can also be used to enter numbers, change spreadsheet locations, and execute program commands.

When you look for a voice input system, consider how accurately the system recognizes voice commands. Eighty percent of all business offices have noise levels of 50 decibels or higher, which means that superfluous sounds can interfere with commands. A voice system should be at least 95 percent accurate under noisy conditions.

You might also want to acquire voice output. Voice output is important for situations in which you need a response from the computer, but are unable to read from the screen.

Although computers as articulate as HAL of *2001* fame are not yet with us, you can expect to see advances in voice recognition. Voice recognition systems will soon accept larger vocabularies. Developments in artificial intelligence may also enable computers to reason, which will let people communicate with computers as they do with other people. For now, though, voice recognition simplifies the work in everyday applications and puts computers to work in new situations.

Ron Stephens is cofounder and president of Votan, a Fremont, California, voice technology systems supplier.

The Input section describes a selection of hardware that ranges from keyboards to devices that let you write or even draw into your computer by hand.

Two characteristics of input devices are important: transmission speed and resolution. Transmission speed, which is usually measured in bits per second, determines how fast information is sent from a device to the computer. Devices such as mice, touchpads, light pens, and digitizing pads allow direct input of visual images. These devices have a characteristic called resolution. Resolution in this context is an indication of the level of detail that can be transmitted to the computer with a device. The unit of resolution measurement is a pixel, which identifies a single dot of information from the visual image. The more pixels or dots produced, the more accurately the image is transmitted to the computer. A high-resolution device can input more points from a given space.

Input devices connect to a computer in several ways. They usually require a game adapter, a serial port, a keyboard port, or a special interface device, such as a graphics controller board or a stand-alone interface box. The type of interface required for each input device is indicated in the product descriptions.

When you select the input device for your application, it's well worth taking the time to shop around. Do some "hands-on" experimenting if possible. After all, your input device is your direct connection to the computer, and if you are comfortable using it, you'll enjoy using your computer that much more.

Kraft Premium Joystick

Kraft Systems, Inc.
450 W. California Ave.
Vista, CA 92083
800/854-1923

The Kraft Premium Joystick is used with games or graphics programs. The joystick's handle is set with an external switch either to spring back to the center or to remain in the same position upon release. This feature permits players to adjust the handle's movement to suit the program in use. The joystick has cursor-centering tabs on top. When the handle is set to spring back to center, trim controls on each axis provide additional adjustability. List price: $50. Requirements: game adapter.

Kraft Premium Joystick, Kraft Systems

Magstik

Tech Designs, Inc.
3638 Grosvenor Dr.
Ellicott City, MD 21043
301/291-0818

Magstik is a magnetic joystick that returns to center without using springs. The joystick is a cursor controller for computer graphics applications and games. The Magstik joystick uses magnets for centering instead of using springs, which can wear out. One magnet can be removed to permit the joystick to move freely. Two push-button switches and a centering adjustment for each direction permit you to fine tune the stick to whatever game you are playing. List price: $65. Requirements: game adapter.

KB5151 Deluxe IBM PC Keyboard

Key Tronic
P.O. Box 14687
Spokane, WA 99214
509/928-8000

The KB5151 Deluxe IBM PC Keyboard is a detachable keyboard. The words *shift* and *enter* are spelled out on the key tops. The KB5151 also features typewriter key placement with oversized <Shift>, <Enter>, <Backspace>, and <Tab> keys. The <CapsLock> and <NumLock> keys have light-emitting diode status indicators to let you know whether they are on or off. The function keys are located in a single row across the top of the keyboard. A separate cursor control pad is located between the alphabet portion of the board and the number pad. List price: $295.

Adam and Eve Paddles

Tech Designs, Inc.
3638 Grosvenor Dr.
Ellicott City, MD 21043
301/291-0818

The Adam and Eve Paddles are a pair of game paddles. Each paddle has an unpluggable handle and a trimmer control to eliminate "short screen" and "wraparound" problems. The connector in the paddle handle has cable stress relief to protect against rough handling. List price: $35. Requirements: game adapter.

Logimouse P-5/Logimate

Logitech, Inc.
165 University Ave.
Palo Alto, CA 94301
415/326-3885

Logimouse P-5 is a three-button mechanical mouse that can be moved on any flat surface. The mouse is available in two resolutions: 200 pixels per inch and 320 pixels per inch. Logimouse comes with Logimate, an interface that connects the mouse through the IBM PC keyboard port. No serial port is required. List price: $268.

PC Mouse

Mouse Systems Corporation
2336H Walsh Ave.
Santa Clara, CA 95051
408/988-0211

The PC Mouse is an optical mouse that users move over a grid-like pad to position the cursor. The three-button mouse can be used with software that includes *Microsoft Word, VisiOn, 1-2-3, VisiCalc, Multiplan, WordStar, Volkswriter,* and IBM's *Personal Editor.* The PC Mouse comes with a connector for a serial port, a grid pad, and software. List price: $295. Requirements: serial port.

Chip Mouse

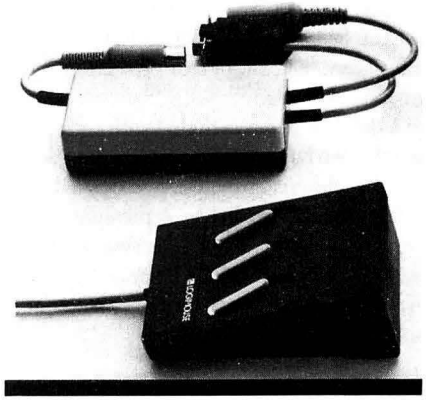
Volks Communications, Inc.
740 N. Brown Rd.
Long Lake, MN 55356
612/473-5828

The Chip Mouse is a combination touchpad and mouse that uses a metallic foil array to detect the touch and position of a finger. The touchpad is divided into two areas—one small area with 12 touch-sensitive keys, and a larger grid area. By moving a finger over the grid, you move the cursor around on the screen. The Chip Mouse has no moving parts or switches. It comes with cursor control software. List price: $295. Requirements: serial port.

OptoMouse

USI Computer Products
150 N. Hill Dr.
Brisbane, CA 94005
415/468-4900

OptoMouse is an optical mouse with two rocker-switch buttons that provide four programmable circuit selections. The mouse has 100-pixels-per-inch resolution and must be used with a grid-patterned desk pad to move the cursor. OptoMouse contains its own processor, optical system, and interface circuitry. The bits-per-second rate can be set at 110 to 9600. List price: $300. Requirements: serial port.



Logimouse P-5, Logitech

Touchpen

Sun-Flex Co., Inc.
CAD Division
20 Pimentel Court
Novato, CA 94947
415/883-1221

Touchpen is a light pen that enables users to draw images on the screen. Touchpen comes with an interface board and a transparent mesh panel that mounts over the monitor's screen. When the panel is touched with the light pen, the conductive mesh transmits the screen coordinates to the computer. The mesh panel also reduces glare. Panels are available for both monochrome and color monitors. List price: $900.

Mouse Trap

Corman Custom Electronics
38 Bridgeport Rd. E
Waterloo, Ontario
N2J 2J5 Canada
519/884-4430

The Mouse Trap is an external device that lets the MARK II Marathon Mouse work without a serial port. Both the mouse and the keyboard plug into the box, which then plugs into the keyboard outlet on the system unit. List price: $345.

Digi-Pad 5

GTCO Corporation
1055 First St.
Rockville, MD 20850
301/279-9550

Digi-Pad 5 is a product line of six digitizing pads that range in size from 11 by 11 inches to 42 by 60 inches. Each digitizer performs computer-aided design and other graphics functions. Software written for one pad size can be used with other pads. Opaque, translucent, backlit, or rear projection pads are also available.

A digitizer pen is included with each pad, and the pen has a solid-state switching device that eliminates the wear associated with mechanical switches. A pressure-sensing pen is sold separately. The system includes a graphics board. List price: 11 inches square $1400. Requirements: serial port.

KoalaPad Touch Tablet

Koala Technologies Corporation
3100 Patrick Henry Dr.
Santa Clara, CA 95050
408/986-8866

The KoalaPad is a 4- by 4-inch touchpad used for creating graphics on the IBM PC monitor screen. A stylus comes with the KoalaPad, although a finger can draw directly on the pad. *PC Design* software is included and offers a menu of shapes and colors. List price: $150. Requirements: game adapter, color graphics board.

"The KoalaPad is indestructible, as evidenced by 4 hours' use with 5- to 11-year-olds fighting over it. The pad is accurate and connects directly to a joystick interface. KoalaPad *software allows pictures to be created, stored to disk, and recalled later."*
David Riness, Glendale, California

Point-1 Touch Screen Monitor

MicroTouch Systems, Inc.
400 W. Cummings Park
Woburn, MA 01801
617/935-0080

Point-1 is a touch screen monitor that lets you operate an IBM PC using your finger as a pointing device. Point-1 enables you to position the cursor, select from menus, and manipulate graphics by touching the screen. The monitor rests on the desk surface and reclines at a slight angle. The 12-inch-diagonal screen has a resolution of 1024 by 1024 pixels and comes with an amber or green phosphor display.

Point-1 works with either a monochrome or color graphics board and contains its own controller inside the monitor housing. The controller has a processor and firmware, and it connects to the PC through a serial port. MicroTouch makes one firmware and two software products for use with the monitor. *Drive Point* is a communications and driver software package used to configure, program, and operate the touch screen controller. Command Point is firmware that allows Point-1 to function as a coprocessor when running applications. *View Point* is a software development package that allows screen layouts, windows, and icons to be created interactively when drawn on the screen. List price: $1495. Requirements: serial port.

ParlePC

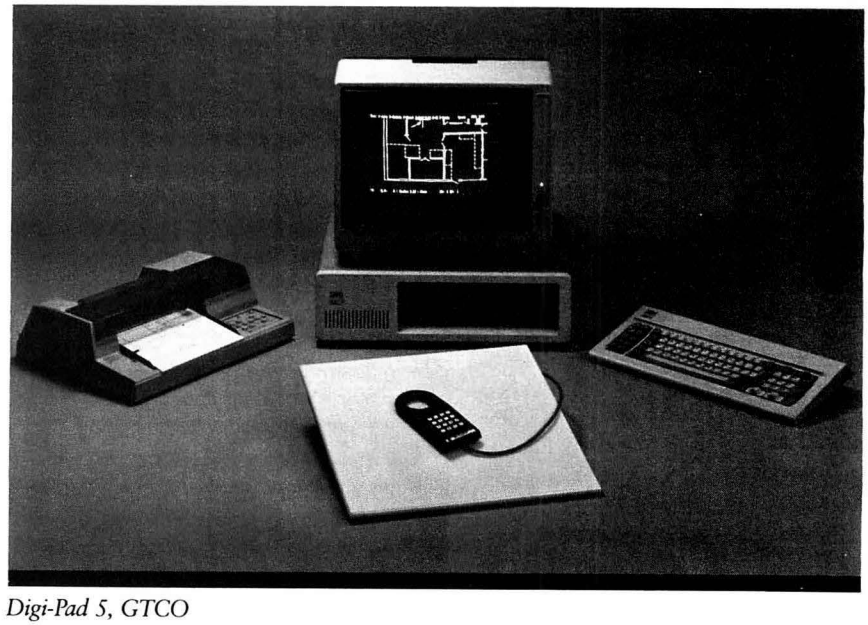
GM Enterprise, Inc.
485 E. Granville Ave.
Roselle, IL 60172
312/893-1171

ParlePC is a speech synthesizer board that enables the IBM PC to imitate human language. Its phoneme-based speech synthesizer, the Votrax SC-01, has an unlimited vocabulary capacity. The variety of words produced depends on the software used. ParlePC has an on-board audio amplifier, a speaker, and a jack for an external speaker. List price: $200.

VS501 Voice Synthesizer

Glenco Engineering
3920 Ridge Ave.
Arlington Heights, IL 60004
312/537-4200

The VS501 Voice Synthesizer Board provides voice synthesis, a game adapter, and program memory expansion. Over 200 words are programmed on the board, and up to 1200 more can be added. Four speech memories can be placed on the board to provide up to 8 minutes of speech. The game adapter has a 15-pin connector on the back panel. The program memory expansion allows 16K ROM or EPROM to be installed. List price: $250.



Digi-Pad 5, GTCO

Light Touch

Information Control Corporation
706 Bostwick Ave.
Bridgeport, CT 06605
203/386-6751

The Light Touch light pen is an electronic pointer that is used with a CRT display to perform functions such as character sensing, text editing, and graphics. It is a 6-inch-long, ½-inch-diameter pen with a plastic tip. The pen connects to a color graphics board. A signal can be triggered by touching the surface of the screen with the pen's tip. Light Touch allows operators to select, draw, or modify images, read or enter data, or choose operations from a menu. List price: $150. Requirements: color graphics board.

Kraft Precision Paddles

Kraft Systems, Inc.
450 W. California
Vista, CA 92083
619/724-7146

The Kraft Precision Paddles are a pair of game paddles. Each paddle has a fire button and a central knob that rotates 185 degrees. The knob controls the cursor along one axis. The paddles can stop the cursor on a single pixel and move the cursor across the screen without skipping pixels. List price: $50. Requirements: game adapter.

Power Pad

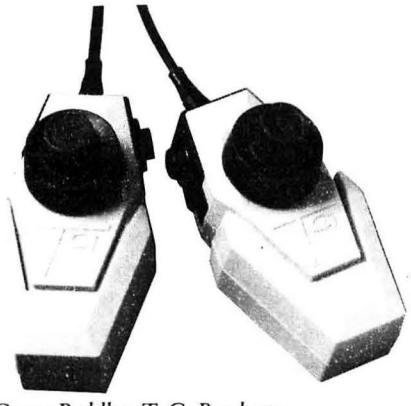
Chalk Board, Inc.
3772 Pleasantdale Rd. #140
Atlanta, GA 30340
800/241-3989

The Power Pad is a touch-sensitive input device. The pad's 12- by 12-inch active work area is encased in a 17- by 20-inch plastic case with a handle. The Power Pad can respond to more than one point of contact at a time. Electronics scan the entire surface about 20 times per second searching for points where pressure is applied. Mylar overlays are included with Chalk Board's software packages. Each overlay is imprinted with color-coded areas that act as both menu and function keys. Chalk Board's starter package for the IBM PC includes the Power Pad, *Leo's 'Lectric Graphics* software, and a serial attachment. List price: $200. Requirements: serial port.

Game Paddles

T.G. Products
1104 Summit Ave. #110
Plano, TX 75074

The Game Paddles are slim, oblong paddles designed for either right- or left-handed players. The fire button is located on an end cap that can be unclipped, reversed, and snapped back on to shift the button to the opposite side of the paddle. List price: $40. Requirements: game adapter.



Game Paddles, T. G. Products

Engineering Workstation

Chancellor Computer Corporation
1305 Grandview Dr.
South San Francisco, CA 94080
415/872-2346

The Engineering Workstation includes a reconfigured IBM PC XT with an 8087 coprocessor, a high-resolution graphics board, a 1024- by 768-pixel color monitor, an optical mouse, and computer-aided design software. Engineers can use the work station to design schematic diagrams and printed circuit boards. The work station can be used alone or as part of a local area network. List price: $23,000.

Soft-Touch

Computer Technology Associates
1704 Moon NE
Albuquerque, NM 87112
505/298-2140

The Soft-Touch touch screen enables the IBM PC monitor to respond to on-screen touch commands. The touch screen uses infrared emitter-sensor array technology to track stimuli moving across the screen. Its resolution is 96 horizontal by 64 vertical pixels. BASICA reads the X-Y coordinates of the moving command. All hardware and software required to install and operate this system is supplied. List price: $495.

Mouse, Voice, and OCR Data Entry

Key Tronic
P.O. Box 14687
Spokane, WA 99214
509/928-8000

Mouse, Voice, and OCR Data Entry are alternative entry devices that work with Key Tronic's IBM PC intelligent keyboard. Data entered with the three devices is processed by the keyboard's 8088 processor. The intelligent keyboard allows the devices to be used with most applications software.

The mouse comes in two versions: mechanical and optical. The optical mouse is operated on a special pad. Users train the voice entry device to recognize one voice and a given vocabulary. Users also determine what string of characters is sent to the computer for each word in the vocabulary.

The OCR device is designed for use in banking. It is programmed to recognize the fonts on checks and magnetic coding on credit cards. List price: OCR without keyboard $1400; Mouse Data Entry, Voice Data Entry, and keyboard $1900.

Command Control Mouse

WICO Corporation
6400 Gross Point Rd.
Niles, IL 60648
312/647-7500

The Command Control Mouse is a mechanical mouse used to edit, draw, or make menu selections. The cursor can be moved to any point on the display by sliding the hand-held mouse across a desktop surface. Its three buttons can be programmed. The Command Control Mouse is used in word processing to add, delete, or reposition copy and to edit or scroll with a spreadsheet program. List price: not available. Requirements: interface board.

VX Series

Votan
26046 Eden Landing Rd. #3
Hayward, CA 94545
415/490-7600

The VX Series consists of devices that provide interactive voice recognition, storage, and response. V1000 offers a speaker-dependent recognition system that recog-

nizes individual words or phrases. It operates by comparing spoken words to a vocabulary entered by users. V4000 combines a voice response feature with a voice storage and forward feature. Voice response enables spoken words to be digitized, compressed, stored, and played back either immediately or later. Voice storage and forward permits spoken words to be digitized, compressed, buffered, and transmitted to a storage device or a node on a communications network. This feature is typically used by voice mail services. V5000 combines the features of V1000 and V4000. V6000 adds speaker-independent recognition of the words *yes* and *no* and numbers 0 through 9. List price: V1000 $5300, V4000 $5300, V5000 $6300, V6000 $8500. Requirements: serial port.

PCScanner Model 240

Caere Corporation
100 Cooper Court
Los Gatos, CA 95030
408/395-7000
PCScanner Model 240 is a bar-code scanner that works with the IBM PC and XT. The scanner reads bar codes and transmits the data to the computer's programs as if the information had been entered manually on the keyboard. PCScanner Model 240 includes a keyboard interface board that plugs into a computer slot. The scanner comes with either a standard- or a high-resolution pen. List price: with standard-resolution pen $745, with high-resolution pen $785.

KB5150 Keyboard

Key Tronic
Dept. E
P.O. Box 14687
Spokane, WA 99214
509/928-8000
KB5150 is an IBM PC keyboard. The <Enter>, <Tab>, <Shift>, and <Backspace> keys have their names printed on the keycaps. The <CapsLock> and <NumLock> keys have light-emitting diode indicators. The KB5150 is also available with a Dvorak key layout. List price: $209.

Light Pen

Symtec
15933 W. 8 Mile
Detroit, MI 48235
313/272-2950
The Light Pen is used to create graphics, edit, read X-Y coordinates, and make sounds. Separately sold software shows how to program the light pen in BASIC. The pen comes in two models. One is activated with a touch-ring and the other uses a push-tip switch. The Light Pen does not work with the IBM monochrome monitor. List price: touch ring $150, push tip $165, software $10. Requirements: color graphics board.

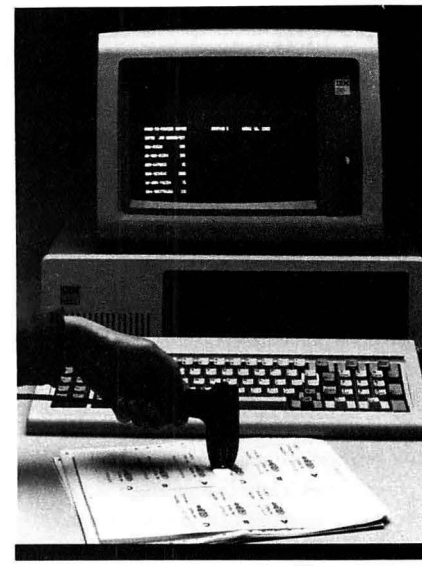
"The steel barrel of the Light Pen looks nice and feels comfortable. The coiled cord complements the keyboard's cord. But the touch-ring model is hard to use and tires the index finger." Stephen J. Hysick, Grosse Pointe Woods, Michigan

Track Ball

T.G. Products
1104 Summit Ave. #110
Plano, TX 75074
214/424-8568
Track Ball is a cursor-moving device designed for children to use with graphics and educational software. It is a 4- by 6-inch box with a red ball 2½ inches in diameter mounted in the center. Track Ball has three control buttons. List price: $50. Requirements: game adapter.

Joystick

T.G. Products
1104 Summit Ave. #110
Plano, TX 75074
214/424-8568
The Joystick is designed for use with game and graphics programs. The cursor moves diagonally or along the X or Y axis. It is self-centering and has trim adjustments for both axes. A toggle switch disengages the self-centering function. List price: $40. Requirements: game adapter.



Series 500 OCR Wand Reader, Caere Corp.

Series 500 OCR

Caere Corporation
100 Cooper Court
Los Gatos, CA 95030
408/395-7000
Series 500 is an optical character recognition (OCR) system that works with the IBM PC and XT. It reads characters printed on items such as credit card sales slips, computer-generated invoices, and price tags. Series 500 can be used for remittance processing and inventory control and with point-of-sale terminals. It recognizes a string of up to 80 characters printed in the standard OCR-A alphanumeric font. Data can be scanned at speeds from 5 to 20 inches per second. Series 500 includes a wand and an interface board. List price: $1145. Requirements: serial port.

Sentry 3000 Optical Mark Reader

National Computer Systems
4401 W. 76th St.
Edina, MN 55435
612/830-7600
Sentry 3000 is an optical mark reader that works with the IBM PC. The reader analyzes marks on specially designed forms. Sentry 3000 is designed primarily for use in education and human resources applications such as test scoring, grade reporting, and survey processing and other data base management functions. The package includes a scanner, *PC-Utility* applications software, and special forms. List price: $2700. Requirements: serial port.

Model 90 Integrated Imaging System

DATACOPY Corporation
1070 E. Meadow Circle
Palo Alto, CA 94303
415/493-3420

The Model 90 Integrated Imaging System consists of the Model 610 electronic digitizing camera, the Model 110 image processing interface board, and accessories. The camera and board are also available separately. The Model 610 camera enables users to enter images of photos, documents, printed text, or three-dimensional objects into the IBM PC without using a keyboard. The digitizing camera scans objects or images and translates them into computer-readable digital code. The electronic image can be displayed, printed, or stored in PC memory for later retrieval. Model 110 includes image-capture software. Model 90 accessories consist of the camera power supply, the camera stand, illumination, the camera lens, and the necessary cables and service manual. List price: Model 90 $9945, Model 610 $7850, Model 110 $795.

CYC-48 Bar Code Reader

New Wave Systems
12123 Washington Pl.
Los Angeles, CA 90066
213/475-8545

CYC-48 is a combination optical bar code wand and decoder. Data is entered into a computer when the wand is passed over bar-coded material. CYC-48 can be used for inventory control, parts and file tracking, point of sale data entry, and repair control. CYC-48 translates Code 39 alphanumeric bar code format to ASCII characters that can be read by the computer. The wand also reads universal product code (UPC) and bar codes printed by inexpensive dot matrix printers. CYC-48 comes with a power supply and two serial attachments for in-line connection to other serial devices. A voice output option is also available. List price: $650. Requirements: serial port.

"We use New Wave Systems' printing program to generate a bar code and read it in with CYC-48. The system has simplified data input for us and minimized errors."
Marilyn Hood, Venice, California

Micro Digi-Pad

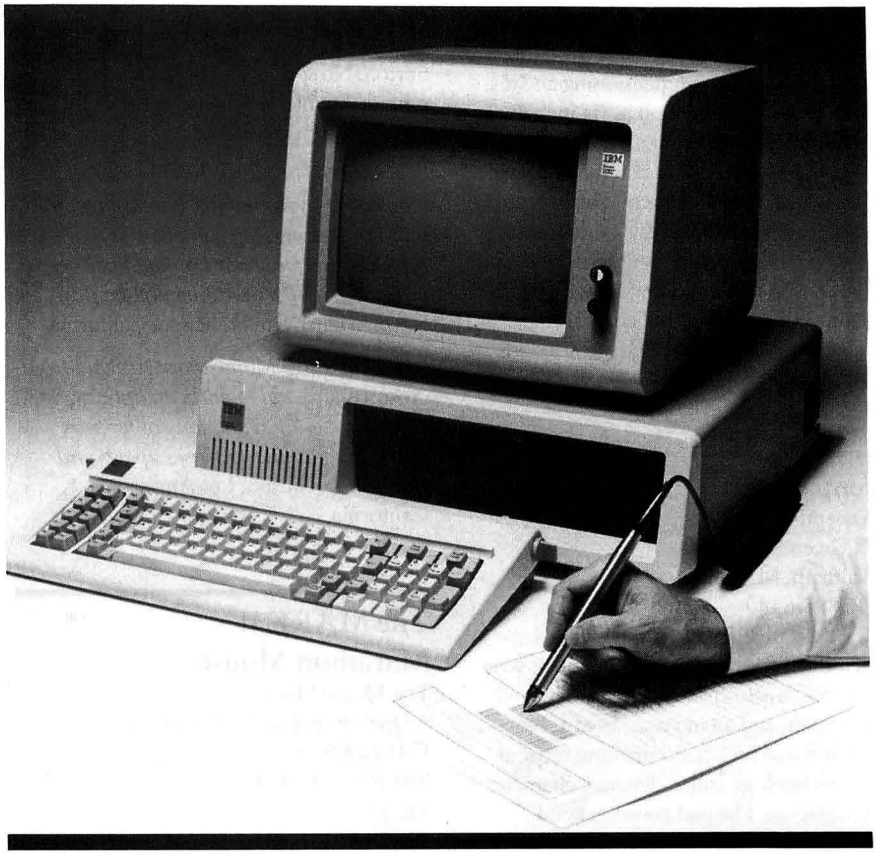
GTCO Corporation
1055 First St.
Rockville, MD 20850
301/279-9550

Micro Digi-Pad works like a combination mouse and digitizing pad. It enables you to select menu functions, position the cursor, draw, and trace. The system includes a pad containing X and Y grid lines, and a mouselike, four-button cursor controller with cross hairs on a 1.75-inch-diameter scratchproof glass window. A stylus with a solid-state tip switch and an ink cartridge are sold separately. The pads come in two sizes, 6 inches square and 12 inches square. List price: 6-inch-square pad with pen $751, with cursor controller $835; 12-inch-square pad with pen $950, with cursor controller $1040. Requirements: serial port.

ARTISTAB

Control Systems
2855 Anthony Ln.
Minneapolis, MN 55418
612/789-2421

ARTISTAB is a digitizing pad that comes with either a three-button cursor controller or a stylus. The cursor controller has a round glass window with cross hairs for accurate cursor placement. The stylus has both a push-tip and a touch-ring switch and is available with ink cartridges. The pad has a 12-inch-square active area. ARTISTAB contains its own processor and requires no additional power supply. The resolution can be set from 50 to 500 pixels per inch. The software included runs only with Control Systems graphics boards. List price: $995. Requirements: serial port, Control Systems graphics board.



PCScanner Model 240, Caere Corp.

TouchCAD Drafting and Design System

Sun-Flex Co., Inc.
20 Pimentel Court
Novato, CA 94947
415/883-1221

TouchCAD is a computer-aided graphics system designed for architects, space planners, and others who need flexible precision graphics capabilities. The system comes with hardware and software. The hardware includes a transparent mesh panel that fits over the IBM PC monitor screen, a CADpad off-screen digitizer, a graphics board, and a rubber-tipped stylus. The CADpad is a 6-inch-square, plug-in, transparent cursor locator that is activated by the same stylus as the on-screen digitizer, the Touchpen.

The TouchCAD software enables users to create and edit drawings using the Touchpen or the CADpad. Digitizing pads are used to enter existing paper drawings into TouchCAD libraries. The software provides automatic dimensioning and displays line lengths as small as 1/64 inch. It allows users to insert trial placements or "soft-line" overlays and automatically calculates distances and areas. The bidirectional zoom feature enables a designer to work on drawings at many levels of detail. The editing features allow drawn objects to be moved, copied, modified, erased, rotated, and scaled vertically and horizontally. List price: $1545.

Penpad 320

Pencept, Inc.
39 Green St.
Waltham, MA 02154
617/893-6390

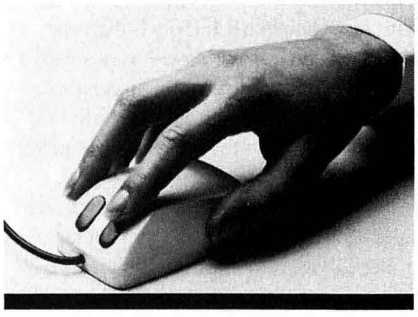
The Penpad 320 system consists of a ½-inch-thick pad with an 11- by 11-inch writing area, an electronically controlled ballpoint pen, and an interface board. Penpad 320 is based on a hand-printing recognition technology called dynamic character recognition. The pad converts hand-printed data to computer code as you write. Grid paper is supplied with the pad. Penpad 320 recognizes capital letters *A* through *Z*, numerals 0 through 9, and 22 other symbols, including punctuation marks. When uppercase letters are printed at half-height, Penpad 320 converts them to lowercase.

Penpad 320 also acts as a digitizing pad or a mouse. In the mouse mode, cursor control codes are transmitted based on pen motion. The digitizer mode offers 200-pixels-per-inch resolution. List price: $995.

Microsoft Mouse

Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
206/828-8080

The Microsoft Mouse is a two-button mouse that moves a cursor on a screen. Actions are initiated by pointing the cursor at different areas on the screen and pressing a button. No special pad or surface is required. An interface board comes with the mouse. List price: $195.



Microsoft Mouse, Microsoft

"The Microsoft Mouse has functioned flawlessly for one month. I am using it for word processing. My complaint is that the mouse's interface board should have been integrated with a multifunction board." Steven Maller, San Francisco, California

"The Microsoft Mouse works well with Microsoft Word *and requires no optical grid. It does not work with many other programs, and its interface uses up a board slot."* W. K. Gibson, Los Angeles, California

The MARK II Marathon Mouse

The Mouse House
A Division of Hawley Laboratories
1741 Eighth St.
Berkeley, CA 94710
415/525-5533

The MARK II Marathon Mouse is a mechanical mouse with three buttons and 200-pixels-per-inch resolution. The mouse moves the cursor across a screen in direct proportion to its own movement. The buttons activate functions such as text selection and scrolling. MARK II can be used on any flat surface, but it requires a separately sold interface box. List price: $300.

Keyboard Mouse

COMCO Concepts, Inc.
465 Convention Way
Redwood City, CA 94063
415/364-3464

The Keyboard Mouse includes a three-button mouse and an external mouse interface unit. The mouse is a cursor positioning device for word processing, spreadsheet graphics, and data base management programs. The interface is compatible with software that uses keyboard cursor control keys. The mouse and the IBM PC keyboard plug into the mouse interface box, which plugs into the PC keyboard port. The Keyboard Mouse can be used with monochrome or color monitors. List price: $300.

VersaWriter

Versa Computing, Inc.
3541 Old Conejo Rd. #104
Newbury Park, CA 91320
805/498-1956

VersaWriter is a digitizing drawing board with accompanying software that allows users to enter graphic images into the computer. VersaWriter works with the IBM PC's color graphics board. The drawing board accepts drawings of up to 8½ by 12 inches. Users enter drawings by tracing images on the digitizing board using a pointer connected to the drawing arm. The supplied software includes over 30 commands. VersaWriter attaches to a game adapter. List price: $300. Requirements: game adapter, color monitor.

Voice Recognition Board

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Voice Recognition Board stores up to 100 words in its 8K memory. An optional 16K memory holds up to 200 additional words. The board provides programmable gain settings, rejection thresholds that aid in recognition accuracy, and noise rejection levels that compensate for different amounts of background noise. An automatic level control compensates for variations in sound levels at the microphone. List price: $995, additional 16K $300.

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2051 South State Street Ann Arbor, MI 48104 313-769-3988

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PC-300 Bar Code Reader

TPS Electronics
4047 Transport
Palo Alto, CA 94303
415/856-6833

The PC-300 Bar Code Reader is a bar code reading wand designed for the IBM PC. It connects between the keyboard and the processor but does not affect keyboard operation. PC-300 enters bar-coded information into the PC as if the keyboard were providing the information. PC-300 reads CODABAR and Code 39 bar codes. The stainless steel wand has a 6-foot coiled cord. List price: $795.

FT-156 High Performance Light Pen

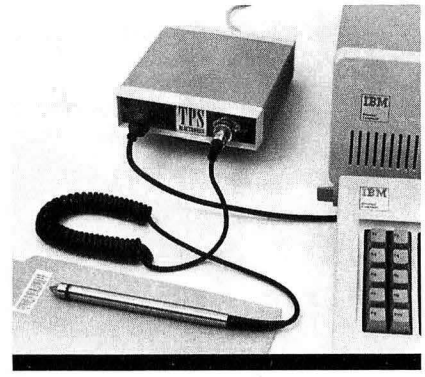
FTG Data Systems/PC Innovations
P.O. Box 615
10801 Dale #J-2
Stanton, CA 90680
714/995-3900

The FT-156 High Performance Light Pen is a push-activated pen used for entering information into the computer. Commands are initiated by touching the pen to the monitor screen. FT-156 can be used for games, graphics, demonstrations, menu selection, and educational applications. This pen works with most color and monochrome monitors, except amber monitors and the IBM monochrome monitor. FTG also offers an economy model light pen for the PCjr. List price: FT-156 $195, PCjr economy model $95. Requirements: color graphics board.

Lenipen Light Pen

Duncan-Atwell Computerized Technologies
1200 Salem Ave.
Hillside, NJ 07205
201/355-1690

The Lenipen Light Pen is a light-sensitive device that reports its location to the computer by reading light from the display. The *Lenipen* color graphics software provides high-speed animation, color mixing, and electronic crayoning. The pen is available with either a push-tip control or a touch-ring control that lets users operate the pen by pointing at the screen rather than touching it. All points on the screen are addressable. List price: $175. Requirements: color graphics board.



PC-300 Bar Code Reader, TPS Electronics

BCR 232 Bar Code Reader

Comtec Information Systems
Digitronics Division
53 John St.
Cumberland, RI 02864
401/724-8500

The BCR 232 Bar Code Reader comes with a hand-held wand for entering bar code values. It translates the codes into ASCII and transmits the information to the computer through a serial port. The bar code reader translates codes 3 of 9 (Logmars 39), 2 of 5 (Interleave), UPC A and E, code-a-bar, and Plesey. BCR 232 is also available as a fixed reader, or it can be purchased with a badge reader option. List price: $595. Requirements: serial port.

Touch Mouse

Touch Technology, Inc.
111 Chinquapin Round Rd.
Annapolis, MD 21401
301/269-6181

The Touch Mouse is a mouse that you control by touch rather than movement. The Touch Mouse has a resistive membrane over a pad measuring 5 by 6 by 1 inches that registers the touch of a finger or a dull instrument. Four buttons control mouse functions, including cursor location, numeric keypad input, and other conventional mouse operations. As a graphics input device, the mouse provides 1000- by 1000-pixel resolution. The package includes an expansion board and software patches for *VisiCalc, VisiWord, WordStar,* and *CalcStar.* List price: $249. Requirements: 64K.

Space Tablet with Software

Micro Control Systems, Inc.
27 Hartford Turnpike
Vernon, CT 06066
203/647-0220

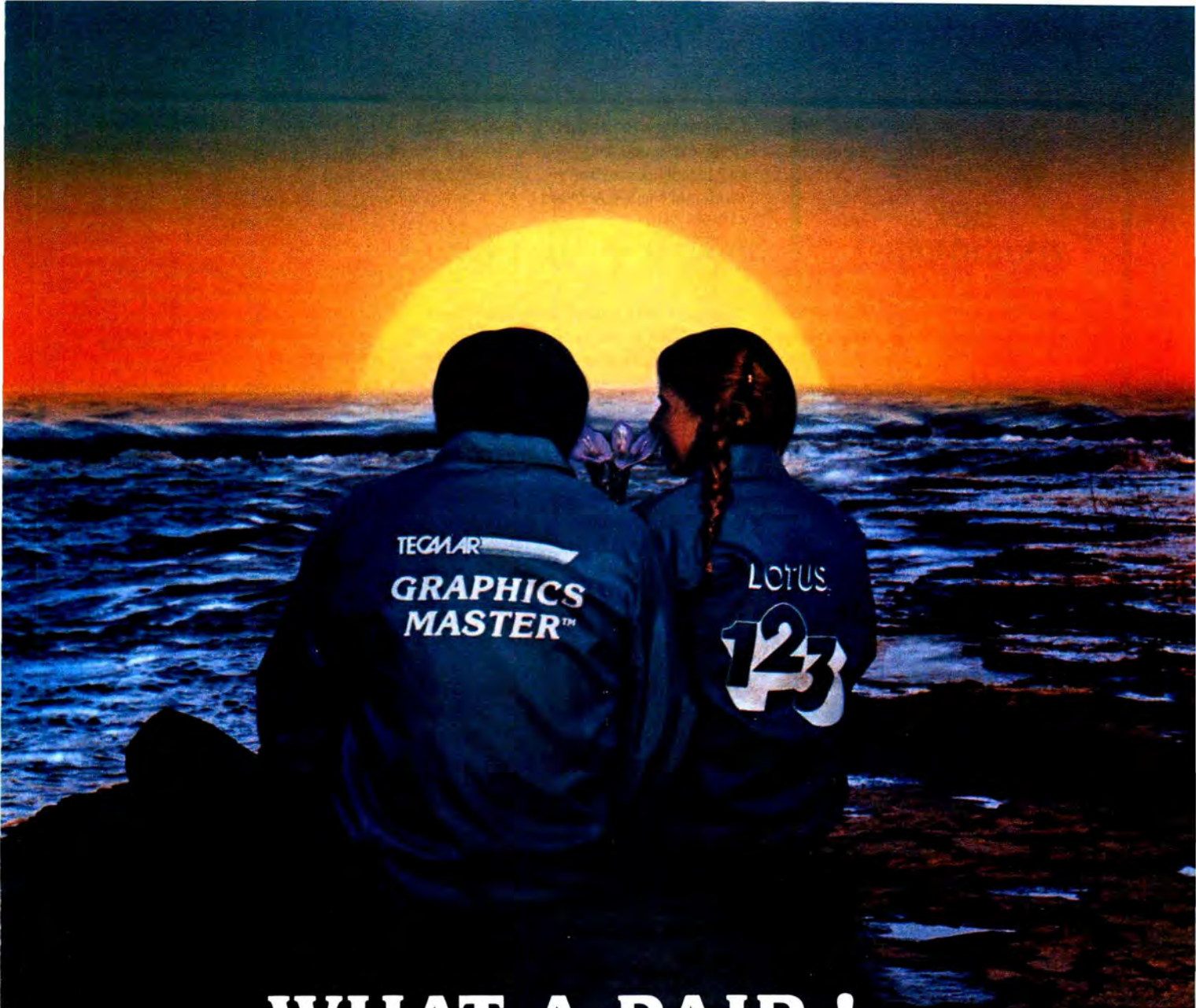
The Space Tablet is a digitizing pad that generates the X-Y coordinates of any point on the pad as well as coordinate data for points off the two-dimensional plane along the Z axis. The pad is designed for entering and manipulating three-dimensional data, especially complex, irregular shapes. The Space Tablet has a four-jointed arm attached to its top with a pointing stylus at the end of the arm. You trace the tip of the pointer over any two-dimensional drawing or over a three-dimensional object to enter the coordinates into the computer.

The Space Tablet comes in two versions. One version attaches to a game adapter and includes basic computer-aided design (CAD) software. The enhanced version includes an interface board and an advanced CAD software package that provides functions such as rotation of three-dimensional objects and zooming. List price: basic version $795, advanced version $1995. Requirements: color graphics board.

HIPAD Digitizer

Houston Instruments
Division of Bausch & Lomb
8500 Cameron Rd.
Austin, TX 78753
512/835-0900

The HIPAD Digitizer is a digitizing pad that attaches to the IBM PC serial port. The pad enables users to select operating parameters such as English or metric scaling, data format (binary/BCD/ASCII), bits-per-second rates, and resolution of either .005 or .01 inch. HIPAD comes with either a single-button or a four-button cursor controller. The pad measures 14 by 17 inches with an 11-inch-square active area. List price: with one-button cursor controller $840, with four-button cursor controller $920. Requirements: serial port.



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Colby Keyboard Key-2

Colby Computer
849 Independence Ave.
Mountain View, CA 94043
415/968-1410

Colby Keyboard Key-2 is a professional word processing keyboard for the IBM PC. Key-2 is 15 inches wide, 4 inches narrower than the IBM keyboard. Its die-cast magnesium frame is about 2 pounds lighter than the PC's plastic keyboard housing. It has ten function keys across the top and a row of four cursor control keys on the upper left. The <Shift> keys are in the standard typewriter positions. The <CapsLock> and <NumLock> keys have light-emitting-diode status indicators. Colby also offers a PCjr model called the Key-2jr. List price: Key-2 $260, Key-2jr $249.

Turbo Stick

KA Design Group
6300 Telegraph Ave.
Oakland, CA 94609
415/654-6300

The Turbo Stick is a joystick designed for graphics, instrumentation systems, and games software. The Turbo Stick offers a rate mode for high resolution (one part in 4096) and an absolute mode for high pointing speed. Switches on the stick control the mode. The switches can be redefined with software to control other functions. List price: $395. Requirements: serial port.

VPC 2000 Voice Card

Votan
4487 Technology Dr.
Fremont, CA 94538
415/490-7600

VPC 2000 Voice Card is an expansion board that provides voice recognition and voice output for the IBM PC. The Voice Card includes a microphone, a speaker, and software that lets your applications respond to voice commands without altering the BIOS or the programs themselves. The device keeps a library of 75 words that it recognizes amid streams of words. By storing vocabulary subsets on disk, you can expand the Voice Card's library. The board comes with telephone jacks and software for telephone applications, including automatic dialing and answering. List price: $2450. Requirements: 128K for software.

VERS Voice Entry/Response System Exchange

NeoLogik
16555 Shannon Rd.
Los Gatos, CA 95030
408/356-3186

The VERS voice recognition system lets a computer communicate over the telephone without a modem. The system is housed in a free-standing unit that fits on top of an IBM PC or other personal computers. VERS recognizes and responds to voice commands and commands issued via a touch-tone telephone's keys. Users must enter a password or a personal identification code; in addition, voice verification safeguards against unauthorized users entering information into the system. The system can give a verbal response in any language in either a male or a female voice. The VERS system is available in a single-phone-line or a multiple-phone-line model. List price: single-phone-line model $12,500, each additional phone line $4000.

PC Dial Log

CMC International
1720 130th Ave. NE
Bellevue, WA 98005
206/885-1600

PC Dial Log is an analog-to-digital conversion board that provides a digitized-voice telephone management system. The board connects a computer and a telephone for transmission of voice messages. Incoming voice messages are translated into digital form for disk storage and later reproduced exactly. Dial Log stores and forwards voice messages and touch-tone codes. Messages are retrieved by calling Dial Log's number and entering a touch-tone identification number. Dial Log then plays back the phone messages that have been left for the caller. Dial Log can also call a number to solicit touch-tone responses to specific questions. Best results are achieved when a hard disk drive is used. List price: $995.

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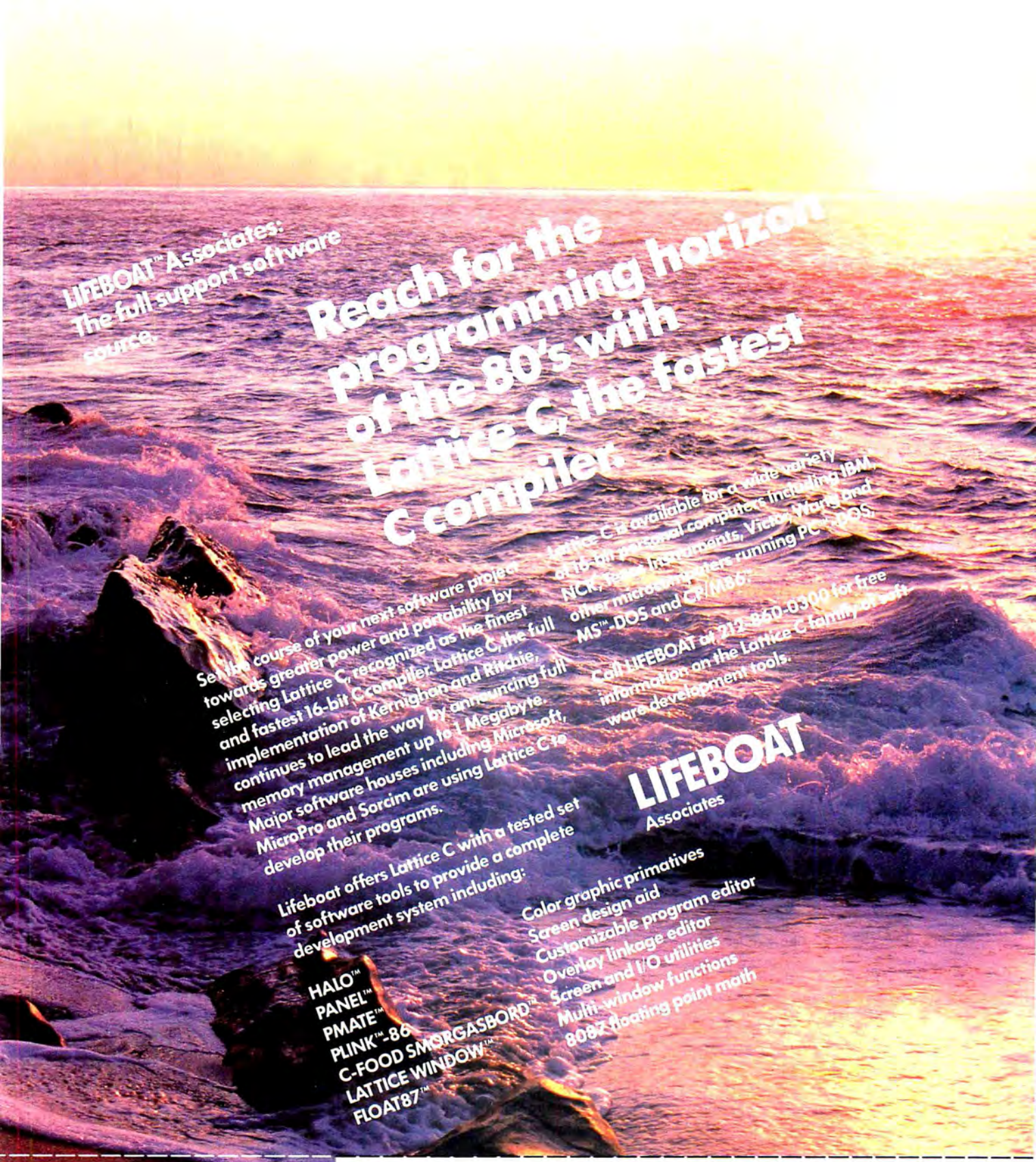

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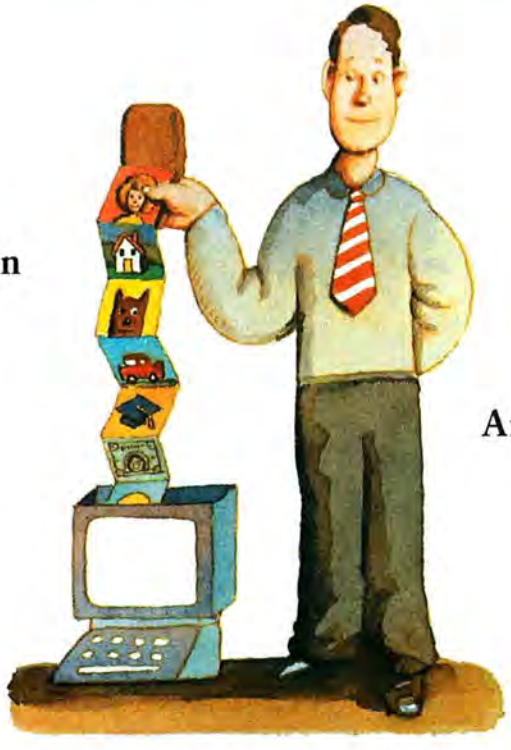

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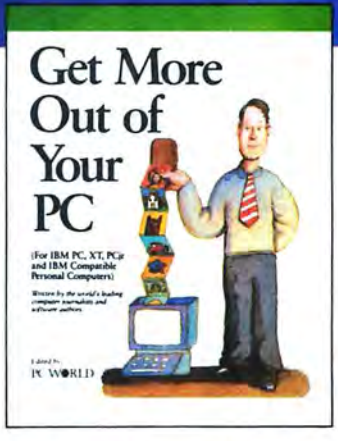

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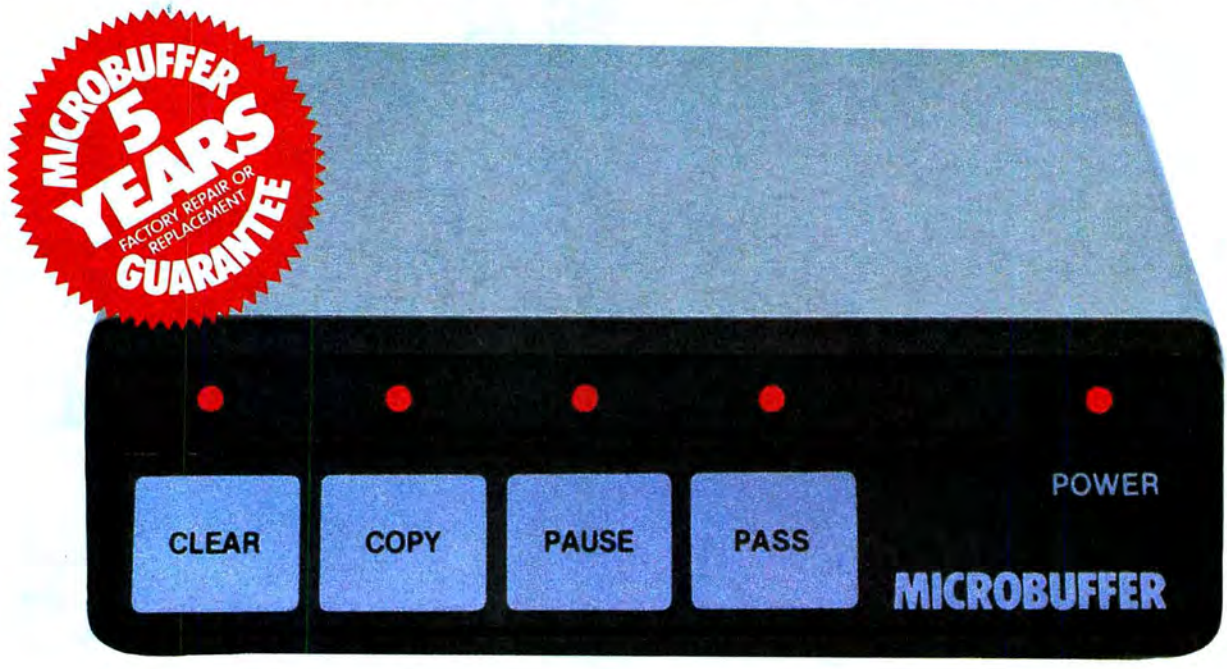

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Display

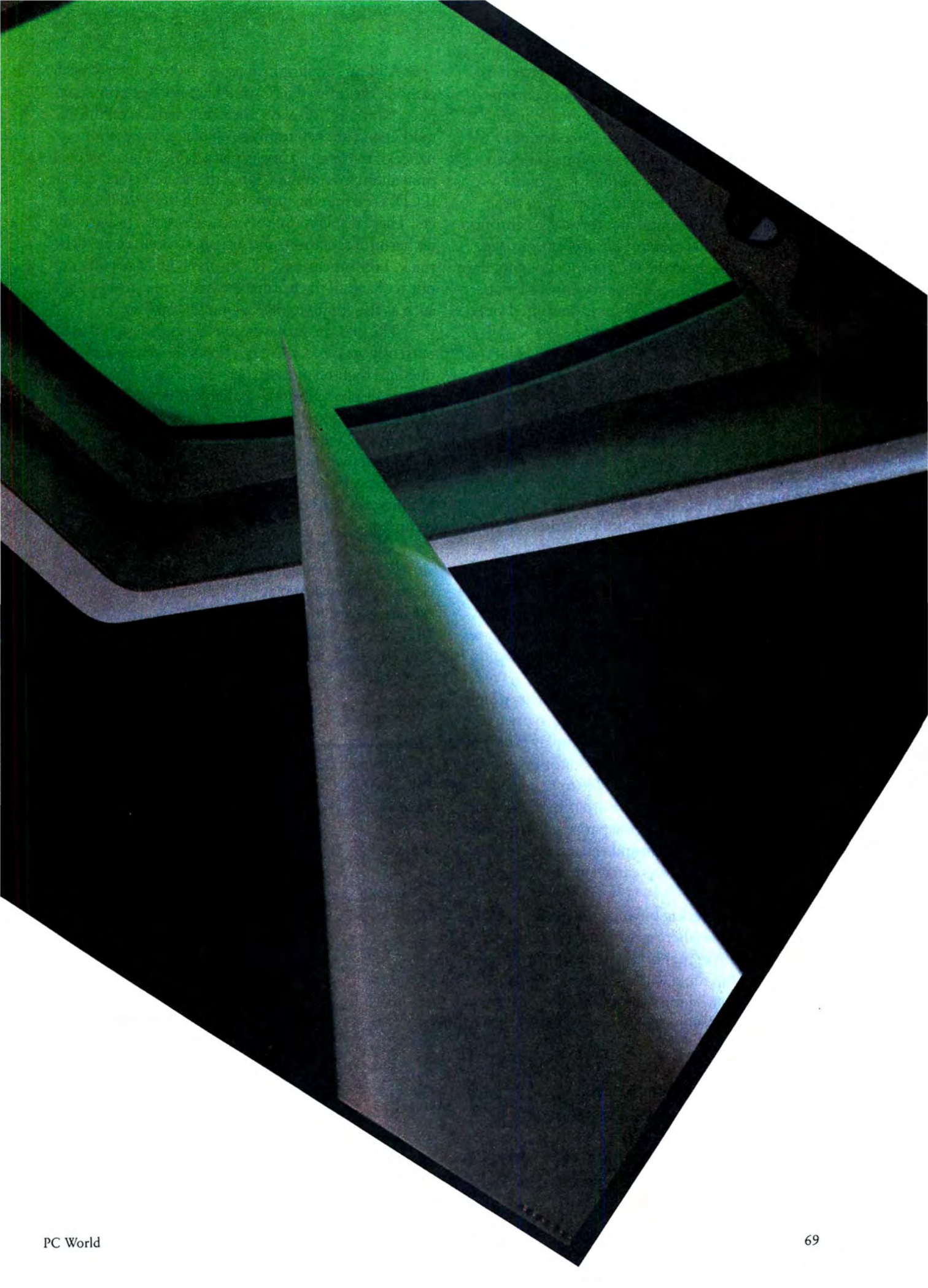
Jiro Oi

Choosing a monitor or display is one of the most critical decisions you face in putting together a computer system. Your monitor is your primary means of getting information from your computer. Because different applications have different display requirements, and because you may well spend hours staring at your computer screen, your choice of monitor can determine how much you enjoy computing. Fortunately, monitors offer the widest range of product and price variation in the IBM PC-peripheral marketplace.

Computer displays fall into four general categories. The simplest and least expensive display is a standard television set. Most sets require an inexpensive radio frequency (RF) modulator that converts computer signals into a format understandable to the monitor. The limitation of a TV-turned-computer-display is the number of characters it can display: a maximum of 25 lines with about 40 characters per line, or a total of approximately 1000 characters. For home computing, a 40-character line may be adequate. Forty columns of text are sufficient for educational use, computer games, learning to program, and simple graphics.

If you use a PC for business applications or word processing, however, you need a display of at least 80 characters per line. This type of display enables you to see more on your screen at one time than a display with 40-character lines, and because most printers print at least 80 characters per line, the image you see on the screen and the printed version look the same.

The second type of display is a dedicated monochrome monitor. If you don't need color graphics, a monochrome monitor is adequate for word processing, data base management, and other nongraphics applications. Prices range from less than $100 to over $300, depending on specifications. Most monochrome monitors provide 25 lines per screen and 80 characters per line. Many monitors have bit-mapped graphics capabilities that allow them to display patterns of individually controlled dots anywhere on the screen. This feature enables a monochrome monitor to display simple graphs that do not need multiple colors to make the information clear. Green on black, which is easier on



the eyes than white on black, has become the dominant screen color combination in the monochrome monitor market. Amber monitors, common in Europe, are gaining popularity in the United States.

The third kind of display is a composite video color monitor. Basically, this monitor is a color TV with direct video input. The composite video signal contains color and horizontal and vertical synchronization information. This monitor has a cleaner image than a color TV because the PC's output does not have to be converted to RF. In a frequency conversion, part of the original signal is lost and some unwanted video "noise" sneaks into the new frequency.

The disadvantage of a composite video color monitor is that, in general, it displays only 40 characters per line. Text displayed on a 40-column composite video monitor is of poorer quality than that produced by a dedicated monochrome monitor or a more expensive red-green-blue (RGB) color monitor. However, not many graphics applications require the higher quality and cost of an RGB monitor. One possibility for people who work primarily with text but sometimes need graphics capability is to buy both a dedicated monochrome monitor and a composite video color monitor; the combined cost is often less than that of a single RGB monitor. Furthermore, if you use a monitor to preview graphics that will be prepared with a high-resolution color plotter, a high-resolution color monitor is not essential.

RGB monitors provide the highest quality graphics display at the highest cost. They range in price from $300 to upwards of $9000. An RGB display is more expensive than a composite video monitor because the video circuits in the unit must be able to handle higher frequencies, and the picture tube offers higher resolution. RGB monitors have three separate color signal inputs along with horizontal and vertical synchronization inputs. The three colors can create any visible color.

If you're considering buying an RGB monitor, you should be aware that there is no industry-standard RGB format. Be sure that both your hardware and software are compatible with the monitor. If your color graphics board limits you to 16 colors, a higher resolution monitor will require a comparable color graphics board.

All four monitor groups use picture tubes called cathode ray tubes (CRTs) and high-voltage power supplies. Non-CRT displays are recent arrivals on the PC market and are beginning to challenge the predominance of the heavy, fragile, glass CRTs. The most common alternative to the CRT is the liquid crystal display (LCD) used in many portable and hand-held computers. These displays use very little electrical power, emit no harmful radiation, and are often less than an inch thick. Like other non-CRT displays, LCD displays do not yet have all the features people expect from a CRT, such as the ability to display multiple colors.

The plasma display is an emerging design that is currently very expensive but holds the promise of producing a high-resolution, flat-screen display. One plasma display currently available offers a 3-inch thick, 17¼-inch-diagonal screen that displays up to 69 lines of text with 160 characters per line, over four times the amount of text that an average monochrome monitor can display. Other new display designs use electroluminescent (EL) or electrophoretic display (EPD) technology.

All non-CRT displays use two glass plates and closely spaced electric wires. Just as the cumbersome electron tube was replaced by the transistor and then the large-scale integrated circuit, the electron beams of CRT monitors may eventually be replaced by the solid-state electronic technology of LCD and plasma displays.

Jiro Oi is marketing manager of Hitachi Sales Corporation of America.

The monitors described in this section fall into two broad categories, monochrome and color. Monochrome monitors display text and images in 1 color, generally green or amber (although other colors are available). Most color monitors display text and images in 7 to 16 colors. Some specialized color monitors provide a spectrum of colors wider than the usual 16.

Monitors differ in a number of characteristics. The screen size, measured diagonally, varies from 9 to 25 inches. Monitors also differ in the type of input signals they use. Some monitors require the National Television Standards Committee (NTSC) standard composite signal; others, known as red-green-blue (RGB) or direct-drive monitors, require a separate signal for each primary color. The kind of signal a monitor uses affects the quality of the images produced.

Although most monitors display 24 or 25 lines of text, some display 80 characters per horizontal line and others display only 40. Specialized monitors may display more lines with more characters per line. One monitor described here displays two full pages of text at once.

One concern when buying monitors for displaying graphics is the monitor's resolution of displayed images. High-resolution monitors provide sharply defined, intricate images that low-resolution monitors cannot display. Graphics resolution is often measured by the number of pixels that appear horizontally and vertically on screen. Monitor resolutions vary from 256 pixels displayed horizontally by 192 pixels displayed vertically, to 1024 horizontal by 1024 vertical pixels. Generally, the greater the number of pixels, the sharper the image produced.

Many monitors also provide special capabilities such as touch-sensitive screens, which allow you to operate the computer by touching options displayed on screen. Some monitors have built-in stereo speakers and amplifiers. Others offer features such as carrying handles, nonglare screens, and control switches conveniently located on the monitor's front. Several of the monitors can be used with a variety of computers in addition to the IBM PC. And, of course, prices differ greatly, ranging from $219 to $3400. As you leaf through the Display section, you'll become more familiar with the new products and better able to make your choice.

SC-100

Sakata U.S.A. Corporation
651 Bonnie Ln.
Elk Grove Village, IL 60007
800/323-6647, 312/593-3211

SC-100 is a composite color monitor with a 13-inch screen, an audio speaker, and an earphone jack. The monitor is compatible with the IBM PC and nine other personal computers including Apples, NECs, the Atari-800, and the VIC 20. SC-100 displays 25 lines with 40 characters per line. It provides color graphics resolution of 280 horizontal by 300 vertical pixels with a dot pitch of .65mm. The monitor displays up to eight colors. Control switches for sound, contrast, and power are located on the monitor's front; vertical hold, color, tint, and brightness controls are on the back. SC-100 requires a phone pin jack connector. List price: $329. Requirements: color graphics board.

SC-200

Sakata U.S.A. Corporation
651 Bonnie Ln.
Elk Grove Village, IL 60007
800/323-6647, 312/593-3211

SC-200 is a 13-inch RGB color monitor compatible with the IBM PC and Apple, NEC, and Fujitsu computers. The monitor displays 25 lines with 80 characters per line. It provides color graphics resolution of 640 horizontal by 240 vertical pixels with a dot pitch of .39mm. SC-200 displays up to eight colors in two intensities. The power switch and the brightness control are located on a front panel; vertical hold and horizontal position controls are on the back of the monitor. SC-200 requires an 8-pin corner-type input connector. List price: $649. Requirements: color graphics board.

SC-300

Sakata U.S.A. Corporation
651 Bonnie Ln.
Elk Grove Village, IL 60007
800/323-6647, 312/593-3211

SC-300 is a 13-inch RGB color monitor compatible with the IBM PC and Apple, NEC, and Fujitsu personal computers. The monitor provides color graphics resolution of 720 horizontal by 240 vertical pixels with a dot pitch of .31mm. It displays 25 lines with 80 characters per line in up to eight colors in two intensities. SC-300 requires an 8-pin corner-type input connector with a video out terminal. List price: $899. Requirements: color graphics board.

KX-8200CD, Sony Corp. of America

SG-1000

Sakata U.S.A. Corporation
651 Bonnie Ln.
Elk Grove Village, IL 60007
800/323-6647, 312/593-3211

SG-1000 is a 12-inch composite monochrome monitor compatible with the IBM PC and nine other personal computers. The monitor displays 25 lines with 80 characters per line, and it provides a resolution of 900 pixels at the screen center and 800 pixels at the corner. The screen has a nonglare, high-contrast faceplate and uses P31-type green phosphor. The power, brightness, and contrast switches are located on the monitor's front; a vertical hold switch is located on the back. The monitor requires an RCA jack input connector. List price: $129. Requirements: monochrome board.

HX-12

Princeton Graphic Systems
1101-I State Rd.
Princeton, NJ 08540
800/221-1490, 609/683-1660

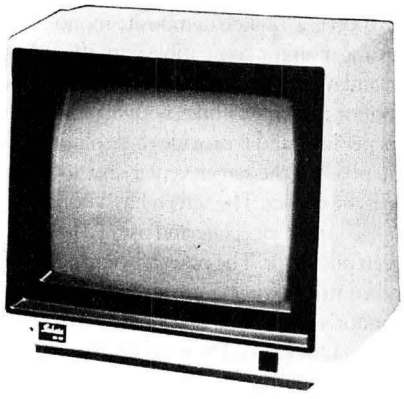
HX-12 is a 12-inch RGB color monitor. The monitor displays 25 lines with 80 characters per line on a nonglare screen. HX-12 provides color graphics resolution of 690 horizontal by 240 vertical pixels (480 lines interlaced) with a dot pitch of .31mm. Up to eight colors can be displayed in two intensities. The monitor comes with a cable ready to plug into the IBM PC. List price: $695. Requirements: color graphics board.

"The HX-12 monitor has good colors, excellent resolution, and low distortion."
A. Robison, Exton, Pennsylvania

KX-8200CD

Sony Corporation of America
Sony Dr.
Park Ridge, NJ 07656
210/930-1000 ext. 6498

KX-8200CD is an 8-inch, 8-color monitor that receives analog and digital RGB input. The screen displays 25 lines with 80 characters per line. The monitor provides graphics resolution of 640 horizontal by 240 vertical pixels with a dot pitch of .25mm. The monitor features a switch that changes the screen to a green monochrome display. The power switch is located on the front of the monitor, and switches for vertical hold, brightness, green display, and display center are located on the back. KX-8200CD requires a VK-399 connector cable. List price: $795. Requirements: color graphics board.

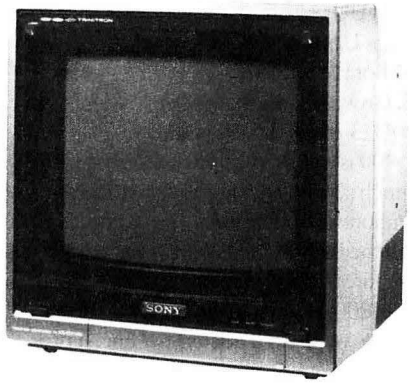


SC-100, Sakata U.S.A. Corp.

KX-1211HG

Sony Corporation of America
Sony Dr.
Park Ridge, NJ 07656
210/930-1000 ext. 6498

KX-1211HG is a 12-inch color monitor that interprets digital and analog RGB and video input signals. The screen displays 25 lines with 80 characters per line. The monitor provides color graphics resolution of 640 horizontal by 200 vertical pixels with a dot pitch of .4mm. A built-in stereo amplifier and a Trinitron electron gun improve the display resolution. Switches for power, sound, and RGB input are located on the front of the monitor. List price: $895. Requirements: color graphics board, PC-701 RGB interface board.



KX-1211HG, Sony Corp. of America

KX-2501A

Sony Corporation of America
Sony Dr.
Park Ridge, NJ 07656
210/930-1000 ext. 6498

KX-2501A is a 25-inch color monitor that receives digital and analog RGB and video input signals. The monitor displays 25 lines with 40 characters per line. It provides color graphics resolution of 500 horizontal by 200 vertical pixels with a dot pitch of .9mm. The monitor has a built-in stereo amplifier, speakers, and a Colorpure filter for sharp picture detail without color spill or distortion. List price: $1500. Requirements: color graphics board, PC-701 RGB interface board.

Compumod

USI Computer Products
71 Park Ln.
Brisbane, CA 94005
415/468-4900

Compumod is a television (TV) modulator that converts a TV into a video display for personal computers. The modulator works on all TVs and has a separate audio input that routes sound through the TV speaker. The modulator provides its own power supply and operates on channels 3 and 4. List price: $29.

USI 900/G and USI 900/A

USI Computer Products
71 Park Ln.
Brisbane, CA 94005
415/468-4900

USI 900 is a 9-inch composite monochrome monitor that comes in two versions. USI 900/G has a green display, and USI 900/A has an amber display. Both monitors display 25 lines with 80 characters per line. Each has a resolution of 1000 pixels at the screen center. Located on the front of each monitor are switches for power, contrast, brightness, and vertical and horizontal hold. Switches for focus, horizontal width, and inverse video are located on the back. The monitors work with the IBM PC and other personal computers, including Apples and Commodores. Each model has a nonglare screen, a metal cabinet, and a 12-volt input for portable battery operation. Both monitors require an RCA phone jack connector. List price: USI 900/G $159, USI 900/A $199. Requirements: monochrome board.

USI 1400/C

USI Computer Products
71 Park Ln.
Brisbane, CA 94005
415/468-4900

USI 1400/C is a 14-inch composite color monitor that displays 25 lines with 40 characters per line. The monitor provides color graphics resolution of 260 horizontal by 300 vertical pixels. The monitor works with IBM, Apple, Atari, Commodore, and Franklin computers. It displays up to 16 colors and has built-in speaker and audio circuitry. Switches for power, volume, vertical hold, brightness, tint, color, and contrast are located on the front of the monitor. The focus switch is located on the back. List price: $399. Requirements: color graphics board.

USI 1200

USI Computer Products
71 Park Ln.
Brisbane, CA 94005
415/468-4900

USI 1200 is a 12-inch monochrome monitor that displays 25 lines with 80 characters per line on either a green or an amber screen. The monitor provides a resolution of 1000 pixels at the center of the screen. Located on the front are switches for power, contrast, brightness, and vertical and horizontal hold. Switches for focus, horizontal width, and inverse video are located on the back. The monitor works with the IBM PC and other personal computers, including Apples and Commodores. The monitor has a nonglare screen, a metal cabinet, and a 12-volt input for portable battery operation. USI 1200 requires an RCA phone jack connector. List price: amber $239, green $199. Requirements: monochrome board.

XL-13 and XL-19

Colorgraphic Communications Corp.
2379 John Glen Dr.
P.O. Box 80448
Atlanta, GA 30366
404/455-3921

XL-13 and XL-19 consist of a color graphics board and either a 13-inch or a 19-inch color monitor. The screens display 24 lines with 80 characters per line. Both monitors provide color graphics resolution of 640 horizontal by 480 vertical pixels with a dot pitch of .31mm. The monitors display up to eight colors. The color graphics board features an escape sequence interpreter for graphics such as vectors, arcs, circles, polygons, and parallelograms. The board also allows text and graphics to be displayed together and independently drawn and erased. Other features include 128 fill patterns including geometric and complex fills, automatic dithering, zooming, panning, scrolling, and scaling. List price: $3495.

XL-13, Colorgraphic Communications Systems

Video 300

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

Video 300 is a 12-inch monochrome monitor available in amber or green phosphor. It works with the IBM PC and the TRS-80 as well as with Apple, Atari, and Osborne computers. The screen displays 24 lines with 80 characters per line. The monitor provides a resolution of 960 pixels at the center of the screen and 800 pixels at the corner. A nonglare screen is provided, and an AC-100 interface cable is required. List price: green $179, amber $199. Requirements: monochrome board.

Video 310

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

Video 310 is a 12-inch monochrome monitor available in amber or green phosphor. The monitor uses a TTL level input signal. The screen displays 24 lines with 80 characters per line. Video 310 provides a resolution of 960 pixels at the center of the screen and 800 pixels at the corner. A nonglare screen is provided, and an AC-100 interface cable is required. List price: $230. Requirements: monochrome board.

Color I PLUS

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

Color I PLUS is a 13-inch color monitor that displays seven colors. The screen displays 24 lines with 40 characters per line using a 5 by 7 character matrix. The monitor provides color graphics resolution of 260 horizontal by 300 vertical pixels. It is equipped with a built-in speaker and an audio amplifier. The monitor works with the IBM PC and the TI99, as well as with Apple, Atari, and Commodore computers. An AC-100 interface cable is required. List price: $379. Requirements: color graphics board.

Color II PLUS

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

Color II PLUS is a 13-inch RGB color monitor that displays seven colors. The screen displays 25 lines with 80 characters per line using a 5 by 7 character matrix. The monitor provides color graphics resolution of 560 horizontal by 240 vertical pixels. Color II PLUS works with the IBM PC and Apple computers. List price: $599. Requirements: color graphics board.

Color III

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

Color III is a 13-inch RGB monitor that displays seven colors. The screen displays 25 lines with 80 characters per line using a 5 by 7 character matrix. The monitor provides color graphics resolution of 260 horizontal by 300 vertical pixels. It is equipped with power and contrast switches on the front and a built-in carrying handle. Color II works with the IBM PC and Apple computers. List price: $449. Requirements: color graphics board.

Color IV

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

Color IV is a 13-inch RGB color monitor that uses RGB analog input to produce an unlimited number of software-controlled colors. The screen displays 24 lines with 96 characters per line using a 5 by 7 character matrix. The monitor provides color graphics resolution of 720 horizontal by 420 vertical pixels. List price: $999. Requirements: color graphics board.

IBM Color Display

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM Color Display is a 12½-inch RGB monitor. The screen displays 25 lines with 80 characters using an 8 by 8 character matrix. The monitor displays up to 16 colors. Color graphics resolution is 640 horizontal by 200 vertical pixels. The monitor highlights text and graphics on the screen with such capabilities as underlining, inverse video, and blinking characters. The brightness, contrast, and power switches are located on the front of the monitor; vertical hold and vertical size controls are located on the rear panel. List price: $680. Requirements: color graphics board.

Quadscreen

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

Quadscreen consists of a 17-inch monochrome monitor and a monochrome board. The screen displays 64 lines with up to 160 characters per line, the equivalent of two 8½- by 11-inch pages of text (10,240 characters). The screen provides color graphics resolution of 968 horizontal by 512 vertical pixels. The monitor is available in amber P4-type or green P39-type phosphor. Up to 16 fonts can be displayed on the screen. The monochrome board provides 128K of memory, which can be used to switch between two screens containing up to 64K of information each. The monitor features inverse video and forward and backward scrolling. Quadscreen also includes cable, a controller board, and software that provides several display modes, font sizes, and enhanced DOS commands. List price: $1995.

Quadchrome

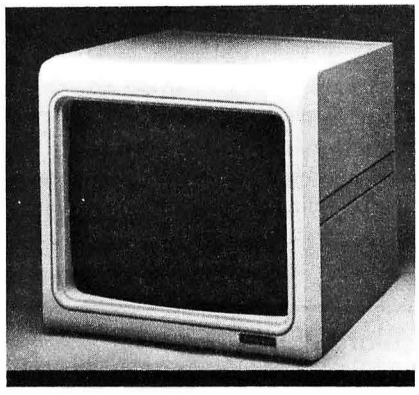
Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

Quadchrome is a 12-inch RGB monitor. The screen displays 25 lines with 80 characters per line using an 8 by 8 character matrix. Color graphics resolution is 690 horizontal by 480 vertical pixels with a dot pitch of .31mm. The monitor displays eight colors in high and low intensities. List price: $795. Requirements: color graphics board.

IBM Monochrome Display

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM Monochrome Display is an 11½-inch monochrome monitor. It displays 25 lines with 80 characters using a 9 by 14 character matrix. Graphics resolution is 720 horizontal by 350 vertical pixels. The monitor displays a 256-character set in green on a nonglare screen. The monitor emphasizes characters by making them brighter, underlining them, or displaying them in inverse video or blinking mode. List price: $345. Requirements: monochrome board.



Quadscreen, Quadram

Touch Information Display

Electro Mechanical Systems Inc.
801 W. Bradley
Champaign, IL 61820
217/359-7125

The Touch Information Display is a 12-inch amber monochrome monitor. The screen displays 24 lines with 80 characters using a 5 by 7 character matrix. The monitor features a touch-sensitive screen composed of crisscrossing beams of infrared light. Touching the screen enables you to control the computer without using the keyboard. Users may define touch-sensitive areas of any size and shape; 648 active touch points cover the entire display surface. The monitor emulates all Lear-Siegler ADM 3A cursor-addressing functions and communicates with the computer through a serial port. List price: $1400. Requirements: serial port.

Green Screen Monitor

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833

The Green Screen Monitor is a 12-inch monochrome monitor that uses TTL input. The monitor displays 25 lines with 80 characters using a 7 by 9 character matrix. Characters are displayed on a P39-type green phosphor screen. The monitor is compatible with the IBM PC and the Leading Edge personal computer. A tilt bracket allows you to adjust the viewing angle. List price: not available. Requirements: monochrome board.

Amber Screen Monitor

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833

The Amber Screen Monitor is a 12-inch monochrome monitor that uses TTL input. The monitor displays 25 lines with 80 characters using a 7 by 9 character matrix. Characters are displayed on an amber phosphor screen. The monitor is compatible with the IBM PC and the Leading Edge personal computer. A tilt bracket allows you to adjust the viewing angle. List price: not available. Requirements: monochrome board.

Gorilla Green/Amber Screen Monitor

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833

The Gorilla Monitor is a 12-inch composite monochrome monitor that displays 25 lines with 80 characters. Characters are displayed on a P39-type green or amber phosphor screen. The resolution is 800 pixels at the center of the screen. The monitor is compatible with the IBM PC and the Leading Edge personal computer. A tilt bracket allows you to adjust the viewing angle. List price: not available. Requirements: color graphics board.

ECM-1301

Electrohome Limited
809 Wellington St. N
Kitchener, Ontario
N2G 4J6 Canada
519/744-7111

ECM-1301 is a 13-inch color monitor intended for commercial and industrial use. ECM-1301 has a resolution of 720 by 512 pixels and displays 40 lines with 80 characters per line. Controls are included for horizontal and vertical centering. ECM-1301 is available with an IBM PC interface or an RS170 RGB interface. One interface is included in the purchase price. List price: $1495, additional interfaces $125 each.

SR-12

Princeton Graphic Systems
1101-I State Rd.
Princeton, NJ 08540
800/221-1490, 609/683-1660
SR-12 is a 12-inch RGB color monitor that displays 25 lines with 80 characters per line on a nonglare screen. The monitor provides color graphics resolution of 690 horizontal by 480 vertical pixels with a dot pitch of .31mm. It displays up to eight colors in two intensities. The monitor comes with a cable that plugs directly into the IBM PC. List price: $799. Requirements: color graphics board.

MAX-12

Princeton Graphic Systems
1101-I State Rd.
Princeton, NJ 08540
800/221-1490, 609/683-1660
MAX-12 is a 12-inch amber monochrome monitor. The monitor works with the IBM monochrome board and comes with a connecting cable. MAX-12 provides graphics resolution of 720 horizontal by 350 vertical pixels. The nonglare screen uses an amber P34-type phosphor. List price: $249. Requirements: monochrome board.

AM-121

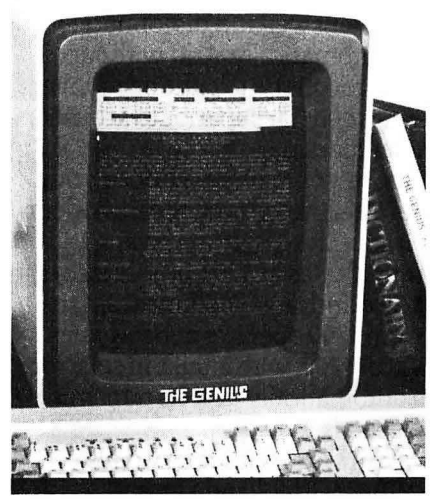
Dynax, Inc.
5698 Bandini Blvd.
Bell, CA 90201
213/260-7121
AM-121 is a 12-inch amber monochrome monitor that displays 25 lines with 80 characters per line. The monitor provides graphics resolution of 600 horizontal pixels. The screen displays with a P4A-type amber phosphor. The monitor has a power switch on the front; brightness, vertical hold, horizontal hold, focus, and contrast switches are located on the back. AM-121 requires an RCA pin jack connector. List price: $219. Requirements: monochrome board.

GM-120

Dynax, Inc.
5698 Bandini Blvd.
Bell, CA 90201
213/260-7121
GM-120 is a 12-inch green monochrome monitor that displays 25 lines with 80 characters per line. The monitor provides graphics resolution of 600 horizontal pixels. The screen displays images with a P31-type green phosphor. The monitor has a power switch on the front; brightness, vertical hold, horizontal hold, focus, and contrast switches are located on the back. GM-120 requires an RCA pin jack connector. List price: $199. Requirements: monochrome board.

The Genius Model 102

Micro Display Systems Inc.
1310 Vermillion St.
P.O. Box 455
Hastings, MA 55033
800/328-9524, 612/437-2233
The Genius is a 15-inch monochrome monitor available with black-and-white, amber, and green screen displays. The monitor features a full-page display of 57 lines with 80 characters per line. It provides graphics resolution of 720 horizontal by 800 vertical pixels with a 7 by 12 character matrix. The monitor attaches to a serial port. Applications software must be adapted to a 57-line display to take advantage of the Genius's screen size. Currently, software packages such as *WordStar*, *dBASE II*, and *SuperCalc II* take advantage of the screen. List price: $1995. Requirements: serial port.



The Genius Model 102, Micro Display

Uni-Verter

ATV Research Inc.
1301 Broadway
Dakota City, NV 68731
402/987-3771
Uni-Verter is a video-RF interface that connects an IBM PC to a television set. Uni-Verter plugs into an existing video connector inside the PC. The interface operates in the high VHF band (channels 7 through 10) above normal computer harmonics and other man-made interferences. The interface comes with a 5-foot cable. List price: $36.50.

PVM-1270Q

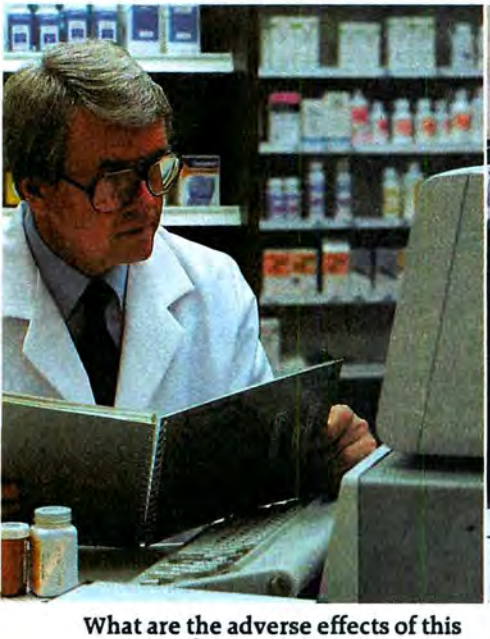
Sony Corporation of America
Sony Dr.
Park Ridge, NJ 07656
210/930-1000 ext. 6498
PVM-1270Q is a 12-inch color monitor with automatic input signal sensing and multiple input signals for digital and analog RGB and video. The monitor provides a resolution of 500 horizontal pixels from video input and 600 horizontal pixels from RGB signals with a .25mm RGB phosphor-stripe pitch. The screen displays 25 lines with 80 characters per line. PVM-1270Q accepts signals for high-resolution computer videotex or teletext applications. List price: $915. Requirements: color graphics board, PC-701 RGB interface board.

KX-1901A

Sony Corporation of America
Sony Dr.
Park Ridge, NJ 07656
210/930-1000 ext. 6498
KX-1901A is a 19-inch color monitor. The screen displays 25 lines with 40 characters per line. The monitor accepts analog RGB input for computer graphics and meets videotex and teletext graphics standards. A stereo amplifier is built-in, and a Colorpure filter shows picture detail without color spill or distortion. Resolution with video input is 350 horizontal pixels; with RGB input it is over 450 horizontal pixels. Switches for sound, power, and RGB input are located on the front of the monitor. List price: $850. Requirements: color graphics board, PC-701 RGB interface board.

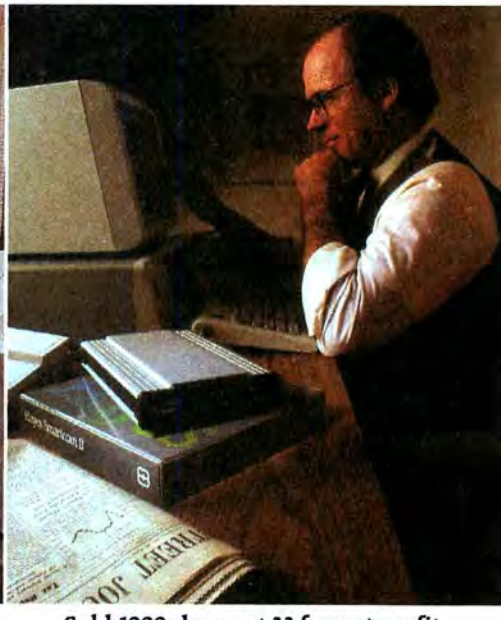
Hayes™

Your computer's telephone.



What are the adverse effects of this compound?

Gary: The pedigrees for next week's auction are as follows...



Sold 1000 shares at 33 for net profit of 6000. Richard.

Wouldn't it be great if you could use your IBM* PC to tap into vast resource libraries across the country? To transfer files to your partner, upstate? Or from your broker, down the street?

It's possible. All you need is a modem, to connect your computer to others. Down the hall. Or thousands of miles away.

Hayes Smartmodem. Think of it as your computer's telephone. Hayes Smartmodem 300,™ and the faster Smartmodem 1200,™ allow you to communicate over ordinary phone lines.

But any modem will send and receive data. Hayes Smartmodems also dial, answer and disconnect calls. Automatically. And without going through the telephone receiver, making them far superior to acoustic coupler modems.

Choose your speed; choose your price. The lower-priced Smartmodem 300 is ideal for local data swaps and communicates at 300 bps. For longer distance and larger volumes, Smartmodem 1200 operates at baud rates of 300 or 1200, with a built-in selector that automatically detects transmission speeds.

Both work with rotary dials, Touch-Tone® and key-set systems; connect to most time-sharing systems; and feature an audio speaker.

Smartmodem 1200B™ is also available as a plug-in board. Developed specifically for the PC, it comes packaged with Hayes' own communications software, Smartcom II.™

Smartcom II. We spent a lot of time developing it, so you can spend less time using it. Smartcom II prompts you in the simple steps required to create, send, receive, display, list, name and rename files. It even receives data completely unattended—especially helpful when you're sending work from home to the office, or vice versa.

If you need it, there's always "help." This feature explains prompts, messages, etc. to make communicating extra easy.

With Smartcom II, it is. Case in point. Before you communicate with another system, you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once. After that, parameters for 25 different remote systems are stored in a directory on Smartcom II.

Calling or answering a system listed in the directory requires just a few quick keystrokes. You can store lengthy log-on sequences the same way. Press one key, and Smartcom II automatically connects you to a utility or information service.

Hayes®

Smartmodem 300, 1200, and 1200B are FCC approved in the U.S. and DOC approved in Canada.

Smartmodem 1200B. (Includes telephone cable. No serial card or separate power source is needed.)

Smartcom II communications software.

NOTE: Smartmodem 1200B may also be installed in the IBM Personal Computer XT or the Expansion Unit. In those units, another board installed in the slot to the immediate right of the Smartmodem 1200B may not clear the modem; also, the brackets may not fit properly. If this occurs, the slot to the right of the modem should be left empty.

And, in addition to the IBM PC, Smartcom II is also available for the IBM Personal Computer XT, COMPAQ Portable, Corona Portable PC, Columbia MPC, DEC Rainbow 100, Xerox 820-II, and Kaypro II personal computers.*

Backed by the experience and reputation of Hayes. A solid leader in the microcomputer industry, Hayes provides excellent documentation for all products. A limited two-year warranty on all hardware. And full support from us to your dealer.

So see him today. Break out of isolation. Get a telephone for your Personal Computer. From Hayes.

Hayes Microcomputer Products, Inc., 5923 Peachtree Industrial Blvd., Norcross, GA 30092. 404/441-1617.

Circle 221 on reader service card

Smartmodem 300, Smartmodem 1200, Smartmodem 1200B and Smartcom II are trademarks of Hayes Microcomputer Products, Inc. *Trademarks of International Business Machines Corporation, Compaq Computer Corporation, Corona Data Systems, Columbia Data Products, Inc., Digital Equipment Corporation, Xerox Corporation, and Kaypro Corporation. Touch-Tone is a registered service mark of American Telephone and Telegraph. ©1984 Hayes Microcomputer Products, Inc.

USI Monochrome Monitors

USI Computer Products
150 N. Hill Dr.
Brisbane, CA 94005
415/468-4900

USI Monochrome Monitors come with amber or green phosphor displays. Both displays are available in either 9- or 12-inch sizes. The display area is 25 lines with 80 characters per line. The resolution is 1000 pixels at the screen center.

The monitors have front panel controls for power, contrast, brightness, vertical hold, and horizontal hold. The horizontal width control and an inverse video switch are located on the back panel. All the monitors have RCA phono jack input sockets and are housed in metal cabinets. List price: 9-inch monitor with green display $160, with amber display $200; 12-inch monitor with green display $200, with amber display $240. Requirements: color graphics board.

USI RGB Color Monitor

USI Computer Products
150 N. Hill Dr.
Brisbane, CA 94005
415/468-4900

USI's RGB monitor is a 12-inch color monitor capable of displaying over 80 pixels per inch. It provides a display of 25 lines with 80 characters per line in 16 colors. List price: $539. Requirements: color graphics board.

MJ-22 Color Monitor

Teknika Electronics Corporation
1633 Broadway
New York, NY 10019
212/977-8640

Teknika's MJ-22 is a 13-inch color monitor that accepts RGB, composite, or separated video signals from a personal computer. The monitor provides RGB resolution of 506 by 240 pixels for the IBM PC and the PCjr. The display produces 16 colors. MJ-22 also works with computers that use composite video. An RGB/composite push button lets users select either signal type; the feature is useful for switching between RGB color and monochrome text. A built-in speaker and an audio amplifier work with games and instructional software. List price: $500. Requirements: color graphics board.

CM 1481B Color Monitor

Hitachi
401 W. Artesia Blvd.
Compton, CA 90220
213/537-8383

CM 1481B is a color monitor with a 13-inch screen. The monitor has a resolution of 260 horizontal by 300 vertical pixels and displays 24 lines with 32 characters per line. It has a video-composite (NTSC) interface and a 2-watt audio output. CM 1481B has contrast, tint, color, brightness, vertical hold, and volume controls. List price: $380.

MM1218 Monochrome Monitor

Hitachi
401 W. Artesia Blvd.
Compton, CA 90220
213/537-8383

MM1218 is a high-resolution monochrome monitor with a 12-inch screen and a green phosphor display. The monitor displays up to 2000 characters, with 24 lines of 80 characters per line. It accepts composite video (NTSC) input. List price: $223.

DT-D1300D

Panasonic Industrial Co.
One Panasonic Way
Secaucus, NJ 07094
800/222-0584

DT-D1300D is a combination RGB and composite monitor with a 13-inch screen that displays 25 lines with 80 characters per line. The monitor has 450- by 240-pixel resolution for RGB displays and 300- by 300-pixel resolution for composite displays. In text mode it displays characters in a 5 by 7 dot matrix. The monitor requires an RGB or a composite jack. List price: $500.

TR-120M1PA and TR-120MPDA

Panasonic Industrial Co.
One Panasonic Way
Secaucus, NJ 07094
800/222-0584

TR-120M1PA and TR-120MPDA are 12-inch monochrome monitors that display 25 lines with 80 characters per line. From composite (RS-170) signals, they display characters in a 7 by 9 dot matrix. The TR-120M1PA has a green screen, and the TR-120MPDA has an amber screen. Each monitor requires an RCA jack. List price: TR-120M1PA $220, TR-120MPDA $240.

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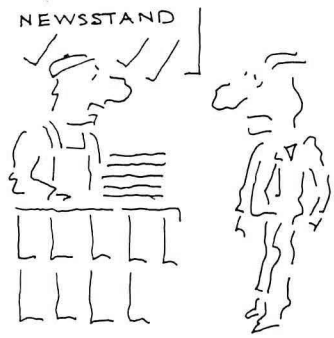

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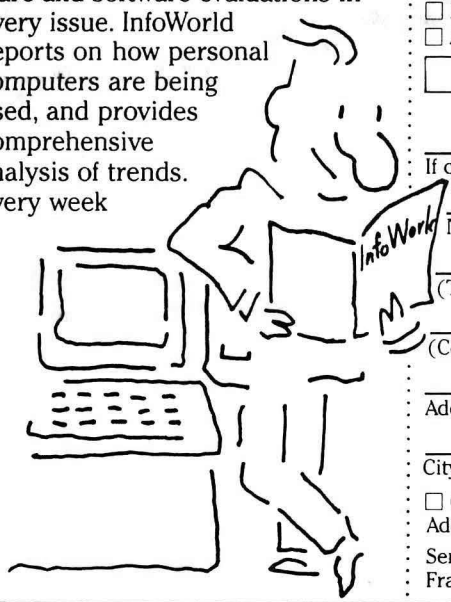

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Storage

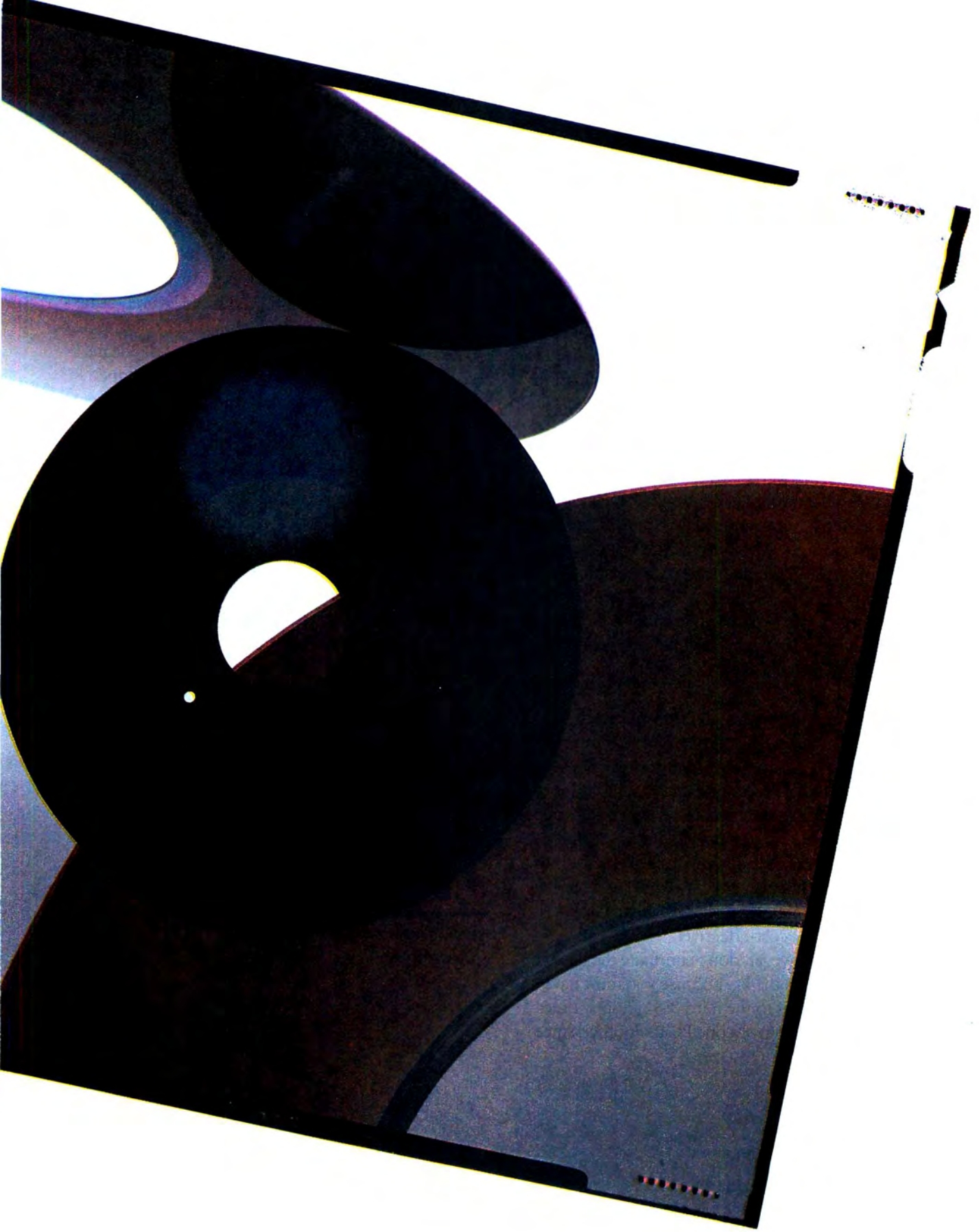
Al Shugart

Amnesia strikes a computer without data storage capacity when the computer's power is turned off. If you want to save information that you have entered into a computer's memory, you need a means of storing data. Storage devices record data by transforming the electronic signals held in random access memory (RAM) into magnetic form. Then the devices read the recorded information back into memory when you want to reuse it. Storage devices include cassette tape drives, floppy disk drives, hard disk drives, backup devices, bubble memory, and optical disks.

Cassette tape drives were commonly used on early personal computers but are rarely used with the IBM PC and compatible computers. Cassette tape drives record digital information on cassette tape. When you want to read stored information back into memory, however, the tape must be wound to the location where information has been stored, which can take a long time.

Floppy disk drives, particularly 5¼-inch disk drives, are the most common type of storage device on PCs and compatible computers. A floppy disk drive is like a small record player that records and reads digital information instead of playing music. The drive has a magnetic head that, instead of tracking a methodical inward spiral like a record player stylus, moves directly to a specific location on a floppy disk. This method of searching out and reading information is much quicker than the sequential method used by cassette drives.

With the exception of cassette tape drives, floppy disk drives used with floppy disks are the least expensive type of storage device. Floppy disk drives permit you to buy programs in an easily transportable form



from your dealer and load them into your computer's memory. Because almost all programs available for the PC are distributed on 5¼-inch floppy disks, it is impractical to have a PC without at least one 5¼-inch drive.

When you add a second floppy disk drive, you can store larger programs and more data than you can with a single-disk-drive system. A second disk drive also makes your computer faster and easier to use because some operations, such as copying files, require the computer to read information from more than one disk. A second floppy disk drive eliminates the need to switch floppy disks in one drive, because information can easily be transferred between the two drives.

Even two floppy disk drives may not meet your storage requirements if you need to store large amounts of information. Hard disk drives, also called hard disks, provide fast and economic storage for large amounts of information. A hard disk is made up of a motor that rotates an aluminum platter coated with a magnetic medium. Read and write heads can be moved to any location on the platter. The heads float on a cushion of air to prevent disruption of the magnetic surface. Hard disks are sealed to protect their components, which are easily damaged by dirt and dust.

Hard disks find and transfer information up to ten times faster than floppy disk drives and store much more information. A typical hard disk stores 5 to 10 megabytes (M) of data, compared to the 360 kilobytes (K) stored on the PC's floppy disks. It also costs less per byte to store information on a hard disk than with a floppy drive. The cost advantage is only relevant, however, if a generous portion of a hard disk's storage capacity is used. Storing .25M on a 10M hard disk, for example, is not very cost-effective.

Hard disks, however, don't eliminate the need for a floppy disk drive in the PC because you must have a way to load programs to the hard disk. Floppy disks also let you move data from one PC to another, since hard disks use a sealed media which can't be transferred. For these reasons almost all computers that have a hard disk also contain a floppy disk drive.

Hard disks and floppy disks are occasionally damaged as a result of handling or system malfunction. When damage occurs you can lose hours or even days of work in an instant unless your data is backed up, or copied. Backing up information on an extra floppy disk is probably the least expensive way to duplicate information from a hard disk. However, using floppy disks for backup can be slow and expensive if you have large amounts of information to duplicate.

Some storage devices, such as streaming tape drives, are especially designed for making and keeping a backup of data. A streaming tape drive is a faster and more practical device for storing large amounts of backup data than a floppy disk drive.

More exotic mass storage technologies, such as bubble memory and optical recording, aren't yet practical for most PC users. Bubble memory was developed before floppy disks, but it has been used very little because of its high cost. Optical disks are useful only for archival storage of extremely large amounts of data.

Storage devices of the future will store greater amounts of data in less space, and they will find and transfer data more quickly than today's storage devices. For the present, storage is an indispensable part of any computer system. Although the word *storage* might make you think of something like an attic in which you've stored heirlooms you have long since forgotten, data storage is more like a studio that an artist returns to daily to add new touches to his or her work.

Al Shugart is the chairman of Seagate Technology.

Most IBM PC users can never get enough storage, even if they have the 10-megabyte (M) PC XT. Manufacturers are providing more kinds of storage media and products with greater storage capacity than ever before. The following descriptions introduce you to internal and external disk systems that use 5¼- and 8-inch floppy disks and hard disk drives, as well as the latest 3¼- and 3½-inch floppy disks and bubble memory boards.

Hard disk drives are available in removable and nonremovable media in 5M to 1000M capacities. You will also find standalone and built-in tape backup, in ¼-inch and ½-inch formats, in the form of removable cartridges that can often be combined with hard disks. You can even back up data onto videotape using your own home videocassette recorder. And you can purchase storage media in the same way you buy stereo equipment—in components, so that you can upgrade your equipment over time and still maintain compatibility.

The File Connection

Flagstaff Engineering
2820 W. Darleen
Flagstaff, AZ 86001
602/774-3588

The File Connection is an 8-inch disk system that serves as a 1.2-megabyte DOS drive for data storage and converts 8-inch disks to the IBM PC's 5¼-inch disks or the XT's hard disk drive. The single-drive unit comes with one 8-inch drive in a cabinet with a power supply, a disk controller, a cable, and software for converting disk data. The two-disk system comes with an additional drive and enables users to read from one 8-inch disk and write to another simultaneously.

Conversion software allows source, data, and word processing files to be exchanged between the PC and CP/M 8-inch disk formats, PC 8-inch disk formats, TRS-80 Model II disk formats, and DEC RT II disk formats. The file-exchange software provides automatic format identification and works with single- or double-sided disks in single or double density with 128, 256, 512, or 1024 bytes per sector. Source file reformatting and ASCII-to-EBCDIC conversion are included. The manufacturer's software, *Word Connection*, can be used with the single- or double-disk-drive units to exchange files between the PC and IBM OS6, Displaywriter, CPT, NBI, and DEC WPS 8-inch word processing disks. List price: one 8-inch drive $1395, two 8-inch drives $2095, software utilities $695.

Universal Mass Storage Systems

Sunol Systems
1072 Serpentine Ln.
Pleasanton, CA 94566
415/484-3322

Universal Mass Storage Systems are hard disk drives with storage capacities of up to 92 megabytes (M). Indicators monitor the drive, status, track, head, and sector. The optional Quadplexer multiplexer links four computers with the hard disk and can build a network of 64 users. List price: 8M $1995, 16M $2495, 25M $2995, 40M $4595, 65M $5295, 92M $6695, Quadplexer $400, interface board $225. Requirements: interface board.

Winchester Hard Disk Kits

Sigma Designs, Inc.
2990 Scott Blvd.
Santa Clara, CA 95050
408/496-0536

Sigma Designs hard disk drives are available in 10-megabyte (M) half-height as well as 10M, 15M, or 33M full-height versions. The 10M half-height drive includes a full or half-height front plate and a disk controller board. The full-height drives come with an auxiliary power supply. Sigma Designs hard disks have plated media and built-in shock mounts. Disks are formatted for use with DOS 2.00 and 2.10. An EPROM containing the Winchester BIOS enables the PC to boot the operating system from the drive. For older IBM PCs a floppy disk provides the BIOS. List price: half-height 10M $1595, full-height 10M $1695, 15M $1995, 33M $3395.

Expansion Chassis Winchester Disk Subsystem

Sigma Designs, Inc.
2990 Scott Blvd.
Santa Clara, CA 95050
408/496-0536

The Expansion Chassis has nine expansion slots and comes with a driver board and cable. The chassis has room for two hard disk drives. As a hard disk drive subsystem, the chassis includes a 10-, 15-, or 33-megabyte (M) hard disk with a controller board. The hard disks are partitioned and formatted for DOS 2.00 and 2.10. List price: expansion chassis $895, with 10M drive $2395, with 15M drive $2695, with 33M drive $4295.

PC-Backup

Alloy Computer Products
100 Pennsylvania Ave.
Framingham, MA 01701
617/875-6100

PC-Backup is a file-oriented cartridge tape backup subsystem for the IBM PC XT and Texas Instruments and IBM PC-compatible computers. It also operates in an IBM expansion chassis. PC-Backup includes *TIP-SIX* software, which operates under DOS 2.00 (or later versions) and provides automatic subdirectory backup and restoration, archive bit support, and date and time stamping. PC-Backup uses one long slot. Software for DOS 1.10, CP/M-86, and Concurrent CP/M-86 is available. List price: $2195.

PC-Disc

Alloy Computer Products
100 Pennsylvania Ave.
Framingham, MA 01701
617/875-6100

PC-Disc is a hard disk system available in 20-megabyte (M) and 52M capacities. It is compatible with DOS 2.10 (or later versions) or Concurrent CP/M-86 3.1 (or later versions). PC-Disc requires one short slot and lets the IBM PC boot from disk. List price: 20M $2295, 52M $3995.

PC-Store

Alloy Computer Products
100 Pennsylvania Ave.
Framingham, MA 01701
617/875-6100

PC-Store is a combination hard disk drive and tape backup for the IBM PC and PC compatibles; it is available in 20-, 52-, or 104-megabyte (M) capacities. It is compatible with DOS 2.10 (or later versions) or Concurrent CP/M-86 3.1 (or later versions) and lets the PC boot from disk. List price: 20M $4295, 52M $5995, 104M $8495.

SQ-5 Winchester

Micro-Design
6301 Manchaca Rd., Ste. B
Austin, TX 78745
800/531-5002, 512/441-7890

The basic SQ-5 removable cartridge hard disk drive provides 5 megabytes (M) of storage on a cartridge measuring 3⁹⁄₁₀ inches square by ½ inch high. SQ-5 is based on the Syquest Technology 5M removable hard disk mechanism. It is designed to work with the IBM PC using MS-DOS 2.00, and it requires no software modifications.

SQ-5 is available as an internal or a stand-alone unit. The basic system can be expanded with other disk drive mechanisms. Add-on drives range from 5M to 20M in either removable or hard format. SQ-5 backs up 10M of information in less than 2 minutes. Five configurations of SQ-5 are available. List price: 5M half-height internal drive $1795; 5M half-height external drive $1995; two 5M half-height external drives $2895; 5M half-height removable drive plus 10M half-height fixed external drive $3195; 5M half-height drive plus 20M full-size external drive $3795.

Pro Series

Micro-Design
6301 Manchaca Rd., Ste. B
Austin, TX 78745
800/531-5002, 512/441-7890

The Pro Series includes four configurations of miniature hard disk drives. Pro-10 has an unformatted capacity of 12.7 megabytes (M) and a formatted capacity of 10M. The unit can be mounted either internally or externally. Pro-20 has an unformatted capacity of 25.5M and a formatted capacity of 20M, and it is available as an external or an internal unit.

With each system the read/write heads lock automatically when the power goes off to prevent damage to data. The heads automatically unlock when the power turns on. Each drive comes with a disk controller, a switching power supply, and cables. The disk and read/write heads are hermetically sealed.The drives' average access time is 80 milliseconds. List price: 10M internal $1299, 10M external $1399, 20M internal $1449, 20M external $1549.

I²BM Winchester Disk Subsystem

I² Interface, Inc.
7630 Alabama Ave.
Canoga Park, CA 91304
213/341-7914

The I²BM Winchester Disk Subsystem is available in 10- to 25-megabyte (M) storage capacities for the IBM PC or XT. The external unit includes a disk drive, a cabinet, a power supply, a cable, a connector, and a hard disk controller. The system is PC software compatible and operates with unmodified DOS 2.00. The average access time is 85 milliseconds for the 10M to 15M units and 54 milliseconds for the 25M unit. List price: 10M $1495, 25M $1895.

I²BM-2X Half-Height Floppy Drives

I² Interface, Inc.
7630 Alabama Ave.
Canoga Park, CA 91304
213/341-7914

I²BM-2X is a set of two half-height 5¼-inch floppy disk drives that mount internally on the IBM PC XT and provide 360K of storage each. Each drive has 80 tracks with 48 tracks per inch. The disk rotation speed is approximately 300 rpm. The average access time, including head-settling time, is 75 milliseconds. List price: two drives $535. Requirements: disk controller.

Davong Hard Disk Systems

Davong Systems, Inc.
217 Humboldt Court
Sunnyvale, CA 94086
408/734-4900

Davong Hard Disk Systems are hard disk drives that can be purchased with either 5, 10, 15, 21, or 32 megabytes (M) of formatted storage. The hard disk drives can be mounted internally, in which case the power supply is external, or they can be used as external drives. The drives come with Davong's *Multi-OS* software, which runs under three operating systems: MS-DOS, p-System, and CP/M. The average access time for each drive is 110 milliseconds, the peak data transfer rate is 625K per second, and the rotational speed is 3600 rpm. List price: (internal systems) 5M $1845, 32M $3695; (external systems) 5M $1995, 32M $3995.

"I got this hard disk drive in October 1981. It has worked long and hard without a single minute of downtime—a remarkable record. But Multi-OS *is awkward and fails to support many features of DOS 2.00."* Peter Morse, Honolulu, Hawaii

QuadDisk Winchester Hard Disk Drive

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

QuadDisk is an internally mounted 5¼-inch hard disk drive available in 6- to 72-megabyte (M) formats. The disk, software, and a disk controller are included. A 6M removable hard disk cartridge is available for people who want to remove data for file-security purposes. QuadDisk's average access time is from 30 to 50 milliseconds.

QuadDisk comes with software that provides a menu-driven file-handling utility as well as a multiuser, multitasking feature. With the multitasking capability, users can perform up to nine concurrent nongraphic jobs. All such jobs can be performed on one IBM PC or distributed among a PC and up to eight dumb terminals attached to the host PC's serial ports. List price: 6M $1995, 72M $6500, hard disk cartridge $1200.

QumeTrak 142

Qume Corporation
2350 Qume Dr.
San Jose, CA 95131
408/942-4000

The QumeTrak 142 half-height 5¼-inch floppy disk drive provides 360K of formatted storage with DOS 2.00. The double-sided drive is internally mounted. List price: $2700. Requirements: disk controller.

"The QumeTrak 142 drives work very well. However, I don't think a beginner could have mounted them without help, and no screws were provided with the mounting brackets." Robert Frischer, Wichita Falls, Texas

QuadDisk, Quadram

QumeTrak 841

Qume Corporation
2350 Qume Dr.
San Jose, CA 95131
408/942-4000

QumeTrak 841 is a full-height 5¼-inch floppy disk drive that mounts internally in the IBM PC. Used with DOS 2.00, the single-sided, double-density drive reaches a maximum storage capacity of 180K. QumeTrak 841 has a programmable door lock and the ability to daisy chain up to four drives. List price: $808. Requirements: disk controller.

NMS PC 8000 Series

National Memory Systems Corp.
355 Earhart Way
Livermore, CA 94550
415/443-1669

The NMS PC 8000 Series provides mass storage for the IBM PC or XT through a hard disk drive that is available in gradients from 25 to 1000 megabytes (M). Data transfer rates reach 1.86M per second and the average data access time is 17 milliseconds. The controller supports one or two disk drives of fixed or removable media. The system includes a disk drive, a cabinet, a disk controller, software, a power supply, and cables. The NMS PC 8000 Series can be used with the manufacturer's 9-track BPI backup tape drive. Disk-to-tape backup allows transfer of 80M in less than 7 minutes. List price: 25M $4600, 1000M $24,900, backup tape drive $5500.

RDS 300 Series Rigid Disk Subsystem

Interphase Corporation
2925 Merrell Rd.
Dallas, TX 75229
214/350-9000

The RDS 300 Series 8-inch hard disk drive provides mass storage on fixed and removable media in capacities ranging from 16 to 50 megabytes (M). Fixed and removable media split storage capacity evenly; for example, the 50M system comes with a 25M hard disk drive and a 25M removable cartridge. The system includes the Maverick SMD disk controller. The RDS 300 Series hard disk drive comes with an enclosure that stores three spare cartridges, a disk drive, a fan, a power supply, the Maverick SMD PC-80 disk controller, cables, and software. List price: 16M $5995, 50M $7995.

TARGA-1, TARGA-2, and TARGA-3

CMC International
1720 130th Ave. NE
Bellevue, WA 98005
206/885-1600

The TARGA hard disk drives provide mass storage with capacities of 5, 10, 15, and 25 megabytes (M) in a modular design. TARGA-1 is a single-drive unit, TARGA-2 is a two-drive unit, and TARGA-3 is a two-drive unit with five expansion slots for the IBM PC. Both two-drive units can run either another disk drive or a 10M 9-track tape drive for backup. The manufacturer's IBM Parallel Interface Module is required but sold separately. List price: TARGA-1 $1795, TARGA-2 $1845, TARGA-3 $2445, IBM Parallel Interface Module $150, tape drive $1395.

PC + 10

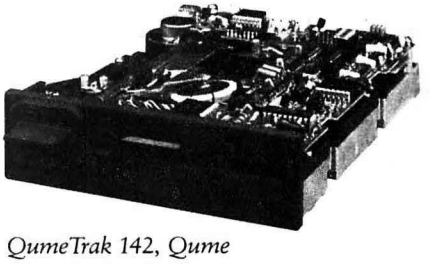
Abex Systems
P.O. Box 6935
Piscataway, NJ 08854
201/968-5046

PC + 10 is a 10-megabyte internal hard disk drive that can be installed in an IBM PC to upgrade its data storage capacity. The hard disk drive comes with software, cables, and a disk controller. List price: $895.

Models 6, 11, and 20

Corvus Systems, Inc.
2029 O'Toole Ave.
San Jose, CA 95131
408/946-7700

Models 6, 11, and 20 are three external hard disk drives. Model 6 provides 5.9 megabytes (M) of formatted storage, Model 11 provides 12.1M of formatted storage, and Model 20 provides 18.4M of formatted storage. All three models include software to install the drive with either PC-DOS 1.10 or PC-DOS 2.00. Each drive includes a power supply, a disk controller, and a cable. The hard disk drives have an average access time of 68 milliseconds, operate at 3600 rpm, and have a peak transfer rate of 687.5K per second. List price: Model 6 $2195, Model 11 $2995, Model 20 $3995.

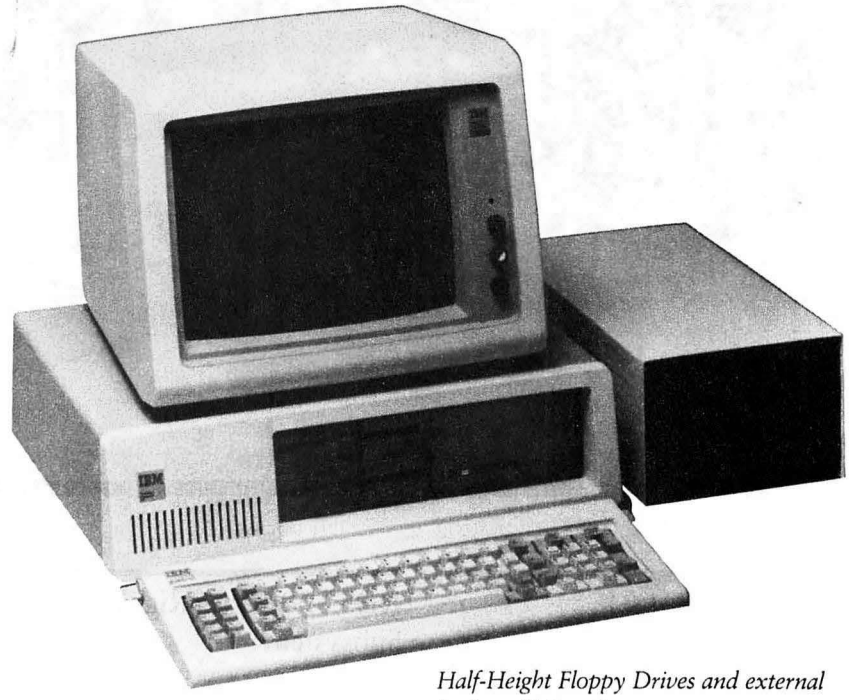


QumeTrak 142, Qume

TM100-1 and TM100-2 Full-Height Floppy Disk Drives

I² Interface, Inc.
7630 Alabama Ave.
Canoga Park, CA 91304
213/341-7914

The TM100-1 and TM100-2 5¼-inch Tandon floppy disk drives are available in internal mount or external subsystem form. TM100-1 is a single-sided, double-density drive with 160K of storage capacity in IBM PC format. The drive formats disks with 40 tracks per disk or 48 tracks per inch. TM100-2 is a double-sided, double-density drive with 360K of storage capacity. The drive formats both sides of disks with 40 tracks per side or 48 tracks per inch. For both TM100-1 and TM100-2, the average access time, including head-settling time, is 75 milliseconds. List price: TM100-1 $215, TM100-2 $235. Requirements: disk controller.



Half-Height Floppy Drives and external backup, I² Interface

The Bank

Corvus Systems, Inc.
2029 O'Toole Ave.
San Jose, CA 95131
408/946-7700

The Bank is a tape cartridge storage device that uses ½-inch tape to back up data stored in a hard disk drive. The Bank uses 100- or 200-megabyte (M) removable tape cartridges. Data is transferred at rates up to 1 megabit per second, data density is 4620 bits per inch, and track density is 254 tracks per inch. The Bank includes a built-in Omninet (Corvus Systems' local area network) server so that it can be attached to a network. List price: $2195, 100M tape cartridge $70, 200M tape cartridge $100.

Mirror

Corvus Systems, Inc.
2029 O'Toole Ave.
San Jose, CA 95131
408/946-7700

Mirror is a backup system that enables any Corvus hard disk system to be connected to a standard video cassette recorder (VCR) for data backup. The VCR can be in either VHS or beta format. A single 2-hour videotape cartridge will hold up to 91 megabytes (M) of information. Mirror can back up 12K of data per second and 10M in 15 minutes. The backup system includes a VCR interface controller, video cables to connect the computer to a VCR, and backup software. List price: $790.

Omninet Disk Systems

Corvus Systems, Inc.
2029 O'Toole Ave.
San Jose, CA 95131
408/946-7700

Omninet Disk Systems are external hard disk drives that provide storage for IBM PCs and XTs in a local area network. The Model 6 provides 5.9 megabytes (M) of formatted storage, the Model 11 provides 12.1M, and the Model 20 provides 18.4M. A disk server pack available from Corvus Systems is required to attach Omninet disks and PC terminals in the network. Each disk system contains a disk drive, a power supply, and a disk controller. List price: Model 6 $1995, Model 11 $2795, Model 20 $3795, disk server pack $990.

Davong Streaming Tape Backup

Davong Systems, Inc.
217 Humboldt Court
Sunnyvale, CA 94086
408/734-4900

Davong Streaming Tape Backup is a backup tape drive that stores data from a Davong hard disk system or floppy disk drives in ¼-inch tape cassettes. The formatted tape cassettes hold up to 18 megabytes (M) of data, and 15M can be backed up in approximately 4 minutes. The system includes installation utilities. List price: $1795.

PC eXTender

Falcon Technology, Inc.
6644 S. 196th St. #T-101
Kent, WA 98032
206/251-8282

PC eXTender is a hard disk drive that provides 10 or 15 megabytes (M) of internal disk storage for the IBM PC. PC eXTender's disk controller fits into an expansion slot and includes a serial port, a clock/calendar, and sockets for the addition of up to 192K RAM. The drive's average disk access time is 68 milliseconds, and its average data transfer rate is 522K per second. PC eXTender uses available power from the PC's power supply. List price: 10M $2295, 15M $2595.

Iomega Bernoulli Box

Iomega Corporation
4646 South 1500 West
Ogden, Utah 84403
801/399-2171

Iomega Bernoulli Box is a hard disk drive that stores data on 10-megabyte cartridges. The average data access time is 35 milliseconds, and the rotational speed is 1500 rpm. The external system includes two cartridges, a power supply, cables, and software. List price: $2695, additional cartridge $75.

Superior 10

Great Lakes Computer Peripherals, Inc.
2200 W. Higgins Rd. #245
Hoffman Estates, IL 60195
800/323-6836, 312/884-7272

Superior 10 is a 10-megabyte external hard disk drive. Its average disk access time is 93 milliseconds, and its data transfer rate is 5 megabits per second. The hard disk drive has a speed of 3600 rpm and comes with a disk controller and software. Space in the cabinet accommodates either a Great Lakes tape backup, a second hard disk drive, or a floppy disk drive. List price: $1495.

"Installation was quite easy. Good support is provided through Great Lakes' 800 telephone number, but the documentation could be improved if more detail were added." John F. Kiernan, Highlands, Texas

Superior 23

Great Lakes Computer Peripherals, Inc.
2200 W. Higgins Rd. #245
Hoffman Estates, IL 60195
800/323-6836, 312/884-7272

Superior 23 is a 23-megabyte external hard disk drive that has an average access time of 215 milliseconds. The drive's average transfer rate is 5 megabits per second, and the rotation speed is 3600 rpm. The drive comes with a disk controller, software, a host adapter, and cables. The cabinet has room for either a Great Lakes tape backup, another hard disk, or a floppy disk drive. List price: $2249.

Stowaway

Great Lakes Computer Peripherals, Inc.
2200 W. Higgins Rd. #245
Hoffman Estates, IL 60195
800/323-6836, 312/884-7272

Stowaway is an internal hard disk drive for the IBM PC or PC-compatible computers. Stowaway provides 10 megabytes of storage. The system includes a disk controller, a host adapter, an external power supply, software, and cables. The drive's average access time is 92 milliseconds, its average transfer rate is 5 megabits per second, and its rotation speed is 3600 rpm. List price: $1295.

Quartermaster

Great Lakes Computer Peripherals, Inc.
2200 W. Higgins Rd. #245
Hoffman Estates, IL 60195
800/323-6836, 312/884-7272

Quartermaster is a tape cartridge backup system that provides 23 megabytes of formatted storage. The system uses ¼-inch streaming tape cartridges to back up data from Great Lakes hard disk systems and other storage devices. The tape is formatted in 512-byte sectors with a record density of 8000 bits per inch. The device transfers 90K of data per second. Quartermaster is available as either an internal model or an external model. Cartridges are available separately. List price: internal model $895, external model $1195, pack of 3 cartridges $150.

TD-1012/PC-STR

Innovative Data Technology
Innovative Peripheral Systems
4060 Morena Blvd.
P.O. Box 178160
San Diego, CA 92117
619/270-3990

TD-1012/PC-STR is a ½-inch streaming tape system for data backup that operates in both start/stop and streaming modes. In start/stop mode, the tape drive operates at a speed of 12½ inches per second (ips). In streaming mode, the drive operates at 100 ips. It records and plays back data in 1600-bits-per-inch single-density format on 9-track IBM/ANSI/ECMA format tape. The data transfer rate is 20K per second in start/stop mode and 160K per second in streaming mode.

The TD-1012/PC-STR subsystem includes a parallel coupler that fits into a slot in the system unit, cables, and device driver software with demonstration programs. The drive is available in vertical rack mount, horizontal drawer mount, and tabletop mount configurations. List price: $4995. Requirements: 192K.

TD-1054/PC-STP

Innovative Data Technology
Innovative Peripheral Systems
4060 Morena Blvd.
P.O. Box 178160
San Diego, CA 92117
619/270-3990

TD-1054/PC-STP is a ½-inch tape drive subsystem that backs up data. The drive operates in start/stop mode at a speed of 45 inches per second. The 9-track tape drive formats two densities: 800 bits per inch (bpi) in NRZI mode and 1600 bpi in phase-encoded mode. The data transfer rate is 50K per second. The tape drive subsystem includes a parallel coupler that inserts directly into a vacant slot in the IBM PC or XT and device-driver software with demonstration programs. List price: $6995. Requirements: 192K.

MFD-80 Micro Flexible Drive

Janome Sewing Machine Co., Ltd.
3533 Old Conejo Rd. #124
Newbury Park, CA 91320
805/498-3512

The MFD-80 Micro Flexible Drive is a 3-inch floppy disk drive that is plug- and format-compatible with 5¼-inch disk drives. Up to four MFD-80 drives can be placed vertically in a 5¼-inch drive opening on the IBM PC or XT. The 3-inch drive records in double-sided, double-density mode at 100 tracks per inch using 48 tracks on each side of the disk to provide up to 600K of data storage per disk. List price: single quantity $200.

FB-500 Series

Martec Int'l Electronics Corp.
3285 Scott Blvd.
Santa Clara, CA 95054
408/727-8447

The FB-500 Series consists of internal half-height hard disk drives that provide 164K, 328K, and 656K of formatted storage. The average access time is 88 milliseconds, the average transfer rate is 125 to 250 kilobits per second, and the rotation speed is 300 rpm. List price: 164K $120, 328K $160, 656K $175.

RD-4000 Series

Martec Int'l Electronics Corp.
3285 Scott Blvd.
Santa Clara, CA 95054
408/727-8447

The RD-4000 Series of hard internal disk drives provides 6.4, 12.7, 19.1, and 25.5 megabytes (M) of unformatted storage. The drive interfaces are compatible with 5¼-inch hard disk drives. Track density is 400 tracks per inch. The 6.4M disk drive has a data transfer rate of 625K per second, and the average access time for each drive is 85 milliseconds. List price: 6.4M $432, 12.7M $473, 19.1M $572, 25.5M $703.

WS-1, WS-2, and WS-3

Maynard Electronics
400 E. Semoran Blvd. #207
Casselberry, FL 32707
305/331-6402

WS-1, WS-2, and WS-3 are hard disk drives that mount internally in the IBM PC and provide up to 10 megabytes of formatted storage. WS-1 includes a 5¼-inch hard disk, a multifunction board, and a hard disk controller module. WS-2 includes a hard disk and a disk controller that controls one hard disk, two internal floppy disk drives, and two additional external floppy disk drives (5¼ inch or 8 inch). WS-3 includes a hard disk and a dual-function board that combines a disk controller with 64K to 576K of memory expansion. The average access time is 55 milliseconds, and the data transfer rate is 5 megabits per second. List price: not available.

FD-55 Series

Maynard Electronics
400 E. Semoran Blvd. #207
Casselberry, FL 32707
305/331-6402

The FD-55 Series half-height 5¼-inch disk drives are available in three models. The FD-55B double-sided drive records data at 48 tracks per inch (tpi), and the FD-55F double-sided drive records data at 96 tpi. Both drives record in a 5¼-inch format. The third model, the FD-55G double-sided drive, is a 5¼-inch drive that uses an 8-inch disk format. It runs on systems that have a disk controller made for 8-inch drives. Formatted storage capacities for the FD-55B and the FD-55F are 328K and 656K, respectively. FD-55G offers 1.25 megabytes of formatted storage. List price: not available.

"Installation of the half-height drives is easy. The fit is tight and the drives fill the panel opening on the PC completely. However, the installation instructions do not remind you to set system board switches to reflect disk installation." John H. Wheatley, San Diego, California

MPI MegaDrive Model 1722

Micro Peripherals, Inc. (MPI)
9754 Deering Ave.
Chatsworth, CA 91311
213/709-4202

MPI MegaDrive Model 1722 is a 5¼-inch internal floppy disk drive that records data at 170 tracks per inch (tpi) to provide an unformatted storage capacity of 3.2 megabytes. The drive can also read 5¼-inch floppy disks recorded at 96 tpi. List price: not available.

MPI 500 and 900 Slimline Series

Micro Peripherals, Inc. (MPI)
9754 Deering Ave.
Chatsworth, CA 91311
213/709-4202

The MPI 500 Slimline Series floppy disk drives record at 48 tracks per inch (tpi), providing unformatted storage capacities of 250K (single density) or 500K (double density). The MPI 900 Slimline Series disk drives record at 96 tpi for unformatted storage capacities of 500K (single density) or 1000K (double density). They use 5¼-inch floppy disks. The drives are available with three different bezels and with an optional full-height door or rotary door latch. List price: not available.

MPI Model 50 and Model 90 Series

Micro Peripherals, Inc. (MPI)
9754 Deering Ave.
Chatsworth, CA 91311
213/709-4202

The MPI Model 50 Series 5¼-inch floppy disk drives record data at 48 tracks per inch (tpi). The MPI Model 90 Series record at 96 tpi in single- or double-sided formats. Model 51 is a single-sided 250K drive, and Model 52 is a double-sided 500K drive. Model 91 is a single-sided 500K drive, and Model 92 is a double-sided 1-megabyte drive. List price: Model 51 $295, Model 52 $335, Model 91 $335, Model 92 $390.

MPI Model 40 Slimline Series

Micro Peripherals, Inc. (MPI)
9754 Deering Ave.
Chatsworth, CA 91311
213/709-4202

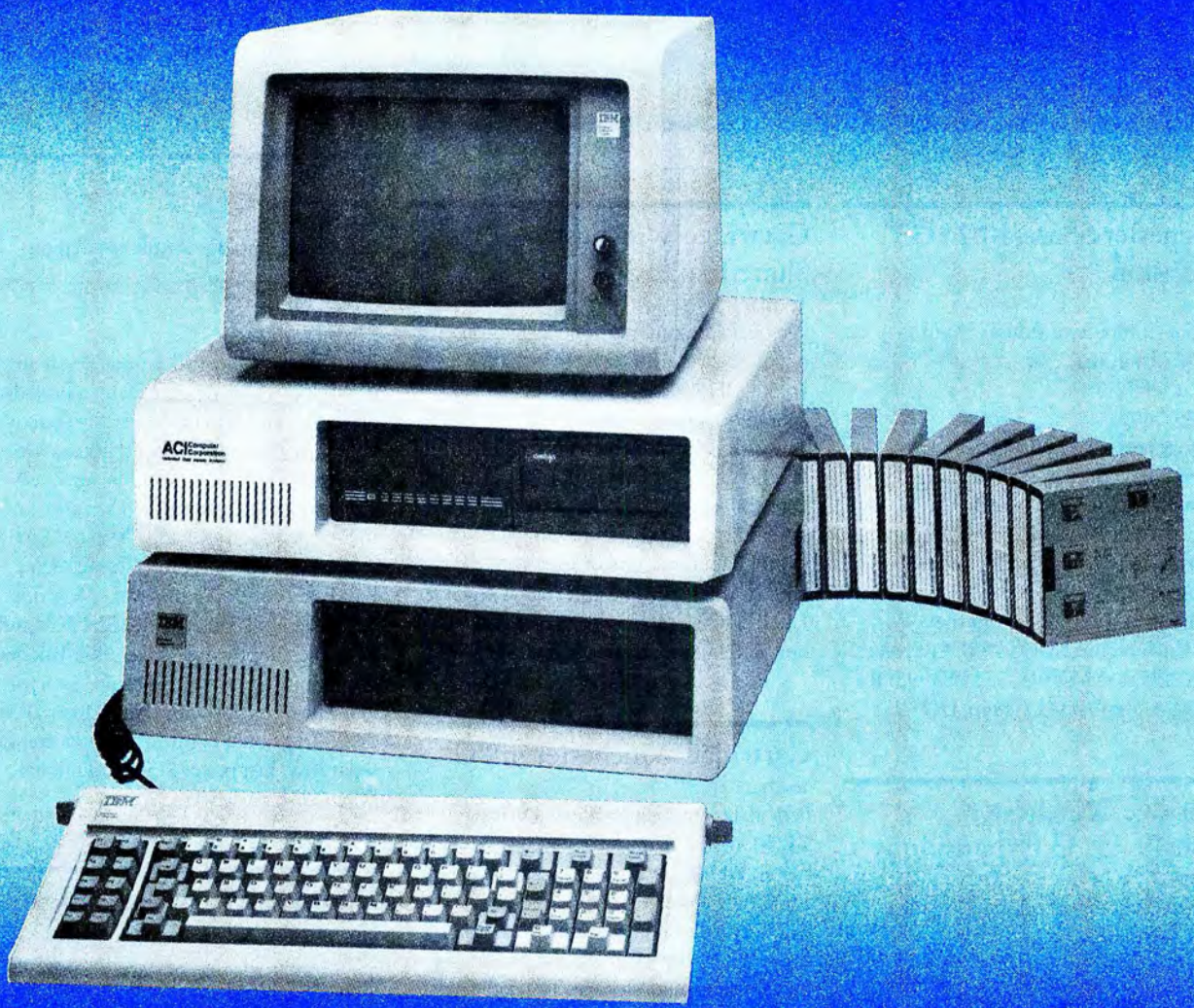
The MPI Model 40 Slimline Series 8-inch disk drives are available in two models. The Model 41 single-sided drive records at 48 tracks per inch (tpi) and offers 800K of unformatted storage, and the Model 42 double-sided drive records at 48 tpi for 1.6 megabytes of unformatted storage. Both the Model 41 and the Model 42 drives are 2 inches high and can be mounted under a terminal keyboard. Two drives can also be installed in a single 8-inch drive space. The average access time is 91 milliseconds, and data transfer rates are 250 kilobits per second for the single-density drive and 500 kilobits per second for the double-density drive. The disk-rotation speed is 360 rpm. The drives use 8-inch soft- or hard-sectored disks in single- or double-sided, single- or double-density formats. List price: Model 41 $500, Model 42 $550.

Helix PC Bubble Disk

Helix Labs
16776 Bernardo Center Dr. #106A
San Diego, CA 92128
213/477-8221

The Helix PC Bubble Disk board provides nonvolatile data storage using bubble memory technology. One Helix PC Bubble Disk board has 512K storage. Up to four boards can be installed in the IBM PC or XT if expansion slots are available. When multiple boards are used, the operating system treats them as a single disk drive. Average disk access and transfer rates are almost as fast as with a hard disk. The average access time is 48 milliseconds; the transfer rate is 400 kilobits per second. The board works with any PC operating system that runs a hard disk. List price: $1495.

and...
the backup is free!



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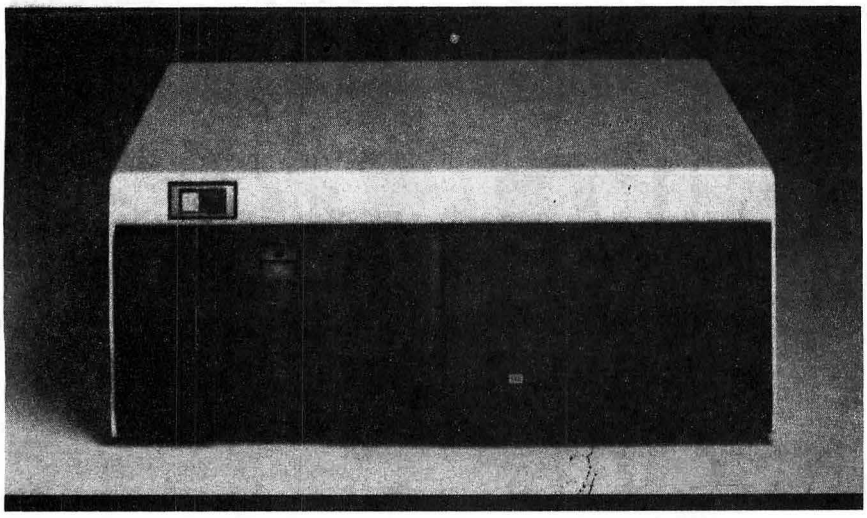

QCS HarDrive Subsystems, Quality Computer Services

Winchester Share/10/15/33 Expansion

Tecmar
Personal Computer Products Division
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Winchester Share/10/15/33 Expansion is an external unit that includes a hard disk drive with 10, 15, or 33 megabytes (M) of storage capacity. Included with the expansion unit are a disk controller and five expansion slots. All three hard disks run with DOS 1.10 or DOS 2.00 except the 33M disk, which requires DOS 2.00. List price: 10M $2495, 15M $2895, 33M $3995. Requirements: with 33M system, DOS 2.00.

Cartridge Winchester Share/10/15/33 Expansion

Tecmar
Personal Computer Products Division
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Cartridge Winchester Share/10/15/33 Expansion unit is an external storage device containing a 10-, 15-, or 33-megabyte (M) hard disk drive and one 5M removable cartridge hard disk drive. Data can be backed up to the removable cartridge and stored separately from the computer. The expansion chassis comes with five expansion slots. Included in the unit is a disk controller. The 10M and 15M systems use DOS 1.10 or DOS 2.00; the 33M system requires DOS 2.00. List price: 10M $3995, 15M $4395, 33M $5495. Requirements: with 33M system, DOS 2.00.

Cartridge Winchester Share Expansion

Tecmar
Personal Computer Products Division
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Cartridge Winchester Share Expansion unit holds one or two removable cartridge hard disk drives and offers extra expansion slots. Each cartridge stores 5 megabytes (M) of data for a total of 10M with the two hard disk option. The unit runs with DOS 1.10 or DOS 2.00. List price: one-cartridge unit $2695, two-cartridge unit $3595.

Cartridge Winchester in PC

Tecmar
Personal Computer Products Division
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Cartridge Winchester in PC hard disk drive fits into the IBM PC and provides 5 megabytes of data storage. The data transfer rate is 5 megabits per second; the rotational speed is 3600 rpm. The hard disk uses the PC's power supply, and the unit runs with DOS 1.10 or DOS 2.00. List price: $1795.

QCS HarDrive Subsystems

Quality Computer Services
3 Quces Dr.
Metuchen, NJ 08840
201/548-2135

The QCS HarDrive Subsystems provide hard disk storage in 12- to 72-megabyte (M) capacities and can be combined with removable disks in 5M storage capacities. The data transfer rate is 5 megabits per second, the track-to-track access time is approximately 8 milliseconds, and the rotational speed is 3600 rpm. List price: 12M $2499, 12M with 5M removable $3799, 72M with 5M removable $7999.

Bak-Pak

Tecmar
Personal Computer Products Division
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Bak-Pak is an external storage device made up of floppy disks that back up a hard disk drive. A molded plastic cartridge, removable from the unit's cabinet, houses five floppy disks. Each disk can be removed from the plastic cartridge. The disks can either be accessed individually with DOS 2.00 or as one continuous storage area. Bak-Pak's controller replaces IBM's disk controller and controls the IBM PC's and Bak-Pak's floppy disk drives. Bak-Pak does not require an extra expansion slot in the PC. The unit runs with DOS 1.10 or DOS 2.00. Additional floppy disk packs are sold separately. List price: $1595, additional floppy disk pack $95.

Hard Disk Drive Subsystem

Digital Search
103 S. Main St.
Greer, SC 29651
803/877-9444

The Hard Disk Drive Subsystem is a 5.33 megabyte (M) Shugart hard disk drive. The subsystem can be upgraded to 20M. A disk controller that controls up to four hard disks and software that runs with DOS 1.10 and DOS 2.00 are included. Additional storage is available separately. List price: 5.33M subsystem $800, additional storage $269 per 5.33M drive. Requirements: one floppy disk drive.

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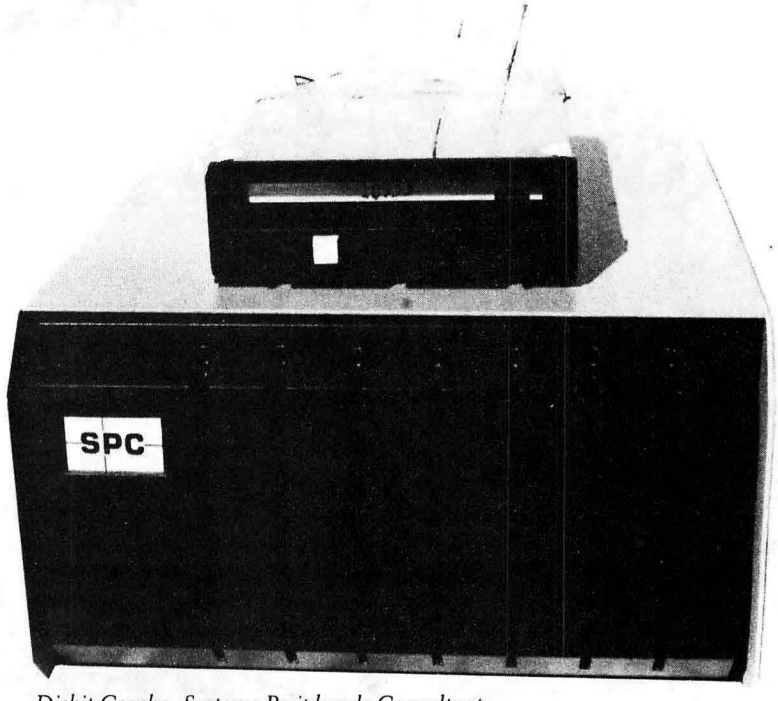
Floppy 5/8 Subsystem

Tecmar
Personal Computer Products Division
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Floppy 5/8 Subsystem external storage cabinet contains one or two 8-inch floppy disks, a 10-, 15-, or 33-megabyte (M) hard disk drive, and one or two removable cartridge hard disk drives. The removable cartridge drives provide 5M storage. The Floppy 5/8 disk controller installed in the IBM PC controls one or two of the PC's 5¼-inch floppy drives as well as the Floppy 5/8's 8-inch drives. One additional slot in the PC is needed for the hard disk controller. Floppy 5/8 comes with software that formats single- and double-density 5¼- and 8-inch disks. The system works with DOS 1.10 or DOS 2.00. List price: $1995 to $7695. Requirements: with 33M hard disk, DOS 2.00.



Diskit Combo, Systems Peripherals Consultants

Diskit Combo

Systems Peripherals Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611

Diskit Combo is a hard disk and removable hard disk drive combination. The removable hard disk can back up the hard disk and store data away from the computer. Diskit Combo is available in four hard disk sizes: 10 megabyte (M), 20M, 30M, and 40M. Each comes with a 5M removable hard disk. An expansion chassis with a power supply must be purchased separately. List price: 10M hard/5M removable (10/5) $2595, 20/5 $2995, 30/5 $3495, 40/5 $3995, expansion chassis $150. Requirements: 128K, DOS 1.10 or DOS 2.00.

Diskit Models 10I, 20I, 30I, and 40I

Systems Peripherals Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611

The Diskit internal hard disk drives can be installed in the IBM PC to increase its data storage capacity. The drives' storage capacities range from 10 megabytes (M) for Model 10I to 40M for Model 40I. Diskit models use half-height drives with an embedded controller. The controller has signal lines for cartridge hard disk drives and 5M or 10M removable disk drives; it handles up to four drives. All four Diskit models use the PC's power supply. The drives can also be installed in a separately sold expansion chassis to form a disk subsystem for the PC. The expansion chassis includes its own power supply. List price: 10I $1495, 20I $1795, 30I $2295, 40I $2995, expansion chassis $150. Requirements: 128K, DOS 1.10 or DOS 2.00.

Diskit Model 10R

Systems Peripherals Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611

The Diskit Model 10R removable hard disk drive backs up hard disks when used with Diskit Models 10I-40I hard disks in the expansion chassis available from the manufacturer. List price: $2295, expansion chassis $150. Requirements: 128K, DOS 1.10 or DOS 2.00.

Diskit Ultrastore

Systems Peripherals Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611

The Diskit Ultrastore hard disk drive provides from 70 to 380 megabytes (M) of data storage. The unit can be installed in a Systems Peripherals expansion chassis and used with removable cartridge hard disks for backup. The separately sold expansion chassis includes a power supply. List price: 70M $4495, 380M $6995, expansion chassis $150. Requirements: 128K, DOS 1.10 or DOS 2.00.

Diskit Model 5R

Systems Peripherals Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611

The Diskit Model 5R removable cartridge hard disk drive provides 5 megabytes of data storage for the IBM PC. The cartridge hard disk may be installed in the PC in place of a second floppy disk drive. Diskit Model 5R can also be installed in Systems Peripherals' expansion chassis. List price: $1295.

Diskit Junior

Systems Peripherals Consultants
9747 Business Park Ave.
San Diego, CA 92131
619/693-8611

The Diskit Junior hard disk drives provide expanded data storage for the IBM PCjr. A variety of hard or removable disk combinations are available in storage capacities ranging from 5 to 40 megabytes. The compact drives can be purchased as separate

components and stacked on top of each other. An external chassis with a power supply can be purchased to house the drives. List price: 5M removable cartridge hard disk drive $1675, 10.8M half-height hard disk drive $1495, 40M hard disk drive $3795, external chassis $150. Requirements: 128K.

TG-3000 Disk/Tape Series

Tallgrass Technologies Corp.
11667 W. 90th St.
P.O. Box 12047
Overland Park, KS 66212
913/492-6002
The TG-3000 Disk/Tape Series combines hard disk storage with built-in tape backup. Hard disk drive sizes include 6.25, 12.5, 20, 35, and 70 megabytes (M). The integral tape drive allows streaming or file-by-file backup of data from the hard disk drive. Cartridges for the tape drive are available separately. List price: 6.25M $2995, 12.5M $3495, 20M $3995, 35M $5595, 70M $6595, tape cartridge $39.95. Requirements: interface board.

TG-4020/4045 Tape Backup Systems

Tallgrass Technologies Corp.
11667 W. 90th St.
P.O. Box 12047
Overland Park, KS 66212
913/492-6002
The TG-4020/4045 Tape Backup Systems provide 20 and 45 megabytes (M) of backup storage for data from hard disk drives. The systems allow file-by-file backup from disks on ANSI-standard tape cartridges. Cartridges are available separately. List price: 20M $2195, 45M $2495, tape cartridge $39.95. Requirements: interface board.

DisCache

Eicon Research, Inc.
c/o Technology Solutions, Inc.
221 E. 48th St.
New York, NY 10017
212/752-6440
DisCache is a hard disk drive available in 10- and 20-megabyte (M) models. DisCache provides a processor and 128K or 256K of integral RAM cache memory. The processor with cache memory improves disk access speed and provides disk backup and a print spooler. The average sector access time from RAM is 100 microseconds. DisCache keeps track of which sectors on the disk are updated, and it gives users the option of writing the updated sectors to the system's floppy disk or to Sony Microdrives. The 1M print spooler permits printing to be performed as a background task. A front panel button allows users to select PC-DOS, CP/M, or UCSD p-System.

Several operating systems may reside on the disk at the same time. Model DCH10 includes a 10.5M formatted disk, a 128K RAM cache, and a parallel or serial port. Model DCH20 includes a 20M formatted disk, a 256K RAM cache, and a parallel or serial port. Separately priced options for both models include a second serial port, integrated floppy disk drives, and Sony Microdrives. An IBM PC interface board is required. List price: DCH10 $3350, DCH20 $4250, IBM PC interface board $349.

Bubble Memory Board

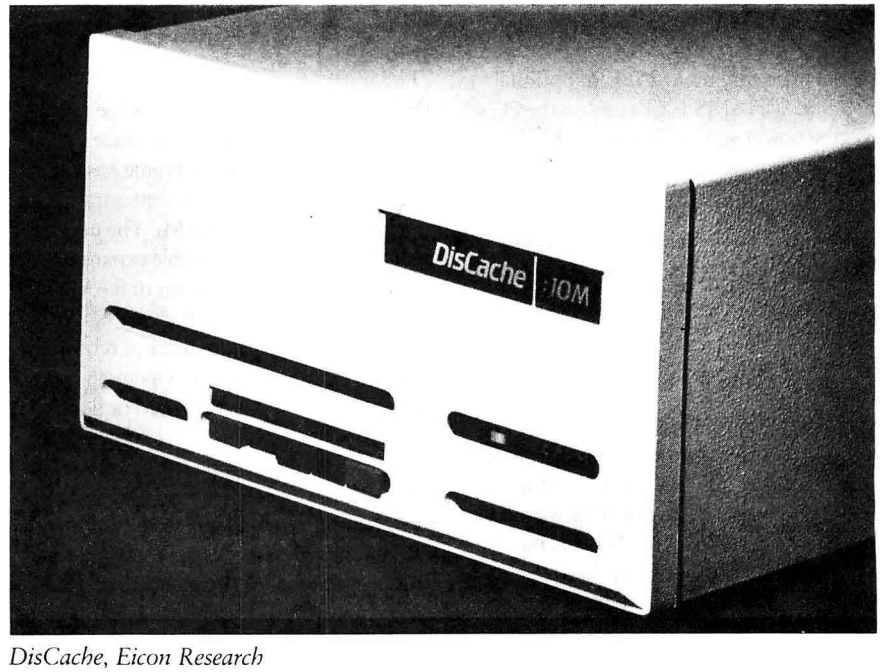
MPC Peripherals
9466 Black Mountain Rd.
San Diego, CA 92126
800/321-1028, 619/578-9222
The Bubble Memory Board fits into an expansion slot on the IBM PC or XT and provides 256K of nonvolatile data storage. The board comes with software that allows users to configure the board as a disk drive. The Bubble Memory Board uses the PC's power supply. List price: $1595.

Toaster Jr.

XCOMP
3554 Ruffin Rd. S
San Diego, CA 92123-2502
619/573-0077, Telex: 182-786
Toaster Jr. is a single-drive 5-megabyte (M) removable cartridge hard disk drive. Data from a hard disk can be copied into Toaster Jr. at a rate of up to 1M in 53 seconds. The removable cartridges measure 4.3 by 4.4 by .43 inches. The unit, including drive, controller, and power supply, measures 5 by 8.7 by 14 inches and weighs 15 pounds. List price: $1995.

Pegasus XT Conversion Kit

Great Lakes Computer Peripherals, Inc.
2200 W. Higgins Rd. #245
Hoffman Estates, IL 60195
312/884-7272
The Pegasus XT Conversion Kit is a 10-megabyte (M) internal hard disk system designed for the IBM PC XT. It includes a hard disk drive, software, and a disk controller. The Pegasus controller supports hard disks with up to 140M storage capacities from different manufacturers. Pegasus hard disks fit in place of the PC XT's second floppy disk drive and are available in 23M, 40M, 65M, and 140M sizes. List price: 10M $1295, 23M $1995, 40M $2495.



DisCache, Eicon Research

V130, V150, V170, and V2100

Vertex Peripherals
2150 Bering Dr.
San Jose, CA 95131
408/942-0606

The V130, V150, V170, and V2100 internal hard disk drives provide 30, 50, 70, and 100 megabytes of storage, respectively. The average access time for all models is 25 milliseconds. List price: not available.

Model 4160

Disc Tech One, Inc.
849 Ward Dr.
Santa Barbara, CA 93111
805/964-3535

Model 4160 is an external 14-inch hard disk drive that has 160 megabytes of storage and comes with a disk controller and software. Model 4160 has an average access time of 38 milliseconds and a 9.67-megabits-per-second transfer rate. Networking software is available for systems running under DOS 2.00. List price: $6500.

WHAMS 1-XT

Piiceon, Inc.
2114 Ringwood Ave.
San Jose, CA 95131
408/946-8030

WHAMS 1-XT is a half-height 10-megabyte hard disk drive that fits in place of the IBM PC's second floppy disk drive. The disk controller includes operating software, a serial port, and up to 256K of optional memory. WHAMS 1-XT runs on the PC's existing power supply. List price: $2375, each optional 64K $90.

Magnabyte 10

Great Lakes Computer Peripherals, Inc.
2200 W. Higgins Rd. #245
Hoffman Estates, IL 60195
312/884-7272

Magnabyte 10 is a 10-megabyte external chassis that comes with a host connecting board that uses any IBM PC slot. Magnabyte 10 includes a disk controller, a power supply, a 10-megabyte (M) Shugart hard disk drive, and room for an additional 10M hard disk. List price: $1495.

Amdisk-V

Amdek Corp.
2201 Lively Blvd.
Elk Grove, IL 60007
312/364-1180

Amdisk-V is a 5¼-inch, half-height, double-sided, double-density disk drive that is compatible with the IBM PC. Its recording format, data transfer rate, and disk rotation speed are compatible with standard 5¼-inch drives. Amdisk-V offers 500K of unformatted on-line storage. It comes with all required mounting hardware and cabling. List price: $329.

Amdisk-III

Amdek Corp.
2201 Lively Blvd.
Elk Grove, IL 60007
312/364-1180

Amdisk-III is a 3-inch floppy disk drive system. It offers 500K of unformatted on-line storage and is compatible with 5¼-inch drives. The system comes with two drives and a built-in power supply. Amdisk-III uses 3-inch floppy disk cartridges, which are sold separately. The interface cable for the IBM PC has a 37-pin connector. List price: $500, pack of 10 disk cartridges $70.

DynaFrame

Vista Computer Company, Inc.
1317 E. Edinger Ave.
Santa Ana, CA 92705
714/953-0523

DynaFrame is a stand-alone storage expansion unit for the IBM PC with space to stack the PC on top. DynaFrame has a hard disk drive and comes in six configurations from 5 to 140 megabytes (M). The unit has eight PC- and XT-compatible expansion slots. Users select the amount of RAM and identify which RAM memory banks are active. DynaFrame enables users to reboot the computer without changing memory contents. Users can boot from hard or floppy disks.

A protective system on the hard disk prevents unauthorized alteration or erasing of files and programs. DynaFrame comes with one of four types of backup: the Amlyn 5855 6M disk, dual Drivetec 320 or dual Amlyn 1860 high-density disk backup units, the Syquest 5M removable hard disk drive, or the Cipher 24M streaming tape backup. The unit comes with its own power supply. List price: 5M fixed $2449, 5M removable $3349, 10M fixed $2695, 20M fixed $3595, 40M fixed $4795, 140M fixed $9995.

IDEAdisk, IDEAssociates

IDEAdisk

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAdisk is a line of 3⅞-inch hard disk drive storage systems with 13 possible configurations of internally and externally mounted drives. The external drives provide storage in 10-megabyte (M), 20M, and 40M increments. A 10M internally mounted hard disk increases the storage capacity of the IBM PC to that of the PC XT. This hard disk fits into the PC slot provided for a second floppy disk drive. The externally mounted disks come in nine configurations ranging from 5M hard or 5M removable to 40M hard with 5M removable.

Each IDEAdisk drive comes with all necessary interface electronics, support software for PC-DOS 1.10 and PC-DOS 2.00, mounting hardware, and cables. Each system also includes an XPR IDEAplus combination board, which acts as the host board. List price: 5M internal $1495, 10M internal $2145, 10M external $2495, 10M external with 5M removable $3545, 20M external $3495, 20M external with 5M removable $4495, 40M external $4925, 40M external with 5M removable $5295.

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Memory Expansion and Multifunction Boards

John Henderson

Memory expansion and multifunction boards let your computer run complicated programs and manage large amounts of data quickly and with increased options. The computer requires space in memory any time you work with a different set of data; when, for example, you change the program you're working with or alter a record. Memory, or more precisely read/write memory, is like a flexible work space in which you can manipulate information.

Adding memory to the PC provides work space so that you can use large programs with sophisticated features. Programs like *1-2-3* and *Visi On* that perform complicated tasks usually take up more memory than simpler programs.

Extra memory also gives computers room to manipulate large files. For example, if you regularly use a word processing program but can only work with a file 40 pages long, doubling the size of your computer's memory will let you manage an 80-page file.

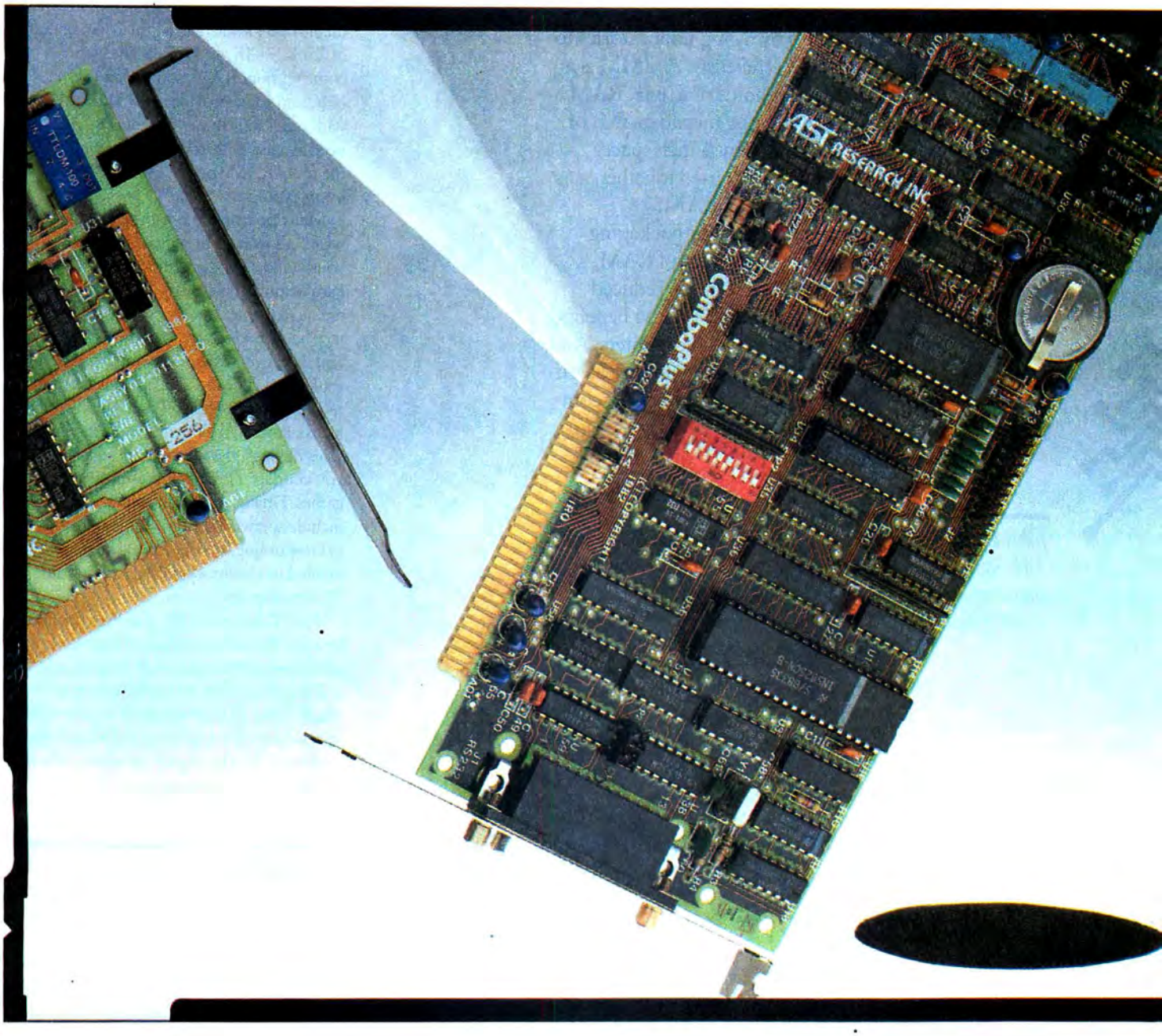
Increasing memory in the PC also provides space to emulate a disk drive—another advantage. A disk emulator treats an area of memory as if it were a disk drive. When the operating system tries to read or write data to a disk drive, the disk emulator directs it to act on memory instead.

Because there are no moving parts on a disk emulator, information access occurs instantly. Another benefit of a disk emulator is its capability to hold in memory more data than the 360 kilobytes (K) that can be stored on a PC-DOS 2.00 floppy disk. With memory allocated to the disk emulator, you can keep several applications programs in memory at once. If you want to change from one applications program to another, you can do so quickly because you don't have to change floppy disks manually.

There are several ways to add memory to the PC, but all involve adding random access memory (RAM) chips in one form or another. The least expensive way to add memory is to fill unused sockets on the PC motherboard with RAM chips. The PC has a motherboard with a capacity of 256K RAM but is usually purchased with only 64K.

If you decide you want more memory after filling your computer's motherboard to capacity, the next step is to add a memory expansion board. Hundreds of different memory boards are available today. Most are multifunction boards; that is, they supply more than one feature on a single board. The functions to choose from include added memory, serial and parallel ports, clock/calendars, and game adapters. Combining a number of functions on a single board conserves the PC expansion slots for other boards and reduces the expense of buying a number of single-purpose boards. Usually multifunction boards provide less memory than boards dedicated to memory expansion.

Two technological developments that will permit more memory to be put in less space are 256K chips and Straight In-line Memory Modules (SIMMs). A few


ASI RESEARCH INC
ComboPlus

manufacturers produce 256K chips in large quantities, but at $65 apiece these chips are not economical for most applications. On the market now are boards that use 64K chips but are also designed to accept 256K chips. When 256K chips become available at a lower price, these boards will enable you to quadruple your computer's memory without buying another board.

SIMMs were developed by Wang Laboratories to package memory chips more efficiently. A SIMM is a 3- by ¾-inch ceramic chip that holds nine 64K RAM chips. This arrangement allows one megabyte (M) of RAM to be set on a board in a 3- by 4-inch space. When a SIMM and 256K chips are used together, a single board will accommodate 8M RAM.

As manufacturers perfect memory packaging techniques and produce greater volumes of RAM, prices will continue to drop. As a result of reduced prices and an increasing recognition of RAM benefits, more people will add memory to their computers. And more sophisticated applications will inevitably be written to take advantage of the growing numbers of computers with large amounts of memory.

John Henderson is president of Tall Tree Systems, a manufacturer of memory boards based in Palo Alto, California.

Multifunction boards add many features to an *IBM PC*. One capability most boards offer is additional random access memory (RAM), which allows you to use disk emulators and applications programs and operating systems that take up lots of memory. Most boards in the Multifunction category are socketed to accept RAM chips in increments of 64 kilobytes (K) up to a maximum of 256K, 384K, or 512K. Some boards come without RAM, some offer RAM only, and some provide up to 512K RAM with other multifunction features. You need at least 192K for disk emulation, and the more RAM you have, the more computing you can do.

Many boards come with serial ports, which allow data to be transferred from your PC to a printer, a modem, or a mouse. Parallel ports quickly transfer blocks of data to a printer. A clock/calendar with battery backup keeps track of the current time and date, even when the computer power is shut down. The clock/calendar is useful for recording times and dates on data disks and for controlling the operation of external devices through the PC. A game adapter lets you connect a joystick for use with video games. Finally, most multifunction boards include software for disk emulation and print spooling, which stores data to be printed in a memory buffer, freeing your PC for other operations.

The PC has room for only five expansion boards. If you buy a different board every time you want to add a new feature, you will quickly use up all five slots. Fortunately, you can buy boards that come with almost any combination of RAM and other functions. You need only determine which configuration is appropriate for you.

ComboPlus

AST Research, Inc.
2372 Morse #104
Irvine, CA 92714
714/863-1333

The ComboPlus multifunction board offers 64K to 256K RAM, a clock/calendar, a serial port, and a parallel port. ComboPlus is also available with a disk emulator and a print spooler. List price: 64K $395, 256K $695.

ALL Card

ALL Computers, Inc.
110 Bloor St. W #501
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M5S 2W7 Canada
416/960-0111
The ALL Card is a multifunction board that increases the IBM PC's memory capacity and optionally provides multitasking capability. The ALL Card enables several users to simultaneously run applications packages and develop programs. The board uses 64K or 256K chips to provide up to 1 megabyte (M) RAM. Optional piggyback ALL Cards snap onto the board to provide up to 3M RAM. The ALL Card comes in a basic model without RAM and in four models with different combinations of features such as memory, memory protection, a clock/calendar, and parity checking. List price: without RAM $300.

Function Pak 512

Image Technology, Inc.
5994 S. St. Paul Way
Littleton, CO 80121
303/794-2074
Function Pak 512 is a multifunction board that has memory expansion and other I/O features. The board comes with 64K but can hold up to to 512K RAM. Function Pak 512 will adapt to 256K memory chips when they become available. Other features include a serial port, a parallel port, and a clock/calendar with battery backup. The board also includes disk emulation and print spooling software. Optional piggyback modules include a second serial port and a game adapter for joystick control. List price: $349.

Switchport

California Micro Computer
17791 Jamestown Ln.
Huntington Beach, CA 92647
714/847-4141
Switchport is a multifunction board that offers a clock/calendar with battery backup, a 2K print buffer, a serial port, and a parallel port. Switchport also has a third port that functions as either a serial or parallel port at the flip of a switch. Separately sold options include an 8K print buffer, a 64K to 256K piggyback RAM board, and a connector cable that lets you use any IBM electronic typewriter as a printer. List price: $295.

PC Multipak

Indigo Data Systems, Inc.
100 E. Nasa Rd. #1
Webster, TX 77598
713/488-8186
PC Multipak provides a serial port (a parallel port is optional), a clock/calendar with a ten-year battery, and up to 256K RAM. PC-DOS 2.00-compatible software includes a disk emulator, a print spooler, and two screen display utilities, *Print-It* and *Color-It*. The utilities give the computer the ability to print monochrome and color screen images. Memory is parity checked and RAM can be added in 64K increments up to 256K. List price: without RAM $297, 64K $365, 256K $565.

Quadboard II

Quadram Corp.
4357 Park Dr.
Norcross, GA 30093
404/923-6666
Quadboard II is a memory expansion board that provides a clock/calendar with battery backup, a serial port, a parallel port, a joystick adapter, and an I/O bracket that organizes the IBM PC expansion port connectors. The board offers up to 384K RAM in 64K increments with parity checking. Three utilities come with the board: *Quadram Multidrive*, which creates up to three disk emulators in memory; *Qspool*, a print spooler; and *Qswap*, which lets you switch between two printers. List price: without RAM $295, 64K $395, 384K $795.

"Easy to install and use, Quadboard II is an excellent product in almost all respects except for the clock, which is not accurate and cannot be adjusted by users." Dan Moore, Columbus, Indiana

Ultra55

Daystar Systems, Inc.
10511 Church Rd., Ste. L
Dallas, TX 75238
214/341-8136
Ultra55 is a multifunction board with two serial ports, one parallel port, a clock/calendar with battery backup, and up to 320K RAM. List price: 320K $995.

Quad 512 +

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
The Quad 512 + board combines memory expansion with a serial port, a disk emulator, and a print spooler. Quad 512 + comes with either 64K, 256K, or 512K. Eight 64K memory banks can be addressed selectively through DIP switch settings, and parity checking is included. List price: 64K $325, 256K $550, 512K $895.

Quad I/O

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
Quad I/O is a half-slot-sized multifunction board that combines five ports on one board. Quad I/O has a parallel port, a serial port, a game adapter for two joysticks or game paddles, and a clock/calendar with battery backup. A second serial port is sold separately. List price: $245, second serial port $45.

Professional I Series Board

Paso Com
P.O. Box 2603
Mission Viejo, CA 92690
714/552-0130
The Professional I Series Board adds 64K, a serial port, and a parallel port to the IBM PC. RAM can be added in 64K increments to a maximum of 256K. Other options include a second serial port and a clock/calendar with battery backup. List price: $495.

Professional II Series Board

Paso Com
P.O. Box 2603
Mission Viejo, CA 92690
714/552-0130
The Professional II Series Board adds up to five I/O functions to the IBM PC. A clock/calendar with battery backup and a serial port are included. A second serial port, a parallel port, and a game adapter are sold separately. List price: $164; with optional serial port, parallel port, and game adapter $299.

SUPER RIO

STB Systems, Inc.
601 N. Glenville
Richardson, TX 75081
214/234-8750

The SUPER RIO multifunction board combines two serial ports, a parallel port, a clock/calendar, a game paddle adapter that uses either Apple- or IBM PC-compatible joysticks, and up to 256K RAM. *PC Accelerator* software, which combines print buffering and high-speed disk emulation, also comes with SUPER RIO. An optional board, the STB Piggyback, adds up to 512K to SUPER RIO, for a total of 768K in one expansion slot. List price: 64K $419, 192K $549, 256K $689.

SixPakPlus

AST Research, Inc.
2372 Morse #104
Irvine, CA 92714
714/863-1333

The SixPakPlus multifunction board combines a parallel port, a serial port, a game adapter, and a clock/calendar with 64K to 384K of additional RAM. The board comes with a disk emulator and print spooling software. List price: 64K $395, 256K $695, 384K $895.

"I consider my SixPakPlus a real bargain. Installation was simple and documentation adequate." Michael D. Glascock, Columbia, Missouri

"In less than 15 minutes I was able to put to work one parallel port for my printer, one serial port for my modem, and 64K more for 1-2-3*."* Terry Hostetler, Austin, Texas

"SixPakPlus is a good expansion board, especially for home users who want to add a joystick to their IBM PC. The documentation lacks information about the Superspool *utility, but the software is usable without instruction."* Amy J. Goebel, Alexandria, Virginia

UltraRAM

Daystar Systems, Inc.
10511 Church Rd., Ste. L
Dallas, TX 75238
214/341-8136

UltraRAM is an expansion board that adds from 64K to 512K to the IBM PC. UltraRAM is bank selectable on 64K boundaries, has parity checking, parity disabling, and a light-emitting-diode parity indicator. List price: 256K $695, 512K $895.

RAM Expansion Board

American Microware, Inc.
901 Laurelwood Rd.
Santa Clara, CA 95050
408/988-7511

The RAM Expansion Board from American Microware is a memory expansion board that provides up to 192K RAM. The board comes with a disk emulator and a print spooler and may be purchased without RAM. This board works only on IBM PCs configured with the 64K system chip. List price: without RAM $119, 64K $179, 192K $299.

"This board offers inexpensive memory expansion with high-quality parts and documentation." Steven P. d'Adolf, Poway, California

Alpha Byte Memory Expansion Card

Alpha Byte Computer Products
31304 Via Colinas
Westlake Village, CA 91362
213/706-0333

The Alpha Byte Memory Expansion Card is available with either 256K or 512K and a serial port. The maximum IBM PC motherboard memory capacity must be filled with RAM chips before the computer can address the added memory provided by the expansion board. The 256K board works with any PC configuration, but the 512K board works only on a PC with 64K. List price: 256K $256, 512K $459.

"The Alpha Byte board is a well-made, no-frills product at a very reasonable price." William Lynch, Newton Highlands, Massachusetts

RIO PLUS

STB Systems, Inc.
601 N. Glenville
Richardson, TX 75081
214/234-8750

The RIO PLUS multifunction board includes all the I/O functions of SUPER RIO but has one less serial port. RIO PLUS has on-board memory expansion capability of up to 384K, which can be added to the existing 256K to give the system 640K. RIO PLUS also comes with *PC Accelerator* software for print buffering and disk emulation. List price: $395.

Versa-RAM Static

Memory Technologies
4343 Grand Prix Dr.
P.O. Box 508
Logansport, IN 46947
219/722-1454

Versa-RAM Static is a CMOS battery-backed-up static memory board designed primarily for industrial research. The board provides up to 288K of error-checked memory in increments of 32K. Versa-RAM Static's rechargeable nickel-cadmium batteries retain data for up to six months with system power off. Versa-RAM Static has parity checking, a parity enable/disable switch, and an on-board parity-failure light that aids in fault isolation. List price: $619.

JRAM

Tall Tree Systems
1032 Elwell Court #124
Palo Alto, CA 94303
415/964-1980

The JRAM memory expansion board offers 512K of add-on RAM. Two more JRAM boards can also be added to provide 1.5 megabytes of additional RAM. JRAM provides memory of over 640K by selecting banks of memory to be accessed in blocks of 64K. JRAM comes with *JFormat*, which includes a disk emulator, high-speed file transfer, a print spooler, quad density and 8-inch disk drive support, and hard disk support. *Jetdrive* for DOS 2.00 is also included and provides a disk emulator and high-speed file transfer. List price: $800.

Versa-RAM Plus II

Memory Technologies, Inc.
4343 Grand Prix Dr.
P.O. Box 508
Logansport, IN 46947
219/722-1454

The Versa-RAM Plus II memory expansion board adds from 64K to 256K of parity-checked RAM to the IBM PC. The board comes with a clock/calendar/alarm, a disk emulator, a print spooler, diagnostics software packages, and a parity enable/disable switch. Versa-RAM Plus II accepts optional Versa-modules for an extra 512K in 64K increments, serial and parallel ports, a disk controller, a print spooler, a 300-bits-per-second modem, a color graphics board, and an SDLC/HDLC synchronous/asynchronous board for IBM 370 communications. List price: 64K $399, 256K $735, 512K $1134.

256K RAM Card

Apparat, Inc.
4401 S. Tamarac Pkwy.
Denver, CO 80237
303/741-1778
The 256K RAM Card is a memory expansion board that adds from 64K to 256K to the IBM PC and includes a disk emulator. List price: 64K $149.

"RAM Card is an excellent buy. It was shipped promptly when ordered by mail from Apparat, no surcharge was added for using a credit card, and a free program disk was included. Instructions are clear and concise." S. S. Starr, Rose Valley, Pennsylvania

512K RAM Card

Apparat, Inc.
4401 S. Tamarac Pkwy.
Denver, CO 80237
303/741-1778
The Apparat 512K RAM Card is the deluxe version of the 256K RAM Card and can be piggybacked with the Apparat multifunction Combo Card. The 512K RAM Card has all the features of the 256K RAM Card as well as programmable ROM for increased flexibility. List price: 64K $189, additional 64K $64.

"This is one of the less expensive RAM boards on the market." Scott J. Kamin, Boulder, Colorado

LNW Busboard

LNW Computers
2620 Walnut
Tustin, CA 92680
714/641-8850
LNW Busboard is a modular 64K motherboard that you can customize to create combinations of memory, I/O functions, and controller functions. The board has eight slots for plug-in modules that enable you to add from 64K to 512K, serial and parallel ports, and game adapters. You can also add a 16-bit analog-to-digital converter, a floppy disk controller that lets you attach an 8- or 5-inch disk drive, a composite video monitor controller, and a 300- to 1200-bits-per-second modem. Also included are a print spooler, a clock/calendar, and a disk emulator. List price: I/O-only board $129.95, 64K $349.95.

Versa-RAM Plus

Memory Technologies, Inc.
4343 Grand Prix Dr.
P.O. Box 508
Logansport, IN 46947
219/722-1454
Versa-RAM Plus is a multifunction memory board that adds two serial ports, one parallel port, and extra RAM to the IBM PC. You can add up to four banks of 64K each into the socketed array. Versa-RAM Plus has parity checking and comes with cable assemblies. List price: 64K $399, 256K $699.

Six Function Board

Prelude Computer Corporation
20380 Town Center Ln. #217
Cupertino, CA 95014
408/257-6033
The Six Function Board is a multifunction board with six capabilities: up to 256K of memory expansion, a game adapter, a serial port, a parallel port, a clock/calendar, and a print spooler. Users can program the clock/calendar to generate real-time interrupts that signal the computer whenever a predefined period of time has elapsed. List price: $365.

Memory Plus Game Port

Prelude Computer Corporation
20380 Town Center Ln. #217
Cupertino, CA 95014
408/257-6033
The Memory Plus Game Port is a two-purpose board designed for IBM PC owners who already have an I/O board and need additional RAM and a game adapter. The Memory Plus Game Port board uses one full-length expansion slot and adds up to 384K RAM. List price: $229.

512K Memory Card

MK Research
14682 Orange Acres
Irvine, CA 92714
714/559-1598
The 512K Memory Card is a board that adds up to 512K RAM to the IBM PC in 64K increments. The board meets PC software and hardware specifications, including diagnostics. The 512K Memory Card has parity checking and is available with an optional serial port and *RAM Disk* software. List price: without RAM $199, 256K $499, 512K $799.

Versa-RAM Plus III

Memory Technologies, Inc.
4343 Grand Prix Dr.
P.O. Box 508
Logansport, IN 46947
219/722-1454
Versa-RAM Plus III comes with 64K, a clock/calendar/alarm, a disk emulator, a print spooler, and diagnostics software. You can also add modules for serial and parallel ports, a game adapter, a color graphics board, a 300-bits-per-second modem, and memory in increments of 64K. A parity enable/disable switch and an onboard parity-failure light are included. List price: 64K $249, 384K $749.

PC-UMC

Adams OEM Products
P.O. Box 8339
Station A
Greenville, SC 29604
803/233-4342
The PC-UMC memory board provides from 2K to 64K of RAM backed up by a lithium battery that ensures data will not be lost in case of power failure. PC-UMC prevents the loss of preset values such as temperature measurements, phone numbers for a modem, or production data. PC-UMC comes with a clock/calendar, also backed up by battery, that lets you know when power was shut down. List price: 2K $219, 64K $550.

Time Spectrum

Persyst Products
15801 Rockfield Blvd., Ste. A
Irvine, CA 92714
714/859-8871
Time Spectrum is a multifunction board that combines up to six functions. Separately sold options include memory expansion of up to 512K RAM and a clock/calendar. I/O ports come in two configurations: either two serial ports and one parallel port, or two parallel ports and one serial port. The board includes print spooling and disk emulation software. Versapak piggyback modules can be added to the Time Spectrum board to provide additional RAM and communications capabilities. List price: 64K $395.

I/O Plus NV Memory

Prelude Computer Corporation
20380 Town Center Ln. #217
Cupertino, CA 95014
408/257-6033

I/O Plus NV Memory is a multifunction board that has serial and parallel ports and game adapters, a clock/calendar with battery backup, and print spooling software. The board also provides 4K of nonvolatile RAM that retains information if power is interrupted or switched off. List price: $389.

PDI464-SP Combination Board

Pure Data Ltd.
950 Denison St. #17
Markham, Ontario
L3R 3K5 Canada
416/498-1616

The PDI464-SP Combination Board provides up to 256K RAM, serial and parallel ports, and a real-time clock/calendar. The board comes with software that includes a disk emulator, a print spooler, and configuration and diagnostics programs. The board is available with plastic-coated 64K RAM chips or with optional cerdip-coated 64K RAM chips. Cerdip is impervious to moisture and dissipates heat more effectively than plastic. An extra serial port is also available. List price: without RAM $390, 64K $453, 256K $682.

"I found this board to be a very reliable product." George Huczek, Prince Albert, Saskatchewan, Canada

MegaRam

Microcomputer Business International
P.O. Box 16115
Irvine, CA 92713
714/553-0133

The MegaRam memory expansion board provides 64K to 512K RAM with memory-write protection. The board also includes a serial port. An optional controller circuit allows memory expansion to 1 megabyte. Separately priced options include *Keylock* software, which restricts unauthorized access to memory, and an extra serial port. List price: 64K $395, additional increments of 64K $95 each.

PCM-KPC

Add-Mem
22151 Redwood Rd.
Castro Valley, CA 94546
415/886-5443

PCM-KPC is a packet of 64K RAM chips that you can install on the IBM PC system board to expand memory without installing a new board. You can upgrade the PC to 256K on the system board with the PCM-KPC kit, reserving the PC's five expansion slots for other circuit boards. The chips can be installed either in conjunction with or in place of the 16K RAM chips found on older PCs. Installation instructions come with the kit if you want to add the chips yourself; otherwise, you can bring or mail your system board to Add-Mem and they will install the kit. List price: $69.95.

Clock Plus Serial Port

Prelude Computer Corporation
20380 Town Center Ln. #217
Cupertino, CA 95014
408/257-6033

The Clock Plus Serial Port is a dual-function board that combines a clock/calendar with a serial port and fits into a short slot in the IBM PC XT. The clock/calendar generates real-time interrupts. The board includes print spooling software. List price: $159.

Sandstar Memory Card

Maynard Electronics
400 Semoran Blvd.
The Greater Mall #207
Casselberry, FL 32707
305/331-6402

The Sandstar Memory Card lets you expand the IBM PC system memory from 64K to 640K using one expansion slot. Memory can be split or assigned contiguously, and the board includes parity checking. The Sandstar Memory Card accepts up to three optional Sandstar plug-in modules, which include a serial port, a game adapter, a parallel port, and a clock/calendar. List price: without RAM $199, 256K $499.

Clock Plus Printer Port

Prelude Computer Corporation
20380 Town Center Ln. #217
Cupertino, CA 95014
408/257-6033

The Clock Plus Printer Port is a two-purpose board that combines a clock/calendar with a parallel port. The board fits into a short slot on the IBM PC XT and comes with print spooling software. The clock/calendar can be used to generate real-time interrupts. List price: $149.

High Density Memory Board

MNC International
511 11th Ave. S #429
Minneapolis, MN 55415
612/333-4303

The High Density Memory Board provides up to 384K of add-on RAM in one expansion slot. The High Density Memory Board includes disk emulator software to allow faster access to data than a disk drive provides. List price: 64K $295.

I/O A+

Applied Business Computer
330 E. Orangethorpe Ave., Ste. C
Placentia, CA 92670
714/993-1101

I/O A + is a multifunction board that has two serial ports, one parallel port, a clock/calendar with battery backup, and a game adapter. Support software automatically switches ports to required settings. List price: $225.

AI-1512

Applied Business Computer
330 E. Orangethorpe Ave., Ste. C
Placentia, CA 92670
714/993-1101

AI-1512 is a memory board that adds up to 512K of parity-checked RAM to an IBM PC. A second AI-1512 board can be added to provide up to 1 megabyte RAM. Switches allow you to disable any 64K block within the 512K limit, providing compatibility with other memory boards that may be preset to a specific address. List price: 64K $275, 256K $530, 512K $870.

Sandstar Multifunction Card

Maynard Electronics
400 Semoran Blvd.
The Greater Mall #207
Casselberry, FL 32707
305/331-6402
The Sandstar Multifunction Card is a board designed to accept as many as six Sandstar modules. Separately sold Sandstar modules include a serial port, a parallel port, a game adapter, and additional memory from 64K to 320K. List price: $89.

Memory Board

Frontier Technologies Corporation
P.O. Box 11238
Milwaukee, WI 53211
414/964-8689
The Memory Board expands memory in 64K increments up to 256K. Parity checking is included. Serial and parallel ports and a clock/calendar are separately priced options. List price: 64K $295, 256K $495.

Chronograph

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
Chronograph is a clock/calendar board that eliminates the need to enter the current date and time each time you turn on the IBM PC. Chronograph includes a rechargeable nickel cadmium battery. List price: $110.

8087 Math Co-Processor

IBM
Systems Products Division
Entry Systems
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois, 800/447-0890 Alaska, Hawaii
The 8087 Math Co-Processor is a specialized chip that, when installed on the IBM PC system board, increases the speed and precision with which floating-point arithmetic, logarithmic, and trigonometric functions are processed. To take advantage of the 8087's capabilities you need programs specifically designed for it. List price: $260.

Mega A +

Applied Business Computer
330 E. Orangethorpe Ave., Ste. C
Placentia, CA 92670
714/993-1101
Mega A + is a multifunction board that provides up to 256K RAM with parity checking, two serial ports, one parallel port, and a clock/calendar with battery backup. Mega A + also comes with disk emulator and print spooling software. List price: without RAM $245, 64K $325, 256K $580.

CI-PCM

Chrislin Industries, Inc.
Computer Products Division
31352 Via Colinas #101
Westlake Village, CA 91362
213/991-2254
The CI-PCM memory expansion board adds 64K, 128K, 192K, or 256K of parity-checked RAM to the IBM PC. List price: 64K $295, 256K $420.

CI-PCM +

Chrislin Industries, Inc.
Computer Products Division
31352 Via Colinas #101
Westlake Village, CA 91362
213/991-2254
The CI-PCM + is a memory expansion board that provides up to 512K additional RAM and a serial port. The board includes parity checking. List price: 256K $570, 512K $775.

1stMate

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600
1stMate is a multifunction board that adds up to 256K RAM to the IBM PC in 64K increments and includes a serial port, a parallel port, and a clock/calendar with battery backup. The board comes with *RAM-Spooler* print spooling software and *Speed-Disk* disk emulator software. A programmable array logic option protects software by restricting its use to a specific computer. List price: without RAM $319, 64K $389, 256K $589.

Wizard PC Memorycard

Wesper Microsystems
14321 New Myford Rd.
Tustin, CA 92680
714/730-6250
Wizard PC Memorycard is a memory board that adds up to 256K RAM to the IBM PC. The board comes with parity checking. List price: 64K $395, 128K $545, 256K $845.

RAMPLUS II

Raytronics
4901 Morena Blvd., Bldg. 900
San Diego, CA 92117
619/270-4000
RAMPLUS II is a multifunction board that is socketed to accept up to four banks of either 64K or 256K RAM chips. Using 64K chips, you can add up to 256K RAM to an IBM PC; when 256K chips become available, you will be able to add up to 1 megabyte (M) of memory. The two chip types cannot be mixed on the RAMPLUS II board. Parity checking is turned on or off with a switch. RAMPLUS II also includes a serial port, a parallel port, and a clock/calendar with battery backup. *DRIVEPLUS* software emulates up to eight disks. List price: without RAM $319, 256K $599, 1M $3019.

HANDI-1 Plus

Apstek, Inc.
2636 Walnut Hill Ln. #335
Dallas, TX 75229
214/357-5288
HANDI-1 Plus is a multifunction board that can hold up to 384K of parity-checked RAM. The board comes with a parallel port, a serial port, and a clock/calendar with battery backup. Also included with the board are *Handi-Disk* disk emulator software, which emulates up to four disks at once, and *Handi-Spooler* print spooling software, which offers a variable-size buffer. Both the serial and parallel printer pin connectors fit on the HANDI-1 Plus mounting bracket to permit access to both ports through one slot. List price: without RAM $299, 256K $579.

Captain

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Captain is a multifunction board that provides up to 384K RAM in 64K increments. The board also includes a serial port, a parallel port, and a clock/calendar with battery backup. A software lockout option lets you write programs that run exclusively on your computer. List price: without RAM $349, 64K $424, 384K $795.

Wave

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Wave is a memory expansion board designed to fit into the short slot in the IBM PC XT. Wave comes with up to 256K RAM. The board includes Tecmar's *RAMSpooler* print spooling software and *SpeedDisk* disk emulator software. List price: 64K $299, 128K $379, 256K $499.

Consocard

Consolink
1840 Industrial Circle
Longmont, CO 80501
303/651-2014

Consocard is a multifunction memory expansion board that provides 64K to 384K RAM in 64K increments. Consocard includes two serial ports and a clock/calendar with battery backup. Print spooling and disk emulator software is optional. List price: 64K $395, 128K $495, 384K $895.

Multicard P/N 0256

Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
714/953-0523

Multicard P/N 0256 is a multifunction memory board that offers a serial port, a parallel port, and a clock/calendar with battery backup. Parity-checked RAM is available in 64K, 128K, 192K, and 256K configurations. Multicard P/N 0256 comes with disk emulator and print spooling software. List price: without RAM $303, 64K $407, 256K $718.

HANDI-4

Apstek, Inc.
2636 Walnut Hill Ln. #335
Dallas, TX 75229
214/357-5288

HANDI-4 is a multifunction board that has a serial port and a clock/calendar with battery backup. *HANDI-SPOOLER* print spooling software is included. List price: $149.

PC Memory

ONTRAX, Inc.
P.O. Box 268
Oakhurst, NJ 07755
201/244-2302

PC Memory is a memory expansion board that provides 64K to 256K of add-on RAM. PC Memory has parity checking but is strictly a memory board; it has no I/O features. List price: without RAM $98, 64K $147, 256K $294.

Turbocard

Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
714/953-0523

Turbocard is a multifunction memory board that combines up to 384K RAM with a serial port, a parallel port, a game adapter, and a clock/calendar with a rechargeable battery. RAM is available in 64K increments. Turbocard also includes disk emulator and print spooling software. List price: without RAM $276, 64K $393, 384K $978.

Maxicard P/N 0576

Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
714/953-0523

Maxicard P/N 0576 is a memory board that expands an IBM PC's RAM in 64K increments up to 576K. Maxicard P/N 0576 comes with disk emulator and print spooling software. All memory is parity checked. List price: 64K $321, 256K $633, 576K $1168.

PC Clock I/O P/N 0240

Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
714/953-0523

PC Clock I/O P/N 0240 provides a serial port, a parallel port, and a clock/calendar with battery backup on a board that fits into the short slot in an IBM PC XT. PC Clock I/O P/N 0240 also includes *DynaClock* print spooling software. List price: $206.

HANDI-3

Apstek, Inc.
2636 Walnut Hill Ln. #335
Dallas, TX 75229
214/357-5288

HANDI-3 is a multifunction board that has a parallel port and a clock/calendar with battery backup. *HANDI-SPOOLER* print spooling software is included. List price: $149.

Baby Blue II

Micrologic, Inc.
222 Rt. 59
Suffern, NY 10901
914/357-8086

Baby Blue II is a multifunction memory board with a Z-80 processor chip that enables the IBM PC to run programs written for the CP/M-80 operating system. The Z-80 chip lets you run CP/M programs with PC-DOS and store PC-DOS and CP/M data files on the same disk. The board also allows bidirectional file transfers between PC-DOS and CP/M disk formats. Baby Blue II also provides 64K RAM, a clock/calendar with battery backup, a parallel port, two serial ports, and disk emulator and print spooling software. Memory can be expanded to 128K, 192K, or 256K. List price: 64K $695.

Com Card + Dual Com Card

ZenTek Corp.
455 Whitepine Dr.
Salt Lake City, UT 84107
801/263-3925

Com Card is a single-function board that provides one serial port. Dual Com Card provides two serial ports. Both boards are small enough to fit into the short slot on an IBM PC or XT. List price: Com Card $65, Dual Com Card $85.

SY2130

Synertek, Inc.
3001 Stender Way
Box MS-34
Santa Clara, CA 95054
408/988-5618

SY2130 is a dual-port memory chip, designed for circuit board manufacturers, that synchronizes operations between two processors that have different frequency rates. With SY2130, no specific timing rate is required. Data can be accessed by the processors simultaneously without timing conflicts. Data sent by one processor can be processed at the same time by another processor. When two processors attempt to read or write data at the same time, SY2130 signals the faster of the two to wait until the slower processor catches up, allowing the two functions to occur at the same time. SY2130 eliminates the need for a large board that would have at least eight peripheral integrated circuits. List price: 100 chips $42.

IDEAplus

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAplus is a multifunction memory board that offers 64K RAM with disk emulator and print spooling software. IDEAplus can also be configured with a serial port, a parallel port, a clock/calendar with battery backup, and up to 256K RAM in 64K increments. The parallel port can be configured as a hard disk drive interface or as a printer port. List price: with one option and 64K $329, 128K $399, 256K $539.

IDEAmini

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAmini is a multifunction board without RAM. It is small enough to fit into the short expansion slot on the IBM PC or XT. The board provides disk emulator and print spooling software. IDEAmini can be ordered with any combination of the following options: a parallel port, one or two serial ports, or a clock/calendar with battery backup. List price: with one option $175.

IDEAboard

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAboard is a memory expansion board that provides either 64K, 128K, 192K, or 256K RAM. Parity checking is also included. List price: 64K $239, 128K $309, 256K $449.

RAMcard

Microsoft Corp.
10700 Northrup Way
Bellevue, WA 98004
206/828-8080

RAMcard is a memory expansion board that provides up to 256K RAM and Microsoft's *RAMdrive* disk emulator software. RAMcard comes in 64K, 128K, 192K, or 256K configurations that can be expanded in 64K increments of separately sold RAM. List price: 64K $350, 128K $525, 256K $875.

SystemCard

Microsoft Corp.
10700 Northup Way
Bellevue, WA 98004
206/828-8080

SystemCard is a multifunction memory board that provides three I/O functions with either 64K or 256K RAM. The three functions include a serial port, a parallel port, and a clock/calendar with battery backup. SystemCard also provides a terminal emulator, a print spooler, and disk emulator software. List price: 64K $395, 256K $625.

Maximizer

Sigma Designs, Inc.
2990 Scott Blvd.
Santa Clara, CA 95050
408/496-0536

Maximizer is a multifunction memory board with a serial port, a parallel port, a clock/calendar with battery backup, and 64K RAM. The board comes with *Spool* print spooling software and *SoftDisk* disk emulator software. Options include additional RAM in 64K increments up to a maximum of 384K, an extra serial port, and a game adapter that supports four paddles or two joysticks. List price: 64K $395, each additional 64K $100.

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AMDEK 300 Amber	159	PRINCETON HX12	569
AMDEK Color II	469	ZENITH ZVM-121	100

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MegaPlus II Multifunction RAM Board

AST Research, Inc.
2372 Morse #104
Irvine, CA 92714
714/863-1333

The MegaPlus II Multifunction RAM Board offers a clock/calendar, two serial ports, one parallel port, a game adapter, a disk emulator, a print spooler, and 64K to 256K RAM. An optional upgrade kit, MegaPak, adds an extra 256K for a total of 512K. List price: 64K $359, 256K $569.

"MegaPlus II's documentation was good and clearly intended for novices. The board did not slip in easily and required much careful adjusting and pushing." Terry Lundgren, Logan, Utah

"My only complaint is that the MegaPlus II print spooler is slow. It seems to hand about two lines to the printer and then waits. The AST documentation is very good if you are familiar with PC-DOS commands and batch files, and the manual is complete and well organized." John H. Wheatley, San Diego, California

"MegaPlus II is a quality product with good documentation—an excellent addition to the PC." Juliana Shei, Marysville, Pennsylvania

I/O Plus II Board

AST Research, Inc.
2372 Morse #104
Irvine, CA 92714
714/863-1333

The I/O Plus II Board is a multifunction board that provides a clock/calendar with battery backup and a serial port. A deluxe version of the board with a parallel port and an extra serial port is also available. Both versions include print spooling software. List price: $165, deluxe version $265.

"The I/O Plus II Board is an easy way to add a clock and I/O ports if you don't need extra RAM. It comes with some well-designed utilities, although the disk emulator is of little value without extra memory." Richard Marlowe, Port Richey, Florida

"I/O Plus II is a workhorse of a multifunction board. Manufacturing details are well designed, the system adaptation software is excellent, and the instructions are clear and easy to follow." Hoa D. Tran, Houston, Texas

UltraPAK

Tseng Laboratories, Inc.
P.O. Box 566
Newton, PA 18940
215/968-0502

UltraPAK is a multifunction board that allows operations to be displayed simultaneously on separate color and monochrome monitors. UltraPAK features a parallel and a serial port, a clock/calendar with battery backup, and display of 132 columns and 44 rows for spreadsheets. Options include an IBM disk controller, a 384K memory with a disk emulator, and an additional serial or parallel port. Two piggyback color graphics boards are also sold separately. Ultracolor provides IBM-compatible color graphics with 640- by 200-pixel resolution, and Ultrachrome offers the same but with 640- by 400-pixel resolution. List price: UltraPak $750.

Super I/O

STB Systems, Inc.
601 N. Glenville
Richardson, TX 75081
214/234-8750

The Super I/O multifunction board adds a parallel port, a serial port, a game adapter, and a clock/calendar to the IBM PC or XT. Super I/O also includes a program that combines print spooling and disk emulation. The board does not provide additional RAM. It is small enough to fit in a short slot inside the PC XT. List price: $299.

AddRAM Plus and AddRAM Elite

Profit Systems, Inc.
P.O. Box 1039
Berkley, MI 48072
313/559-0444

AddRAM Plus and AddRAM Elite are multifunction boards that provide up to 512K of memory expansion, a clock/calendar, and two serial ports (AddRAM Plus) or a parallel and a serial port (AddRAM Elite). The boards include software that performs disk emulation and print spooling for a parallel or serial printer. List price: 64K $475, 256K $775, 512K $1175.

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FX80, 160 cps	$ 699	$ 549
FX100, 160 cps	$ 895	$ 739
MX100F/T, 80cps, w/Graftrax+	$ 995	$ 545
Apple II Graphics Dump	$ 15	$ 9
MANNESMANN 160L, 80 col. 160cps	$ 798	$ 568
TALLY, 180L,132col. 160cps	$1098	$ 778
Spirit, 80 col 80cps	$ 399	$ 299
NEC, PC-8023A, FT, 120cps, 80col, para	$ 599	$ 439
PC-8025, 120cps, 136 col, para	$ 895	$ 775
Cable, 8023/8025 to IBM-PC	$ 50	$ 40
OKIDATA, 82A, 80 col., 120 cps, para.	$ 349	Call
83A, 132 col., 120 cps, para.	$ 749	Call
92, 80 col., 160 cps, para.	$ 599	Call
93, 136 col., 160 cps, para.	$ 999	Call
2350P,Pacemark,350cps,para	$2695	Call
2410P,Pacemark, 350cps,para.	$2995	Call
ORANGE MICRO,Grappler+, for Apple	$ 165	$ 119
PRACTICAL, Microbuff In-Line 64K,Para.	$ 349	$ 259
Microbuff In-Line 64K,Ser.	$ 349	$ 259
QUADRAM, Quadjet, Jet Color Printer		Call
* STAR MIC., Gemini 10"X,120cps,2.3K	$ 499	$ 289
Gemini 15"X,120cps,2.3K	$ 549	$ 439

LETTER QUALITY:		
NEC, 15LQ, 14cps, Para,w/TF, 101col	$ 695	$ 525
35LQ, 31cps, Para,w/TF, 132col	$1335	$ 995
* TTX, 1014, 13cps, Para.&Ser., Pin&Fric.	$ 649	$ 459

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IBM-PC to Epson or Star Micro. Cable	$ 60	$ 35
Apple I/F & Cable for Epson or Gemini	$ 95	$ 59
Microfazer, w/copy, PP, 8K, #MP8 w/PS	$ 189	$ 129
Microfazer, w/copy, PP, 64K, #MP64 w/PS	$ 319	$ 219
Microfazer, w/copy, PP, 128K, w/PS	$ 465	$ 295
Microfazer, Snap-on, 8K, PP, Epson w/PS	$ 179	$ 145
Microfazer, Snap-on, 64K, PP, Epson w/PS	$ 319	$ 235

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* 12" Amber, #300A	$ 210	$ 149
* 12" Amber, #310A for IBM-PC	$ 230	$ 169
* 13" Color I, Composite	$ 379	$ 289
* 13" Color II, RGB, Hi Res	$ 529	$ 439
13", Color IV, RGB, 720Hx400V		Call
NEC, 12" Green, Model 1260MA	$ 150	$ 109
12" Green, Model 1201MA	$ 199	$ 149
12" Amber, Model 1205MA	$ 210	$ 159
12" Color,RGB,1216 FA(IBM&NEC-PC)	$ 599	$ 449
12" Color, Composite, 1215A(Apple)	$ 399	$ 299
* PRINCETON, RGB Hi Res, HX-12	$ 795	$ 499
* RGB Hi Res, SR-12	$ 799	Call
* Amber, MAX-12(Mono Brd.)	$ 249	Call
QUADRAM, Quadchrome 12" RGBColor	$ 695	$ 495
Quadscreen 17" 968x512	$1995	$1495
ZENITH, 12" Green, Mdl. ZVM123 NEW!	$ 200	$ 99
12" Amber, ZVM124 (IBM-PC)	$ 200	$ 115

MODEMS AND ACCESSORIES

	LIST PRICE	OUR PRICE
ANCHOR, Signalman MK I (RS232)	$ 99	$ 75
Signalman Mark XII	$ 399	$ 269
HAYES, IBM-PC Smartmodem 1200B	$ 599	$ 439
IBM-PC Smartcom II Software	$ 149	$ 109
IBM-PC to Modem Cable	$ 39	$ 29
NOVATION		
IBM-PC Access 1-2-3 Package	$ 595	$ 445

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	LIST PRICE	OUR PRICE
CDC, 100 ea SS/DD, 40T (Apple, IBM)	$ 550	$ 239
10 ea SS/DD, 40T (Apple, IBM)	$ 55	$ 26
100 ea DS/DD, 40T (IBM, H/P)	$ 750	$ 295
10 ea DS/DD, 40T (IBM, H/P)	$ 75	$ 35
DYSAN, 10 ea SS/SD (Apple, etc.)	$ 69	$ 39
10 ea DS/DD 48T(IBM,H/P,etc.)	$ 89	$ 49
MAXELL, 10 each, MD1, SS/DD	$ 55	$ 29
10 each, MD2, DS/DD	$ 75	$ 39
VERBATIM, 10 ea MD525-01, SS/DD	$ 49	$ 25
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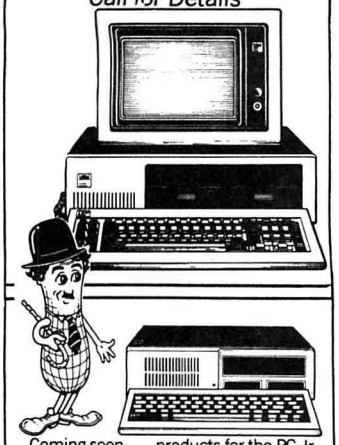

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	MegaPlus II, 64K, 2S/P/C	$ 495	$ 375
	MegaPlus II, 256K, 2S/P/C	$ 795	$ 595
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	SixPakPlus, 64K, S/P/C +S/W	$ 395	$ 295
	SixPakPlus, 256K,S/P/C +S/W	$ 695	$ 495
	SixPakPlus, 384K,S/P/C +S/W	$ 895	$ 595
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CCS	SuperVision, 132 col., mono. board	$ 799	$ 599
	Z Plus 64, fast Z80B, 64K para port	$ 875	$ 695
Chalkboard,	Power Pad, Req. Kit	$ 100	$ 73
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	Memory Card 256K	$ 499	$ 395
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	SystemCard 256K	$ 625	$ 469
	SystemCard 64K	$ 395	$ 295
	Mouse	$ 195	$ 145
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	Quadboard 64K, expand to 384K	$ 395	$ 279
	Quadboard 256K, expand to 384K	$ 675	$ 525
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	1st MATE, 256K	$ 589	$ 439
	Captain, 64K,S/P/C/Prog	$ 424	$ 324
	Captain,384K,S/P/C/Prog	$ 795	$ 595
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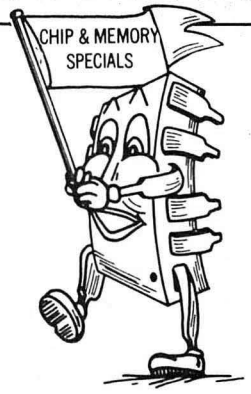

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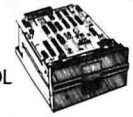

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BUSINESS

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ASHTON-TATE		
* dBase II, req. PC-DOS & 128K	$ 700	$ 385
dBase II User's Guide (Book)	$ 30	$ 20
Everyman's DB Primer (Book)	$ 15	$ 12
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Friday	$ 295	$ 199
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Market Manager	$ 300	$ 239
Market Microscope	$ 700	$ 525
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Tax Preparer, 1984 for 1983 year	$ 295	$ 220
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IUS, EasyWriter II System	$ 350	$ 259
EasySpeller II	$ 225	$ 149
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GL,AR,AP,OE or INV, each	$ 595	$ 395
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MICRO LAB, Tax Manager for 1983	$ 250	$ 169
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* WordStar Professional, 4 Pak	$ 695	$ 395
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InfoStar™	$ 495	$ 259
* **MICRORIM,** R:base, Series 4000	$ 495	$ 335
MICROSOFT, Multiplan	$ 250	$ 169
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BUSINESS

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XT-300	300 Watts
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PC-200	4 Milisec. (¼ Cycle)
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1114 Industry Dr.
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800/426-8936

RAM + is a memory board available without RAM or with 64K, 128K, 192K, or 256K RAM. The board includes a serial port and *Flash Disk* disk emulator software. RAM expansion kits can be ordered separately to expand the board in increments as needed.

RAM + also has parity checking with on-board light-emitting diodes that indicate the location of parity errors. List price: without RAM $220, 64K $295, 256K $535.

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Seattle Computer
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Seattle, WA 98188
800/426-8936

RAM + 3 is a multifunction memory board with a serial port, a parallel port, a clock/calendar with battery backup, and up to 256K RAM. RAM + 3 can be ordered without RAM or with RAM in 64K blocks up to 256K. The RAM + 3 memory provides parity checking with on-board light-emitting diodes that indicate the location of parity errors. RAM + 3 also comes with disk emulator and print spooling software. List price: without RAM $320, 64K $395, 256K $625.

64-512K RAM Card

ZenTek Corp.
455 Whitepine Dr.
Salt Lake City, UT 84107
801/263-3925

64-512K RAM Card is a memory expansion board that adds from 64K to 512K RAM to an IBM PC. The 64-512K RAM Card has two output ports that can be configured as either two serial ports or one serial port and one parallel port. *Z-Drive* disk emulator software and *Z-Spool* print spooling software are included with RAM configurations of 192K or higher. The 64-512K RAM Card is also available without RAM; additional memory can be added in 64K blocks as needed. List price: without RAM $155, each additional 64K $48.

PC Master

Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
714/953-0523

PC Master is a multifunction board that adds two serial ports, one parallel port, and a game adapter to the IBM PC. The board also provides a hard disk controller and a clock/calendar with battery backup. A separately priced software package adds a print spooler, a disk emulator, clock/calendar support, and a Votrax speech synthesizer. List price: $359, software package $29.

MagicCard

Everex Systems, Inc.
891 Maude Ave.
Mountain View, CA 94043
415/967-1495

MagicCard is a multifunction memory board that adds up to 384K RAM in 64K increments to the IBM PC. MagicCard also provides a serial port, a parallel port, a game adapter, and a clock/calendar with battery backup. Accompanying software includes disk emulation, print spooling, clock management, a spreadsheet, and word processing. List price: without RAM $275, additional RAM $95 per 64K.

SemiDisk

SemiDisk Systems
P.O. Box GG
Beaverton, OR 97075
503/642-3100

SemiDisk is a 512K RAM board designed to emulate a small-capacity hard disk drive. The SemiDisk disk emulator lets you access RAM-intensive programs 5 to 30 times faster than a floppy disk drive and 2 to 5 times faster than a hard disk drive. A battery backup option protects data if power is interrupted or switched off. *SemiSpool* software lets you allocate a portion of SemiDisk as a print buffer, and a software driver is provided. The board comes with either 512K or 1 megabyte (M) RAM. List price: 512K $1495, 1M $2350.

Electronic Disk

Dilog PC Products
Distributed Logic Corporation
12800 Garden Grove Blvd.
Garden Grove, CA 92643
714/534-8950

The Electronic Disk is a disk emulation board that does not use up program memory because it has its own Z-80A processor. The board has 368K, operates faster than a floppy disk, and does not require special software or modification of the operating system. It can be powered from the PC or from an external power supply that prevents data loss. A serial port is optional. List price: $1295, serial port $100.

ISM 4A2 and 8A2

Intermedia Systems
10601 S. De Anza Blvd.
Cupertino, CA 95014
408/996-0900

ISM 4A2 is a memory expansion board that adds 256K RAM and two serial ports to the IBM PC. ISM 8A2 combines ISM 4A2 with a 256K piggyback RAM board to provide 512K additional RAM. List price: ISM 4A2 $539, ISM 8A2 $889.

64K RAM Card

Image Technology, Inc.
5994 S. St. Paul Way
Littleton, CO 80121
303/794-2074

The 64K RAM Card is a memory expansion board that provides 64K additional RAM or 256K with a 256K RAM chip. A mounting bracket is sold separately. List price: 64K (without bracket) $79.95, bracket $20.

Cygnus

Titan Technologies, Inc.
P.O. Box 8050
Ann Arbor, MI 48107
313/662-8542

Cygnus is a multifunction board that fits in a short slot on the IBM PC XT. Cygnus comes with a clock/calendar, a game adapter, and either a serial or a parallel port. A removable lithium battery backs up the clock. List price: parallel $199, serial $299.

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Circle 15 on reader service card

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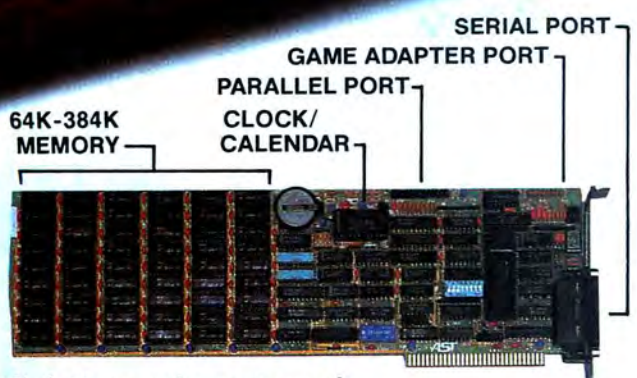

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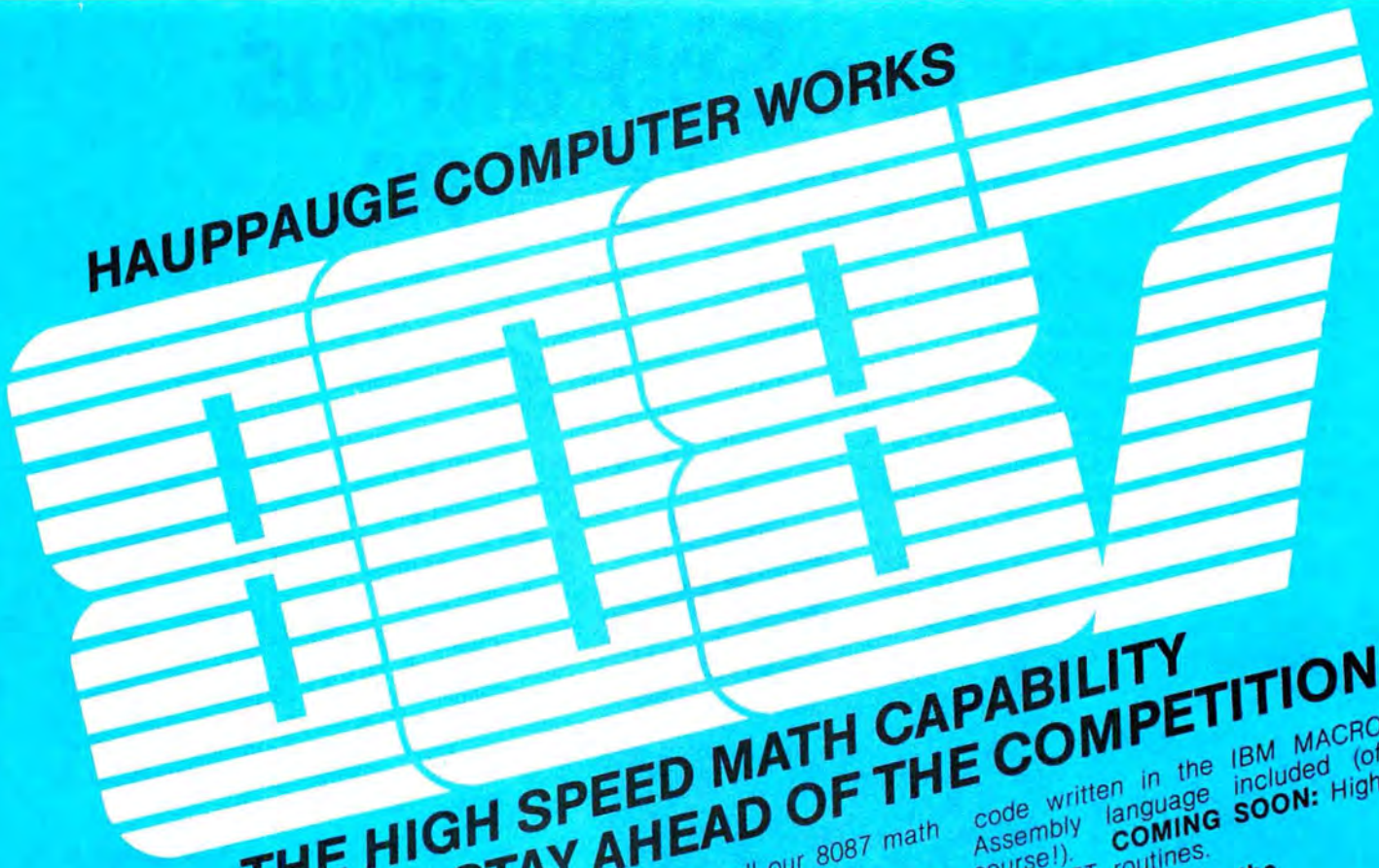

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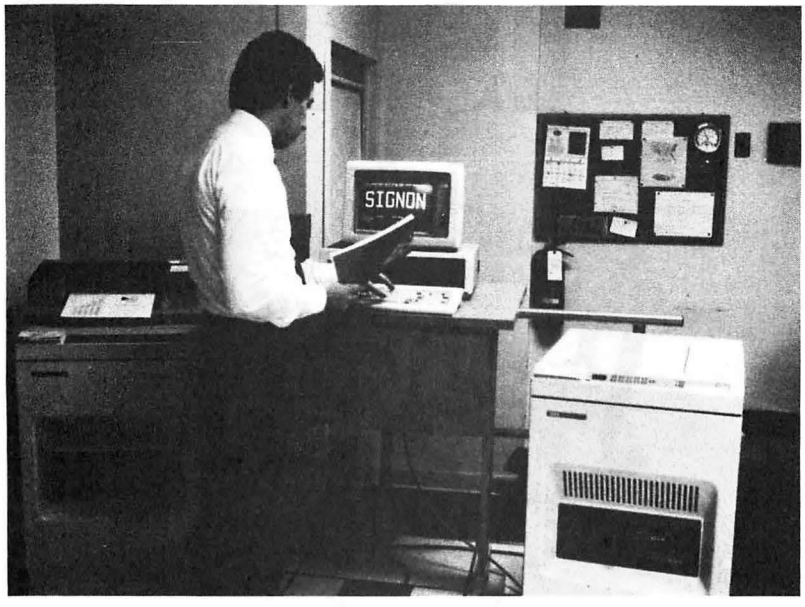

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She called herself Joan Crawford. Because a star needs a star's name. One that commands attention. And gets it.

MultiMate International is that kind of a name. Replacing Softword Systems. A good name too, but one that no longer suits the company we've become.

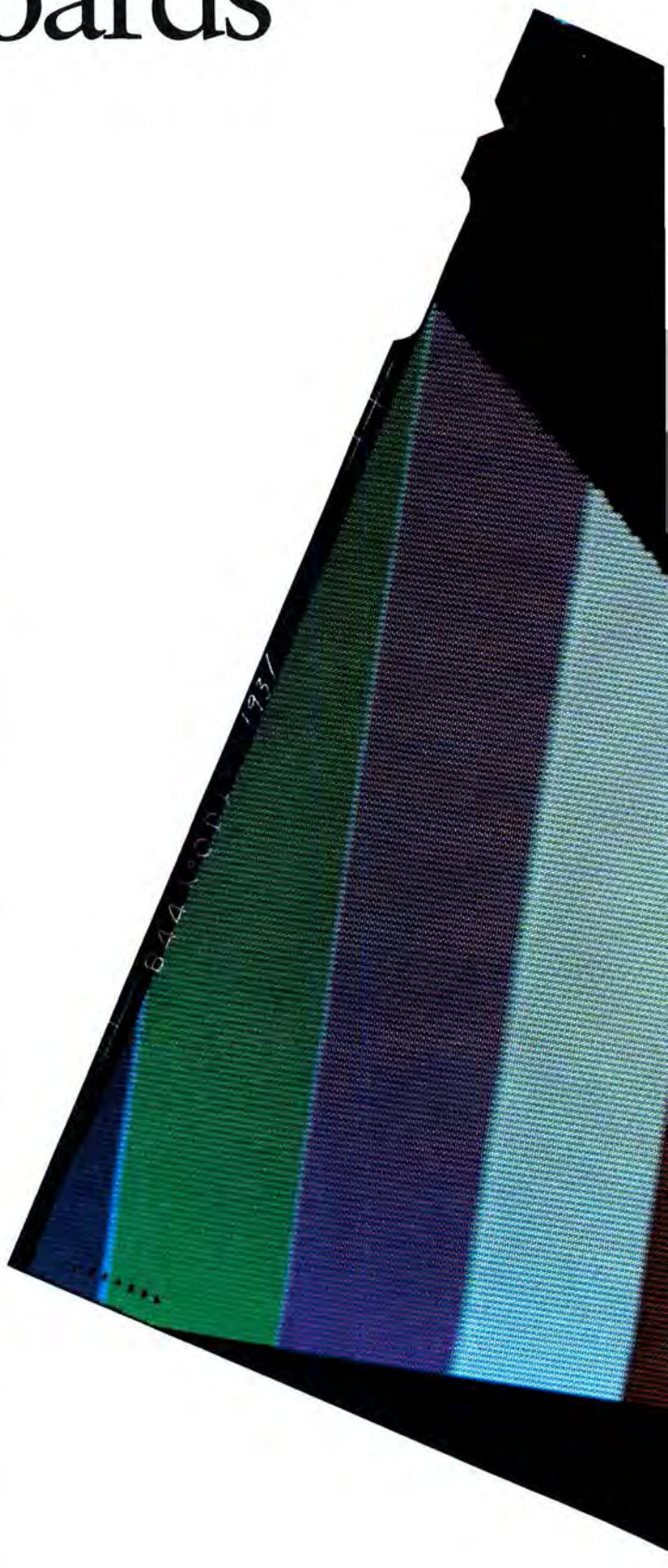
Today, MultiMate International spans four continents. MultiMate, the word processor that redefined the IBM PC, has been translated into five languages. Its similarity to Wang has resulted in phenomenal growth, both in acceptance and sophistication, and fueled our own phenomenal growth as a company.

MultiMate International. It's the name we deserve. Because it's the name we've earned.

MULTIMATE INTERNATIONAL

We've made a name for ourselves.

Graphics Boards



Kevin Jenkins

About the time that graphics boards and monitors from manufacturers other than IBM became available for the IBM PC, graphics software for personal computers was growing in sophistication. Only a couple of years ago, the software was limited to games and the representation of spreadsheet data in the form of pie charts and bar graphs. In recent months graphics software has come a long way, with the release of a number of computer-aided design (CAD) engineering programs and spreadsheet programs that use windows. Many of these sophisticated programs profit from today's high-resolution, multicolor graphics boards.

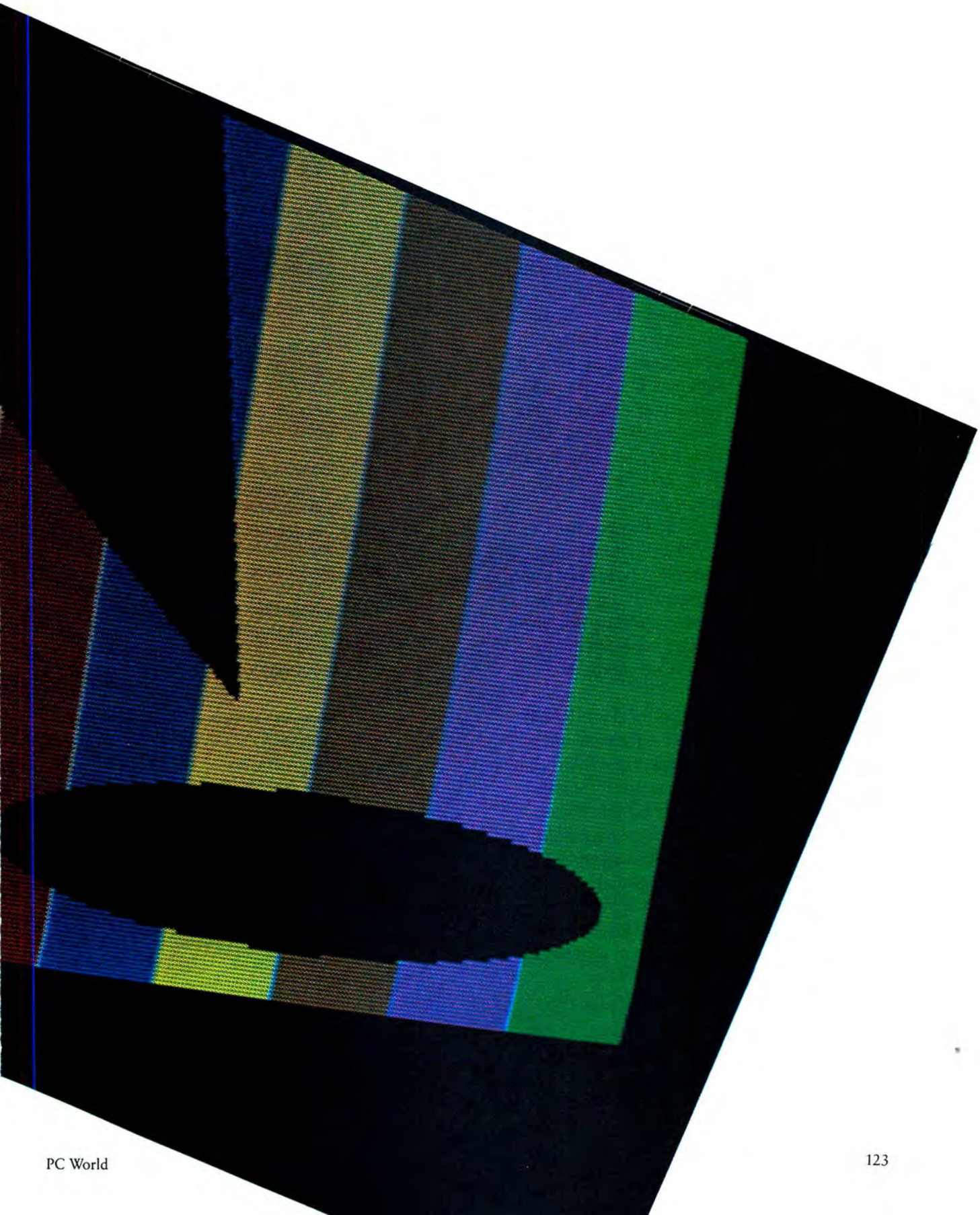
Graphics boards for the PC have so many combinations of features that categorizing them is an almost impossible task. Many share the same features; most boards operate either in text mode, displaying letters, numbers, and symbols, or in graphics mode, displaying screen images as does the IBM color graphics board.

Following are some of the characteristics of graphics boards for the PC:

IBM monochrome graphics. IBM's Monochrome Display Adapter offers high-quality text but no graphics for the monochrome display. Graphics boards designed by other manufacturers for this display usually offer text and graphics resolution of 720 by 350 pixels.

IBM color graphics. IBM's Color/Graphics Adapter displays 4 out of 16 colors in 320- by 200-pixel medium resolution. Many color graphics boards from other manufacturers are compatible with PC graphics software.

Enhanced color graphics. Many color graphics boards from non-IBM manufacturers offer more colors and finer resolution than does IBM's board (from



640 by 200 pixels to 1024 by 1024 pixels). Prices for these boards range from $500 to $3000.

Connector for a parallel printer. Some graphics boards have a parallel port. Remember that the IBM monochrome board has a parallel port, so if you plan to use another graphics board, you will need one with a parallel port.

Before you rush off to buy a high-resolution graphics board with any of these features, consider the problems involved. Because of the enhanced features of some graphics boards, you may not be able to run IBM graphics programs without modifications. Your first consideration should be whether the board runs the graphics software you intend to use. Find out which graphics software is compatible with the board; then ask the software developer whether the compatible software is available. If possible, try to see the graphics software run with the graphics board you want.

You can avoid the problem of graphics software that is incompatible with high-resolution graphics boards if you plan to do your own programming, but you should ask some questions first. Does the graphics board include graphics software with all the utilities you require? Do any other software developers offer utilities? Does the software run with the compilers and languages you plan to use? Is the board easy to program? Is the documentation adequate?

Monitor incompatibility is another potential trouble spot. Make sure that you know which monitors are compatible with the graphics board you want. Since the IBM monochrome monitor has special requirements and the IBM color monitor may not have a high enough resolution, the board you want may require a more expensive monitor from another manufacturer.

The amount of random access memory (RAM) that a graphics board has determines the resolution and the number of colors it provides. Since RAM chips continue to decline in price, future graphics boards will offer higher resolution and more color choices. Until a universal graphics interface is established to make software compatible with different graphics boards, however, the number of programs that can take advantage of the high-performance boards will be limited. Make sure that the software you need is compatible with the graphics board you want by insisting on a demonstration before you purchase.

Kevin Jenkins is president of Hercules Computer Technology.

Graphics boards enable the IBM PC to display graphics and text on color or monochrome monitors. Images on a video screen are formed by linking thousands of tiny colored dots, or pixels, into patterns that form letters or pictures. Graphics resolution is measured in terms of these pixels. The more pixels per line, the sharper and crisper the image.

Standard PC color graphics resolution is 320 by 200 pixels, or 64,000 pixels, with four colors. 16K RAM (16 kilobytes of random access memory) is needed to produce this resolution and four colors; for higher resolution or more colors, a board must have more RAM. Some boards described in this section use RAM segmented into 16K blocks called memory planes. One memory plane generates the equivalent of standard PC color graphics resolution; combining two or more planes results in higher resolution or more colors. Boards that have 16K RAM don't offer as high a resolution as boards with 256K, but they may still be suitable for your needs.

If you want to design your own graphics for business or artistic reasons, look for boards that let you fill in enclosed areas and draw lines, circles, arcs, and rectangles. These boards also enable you to make use of video effects such as scrolling, panning, and inverse video (the interchanging of background and foreground colors), or call attention to specific details through zooming, blinking, and highlighting.

RAM boards, modems, and hard disk drives are useful add-ons for your computer, but a color graphics board and monitor add visual excitement as well as practicality to the PC.

Artist

Control Systems
2855 Anthony Ln.
Minneapolis, MN 55418
612/789-2421

Artist is a graphics display controller board for use in business graphics, graphic art, Tektronics 40xx emulation, or mechanical and electrical design. Artist has an onboard 16-bit NEC 7220 graphics processor chip that handles graphics primitives, video

refresh, memory refresh, direct memory access, and read-write I/O without tying up the IBM PC's processor.

Artist is available in two models. Artist I has four 1024- by 1024-pixel memory planes controlled by a color lookup table, which provides 16 colors from a palette of 4096 colors or a separate display of each memory plane. Artist II has four 512- by 512-pixel memory planes, and the color lookup table is sold separately. List price: Artist I $2495, Artist II $1395.

MultiDisplay Card

Paradise Systems, Inc.
150 N. Hill Dr.
Brisbane, CA 94005
415/468-6000

The MultiDisplay Card combines the functions of IBM's monochrome display and color graphics boards. The MultiDisplay Card controls an IBM monochrome monitor or a similar device; a composite color monitor, an RGB color monitor, a black-and-white monitor, or a television set with an RF modulator; a light pen; and a parallel printer. Color graphics resolution is 320 by 200 pixels with four colors; black-and-white resolution is 640 by 200 pixels. List price: $595.

MAI Multiple Interface Board

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

The MAI video graphics board provides standard monochrome or color graphics, 64K RAM, a light pen interface, and a parallel port. The board also comes with print spooling software and *Halo* graphics software. Color graphics resolution modes are 320 by 200 pixels with 16 colors or 640 by 200 pixels with 4 colors. These modes are supported by 58 *Halo* graphics primitives that provide users with point, line, arc, circle, and ellipse functions, along with such capabilities as line drawing, clipping, crosshatching, text display, filling, and pie sectioning. List price: $599.

"When the board is used with a Quadchrome monitor, the screen image must be adjusted to the right, and horizontal skewing requires further monitor adjustment. MAI's expansion memory is incompatible with my 256K motherboard." Charles Whitley, Jackson, Mississippi

Graphix Plus

STB Systems, Inc.
601 N. Glenville Ave. #125
Richardson, TX 75081
214/234-8750

Graphix Plus is a color graphics board capable of driving an RGB color monitor or a composite monochrome monitor. Graphix Plus uses the same colors, resolution, and modes as IBM's color graphics board but provides 50 percent faster scrolling. Graphix Plus handles color or monochrome graphics and text displays and includes a parallel port and a light pen interface. Graphix Plus also comes with *PC Accelerator* software, which combines a disk emulator that emulates two drives with a print spooler. A battery-backed clock/calendar is a separately priced option. List price: $495.

PC640

Scion Corp.
12310 Pinecrest Rd.
Reston, VA 22091
703/476-6100

PC640 is a color graphics board that enables you to display 16 colors or shades of gray with a resolution of 640 by 480 pixels on a color or monochrome monitor. The board contains 256K RAM; 151K is used by the display and color palette, and 105K is available for general use. Included with PC640 is *Halo 1.0* software, which lets you flood regions with colors and patterns and create lines, arcs, circles, ellipses, boxes, and text in various fonts and at any angle.

PC640 comes in two versions. PC640-1 includes the board, *Halo 1.0* software, and a video cable to connect the IBM PC. PC640-2 provides the same features as well as *Cheetah* software, a menu-driven program that helps you use the board. Both boards can be ordered with the program stored in ROM written in BASIC, FORTRAN, Pascal, C, or assembly language. List price: PC640-1 $1595, PC640-2 $2495.

"The resolution is extremely good and the graphics appear very quickly. For software to go with the board, I recommend Halo *over* Cheetah." Amy F. Goebel, Alexandria, Virginia

VectorScan 512

Applied Data Systems
9811 Mallard Dr. #213
Laurel, MD 20708
301/953-9326

VectorScan 512 is an external color or monochrome graphics controller system that connects with an IBM PC through a serial port. The system provides high-resolution graphics of 512 by 480 pixels in 16 colors or shades of gray. It has an internal character generator for creating vertical and horizontal axes. VectorScan 512 has a parallel port and 128K RAM that can be used as a print spooler. List price: $975.

Matrigraph

Matrivision, Inc.
26 Beacon St.
P.O. Box 377
Burlington, MA 01803
617/272-7203

Matrigraph is a color graphics board controlled by an NEC 7220 processor that handles all display control and refresh functions. The 7220 chip enables you to draw lines, arcs, rectangles, and characters and fill rectangular areas. The chip also allows zooming, panning, and scrolling. Matrigraph provides high-resolution color and monochrome graphics in 16 colors or shades. Color graphics resolution is 640 by 400 pixels. The board comes with a game adapter, a light pen interface, a serial port for graphics tablet and plotter support, and demonstration software. List price: $1395.

Graphics Dazzler

Sigma Designs, Inc.
2990 Scott Blvd.
Santa Clara, CA 95050
408/496-0536

Graphics Dazzler is a high-resolution color graphics board. Graphics display software combines with Dazzler's NEC 7220 processor to perform line drawing, arc drawing, area fill-in, and 1 to 16 zooming and panning. Noninterlaced resolution is 640 by 200 pixels; in interlaced mode, resolution is increased to 640 by 400 pixels. Graphics Dazzler has 256K of display memory that provides four colors. An op-

tional Graphics Enhancer piggyback RAM board boosts memory to 512K for 16 colors and a 1024- by 1024-pixel display area. A light pen interface is also included with the board. List price: Dazzler $895, Enhancer $695.

Color/Graphics Adapter Board

Eagle Computer, Inc.
983 University Ave.
Los Gatos, CA 95030
408/395-5005

The Color/Graphics Adapter Board operates in either color or monochrome mode. The board offers medium resolution of 320 by 200 pixels, up to 16 foreground and 8 background colors, and character blinking in color mode. High-resolution 640- by 200-pixel graphics may be displayed in monochrome mode. Inverse video, blinking, and highlighting features are also available in monochrome mode. The Color/Graphics Adapter Board provides three video ports: a composite video port, an RGB port, and a port for driving an RF modulator. List price: $295.

Graphics Master

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Graphics Master displays text and graphics on the IBM monochrome monitor or on any standard NTSC or RGB monitor. The board can replace or work in conjunction with either of the two IBM PC video boards. Color graphics resolution is 640 by 400 pixels with 16 colors; monochrome resolution is 720 by 700 pixels. Graphics Master also comes with a light pen interface and software. List price: $695.

"Graphics Master has excellent flexibility and an unequaled variety of operating modes, but it uses an annoying number of jumpers. Switch banks would be easier to change and check for the accuracy of the settings." A. G. Robison, Exton, Pennsylvania

IDEAgraph

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAgraph is a color graphics board that features automatic line, circle, vector, and space-filling functions. The board is available in 28 MHz or 40 MHz versions with either 128K or 256K RAM and is programmable up to 1024 by 1024 pixels. IDEAgraph can highlight specific areas of the display and has a software-controlled blink feature that causes display blinking on a pixel-by-pixel basis. With 256K memory programmable to eight planes, you can select 256 colors from a palette of 4096 colors. List price: 28 MHz with 128K $895, 40 MHz with 256K $1895.

Monochrome Board

Persyst Products
15801 Rockfield Blvd., Ste. A
Irvine, CA 92714
714/859-8871

The Persyst Monochrome Board is an IBM PC-compatible monochrome display board. The board supports high RGB direct-drive output, an 18.432 kHz horizontal rate, a display area of 80 characters by 25 rows, and blinking, blanked, and inverse video character attributes. Other features include support for the IBM monochrome and AMDEX model 310 monitors, 16K of video memory for alphanumeric and graphics information, 7 by 9 dot characters in 9 by 14 dot fields, and 256 display characters. The board comes with a parallel port. List price: $295.

Discortex

Discortex Corp.
87 Bethpage Rd.
Hicksville, NY 11801
516/935-5538

Discortex is a half-size board that uses a color transformer to change a 16-color set generated by a graphics board into a different set of colors. The color transformer generates different intensities of red, green, and blue and blends the hues to produce altered combinations. The board comes with a short cable that connects to a color graphics board; monitor cable must be ordered separately. Discortex also includes a utility and demonstration disk that aids in setting up color palettes and provides color palette storage and retrieval. List price: $295.

Video Van Gogh

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Video Van Gogh is a digitizing board that converts data sent by a standard television camera into 8-bit pixels in a display area of 255 by 255 pixels. The IBM PC can then store the image in RAM. Conversion for a single pixel takes 15 microseconds; a complete picture can be digitized in 6 seconds. Separately priced Video Van Gogh software allows users to digitize, manipulate, and store images on disk using BASIC or FORTRAN commands. The software displays inverse images, enables images to be averaged and subtracted from one another, and digitizes and displays specific points. Video Van Gogh digitizes information from microscopes and telescopes, and it aids in signature recognition, robotics, and assembly line inspection. List price: $345, software $95.

The Ace

Everex Systems, Inc.
891 Maude Ave.
Mountain View, CA 94043
415/967-1495

The Ace is a color graphics board that uses the NEC 7220 graphics display controller chip for high-resolution color graphics. The Ace has 256K RAM that provides a 720- by 720-pixel displayable window of 16 colors. Memory can be upgraded to 512K for a 1024- by 1024-pixel window or to 1 megabyte for a window of 1440 by 1440 pixels. The Ace performs vector, arc, rectangle, and graphics character drawing in 1.2 or 2.4 microseconds per pixel. It pans or zooms up to 16 times, scrolls, and operates in interlaced or noninterlaced mode. List price: $995.

Evercolor

Everex Systems, Inc.
891 Maude Ave.
Mountain View, CA 94043
415/967-1495

Evercolor is a color graphics board that features 640- by 200-pixel color graphics resolution, a light pen interface, and 32K of *display* memory. The board is compatible with the IBM color graphics board and provides an 80-column by 25-row alphanumeric display. Evercolor can be upgraded to allow a 132-column by 44-row alphanumeric display and to run both a color and a monochrome monitor simultaneously. A parallel port is also available. List price: $260.

MasterGraphics 1 Adapter

MicroGraphics Technology
1820 McCarthy Blvd.
Milpitas, CA 95035
408/996-8423 ext. 421

The MasterGraphics 1 Adapter is a graphics board that combines the functions of the IBM monochrome board with those of a parallel port and the IBM color graphics board. The board increases the number of active colors from 4 to 16 and increases the display storage provided by IBM from 16K to 64K. MasterGraphics 1 offers higher resolution than standard boards: 640 by 200 pixels in 16 colors and 768 by 340 pixels in monochrome. MasterGraphics 1 supports an IBM PC-compatible light pen interface and includes drivers for Interpreted and Compiled BASIC, FORTRAN, and Pascal. List price: $579.

Chairman

Mylex Corp.
5217 N.W. 79th Ave.
Miami, FL 33166
305/592-9669

The Chairman graphics board incorporates the functions of the IBM monochrome and color graphics boards and also provides monochrome graphics in shades of green. The board has 32K RAM; 2K is for customized character sets. The Chairman board provides 320- by 200-pixel resolution for 16 colors, 640- by 200-pixel resolution for 4 colors, and 640- by 400-pixel resolution for green and black. List price: $595.

PC Peacock

MA Systems, Inc.
2015 O'Toole Ave.
San Jose, CA 95131
408/943-0596

PC Peacock is a color graphics board that works with color and composite monochrome monitors. The board allows multicolor operation with a medium resolution of 320 by 200 pixels, and it operates in monochrome mode with a high resolution of 640 by 200 pixels. In medium-resolution mode the board displays 4 colors simultaneously in the foreground with one of 16 colors in the background and one of 16 colors as a border. In high-resolution mode PC Peacock displays one of 16 colors in the foreground with a black background.

The board is compatible with all IBM PC software, and it has a parallel port. Connections for RGB, composite monochrome, and television displays are included. A picture selection feature allows a choice of single-dot character sets for high-resolution displays or double-dot character sets in lower resolution. List price: $399.

Graphics Card

Hercules Computer Technology
2550 Ninth St.
Berkeley, CA 94710
415/450-6000

The Hercules Graphics Card replaces the IBM Monochrome Display and Printer Adapter and enables you to create bit-mapped graphics on the IBM monochrome monitor without lowering the quality of the monitor's text characters. Graphics resolution is 720 pixels horizontally by 348 pixels vertically. The board allows *1-2-3* to produce high-resolution graphics on a monochrome display. You can run text mode software like *WordStar, VisiCalc,* and *dBASE II* without modifications. List price: $499.

"My Hercules Graphics Card makes 1-2-3 *very powerful."* Michael D. Glascock, Columbia, Missouri

SuperVision

California Computer Systems
250 Caribbean Dr.
Sunnyvale, CA 94089
408/734-5811

SuperVision is a monochrome video interface board that enables the standard IBM monochrome monitor to display 132 columns by 44 rows. SuperVision also includes a parallel port and a full-screen text editor that operates in either 80- or 132-column modes. A dot-addressable graphics capability is also available with graphics resolution of 720 by 348 pixels. List price: $799, with graphics capability $995.

Innovation Product No. 1007

Innovation Co.
16529 Lakeshore Rd.
Cleveland, WI 53015
414/693-8062

Innovation Product (IP) No. 1007 is a color graphics board that emulates all the functions of the IBM color graphics board. The IP No. 1007 board provides a 40- or 80-column by 25-line display. Color graphics resolution is 320 by 200 pixels. The board supports graphics on monochrome monitors, with the exception of the IBM monochrome monitor, and has RGB and composite video output. The board provides a parallel port and a socketed character ROM that accepts alternate character fonts, enabling users to select either a single- or a double-dot font. IP No. 1007 also has 16K RAM that can be expanded to 64K. List price: $300.

Business Graphics Board

Frontier Technologies Corporation
P.O. Box 11238
Milwaukee, WI 53211
414/964-8689

The Business Graphics Board shares many features with the Intelligent High Resolution Graphics Board, but it is tailored to meet business graphics needs. The board uses the NEC 7220 graphics controller to provide 640- by 480-pixel, 512- by 512-pixel, or 1024- by 512-pixel resolution. List price: $695.

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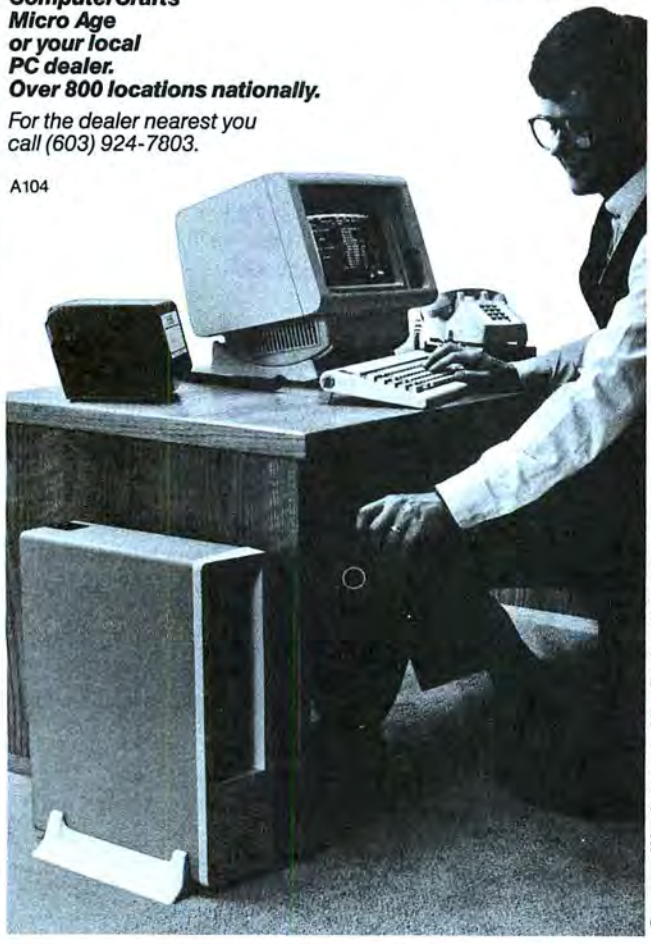

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reduce footprint

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Graphics Edge

Everex Systems, Inc.
891 Maude Ave.
Mountain View, CA 94043
415/967-1495

Graphics Edge is a color graphics board with a parallel port and a light pen interface. The board supports a color monitor and a monochrome monitor simultaneously. Graphics Edge runs IBM PC color graphics software and is compatible with *ColorPlus* and *Hercules* software. It offers 640- by 200-pixel color graphics resolution with 16 colors. Monochrome resolution is 720 by 348 pixels in 16 shades of green with composite monitors. Graphics Edge switches from an 80-column by 25-row display to a 132-column by 44-row display for spreadsheet applications. The board works with *1-2-3* and has three programmable character fonts. List price: $499.

RAMROM

Automatic Micro Systems, Inc.
1089 25th Ave. SE
Minneapolis, MN 55414
612/379-1354

RAMROM is a character generating RAM board that allows full software control of the IBM PC screen character set. The board fits into any slot in a PC or XT next to a color graphics board. A cable from the RAMROM board plugs into the ROM socket in the color graphics board. Any character set can be loaded into RAM from disk with a BASIC program called from a batch file. Users can switch between RAM and ROM character sets and write programs to change any character or dot as needed. Separately priced options include a mouse port, an optical mouse, and a light pen. List price: $99, with mouse port $149, optical mouse $199, light pen $99.

Intelligent High Resolution Graphics Board

Frontier Technologies Corporation
P.O. Box 11238
Milwaukee, WI 53211
414/964-8689

The Intelligent High Resolution Graphics Board features a dedicated Intel 8088 processor and an NEC 7220 graphics controller that provides more color and greater resolution than is possible with the IBM color graphics board. The 8088 and 7220

processors enable users to draw circles, rectangles, and specially designed characters and to zoom, pan, scroll, and fill in defined areas. Graphics resolution is 1024 by 1024 pixels with two memory planes that provide four colors. One or two additional memory planes are optional, as is a lookup table that displays up to 16 colors simultaneously from a palette of 4096 shades. The board also includes a light pen interface. List price: $995, third plane option $395, fourth plane option $295, lookup table $295.

Multigraph

Profit Systems, Inc.
P.O. Box 1039
Berkley, MI 48072
313/559-0444

Multigraph is a color graphics board that uses a 32-bit processor with 32K RAM for color and monochrome graphics control. Multigraph offers monochrome resolution of 720 by 350 pixels. The board provides scrolling and runs IBM color graphics software with a monochrome monitor. Separately sold options include a parallel port, *Soft Scroll* scrolling, 620-pixel by 200- or 400-pixel color graphics resolution with 16 colors, a 132-column monochrome display, and 720- by 700-pixel monochrome resolution. List price: $499.

Colorplus

PC + Products
Plantronics Enhanced Graphics Products
1751 McCarthy Blvd.
Milpitas, CA 95035
800/638-6211, 408/945-8711

Colorplus is a color graphics board with a parallel port. It works with both RGB and composite video monitors and is compatible with all IBM PC software. Colorplus provides up to 16 colors with 320- by 200-pixel resolution and 4 colors with 640- by 200-pixel resolution. Colorplus comes with a parallel port, a light pen interface, a composite video/RF interface, an RGB interface, and *Draftsman* software. List price: $395.

Number Nine REVOLUTION Graphics Board

Number Nine Computer Corporation
619 Concord Ave.
Cambridge, MA 02138
617/492-0999

The Number Nine REVOLUTION Graphics Board is a graphics board based on the Intel 82720 VLSI graphics display controller. The board enables a program to draw arcs, circles, vectors, rectangles, and graphics characters using set, complement, replace, clear, and mask-memory operations. You can zoom the display while independently scrolling and panning partitioned screen areas.

All video raster parameter, pixel rate, color palette, and color plane selections are controlled by software. High-level language commands are included for absolute, relative, and cursor-relative addressing, and they operate with BASIC, Pascal, FORTRAN, C, and machine language interpreters. Applications software includes image processing, presentation graphics, *CAD/M*, mapping, animation, and terminal emulation packages.

Number Nine also doubles as a memory expansion board and an interface to digitizing pads, light pens, mice, joysticks, camera digitizers, dot matrix printers, pen plotters, and video recorders. List price: $945.

Colormax

Micromax
6868 Nancy Ridge Dr.
San Diego, CA 92121
619/457-3131

Colormax is an expansion board that provides monochrome graphics support and lets users alternate between monochrome and color monitors without having to disconnect and reconnect them. Colormax has a connector for each of the monitors, a light pen adapter, and an RCA jack for composite monitors. The board permits customization of character sets and is compatible with IBM monochrome and color graphics boards. A parallel port is a separately priced option. List price: $499.95, with parallel port $559.95.

Quadcolor I and II

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

Quadcolor I and II are color graphics boards with a variety of capabilities. Quadcolor I provides 128 colors, access to display memory without interference on the screen, and 32K graphics storage. In text mode, Quadcolor I allows 16 active and visual pages in 40-column format and 8 in 80-column format. In graphics mode, Quadcolor I lets you work on 2 pages; you can keep 1 page in memory, display the other, and swap them back and forth with a single command. This feature allows you to create animated displays. Quadcolor II is a 64K piggyback board that provides bit-mapped graphics and a game adapter. List price: Quadcolor I $295, Quadcolor II $275.

PCVISION Frame Grabber

Imaging Technology Inc.
600 W. Cummings Park
Woburn, MA 01801
617/938-8444

PCVISION Frame Grabber is an analog-to-digital converter that translates a video camera's RS-170 signal to digital data in real time. The board allows you to view the video image on the IBM PC screen and to map the data directly to memory in 64K segments. You can change pixel intensity and overlay text or graphics on the image without disturbing stored video data. PCVISION Frame Grabber simultaneously acquires and displays 6-bit pixel data (in 64 gray scale intensities) at 30 frames per second and stores it in a 512- by 512-frame memory 8 bits deep. The board comes with software. List price: $2995. Requirements: 64K.

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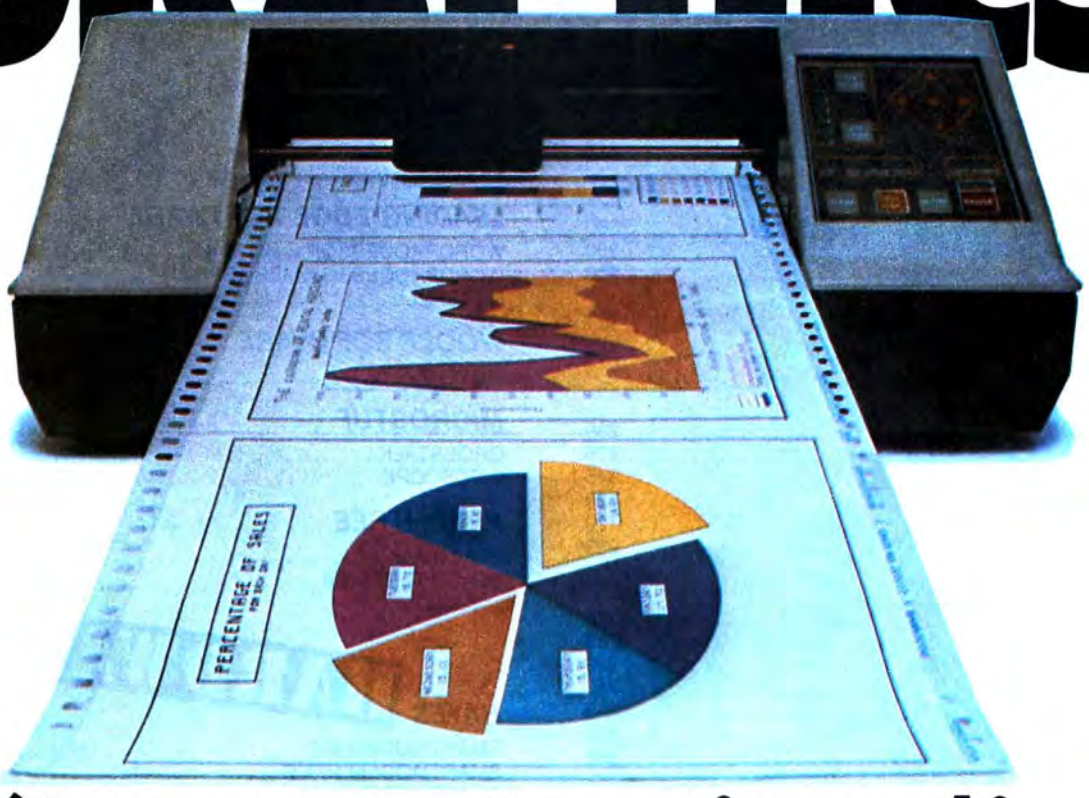

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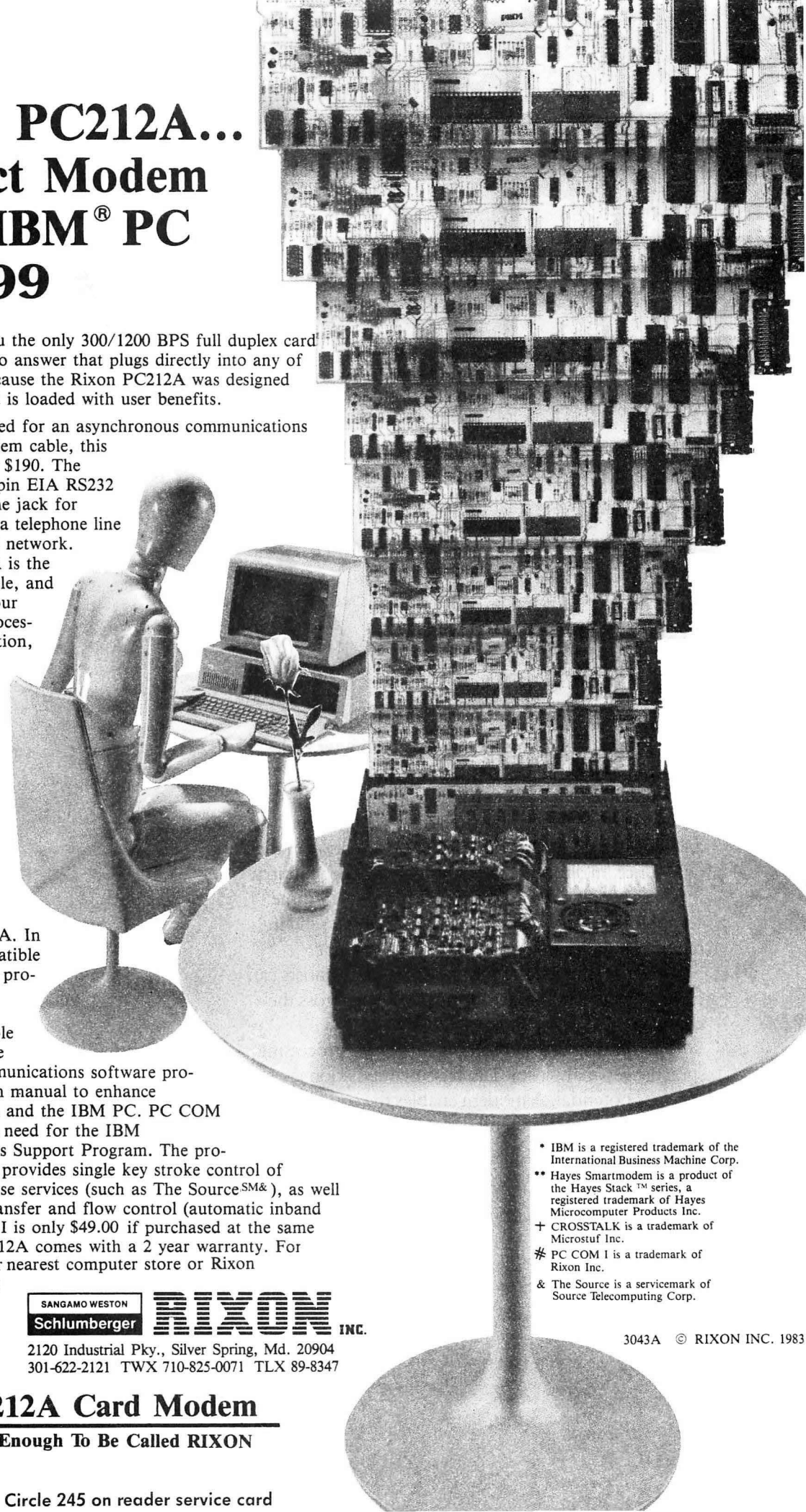

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The Rixon PC212A Card Modem

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Modems

Dennis Hayes

A modem can be thought of as your computer's telephone. A modem is a device that allows a computer to send and receive messages to and from other computers over ordinary telephone lines. With a modem, you and your computer can hook up to information in the next office, in another city, or even in another country. Business people can call their company's mainframe computer to query data files, salespeople can send in reports from field locations and receive instant printouts of shipped orders, and research scientists can tap technical information from colleagues across the country.

To limit a personal computer to word processing, spreadsheet analysis, or data base manipulation ignores its potential. A modem enables the computer to exchange information with distant computers, gather data stored elsewhere, use computing power available only on large mainframe computers, and send and receive electronic mail.

With a modem, personal computer owners can log on to a large computer to read the latest stock market information, secure vital medical or legal information, perform bibliographic research, or receive current weather reports. Using a modem, people can also bank or shop, check airline schedules and fares, plan travel itineraries, read electronic bulletin boards, or receive state, national, or international news.

A modem makes this information exchange possible by converting a computer's digital signals into analog, or audio, signals that are transmitted over ordinary telephone lines. Another modem connected to the computer at the other end of such transmissions con-

PC World

verts the analog signals back into digital ones. This capacity to modulate and demodulate audio tones gives the modem its name.

To use the United States telephone system, modems must have Federal Communications Commission (FCC) approval. When the telephone company initiated the use of voice-grade modems, it also established standards that most of the industry's manufacturers support. The Bell standards apply to the audio tones that modems use to place and answer calls. The Bell 103 standard covers data transmission rates of 0 to 300 bits per second (bps), while the Bell 212A standard applies to transmission rates up to 1200 bps.

Modems come in a variety of forms. A modem can be a printed circuit board that fits directly into one of the IBM PC's expansion slots, or it can be a separate, free-standing unit that connects to your PC through a serial port.

Each type of modem has its advantages. A modem board installed inside a computer saves desktop space and usually eliminates the need for a serial port and connecting cable. An internal modem usually costs less than an external unit and can be easily installed. An external modem can be placed on the computer or under the telephone. The external modem may offer visual signals to help you monitor communications and may include clock and calendar operations. Free-standing modems usually can be attached to any computer with a serial port; they are not limited to use with a PC.

Some modems are called acoustic couplers. The handset of a standard telephone fits into special rubber cups through which audible tones are sent and received across telephone lines. Many people prefer direct-connect modems, however, which easily plug into a telephone wall jack. Direct-connect modems offer superior performance by eliminating background noise that interferes with communications.

Judicious selection of a modem requires weighing a number of considerations. First, make sure the modem is compatible with your PC and the telephones you use, whether they have pulse (rotary) dialing, tone dialing, or both. Next, consider the modem you plan to communicate with. Since your modem must be compatible, determine the Bell standards the other modem adheres to. Identify the data format used, and check options for data transmission rates.

Let your specific needs determine the speed of the modem you select. People who use data communications only for bulletin boards or for short exchanges of text with a remote computer will probably find 300 bps (about 30 characters per second) adequate. Modems limited to 300 bps transmission rates usually cost less than higher speed modems. However, people who transfer large amounts of text will find communicating at 1200 bps (about 120 characters per second) faster and therefore less costly, especially when transmitting over long distances.

Different modems offer different features. Some supply visual aids, such as light-emitting diodes (LEDs) that tell you if your modem and PC are on, if your modem has successfully connected to another modem, or if the modem is transmitting or receiving data. Others have incorporated a speaker that can alert you to busy signals, wrong numbers, or trouble on the line. Additional features include self-testing, verbal or numeric result codes, and easily set switches or simple keyboard commands to adjust the modem and communications parameters.

Some modems require complicated keyboard commands or software to control their operation. The newest modems get instructions from a small processor built into the modem. These intelligent modems operate easily. With a few quick keystrokes, you can command an intelligent modem to place calls, redial, answer calls, or terminate calls automatically.

Intelligent modems can also control the timing of operations. For example, some modems allow you to specify dialing speed, tone or pulse dialing, full- or half-duplex mode, ASCII character assignment, and the number of rings a modem counts before answering a call.

Modems of the future are likely to be even smaller and faster. Continued technological advances in integrated circuitry should lead to miniature modems. Other industry trends point to an increase in 1200 bps communications and an expansion in the popularity of information services and electronic mail. With a modem as a ticket to the information age, more and more PC owners can be expected to go on line to tap the growing number of public information services.

Dennis Hayes is president of Hayes Microcomputer Products, Inc.

The modems described in this section range from inexpensive acoustic couplers to elaborate modems with security features for use with networks. Stand-alone or freestanding modems are called "external" modems. They require a serial port in the IBM PC, and they may have light-emitting diodes (LEDs) or a speaker for indicating the status of calls. Internal modems are called "modem boards," and they often include a software communications package. All the modems listed are compatible with either Bell 103 or Bell 212A protocols.

A modem that transmits information at 1200 bits per second (bps) costs more, of course, than one that transmits at 300 bps. If you choose a modem with automatic dialing, you'll need only a telephone line, not the telephone itself. Automatic answering lets your computer receive information when you're away. Some "intelligent" modems with processors inside can store telephone numbers, redial a number for you if it's busy, or call alternate numbers. Some modems also have diagnostic tests to ensure that they are operating correctly.

If you want to play the bulletin boards, take advantage of information services like Dow Jones News/Retrieval and The Source, or use data stored in a mainframe, pick the modem with the features you need.

Visionary 100 and Visionary 1200

Visionary Electronics, Inc.
141 Parker Ave.
San Francisco, CA 94118
415/751-8811

Visionary 100 and 1200 are programmable external modems. Each modem comes with a clock and a message buffer. The Visionary 100 buffer expands to 24K, and the Visionary 1200 buffer to 48K. The modems have programmable features, including automatic answering, dialing, sending, and receiving, and they operate when the host computer is occupied or turned off. Visionary 100 transmits at 300 bits per second (bps), and Visionary 1200 at 1200 bps. The clock permits the modems to transmit and receive data at preset times. List price: Visionary 100 $595, Visionary 1200 $795. Requirements: serial port.

CDS 224 and CDS 224 Autodial

Concord Data Systems
303 Bear Hill Rd.
Waltham, MA 02154
617/890-1394

CDS 224 is an external 2400-bits-per-second (bps) modem for synchronous and asynchronous communications. The modem provides a second handset jack, remote and local diagnostics, half- and full-duplex protocols, and an automatic equalizer for transmission over marginal lines. CDS 224 Autodial also features automatic answering and dialing. If the remote modem operates at 1200 bps, CDS 224 automatically adjusts its speed and modulation accordingly. CDS 224 and CDS 224 Autodial require terminal emulation software. List price: CDS 224 $995, CDS 224 Autodial $1195. Requirements: serial port.

212 Auto-Cat

Novation, Inc.
20409 Prairie St.
Chatsworth, CA 91311
213/996-5060

212 Auto-Cat is an external modem controlled either manually or by computer. The modem operates at 0 to 300 and 1200 bits per second in full-duplex mode with synchronous or asynchronous transmission. It has automatic or manual answering and disconnecting, and it automatically selects the proper speed for incoming calls. Light-emitting diodes show the operating mode. List price: $695. Requirements: serial port.

103 Smart-Cat and 103/212 Smart-Cat

Novation, Inc.
20409 Prairie St.
Chatsworth, CA 91311
213/996-5060

The 103 and 103/212 Smart-Cat modems are full-duplex external modems that detect dial tones and busy signals. 103 Smart-Cat and 103/212 Smart-Cat operate asynchronously at 110 to 300 and 300 to 1200 bits per second, respectively, with tone or pulse dialing capabilities. A set of 21 commands controls operations such as automatic answering, dialing and redialing, and analog and digital loopback testing. The modems respond with abbreviated or complete English messages. List price: 103 Smart-Cat $249, 103/212 Smart-Cat $595. Requirements: serial port.

R103J

Rixon Inc.
2120 Industrial Pkwy.
Silver Spring, MD 20904
301/622-2121

R103J is an external modem that operates at speeds up to 300 bits per second for full-duplex asynchronous communications. Calls are originated manually with a pulse or tone dial telephone and may be answered manually or automatically. The modem automatically disconnects when nondata calls are received. Other features include a self-test and a control for switching between talk and data modes. List price: $249. Requirements: serial port.

R212A and Executive 212

Rixon Inc.
2120 Industrial Pkwy.
Silver Spring, MD 20904
301/622-2121

R212A and Executive 212 are external modems; each has an automatic dialer that stores up to ten numbers of 60 characters each. The modems operate at 0 to 300 and 1200 bits per second asynchronously. They feature automatic answering, pulse and tone call capabilities, and redialing on command. Front panel switches control the Executive 212; the keyboard controls the R212A. The automatic dialers enable the modems to dial an alternate number after reaching a busy signal. List price: R212A $499, Executive 212 $599. Requirements: serial port.

PC1200B

Novation, Inc.
20409 Prairie St.
Chatsworth, CA 91311
213/996-5060

PC1200B is a modem board that includes *Crosstalk XVI* communications software. The asynchronous modem operates at 300 and 1200 bits per second in full-duplex mode. It has automatic dialing (tone or pulse), automatic answering, busy signal detection, and automatic redialing. Diagnostic features include error checking, automatic retransmission, and remote testing, local testing, and self-testing. The modem transfers transmitted data to a printer, a disk, or a buffer. List price: $595. Requirements: 128K for *Crosstalk XVI* software.

Datec PAL 103 and Datec PAL 212

Datec, Inc.
200 Eastowne Dr. #116
Chapel Hill, NC 27514
919/929-2135

Datec PAL 103 is an external modem that communicates asynchronously at 0 to 300 bits per second (bps) in full- or half-duplex mode. The modem has automatic answering and dialing, tone and pulse dialing, a monitor speaker, and commands compatible with public and commercial communications software. Datec PAL 212 includes all the features of PAL 103 and operates at 1200 bps as well. When dialing unattended, the modem detects dial tones, busy signals, and ringing. List price: Datec PAL 103 $195, Datec PAL 212 $449. Requirements: serial port.

POPCOM Model X100

Prentice Corp.
266 Caspian Dr.
P.O. Box 3544
Sunnyvale, CA 94088-3544
408/734-9810

POPCOM Model X100 is an external modem that switches between voice and data communications by sensing when the telephone handset is lifted. The full-duplex modem operates at 0 to 300 and 1200 bits per second asynchronously. Features include automatic dialing and answering, automatic detection of dial tones and busy signals, and automatic sensing of the mode and speed of incoming data. The Model X100 is compatible with most communications software packages. List price: $475. Requirements: serial port.

VA212LC

Racal-Vadic
1525 McCarthy Blvd.
Milpitas, CA 95035
408/946-2227

VA212LC is an external full-duplex modem for 0 to 300 and 1200 bits per second asynchronous transmission. The modem offers manual dialing and manual or automatic answering. It automatically recognizes the speed and mode of the calling modem. Five light-emitting diodes display the modem's status, including results of remote and local diagnostics. List price: $450. Requirements: serial port.

AJ 1212-ST, AJ 1212-AD1, and AJ 1212-AD2

Anderson Jacobson, Inc.
521 Charcot Ave.
San Jose, CA 95131
408/263-8520

The AJ 1212 series consists of three external modems that communicate at 0 to 300 and 1200 bits per second synchronously and asynchronously. Touch switches on the AJ 1212-ST control manual dialing, manual and automatic answering, and local digital and analog loopback diagnostics. The modem automatically identifies incoming calls and adjusts to the appropriate data rate. To prevent loss of data, the modem senses when the handset is lifted.

In addition to the features of the AJ 1212-ST, the AJ 1212-AD1 provides automatic pulse or tone dialing, automatic redialing, and nonvolatile storage of 16 telephone numbers up to 37 digits long each. Calls can be initiated directly from the modem or from a computer.

The AJ 1212-AD2 has additional security features. It can dial from code names rather than numbers, dial only designated computers, or refuse calls that lack a suitable password. Access to the modem's memory requires a second password. List price: AJ 1212-ST $495, AJ 1212-AD1 $595, AJ 1212-AD2 $695. Requirements: serial port.

VA212LC, Racal-Vadic

103J

Universal Data Systems
5000 Bradford Dr.
Huntsville, AL 35805-1953
205/837-8100

The 103J is an external modem that communicates asynchronously at 0 to 300 bits per second in full-duplex mode. For unattended operation, the modem answers automatically. Switches control voice and data transmission and local and remote diagnostics. Light-emitting diodes indicate call status. List price: $425. Requirements: serial port.

VA212

Racal-Vadic
1525 McCarthy Blvd.
Milpitas, CA 95035
408/946-2227

VA212 is an external modem that operates asynchronously or synchronously at 0 to 300 and 1200 bits per second. The modem includes an automatic dialer, automatic speed and parity detection, and storage for 15 telephone numbers with battery backup. An 8-character liquid crystal display shows messages and telephone numbers and reports the modem's operations. Built-in software provides single-key redialing and permits operation from the keyboard. List price: $650. Requirements: serial port.

224 Data Modem

Codex Corporation
20 Cabot Blvd.
Mansfield, MA 02048
617/364-2000

The 224 Data Modem is an external modem that operates at 1200 and 2400 bits per second. The modem transmits data in full-duplex mode synchronously or asynchronously. Switches control the transmission speed, manual and automatic answering, manual and automatic dialing, and local testing, remote testing, and self-testing. An equalizer allows transmission over poor quality phone lines. The 224 Data Modem automatically detects a Bell 212-compatible modem and adjusts its speed and modulation accordingly. List price: $1195. Requirements: serial port.

PCT-100

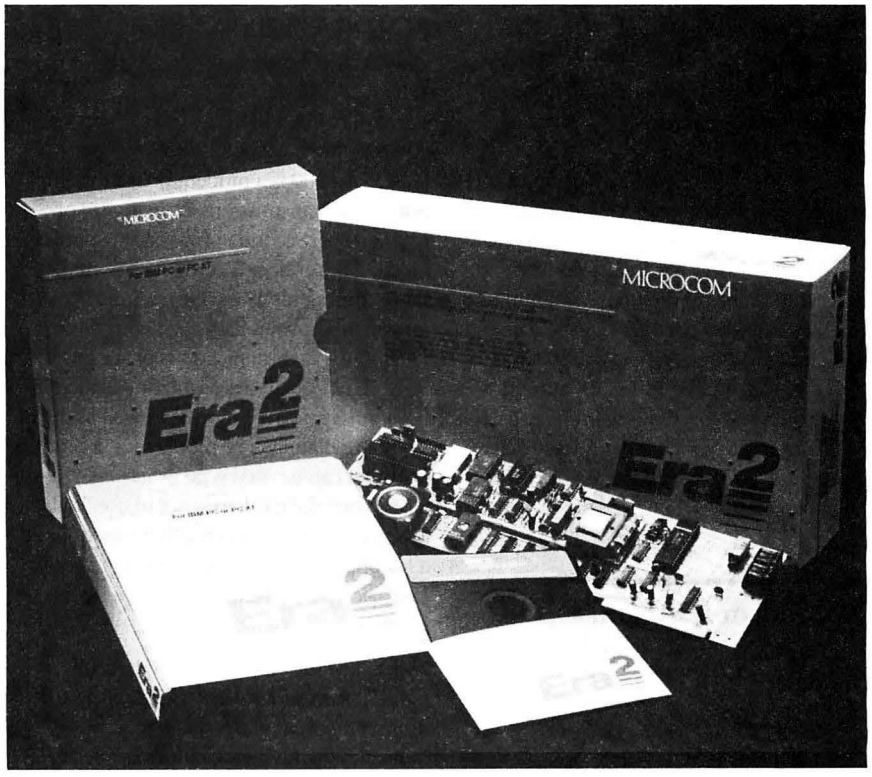
Method Systems Incorporated
19751 S. Lakeshore Blvd.
Euclid, OH 44119
216/531-0404

PCT-100 is a data translation tool that acts as a communications interface between incompatible systems. Using the communications translation language, it allows incoming characters to be translated into user-specified characters or character strings. PCT-100 provides data buffering, nonvolatile storage, and bidirectional, real-time data translation. Placed in any asynchronous serial link, the unit performs terminal or printer emulation, operating at speeds up to 19.2 kilobits per second. List price: $398. Requirements: serial port.

Era 2

Microcom, Inc.
1400A Providence Hwy.
Norwood, MA 02062
617/762-9310

Era 2 is an asynchronous modem board that includes the Microcom networking protocol (MNP) and communications software. The modem operates at up to 1200 bits per second in full-duplex mode. It provides manual dialing and answering, automatic answering, and pulse or tone dialing. The menu-driven communications software allows storage of phone numbers up to 31 digits, setting of parameters such as line parity or speed, and sending and receiving of complete files. The software also provides printer control and keyboard macros and includes IBM 3101, DEC VT-100, and DEC VT-52 terminal emulation. List price: $429. Requirements: 128K for software.



Era 2, Microcom

103 LP, 103J LP, and 212 LP

Universal Data Systems
5000 Bradford Dr.
Huntsville, AL 35805-1953
205/837-8100

The 103 LP and 103J LP full-duplex modems transmit data asynchronously at 0 to 300 bits per second (bps); a third modem, the 212 LP, also transmits at 1200 bps. The telephone line powers the modems directly, so no separate power connection is required. A switch selects data or voice mode. Both the 103 LP and the 212 LP have manual dialing and answering; the 103J LP also has automatic answering. List price: 103 LP $145, 103J LP $195, 212 LP $445. Requirements: serial port.

212A/D

Universal Data Systems
5000 Bradford Dr.
Huntsville, AL 35805-1953
205/837-8100

The 212A/D is a 0 to 300 and 1200 bits per second external modem that automatically dials, answers, and disconnects. The modem communicates synchronously or asynchronously in full-duplex mode with tone or pulse dialing. Battery-backed storage holds five 30-digit numbers and contains commands for redialing until a call is completed. When the 212A/D is called, it automatically adapts to the speed of the originating modem. List price: $645. Requirements: serial port.

TM-1200

ComDesign
751 S. Kellogg Ave.
Goleta, CA 93117
805/964-9852

TM-1200 is a full-duplex external modem that operates asynchronously at 300 bits per second (bps) and synchronously or asynchronously at 1200 bps. The modem answers incoming calls automatically. A built-in timer disconnects the modem when the absence of a signal is detected. Light-emitting diodes display call status, and front panel switches control diagnostics. List price: $750. Requirements: serial port.

Multi-Modem and Multi-Modem HC

Multi-Tech Systems, Inc.
82 Second Ave. SE
New Brighton, MN 55112
612/631-3550

The Multi-Modems are external modems that provide asynchronous 300- and 1200-bits-per-second communications in full- and half-duplex modes. Features include automatic dialing and answering and pulse and tone dialing. Commands control the modems from the computer or terminal. Both modems are compatible with most software communications packages, and Multi-Modem HC is compatible with Hayes's *Smartcom II*. Multi-Modem stores up to six phone numbers 31 digits long and has busy signal and dial tone detection. List price: $549 each. Requirements: serial port.

Multi-Modem PC

Multi-Tech Systems, Inc.
82 Second Ave. SE
New Brighton, MN 55112
612/631-3550

Multi-Modem PC is a 300- and 1200-bits-per-second modem board that comes with a software communications package. The modem answers and dials automatically and selects the speed in either mode. Features include redialing, pulse or tone dialing, and a speaker for monitoring calls. The menu-driven software lets the modem dial and log on automatically, transfer multiple files with one command, store or print messages, and store up to 20 telephone numbers. Multi-Modem PC includes an extra telephone jack for voice communication. List price: $549. Requirements: serial port.

1200 Plus

Ven-Tel, Inc.
2342 Walsh Ave.
Santa Clara, CA 95051
408/727-5721

The 1200 Plus is an external 300- and 1200-bits-per-second modem with automatic answering and dialing. The modem operates asynchronously in full- or half-duplex mode and can be used with most communications software packages. A speaker and light-emitting diodes report call status. When answering, the 1200 Plus automatically detects the speed of incoming calls. It includes remote diagnostics and self-diagnostics. List price: $499. Requirements: serial port.

PC Modem 1200 and PC Modem Half Card

Ven-Tel, Inc.
2342 Walsh Ave.
Santa Clara, CA 95051
408/727-5721

The PC Modem 1200 and the PC Modem Half Card are modem boards that include the *Crosstalk XVI* communications software package. Both modems operate asynchronously at 300 and 1200 bits per second in full- or half-duplex mode. Features include automatic dialing and answering and tone or pulse dialing. The PC Modem Half Card fits into a small expansion slot in the IBM PC XT, but like the PC Modem 1200, it operates in any slot inside the IBM PC. The *Crosstalk XVI* software provides terminal emulation and keyboard macros. PC Modem 1200 includes a speaker for monitoring the progress of a call. List price: PC Modem 1200 $499, PC Modem Half Card $549. Requirements: 96K for *Crosstalk XVI* software.

PC/Telink

Anderson Jacobson, Inc.
521 Charcot Ave.
San Jose, CA 95131
408/263-8520

PC/Telink is a 1200-bits-per-second modem board with automatic answering and dialing and jacks for both voice and data communications. The modem comes with *Crosstalk XVI* communications software. The modem has a serial port, a speaker for monitoring calls, and self-diagnostics. List price: $495. Requirements: serial port, 96K for software.

PC-212A/1200 Modem Card

Qubie' Distributing
4809 Calle Alto
Camarillo, CA 93010
800/821-4479, 805/482-9829

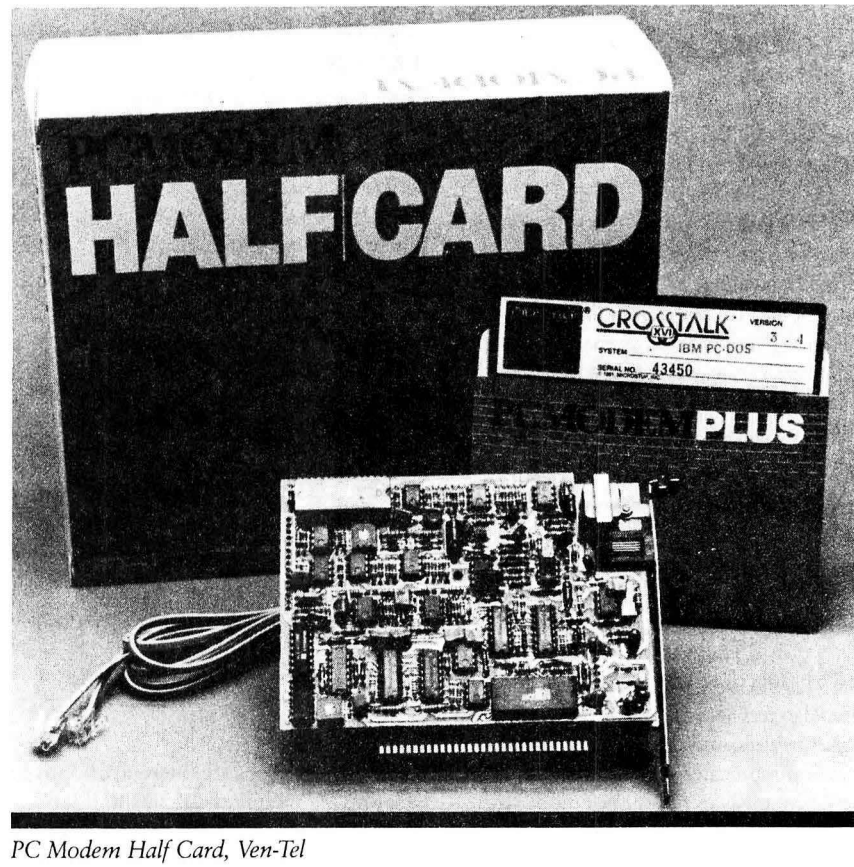
PC-212A/1200 is a modem board that supports data transmissions at up to 300 or 1200 bits per second in full- or half-duplex mode. The modem is controlled with the same commands as the Hayes Smartmodem and comes packaged with the *PC-Talk III* communications program. PC-212A/1200 allows automatic dialing in both pulse and tone modes, as well as direct keyboard dialing. The modem has a serial port that can be used with other serial devices when the modem is not in use. It also has a telephone connector that functions as a telephone jack for voice communications. List price: $299. Requirements: 64K for software.

"I installed the board as COM1, reconfigured my AST card as COM2, and turned it on. It worked on the first try." John Wheatley, San Diego, California

Series PCS/2000 Networking Modem

Microcom, Inc.
1400A Providence Hwy.
Norwood, MA 02062
617/762-9310

The Series PCS/2000 Networking Modem is a 1200-bits-per-second external modem that allows unattended transfer of files between microcomputers and between microcomputers and minicomputers. The modem allows automatic dialing, redialing, and answering, and it provides full error detection and correction in file transfers when used with another Microcom modem. The modem also communicates with any standard Bell 212A-compatible modem. The Series PCS/2000's on-board liquid crystal display clock and 32K file buffer enable users to carry out both unattended and prescheduled file transfers. The modem permits remote password-protected file access and includes an extra serial port for use with serial printers and other serial devices. List price: $995. Requirements: serial port.



PC Modem Half Card, Ven-Tel

HP 150 Internal Modem

Ven-Tel, Inc.
2342 Walsh Ave.
Santa Clara, CA 95051
408/727-5721

The HP 150 Internal Modem is a modem board for the HP 150 that is compatible with all Hewlett-Packard software, including *DSN/Link* and *PCF*. The modem operates asynchronously at 300 and 1200 bits per second in full- or half-duplex mode. It includes automatic dialing and answering, tone or pulse dialing, and an internal speaker for monitoring calls. List price: $425. Requirements: serial port.

Password with Telpac

U.S. Robotics, Inc.
1123 W. Washington Blvd.
Chicago, IL 60607
312/733-0497

Password with *Telpac* is a 300- and 1200-bits-per-second external modem with separately priced communications software. The modem weighs approximately 1 pound and measures 7.4 by 4.4 by 1.4 inches. Password provides direct connection, programmable automatic dialing and answering, automatic mode and speed selection functions, and an audio phone line monitor instead of light-emitting diode indicators. List price: Password $449, *Telpac* $79. Requirements: serial port, 64K for software.

"Password is simple to use and connect. There are convenient configuration switches on the rear of the modem. There is no volume control for the speaker." Larry Marola, Marietta, Georgia

Turbo-MUX-2

Chung Telecommunications
4046 Ben Lomond Dr.
Palo Alto, CA 94306
415/858-2456

Turbo-MUX-2 is a data compaction unit with a 2-channel statistical multiplexer that supports two data streams of 2400 bits per second (bps) over a 1200 bps modem. Turbo-MUX-2 also transmits one 2400 bps or two 1200 bps data streams. Controlled by a Z-80A processor, the unit has 10K ROM and 8K RAM, expandable to 32K and 16K, respectively. Standard features include error detection, automatic retransmission, and local and remote diagnostics. List price: $995.

Info-Mate 212A, Cermetek Microelectronics

PC ModemCard

Transend Corp.
2190 Paragon Dr.
San Jose, CA 95131
408/946-7400

PC ModemCard is an asynchronous modem board with command sets compatible with Hayes and Racal Vadic software. The modem is available in two versions: one operates at 300 bits pers second (bps) and the other at 1200. Features include automatic dialing and answering, pulse and tone dialing, automatic redialing, and local and remote diagnostics. The board comes with communications software that provides unattended electronic mail capabilities. The 1200 bps version automatically detects the speed of the other modem and adjusts itself accordingly. List price: 300 bps version $349, 1200 bps version $549. Requirements: 256K for software.

Info-Mate 212A

Cermetek Microelectronics
1308 Borregas Ave.
P.O. Box 3565
Sunnyvale, CA 94089-3565
408/734-8150, TWX: 910-379-6931

Info-Mate 212A is an intelligent external modem that transmits data at 110, 300, or 1200 bits per second. The modem automatically adapts to the host computer's communications parameters. The 212A features automatic dialing, answering, and speed selection, and automatic or manual selection of pulse or tone dialing. An "unlisten" command prevents data from being interpreted as commands during data transmission. Commands are entered as ASCII characters on a single level, which eliminates working through several menus to perform one function.

The 212A's voice recognition circuit determines when a voice answers a call and displays that information on the screen. Up to 52 32-digit telephone or logon numbers can be stored in the modem's memory. Dialing commands include "dial last number," "dial until answered," "dial alternate number," and "dial from memory." List price: $595. Requirements: serial port.

AM/FM Downloader

Microperipheral Corporation
2565 152nd Ave.
Redmond, WA 98052
206/881-7544

AM/FM Downloader is a receive-only modem designed to download computer data—ASCII text files or processor-specific program files—from commercial radio stations. The modem is compatible with Bell-103 300-bits-per-second (bps) signals and operates at speeds of up to 4800 bps. A radio station's main audio channel may either be recorded on tape, which is played into the modem, or received directly by the modem. List price: $69.88. Requirements: serial port.

PConnection

Microperipheral Corporation
2565 152nd Ave. NE
Redmond, WA 98052
206/881-7544

PConnection is a plug-in communications board that contains a clock/calendar and a serial port directly connected to a modem. The board has a timer for managing dialer routines. The modem disconnects when power failure or carrier loss occurs. PConnection automatically answers the telephone or dials predetermined telephone numbers at specified times. List price: $175.

TransModem 1200

Transend Corp.
2190 Paragon Dr.
San Jose, CA 95131
408/946-7400

TransModem 1200 is a full-duplex external modem that operates asynchronously at up to 300 and 1200 bits per second. The modem automatically adjusts its speed to match the modem on the other end of the line. It has automatic dialing and answering and pulse and tone dialing. Single keystroke commands control redialing, menus, and parameters such as parity and speed. List price: $695. Requirements: serial port.

Signalman Mark XII

Anchor Automation
6913 Valjean Ave.
Van Nuys, CA 91406
213/997-6493

Signalman Mark XII is an external modem that answers and originates calls at either 300 or 1200 bits per second. Using its own commands and those of the Hayes Smartmodem, Mark XII operates manually or automatically to detect dial tones and busy signals. The modem displays dialing status on the screen, and it comes with two telephone jacks and a built-in serial cable. List price: $399. Requirements: serial port.

Teleport 300

Teltone Corporation
P.O. Box 657
Kirkland, WA 98033
206/827-9626

Teleport 300 is an external modem that enables users to enter data from a remote touch-tone telephone without using a terminal. Teleport 300 includes automatic call answering and originating, a password protection system, and two operating modes. One mode provides conventional computer-to-computer transmissions at speeds up to 9600 bits per second. In the other mode, users call the computer system with a touch-tone device and enter data that is then converted to ASCII code by Teltone's conversion system. List price: $399.95. Requirements: serial port.

1012 Intelligent Modem

BIZCOMP Corporation
532 Mercury Dr.
Sunnyvale, CA 94086
408/733-7800

The 1012 Intelligent Modem is a 1200-bits-per-second external modem that toggles between command and data modes on a single line. Features include automatic dialing, automatic redialing, automatic answering, automatic speed detection, and self-diagnostics. Users can program automatic logon sequences and logon messages. List price: $549. Requirements: serial port.

USR PC Modems I, II, and III

U.S. Robotics, Inc.
1123 W. Washington
Chicago, IL 60607
312/733-0497

The USR PC Modems are asynchronous 300- and 1200-bits-per-second modem boards with automatic and manual features for dialing and answering. Packaged with *Telpac* communications software, the USR PC Modem I has an audio monitor for the phone line and automatic speed detection. In addition to the features of the Modem I, the Modem II includes 64K, a parallel port, and a clock/calendar with battery backup. The Modem III provides the same features and 256K. The *Telpac* software provides customized phone directories, password protection, and error checking. It directs the computer to initiate timed calls automatically. List price: USR PC Modem I $449, USR PC Modem II $699, USR PC Modem III $1149. Requirements: serial port.

Datec PAL Plus

Datec Inc.
200 Eastowne Dr. #116
Chapel Hill, NC 27514
800/334-7722, 919/929-2135

Datec PAL Plus is a modem board that includes a serial port and the *Crosstalk XVI* communications program. The modem features automatic dialing and answering, tone and pulse dialing, automatic speed and parity detection, dial-up or dedicated line capability, and a monitor speaker. Datec PAL Plus operates at 0 to 300 and 1200 bits per second. List price: $599. Requirements: 96K for *Crosstalk XVI* software.

Smartmodem 300 and Smartmodem 1200

Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Blvd.
Norcross, GA 30092

Smartmodem 300 is an asynchronous external modem that has automatic dialing and answering. The modem communicates at 300 bits per second (bps) in full- or half-duplex mode. It provides tone and pulse dialing, automatic redialing, and self-diagnostics. Indicator lights and a speaker report call status. In addition to having the features of Smartmodem 300, Smartmodem 1200 operates at 1200 bps and automatically detects and adapts to incoming transmission speeds. List price: Smartmodem 300 $289, Smartmodem 1200 $699. Requirements: serial port.

"The 300 bps rate is too slow for serious, frequent use; the Hayes 1200 bps modem is better for that." Keith P. Rhea, Missoula, Montana

"The Smartmodem has diligently served us without failure for six months. It's a little overpriced considering there are some 1200 bps modems going for $300. However, it's as close to error-free as we've found." Amy J. Goebel, Alexandria, Virginia

Cat

Novation, Inc.
20409 Prairie St.
Chatsworth, CA 91311
213/996-5060

The Cat modem is an acoustic coupler compatible with Bell 103 modems. The modem transmits data at up to 300 bits per second in full- or half-duplex mode. Answer, originate, and test modes are manually selected. List price: $189. Requirements: serial port.

J-Cat

Novation, Inc.
20409 Prairie St.
Chatsworth, CA 91311
213/996-5060

J-Cat is an asynchronous external modem the size of a pocket calculator, measuring 5 by 2 by 1 inches. The full-duplex modem communicates at 300 bits per second and provides manual or automatic answering and dialing. It has self-diagnostics, and audio signals and light-emitting diodes indicate transmission status. List price: $149. Requirements: serial port.

PC212A

Rixon Inc.
2120 Industrial Pkwy.
Silver Spring, MD 20904
301/622-2121

PC212A is a modem board with an automatic dialer that stores up to ten phone numbers. The modem operates at 0 to 300 and 1200 bits per second and provides automatic answering, tone or pulse dialing, and redialing on command. It is also available with an additional serial port. List price: $499, with extra port $539.

PC:IntelliModem

BIZCOMP Corporation
532 Mercury Dr.
Sunnyvale, CA 94086
408/733-7800

The PC:IntelliModem is a modem board packaged with communications software. The system also provides a telephone handset jack for combined voice and data communications. The modem transmits asynchronously at 300 and 1200 bits per second and is compatible with Bell 212A modems. The communications software controls programmable features such as automatic dialing, repeating, answering, and local self-testing. The software also includes terminal emulation, a telephone directory, and an automatic dialer. List price: $499. Requirements: serial port.

OZ/Guardian

Tri-Data Corp.
505 E. Middlefield Rd.
Mountain View, CA 94043-7505
415/969-3700

OZ/Guardian is a full-duplex external modem that operates asynchronously at 110 or 300 bits per second (bps) and synchronously or asynchronously at 1200 bps. The modem has automatic dialing and answering, pulse and tone dialing, an 8K buffer, complete diagnostics, and battery backup. It provides a directory for up to 250 phone numbers, automatic logon, and automatic disconnection to prevent unnecessary phone charges. Security features include passwords up to 250 characters long and optional software locks on directories and logons. The modem disconnects incoming calls and dials the number associated with the caller's password. List price: $750. Requirements: serial port.

IDEAComm 1200

IDEAssociates Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAComm 1200 is a 1200-bits-per-second modem board that has an extra serial port and an additional jack for voice communications. The modem comes with *IDEACOMM* communications software that supports automatic dialing and logging on, terminal emulation, storage of phone numbers and logon sequences, and spooling to printer or disk. The transmission speed may be controlled by software or automatically selected by the modem. List price: $545.

Info-Mate 212PC

Cermetek Microelectronics
1308 Borregas Ave.
P. O. Box 3565
Sunnyvale, CA 94089-3565
408/734-8150, TWX: 910-379-6931

Info-Mate 212PC is an internal modem for the IBM PC that transmits data at 110, 300, or 1200 bits per second in full-duplex mode. The modem has automatic dialing and answering, automatic speed and parity selection, detection of busy signals with ring-back, and tone or pulse dialing. The modem comes with *Modem-Mate* communications software that features ASCII and binary file transfer as well as a 60-entry dialing directory. List price: $495. Requirements: serial port, 64K for software.

Smartmodem 1200B

Hayes Microcomputer Products, Inc.
5923 Peachtree Industrial Blvd.
Norcross, GA 30092
404/449-8791

Smartmodem 1200B is an FCC-approved modem board with *Smartcom II* communications software. The modem and the software are functionally equivalent to the Hayes Smartmodem 1200 connected to a serial port. A telephone jack on the board permits direct connection to a telephone line with a standard telephone cable. The Smartmodem 1200B automatically dials, answers, and disconnects calls. It is compatible with Bell System 212A or 103 asynchronous modems, and it transmits data at either 300 or 1200 bits per second. List price: $595. Requirements: 96K for software.

Bytcom 212AD

Bytcom, Inc.
2169 Francisco Blvd., Ste. H
San Rafael, CA 94901
800/227-3254, 415/485-0700

Bytcom 212AD is a full-duplex intelligent modem that operates at 0 to 300 or 1200 bits per second. The modem stores up to nine 40-digit phone numbers and ten names (one for the number last called) in nonvolatile memory. A built-in voice/data transfer switch allows a single phone line to be used for voice and data transmission alternately, eliminating the need to plug and unplug the phone line wire. List price: $495. Requirements: serial port.

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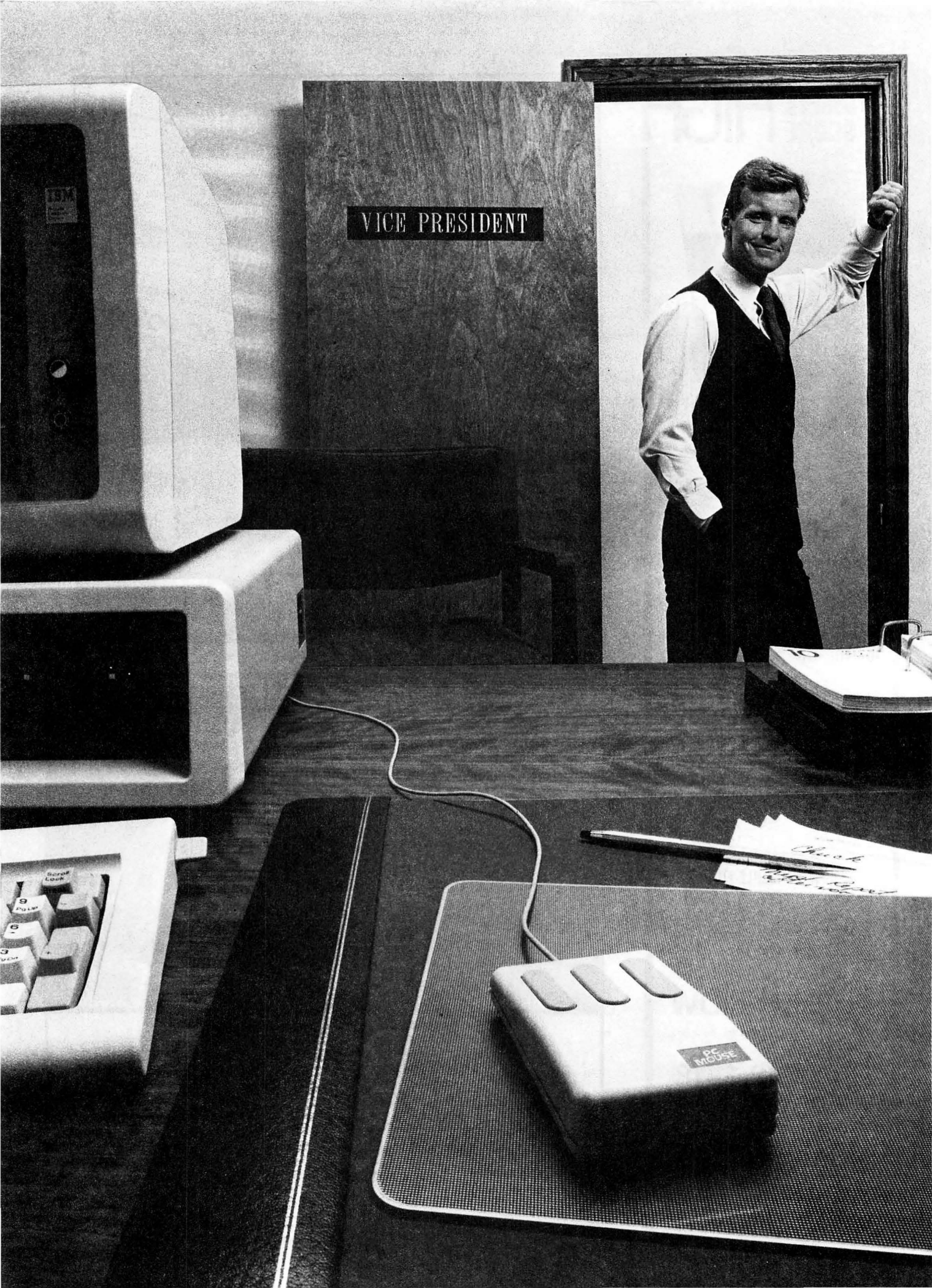
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PC Mouse is pre-configured for Lotus 1-2-3, Multiplan, VisiCalc, SuperCalc3, WordStar, PFS:Write, Personal Editor, and Multimate. It's also fully compatible with Microsoft Word, Visi On and DesQ. And as more advanced software is developed, you can be sure PC Mouse will never become extinct. Our *Designer Pop-ups* even let you personalize menus to fit individual needs. Or create new menus for any program that runs on the PC.

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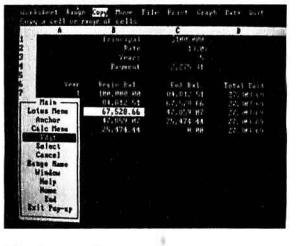

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Circle 122 on reader service card

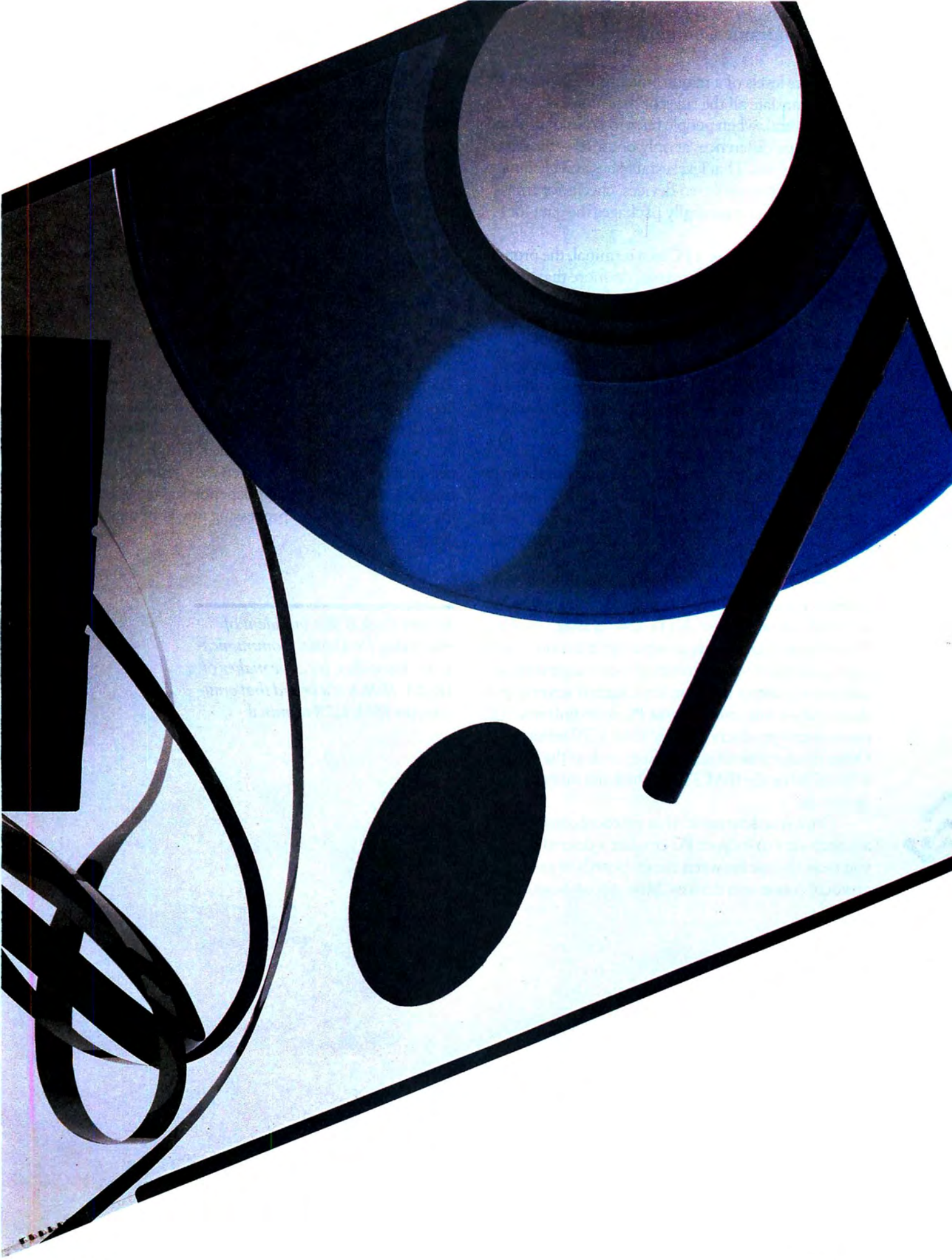
PC-to-Mainframe Communications

Robert Zack

Personal computers can do more than the independent processing tasks they usually perform; they can also replace terminals in mainframe networks. Using an IBM PC as a terminal enables you to share the centrally stored data and powerful processing capability of a mainframe computer, but frees you from the processing slowdowns that are common in mainframe systems burdened by a large number of time-sharing users.

If you want to operate a PC as a terminal on a mainframe network, you need to add some type of PC-to-mainframe communications hardware to your computer. PC-to-mainframe communications products usually consist of either a circuit board that fits into an expansion slot of the PC or an external protocol conversion box that is placed in the communications line between the PC and the mainframe. These devices act as translators between PCs and mainframe computers, bridging the gap between the different communications protocols used by the two types of computers.

A protocol is a set of rules for controlling the transmission of data over a communications channel or link. The rules of a protocol apply to many types of communications conventions, from the physical connection of hardware to commands used by terminals to control mainframe software. A protocol is subdivided into levels, or "layers." Each level is a set of rules that work together to control an aspect of communication. Different mainframe computers use different protocols; when you choose a communications product for your PC, make sure you know what protocol is used by the mainframe you want to communicate with. Also consider that products that translate



one or more levels of a mainframe protocol for a PC may not translate all the rules of that protocol.

In general, when people refer to types of protocols they compare differences at only one level—the data link control level. That level establishes and terminates a connection between two devices, checks for transmission errors, and generally packages the data for transmission.

If you want to use a PC as a terminal, the protocol conversion product you use must do more than just translate the data link control level of a mainframe protocol: it must make a proper electrical connection between the mainframe data line and the PC. The product must also perform necessary character code conversions if the PC and the mainframe use different codes, such as ASCII or EBCDIC, to refer to characters as they are stored and transferred.

To communicate with a mainframe, a PC must have some of the characteristics of a terminal the mainframe would normally exchange data with. PC-to-mainframe products that enable a PC to behave like a specific mainframe terminal are called "terminal emulators." A terminal emulator must be able to reformat data generated on the PC so that the mainframe computer receives the data in a form that it recognizes. A terminal emulator must also be able to assign simple PC keyboard commands to represent a terminal's escape code sequences. A terminal uses escape code sequences to control function keys, format screens, and direct cursor movement. Most PC-to-mainframe communications products emulate IBM 3270 terminals. Other products emulate terminals such as the IBM 2780/3780 or the IBM 3770, which use different protocols.

Once you determine what protocol conversions are necessary to let your PC emulate a desired terminal, you must choose between circuit boards or external protocol conversion devices. Most circuit boards let the PC emulate a single terminal. They offer the advantage of using existing IBM controllers through coaxial cable connections without needing additional modems. External protocol conversion products often let you connect several types of mainframes or terminals. An external protocol converter connects to a serial port on a PC and to a mainframe with a mainframe-compatible modem or a coaxial cable connection. External protocol converters may not emulate any specific terminal. When choosing a PC-to-mainframe communications product, make sure that it provides not only a hardware link between the PC and the mainframe, but also software that supplies terminal emulation functions.

PC-to-mainframe communications benefits people who use both types of computers. Mainframes are relieved of chores that burden a large system, and PC users have the best of both the mainframe and the personal computer worlds when they combine the freedom and flexibility of independent processing with the central storage and processing power of mainframe computers.

Robert Zack is vice president of marketing for Digital Communications Associates, Inc., the maker of IRMA. IRMA is a board that emulates the IBM 3278 terminal.

The PC-to-Mainframe section contains descriptions of hardware and software that enable the IBM PC to communicate with mainframe computers. Mainframe communications products can be divided into two groups. Some products are circuit boards that attach to the IBM PC bus through one of the expansion slots inside the PC system unit. Others are external units, connecting to the PC through a serial port. Most products described here are designed to let a *single PC* communicate with mainframes, although a few of the products allow several PCs to communicate at the same time.

The software supplied with most PC-to-mainframe communications devices allows the PC to emulate (perform the functions of) a mainframe terminal. Because the IBM 3270 display terminals are among the most widely used mainframe terminals, they are also the most frequently emulated. Other boards and software covered in this section emulate mainframe terminals such as the IBM 2770/3770 and 2780/3780 batch terminals and the IBM 5251 display terminal (used with the IBM System/34, System/36, or System/38).

The devices described here enable users to select various communications protocols, depending on the particular terminal emulated. Most devices offer a choice of binary synchronous or synchronous data link control (SDLC). Many devices conform to IBM's systems network architecture (SNA). Some of the boards connect directly to the mainframe computer terminal controller or adapter unit with coaxial cable.

The PC-to-Mainframe Communications section describes a rich selection of products. PC owners who need to integrate their PCs into a mainframe environment have a wide choice of options, sufficient to fill the requirements of most applications.

AST-SNA

AST Research, Inc.
2372 Morse Ave.
Irvine, CA 92714
714/540-1333

AST-SNA consists of a board and software that enable the IBM PC to emulate the IBM 3274 Model 51C, the 3278 Model 2 or 3279 Model 2A display stations, and the 3287 printer. Data is transferred at line speeds up to 9600 bits per second using SDLC protocols. Users may also choose to have the PC emulate the IBM 3770 remote job entry work station. A second board added to the PC enables it to operate as a controller for a cluster of up to three additional PCs or ASCII terminals; each PC or terminal operates as a 3278 display station. List price: $895. Requirements: 128K, one disk drive, synchronous modem or modem eliminator.

AST-BSC

AST Research, Inc.
2372 Morse Ave.
Irvine, CA 92714
714/540-1333

AST-BSC consists of a board and software that are similar to AST-SNA. AST-BSC differs only in that it uses binary synchronous line protocols and emulates the IBM 2770 remote job entry work station. List price: $895. Requirements: 128K, one disk drive, synchronous modem or modem eliminator.

AST-5251

AST Research, Inc.
2372 Morse Ave.
Irvine, CA 92714
714/540-1333

AST-5251 consists of a board and software that enable the IBM PC to communicate interactively with an IBM System/34, System/36, or System/38 by emulating an IBM 5251 Model 12 work station. Operating at speeds up to 9600 bits per second, the board can be connected directly to the mainframe computer or through synchronous modems. Any printer attached to the PC through the parallel port can emulate the IBM 5256 printer. List price: $895. Requirements: 64K with DOS 1.10, 128K with DOS 2.00, one disk drive.

AST-3780

AST Research, Inc.
2372 Morse Ave.
Irvine, CA 92714
714/540-1333

AST-3780 consists of a board and software that enable the IBM PC to emulate most popular remote job entry (RJE) work stations that use binary synchronous line protocols. AST-3780 emulates the following IBM RJE work stations: the 2780, the 3780, the 2770, and the 3741. Data is transferred at line speeds up to 19,200 bits per second. List price: $945. Requirements: 64K with DOS 1.10, 128K with DOS 2.00, one disk drive.

AST-PCOX

AST Research, Inc.
2372 Morse Ave.
Irvine, CA 92714
714/540-1333

AST-PCOX consists of a board and software that enable the IBM PC to emulate an IBM 3278 Model 2, 3, or 4 display station, or if the PC has a color graphics board and a monitor, a 3279 Model 2A or 3A color display station. Once equipped with AST-PCOX, the PC communicates with a mainframe computer through a 3274/6 control unit (channel attached, remote binary synchronous, or remote SNA/SDLC). Users can concurrently conduct a 327X session in communication with a mainframe computer and a PC-DOS session. List price: $1195. Requirements: 128K, one disk drive.

BARR/HASP

Barr Systems, Inc.
2500 Blue Ridge Rd. #315
Raleigh, NC 27607
919/782-4462

BARR/HASP consists of a board and software that turn the IBM PC into a remote job entry work station suitable for communicating with mainframes operating with HASP/JES2. Operating at speeds up to 19,200 bits per second, BARR/HASP uses binary synchronous protocols, multileaving communications techniques, and data compression and decompression to achieve high throughput. List price: $890. Requirements: 128K, one disk drive.

"We have been so impressed with the quality and ease of use of BARR/HASP that we permit all users access to the [command] console." Robert Bronstein, Tuckahoe, New York

Interlynx/3278

Local Data
2701 Toledo St. #706
Torrance, CA 90503
213/320-7126

Interlynx/3278 is an external protocol converter and controller that enables an IBM PC to communicate with an IBM 3274/6 cluster controller by emulating an IBM 3278 Model 2 display station. Communications at speeds up to 9600 bits per second

are channelled through the PC's serial port. Separately priced software that completes the package is available and allows the PC to emulate full-screen IBM 3278 operations. List price: $1395, software $260. Requirements: serial port.

PC Express

Intelligent Technologies International
151 University Ave.
Palo Alto, CA 94301
415/328-2411

PC Express consists of a board and software that allow the IBM PC to communicate with a mainframe computer using SNA protocols at speeds up to 9600 bits per second. The PC operates as though it were an IBM 3274 cluster controller with an attached 3278 display station. The PC can also emulate a 3770 remote job entry work station. List price: $1295. Requirements: 192K, two disk drives.

ClusterNet 3270

Intelligent Technologies International
151 University Ave.
Palo Alto, CA 94301
415/328-2411

ClusterNet 3270 consists of a board and software that enable the IBM PC to serve as an IBM 3274 cluster controller linking as many as 12 PCs with a mainframe computer. Using SNA protocols to communicate with a mainframe at speeds up to 9600 bits per second, a central PC equipped with ClusterNet 3270 connects up to 12 PCs outfitted with PC Express hardware supplied by the same manufacturer. Each attached PC operates as a 3278 display station. Software allows users to switch between any communications sessions under way between the mainframe and any of the clustered PCs. List price: not available. Requirements: 256K, two disk drives.

Virtual Terminal System

ICOT Corporation
830 Maude Ave.
P.O. Box 7248
Mountain View, CA 94039
415/964-4635

Virtual Terminal System consists of an external protocol converter and software designed to operate as an IBM 3274/6 cluster controller linking up to 12 PCs with one or two mainframe computers. Communications between the mainframe(s) and the converter use SNA/SDLC protocols at speeds up to 19,200 bits per second (bps) or binary synchronous protocols at speeds up to 9600 bps. Between the converter and the PCs, an asynchronous protocol is used via the serial port. The PCs operate as IBM 3278 display stations. List price: not available. Requirements: serial port.

DataTalker II

Winterhalter, Incorporated
3853 Research Park Dr.
Ann Arbor, MI 48104
313/682-8834

DataTalker II is an external protocol converter that connects the IBM PC's serial port to a mainframe computer. With software supplied by Winterhalter, users can configure the PC to appear on the communications line as any one of the following terminals: the IBM 3271, 3275, or 3276 interactive terminals or the IBM 2770, 2780, 2968, 3741, or 3780 remote job entry terminals. Communications between DataTalker II and the mainframe use a binary synchronous protocol at line speeds up to 19,200 bits per second. The unit measures 9 by 5 by 3 inches and weighs 5 pounds. List price: $995. Requirements: 64K, serial port.

DataTalker PC and PC/+

Winterhalter, Incorporated
3853 Research Park Dr.
Ann Arbor, MI 48104
313/682-8834

DataTalker PC and DataTalker PC/+ are internal protocol converters similar to Winterhalter's DataTalker II. DataTalker PC is a short board suitable for any expansion slot in the IBM PC or XT, and DataTalker PC/+ is a full-size board that inserts only in the long expansion slots. The boards are equivalent in function. List price: DataTalker PC $695, DataTalker PC/+ $895. Requirements: 128K, one disk drive.

Multiple Protocol Communications Controller (MPC)

Persyst Products
15801 Rockfield Blvd., Ste. A
Irvine, CA 92714
714/859-8871

MPC is a board used with separately sold software to enable the IBM PC to communicate directly with a mainframe computer as though the PC were an IBM 3278. At speeds up to 9600 bits per second, MPC uses either binary synchronous or SDLC line protocols. The MPC software allows users to switch between a communications application and regular PC operation under PC-DOS. The board is also used *in cluster* configurations that utilize the DCP/88 controller board made by Persyst Products. List price: $299, *3270/PC* software $595. Requirements: 128K, synchronous modem.

DPC/88

Persyst Products
15801 Rockfield Blvd., Ste. A
Irvine, CA 92714
714/859-8871

DPC/88 is a board that incorporates an Intel 8088 processor and 64K RAM. Used with separately sold software, DPC/88 provides multiline communications services utilizing a variety of asynchronous and synchronous protocols (binary synchronous, SDLC, and HDLC). An IBM PC equipped with DPC/88 operates as a cluster controller capable of controlling up to five printers and four other PCs functioning as IBM 3278 terminals. Each of the attached PCs must be outfitted with a Persyst Products MPC board. Separately priced software enables a PC installed with DPC/88 to function as an IBM 3780 and as a HASP remote entry work station. List price: $695, *PC/HASP* software $995, *PC/3780* software $595. Requirements: 128K, one disk drive.

COAX/3270

Persyst Products
15801 Rockfield Blvd., Ste. A
Irvine, CA 92714
714/859-8871

COAX/3270 consists of a board and software that convert an IBM PC to an IBM 3278 Model 2 or 3279 Model S2A display station, which can be directly connected to an IBM 3274/6 cluster controller using coaxial cable. Users can switch back and forth between regular PC operation under PC-DOS and 3278/9 functions without interrupting either session. List price: $995. Requirements: 128K, one disk drive.

Blue Lynx Series

Techland Systems, Inc.
25 Waterside Plaza
New York, NY 10010
212/684-7788

Blue Lynx is a series of external protocol converters and software that allow the IBM PC to communicate with various mainframe computers using several protocols. Two types of emulators are available. The 3276 emulator converts the PC into either a 3276 Model 12 display station for use in SNA/SDLC networks, a 3276 Model 2 display station for use in binary synchronous leased-line networks, or a 3275 Model 2 display station for use in binary synchronous switched networks. The 5251 emulator enables the PC to communicate with IBM System/34, System/36, and System/38 mainframe computers as though it were an IBM 5251 Model 12. Data is transferred at line speeds up to 9600 bits per second. List price: each emulator $690. Requirements: 96K, one disk drive, serial port.

MDS-8070

Commtex Inc.
2411 Crofton Ln.
Crofton, MD 21114
301/721-3666

MDS-8070 is an external communications processor and protocol converter. MDS-8070 connects one or two IBM mainframe computers that operate using SNA/SDLC protocols with up to 25 ASCII devices. An IBM PC and a printer count as 2 devices. To each mainframe computer, the MDS-8070 appears to be one or two 3274 Model 1C/21C/31C/51C or 3276 cluster controllers operating at up to 19,200 bits per second. A PC attached to the converter appears to be a 3278 or a 3279 display station and, if a printer is attached, a 3287 printer. An asynchronous communications program is required. List price: for each attached work station $640. Requirements: serial port.

IRMA

Digital Communications Associates, Inc.
303 Technology Park
Norcross, GA 30092
404/448-1400

IRMA is a board that allows an IBM PC to operate as though it were a 3278/9 display station and to connect coaxially to a 3274/6 cluster controller. With IRMA the PC performs all 3278/9 functions, as well as regular PC operations using PC-DOS. IRMA's text file transfer program allows transmission of files to and from IBM mainframe computers. List price: $1195.

"IRMA is an excellent product. It works as advertised and emulates all the functions of the 3278 (monochrome) and 3279 (color) terminals." Dan Moore, Columbus, Indiana

IRMALINE

Digital Communications Associates, Inc.
303 Technology Park
Norcross, GA 30092
404/448-1400

IRMALINE is a protocol converter that attaches by coaxial cable to an IBM 3274/6 cluster controller. Any ASCII device, such as an IBM PC with a serial port, can connect to IRMALINE and operate as though it were a 3278 display station. The PC's serial port can attach directly to IRMALINE, or the connection can be made through modems and across communications links. Data transmission occurs at speeds up to 9600 bits per second. Either a program must be resident in the PC to interpret and act upon formatting instructions transmitted by IRMALINE, or the manufacturer's IRMALETTE board for the PC can perform the necessary functions. List price: $1395.

Advanced Communications Board

Frontier Technologies Corporation
P.O. Box 11238
Milwaukee, WI 53211
414/964-8689

The Advanced Communications Board is a multiprotocol board that enables the IBM PC to communicate with a mainframe or an X.25 communications network. The board provides asynchronous, binary synchronous, HDLC, SDLC, and CCITT-X.25 protocols. It operates with 3270 and 3780 emulation software, X.25 level 3 software, and 9600 asynchronous software. Its direct memory access capability allows high-speed communications. For example, the asynchronous programmable bits-per-second rate ranges from 110 bits to 19.2 kilobits per second. A clock/calendar with battery backup and a parallel port are separately priced options. List price: $275.

BabyTalk

Microlog, Inc.
222 Rt. 59
Suffern, NY 10901
914/357-8086

BabyTalk is a board that provides communications services for the IBM PC. With special software installed, the board turns the PC into one of several devices for communicating with mainframe computers. BabyTalk has its own Z-80 processor and memory and comes with software that allows the PC to emulate several asynchronous terminals. Separately priced software modules permit the PC to operate as a 3270 using binary synchronous or SNA/SDLC protocols, as a 3770 using SNA/SDLC, or as a HASP work station. BabyTalk enables users to run CP/M-80 software, provides print spooling using its memory as a print buffer, and adds a clock/calendar. List price: $895, software modules $99 to $399 each.

IDEAComm 3278

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430

IDEAComm 3278 is a board with software that allows the IBM PC to emulate the IBM 3278 terminal. Once equipped with IDEAComm 3278, the PC can be connected to an IBM 3274/6 cluster controller by coaxial cable. The transmission speed of the communications link depends on the type of connection between the cluster controller and the mainframe. In addition to emulating the keyboard and screen functions of the 3278, IDEAComm allows files to be transferred to and from the mainframe. The board also allows the PC's printer to print data while users work on other applications. List price: $1195.

Linkup Model 501 Communications Support System

Information Technologies Inc.
7850 E. Evans Rd.
Scottsdale, AZ 85260
800/431-3460, 602/998-1033

Model 501 is a board with a programmable hardware module and software options. These options enable an IBM PC to communicate with other computers that use

standard protocols by emulating a mainframe terminal. Software emulator options include TTY with asynchronous block protocol, DEC VT52/100, IBM 3101, and IBM 2780/3780. The package includes a 50-pin connector and two serial ports, and it allows unattended operations as well as data rates up to 56 kilobits per second. List price: basic board with TTY and asynchronous block protocol $795, additional software options $150 to $195.

CC-232
Multi-Protocol Card

AST Research, Inc.
2372 Morse #104
Irvine, CA 92714
714/863-1333

The CC-232 Multi-Protocol Card is designed for people who write their own communications software. The CC-232 Multi-Protocol Card uses the Z-80-S10 communications processor; it is programmable for use with asynchronous or synchronous line protocols, including bisynchronous and SDLC/HDLC.

The CC-232 Multi-Protocol Card has two independent full-duplex channels and two programmable bits-per-second rate generators. The board has switches for port addressing and interrupting line use. The CC-232 Multi-Protocol Card is not a replacement for the standard IBM serial ports, but it can coexist with them. The board comes with a 6-foot connector cable, schematics, and SIO technical programming documentation. Both 64K and 256K versions are available. List price: 64K $295, 256K $595.

PC/3278
Emulator/Adapter Board

Forte Data Systems, Inc.
1500 Norman Ave.
Santa Clara, CA 95050
408/980-1750

The PC/3278 Emulator/Adapter Board enables an IBM PC to emulate an IBM 3278 or 3279 terminal with all standard highlighting and color options. The board features an 8X305 processor, a full-screen buffer, and attribute memory. A single keystroke switches control between DOS and terminal modes without interrupting operations in either mode. The board comes with software for performing screen capture, screen print, and file transfer. The PC/3279G Color Graphics Emulator/Adapter Option Board can be piggybacked onto the PC/3278 board to provide color graphics. List price: PC/3278 $1195, PC/3279G $1395.

IRMALETTE

Digital Communications Associates, Inc.
303 Technology Park
Norcross, GA 30092
404/448-1400

IRMALETTE is a board that provides a serial port and on-board logic to connect an IBM PC to an IRMALINE protocol converter. The connection is made directly or through modems and a communications link. In conjunction with IRMALINE, IRMALETTE makes a remotely located PC equivalent to a locally attached PC equipped with an IRMA board. List price: $325.

COAX/3278

Persyst Products
15801 Rockfield Blvd., Ste. A
Irvine, CA 92714
714/859-8871

The COAX/3278 controller board lets users accept and display data from a mainframe computer or execute programs on the IBM PC. COAX/3278 enables the PC to emulate the IBM 3278-2 or 3279-S2A display stations while serving as a personal computer. Users can save and restore IBM 3270 screens. COAX/3278 permits switching from PC operation to 3270 operation and back again without logging on and off the host computer, and it automatically restores the previous screen position. List price: $995.

PA-1000 Protocol Converter

Avatar Technologies Inc.
99 South St.
Hopkinton, MA 01748
617/435-6872

PA-1000 is a processor-based protocol converter. It provides IBM 3278/2 terminal emulation and connects via coaxial cable to an IBM 3274/3276 cluster controller. It also allows asynchronous communications through an auxiliary serial port for access to other computer systems or public information services, or for sending on-screen information to a printer. Users can switch instantaneously between synchronous and asynchronous modes. Data transmission rates of up to 9600 bits per second can be selected. PA-1000 can be connected to a modem. List price: $995.

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PCI 1076

Protocol Computers, Inc.
6150 Canoga Ave. #100
Woodland Hills, CA 91367
213/716-5500

PCI 1076 is an external protocol converter that transforms an attached IBM PC into an IBM 3278. The PC can then communicate with a mainframe computer using SNA/SDLC line protocols. Up to seven PCs can be attached and operated simultaneously. Each PC's printer functions as an IBM 3287 printer. Separately priced software offers enhancements such as user-defined windows and mouse control. A version of the converter that allows communications through an X.25 packet network is available. List price: for one attached PC $3100, for seven attached PCs $7000, software $200. Requirements: 128K, one disk drive, serial port.

PCI 1051

Protocol Computers, Inc.
6150 Canoga Ave. #100
Woodland Hills, CA 91367
213/716-5500

PCI 1051 is an external protocol converter that allows an attached IBM PC to communicate with an IBM System/34 or System/38 as though the PC were an IBM 5251 Model 11. Up to seven PCs can be attached and operated simultaneously. Separately sold software offers such features as user-defined windows and mouse control. A version of the converter that allows communications through an X.25 packet network is available. List price: for one attached PC $3100, for seven attached PCs $7000, software $200. Requirements: 128K, one disk drive, serial port.

PCI 1071

Protocol Computers, Inc.
6150 Canoga Ave. #100
Woodland Hills, CA 91367
213/716-5500

PCI 1071 is an external protocol converter similar to PCI 1076 except that it communicates with mainframe computers using binary synchronous protocols. List price: for one attached PC $3100, for seven attached PCs $7000, software $200. Requirements: 128K, one disk drive, serial port.

Pathway/Communications Adapter

Pathway Design, Inc.
177 Worcester St.
Wellesley, MA 02181
617/237-7722

Pathway/Communications Adapter is a board used with software from Pathway Design to transform the IBM PC into one of several terminal types suitable for communications with mainframe computers. Either synchronous or asynchronous protocols can be used, depending upon the software chosen. Data is transferred at line speeds up to 19,200 bits per second. Separately sold software includes *Pathway/BSC*, which allows the PC to operate as an IBM 2780, 3270, 3770, or 3780 using binary synchronous protocols, and *Pathway/SNA*, which allows the PC to operate as an IBM 3270 or 3770 using SNA/SDLC protocols. List price: $295, *Pathway/BSC* or *Pathway/SNA* $595. Requirements: 128K, one disk drive.

MicroGate 2780/3780 and MicroGate II

Gateway Microsystems, Inc.
9501 Capitol of Texas Hwy. #105
Austin, TX 78759
512/345-7791

MicroGate 2780/3780 and MicroGate II each consist of a communications board, the Serial Communications Controller, and software. Each package enables the IBM PC to emulate the IBM 2780/3780 remote batch terminals using binary synchronous protocols. Data is transferred at line speeds up to 4800 bits per second. The two packages are identical except that MicroGate II allows more configuration options to be specified through programming and supplies a communications interface directly accessible from programs written in COBOL or assembly language. List price: each package $895. Requirements: 64K, one disk drive.

MicroGate 742

Gateway Microsystems, Inc.
9501 Capitol of Texas Hwy. #105
Austin, TX 78759
512/345-7791

MicroGate 742 consists of a Gateway Serial Communications Controller board and software that allow the IBM PC to emulate the Texas Instruments 742 terminal operating in block mode. With MicroGate 742, the PC can be used in the unattended batch environment of the Texas Instruments 700 TPS or other host-controlled 742 polling networks. List price: $895. Requirements: 64K, one disk drive.

MicroGate CD

Gateway Microsystems, Inc.
9501 Capitol of Texas Hwy. #105
Austin, TX 78759
512/345-7791

MicroGate CD consists of a Gateway Serial Communications Controller board and software that allow the IBM PC to emulate standard terminals used with CableData host computers. With the board installed in the PC, users can access all applications programs available on the host computer. This product is designed specifically for CableData users in the cable television industry. List price: $895. Requirements: 64K, one disk drive.

MicroGate 6530

Gateway Microsystems, Inc.
9501 Capitol of Texas Hwy. #105
Austin, TX 78759
512/345-7791

MicroGate 6530 is composed of a Gateway Serial Communications Controller board and software that allow the IBM PC to emulate the Tandem 6520/6530 Multi-Page terminal. MicroGate 6530 provides communications at speeds up to 19,200 bits per second. List price: $895. Requirements: 64K, one disk drive.

MicroGate 940

Gateway Microsystems, Inc.
9501 Capitol of Texas Hwy. #105
Austin, TX 78759
512/345-7791

MicroGate 940 consists of a Gateway Serial Communications Controller board and software that enable the IBM PC to emulate the Texas Instruments 940/931 EVT terminal emulator. The PC can then be used with Texas Instruments DS990 and Business Series systems. List price: $895. Requirements: 64K, one disk drive.

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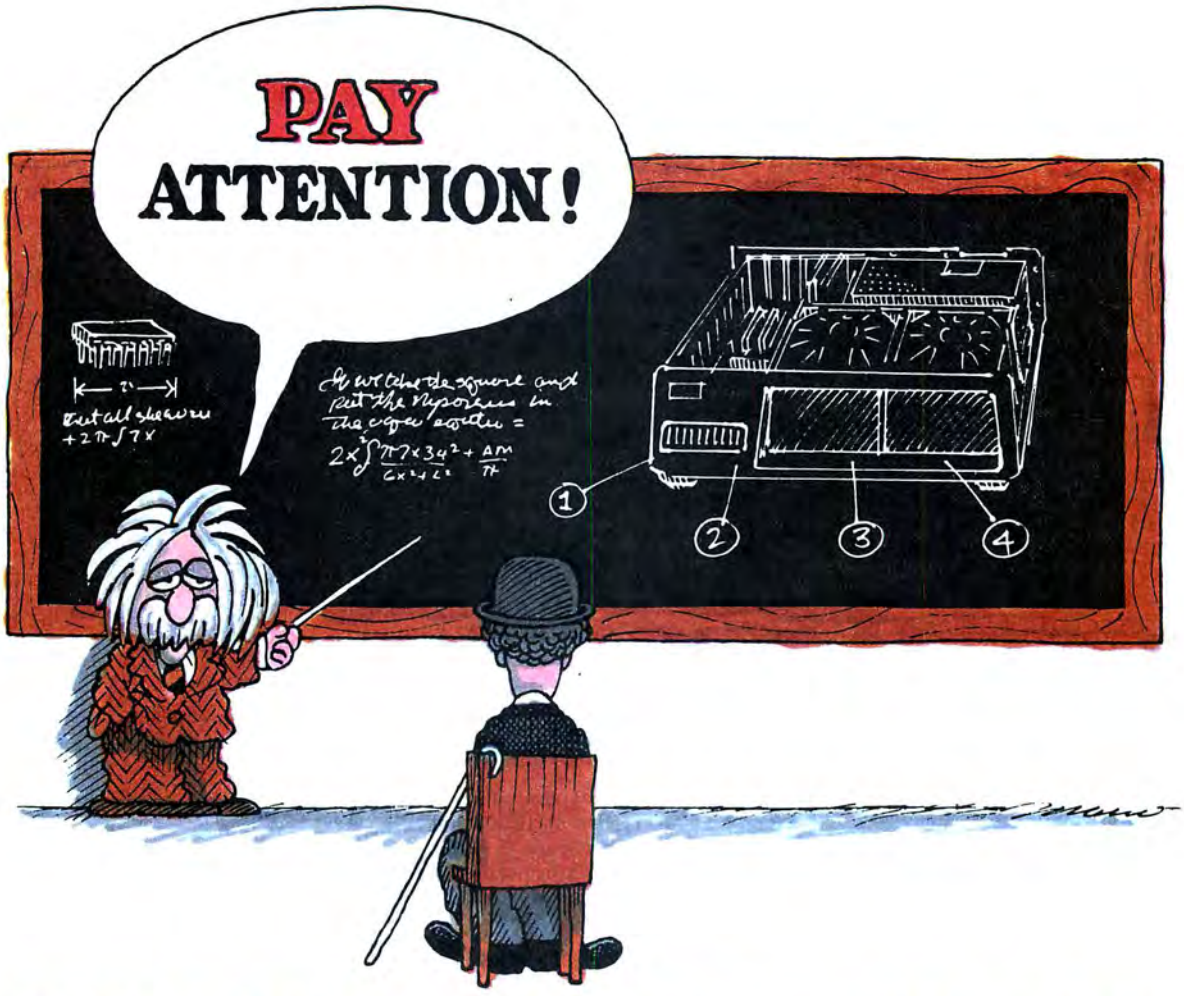

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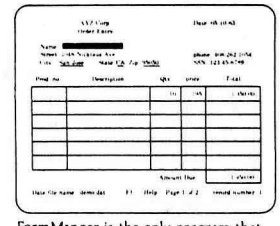

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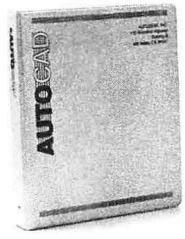

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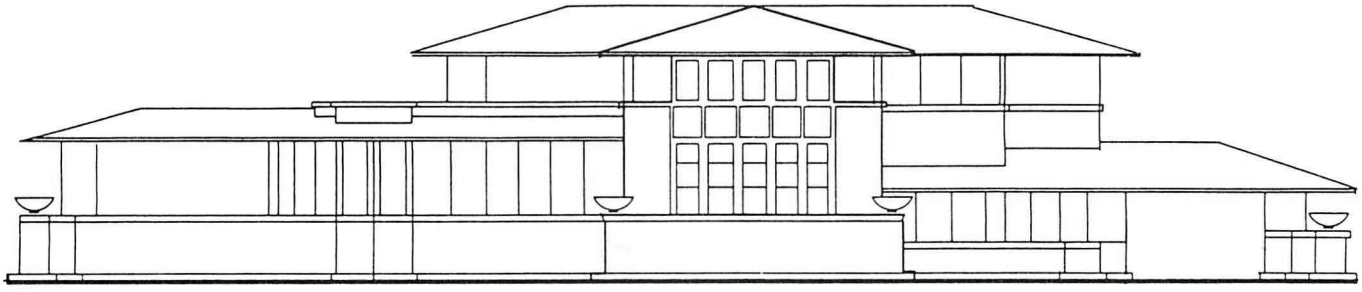

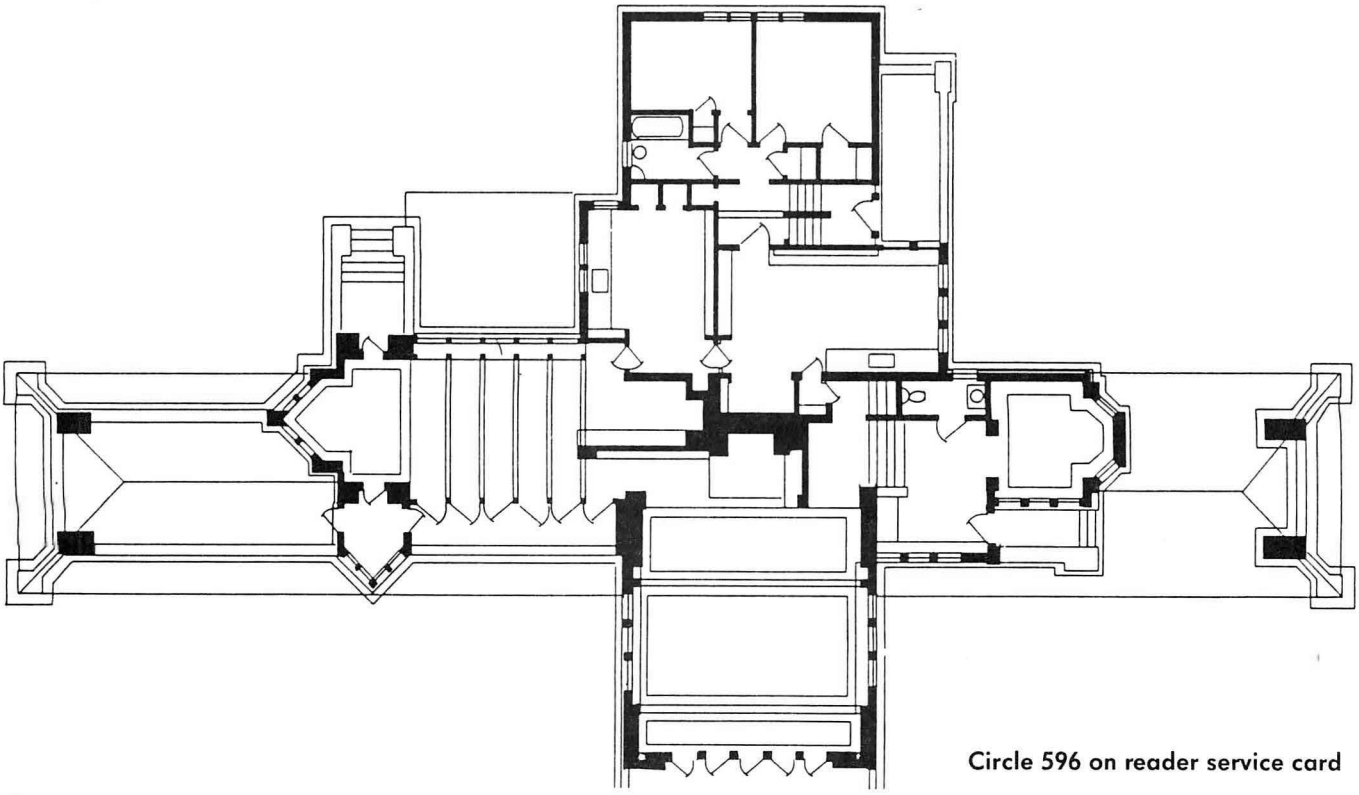

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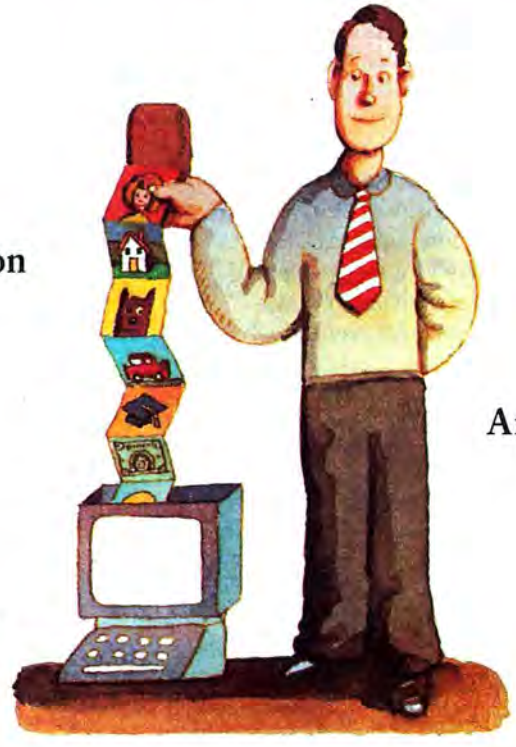

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PC WORLD

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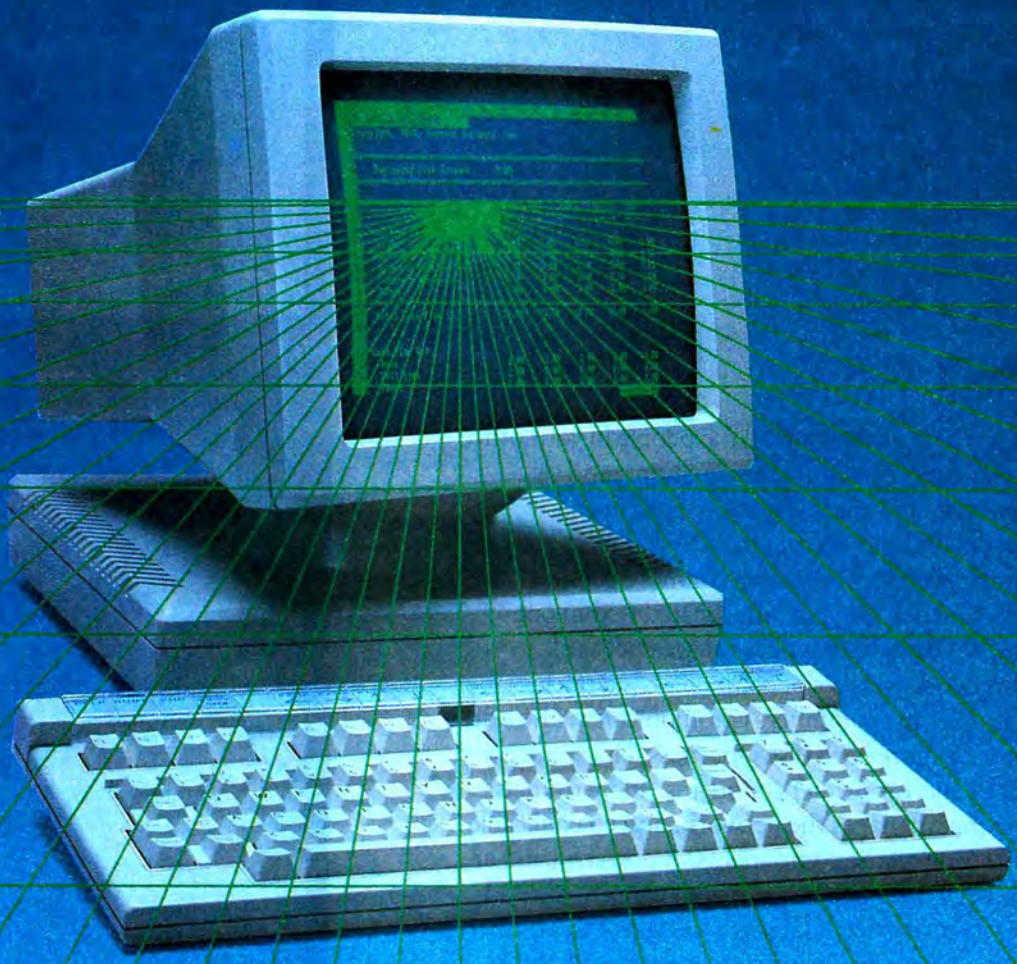

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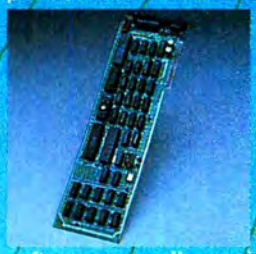

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Networks

Craig Burton

Wouldn't it be convenient if all the people in your office with computers could pool information, send electronic memos, and share expensive hard disk drives and printers without leaving their desks? Now they can. Any organization with two or more personal computers, which are generally located within one building, is a candidate for a local area network.

A network consists of computers; interface boards that let the computers communicate with each other; one or more hard disks for mass data storage; peripherals such as printers, modems, and terminals; software that manages the network; and coaxial cable for connecting all the components. A powerful and affordable network must be built with care. To take advantage of software available for the IBM PC, you need a single-user operating system such as PC-DOS. However, features important to managing multiuser networks, such as record locking and security (which ensure that only authorized users have access to data), are not part of PC-DOS. As a result, the different network hardware manufacturers have devised their own methods of network management.

Networks by their nature present problems. What happens when two people using a network attempt to modify a spreadsheet file at the same time or update an inventory file simultaneously? Obviously, concurrent data sharing requires a means of locking files so that they can be accessed by only one person at a time. Network manufacturers usually provide file-locking software routines, but the application or the application language must invoke the routines. Otherwise, several people on a network may gain access to

the same software and data, with each person making changes to records without knowledge of changes the others are making. As each person saves the changes, everyone else's changes are written over. This situation is critical and must be addressed by the network management software.

The key to successful networking lies not only in hardware but also in the availability and usefulness of PC software, much of which needs to be adapted for multiuser environments. Networking has encouraged new applications such as electronic mail, multiuser accounting and data base management systems, and interfaces to languages. But be warned—your favorite data base manager, when placed in a network, may not automatically become multiuser. The phrase "works in network systems without modification" in software brochures sounds reassuring, but it usually means that a single-user program may work on a network only as long as two people do not attempt to modify data simultaneously.

Another problem for both software suppliers and users is network software licensing. What should be the price of a word processor for a group of 100 users in a network? Soon networks will be communicating with other networks and mainframes. You will be able to use files and programs on the network at your office from your PC at home. These applications will confuse software licensing issues. To solve the problem of software piracy and network licensing, a cooperative effort between network and software manufacturers must be encouraged.

Networks originally came into demand as a way to cut costs. By allowing more computers to share printers and hard disks, less hardware was needed. A few years ago, a 10-megabyte hard disk with controllers and a power supply cost more than a PC XT. Today, even though the price of computer peripherals is decreasing, the savings derived from sharing the peripherals is still an important reason to install a network. But the efficient management of information that a network provides is and will continue to be the prime reason to use a network.

Craig Burton is director of marketing for Novell, Inc.

A local area network lets two or more computers share hardware and software. By linking all the computers and peripherals, such as hard disk drives and printers, within a given area, networks permit maximum use of each component. For example, several people in an accounting department may need access to a large accounting program that requires hard disk storage. But supplying hard disks for everyone in the department would be very expensive, and information could not be shared and updated. In a network operation, one hard disk can be shared by everyone in the network.

Networks also offer data security. Access to files requires a password. File locking software prevents another person from reading or writing to a file while you are working on it. Also, with all files stored on a shared disk, data backup procedures are much faster and easier to implement.

Some features to consider when shopping for a network system include data transmission speeds, which range from 500 kilobits per second to 10 megabits per second; maximum connector cable lengths, which generally run up to 10,000 feet, or more with signal amplifiers; and the number of work stations (computers and peripherals, also called nodes) that can be connected. Most networks allow from 2 to 350 work stations per system. One network manufacturer claims that over 64,000 work stations can be hooked into its network.

You might also check whether the system you want offers convenient utilities such as electronic mail and print spooling software, or features such as mainframe communications and data encryption capabilities.

Shopping for a network requires accurate knowledge of your company's present and future needs, as well as considerable research into networks that may fill those needs. The *PC World Hardware Review* is a good place to begin that research.

Decision Net

NCR Corporation
1700 S. Patterson Blvd.
Dayton, OH 45479
513/445-2075

Decision Net is file-sharing and networking hardware. Decision Net uses NCR's Omninet local area network protocol to allow communications between up to 63 IBM PCs and personal computers from manu-

facturers such as NCR and Apple. The network enables the connected computers to share records, files, programs, and peripheral devices such as disks and printers. Electronic mail can be sent between the computers. The network also provides remote batch entry communications with mainframe computers. List price: for file sharer $9995, for each attached personal computer $500.

PC Local Network Interface Module

Gateway Communications, Inc.
139 E. Alton Ave.
Santa Ana, CA 92707
714/957-0762
The PC Local Network Interface Module (PC-LNIM) is a board that connects the IBM PC to the Gateway local area network (G-NET). G-NET allows up to 255 terminals and personal computers to communicate. The terminals and computers linked to the network can share data bases, programs, and peripheral devices such as printers and disks. When connected to PC-LNIM, the PC can emulate an IBM 3270 terminal and access SNA, binary synchronous, DSP, and X.25 networks. List price: for each attached work station $595. Requirements: Gateway processor.

HiNet

Digital Microsystems
1840 Embarcadero
Oakland, CA 94606
415/261-1034
HiNet is a board that links terminals and personal computers with Digital Microsystems' HiNet local area network. Up to 32 work stations can be connected. HiNet is a packet-switched network that provides data transmission at 500 kilobits per second using SDLC protocol. The network also provides electronic mail capabilities. List price: for each attached work station $375.

Netway

Tri-Data Corp.
505 E. Middlefield Rd.
Mountain View, CA 94043
415/969-3700
Netway is a family of networking products: the Netway 200 communications processor, the 150 network interface processor, the 100 device interface processor, and the 50 local network interface. The combination of products varies with the application. Netway links up different kinds of work stations with host computers from manufacturers such as IBM, DEC, ICL, CDC, Honeywell, Burroughs, and Univac. The system also connects personal computers, display terminals, dedicated word processors, and printers. IBM PCs and XTs link up to the network via a serial port connected to the Netway 100 interface processor.

The Netway 200 communications processor allows connections utilizing protocols such as IBM 3270 binary synchronous, IBM 3270 SDLC, IBM SNA/SDLC, IBM 2780/3780, IBM 1006 IPARS (airline reservation system), Burroughs Poll/Select, ICL C01 and C03, CDC Mode 4, and X.25. List price: Netway 200 $6880, Netway 150 $750, Netway 100 $420, Netway 50 $200. Requirements: serial port.

IDEAnet

IDEAssociates, Inc.
7 Oak Park Dr.
Bedford, MA 01730
617/275-4430
IDEAnet provides asynchronous networking for IBM PCs. The network links a maximum of 20 PCs located within 2000 feet of each other. Transmission speed is 800 kilobits per second. The IDEAnet software includes a file-locking feature that prohibits more than one person from using a file at the same time. List price: hardware $595, software $795.

X-NET

XCOMP
3554 Ruffin Rd. S
San Diego, CA 92123
619/573-0077
X-NET connects from 2 to 255 IBM PCs in a local area network. The network transfers information at a speed of 2.5 megabits per second with cables up to 600 feet long. Repeaters are available that allow an increase in cable length to 10,000 feet. The system provides security features to assure that data is kept private and that only people authorized to use the network are able to do so. List price: for a two-PC system $995, for each additional attached PC $490.

Omninet and Corvus SNA Gateway

Corvus Systems, Inc.
2029 O'Toole Ave.
San Jose, CA 95131
408/946-7700
The Omninet networking board links personal computers and devices such as disk drives and printers in a network. Up to 64 work stations can be connected. The network is designed for personal computers including IBM PCs and XTs, Corvus Concept work stations, DEC Rainbows, and Apple IIs and IIIs. Data is transmitted at 1 megabit per second.

The Corvus SNA Gateway processor allows PCs, XTs, and Corvus Concept work stations connected to the Omninet network to communicate with IBM mainframe computers on an IBM SNA network. The computers on Omninet function individually, as networked computers, or as IBM 3270 terminals for the mainframes. Gateway also provides printer emulation. In addition to exchanging information between the personal computers and the mainframes, the Gateway processor functions in "program-to-program" mode, which allows a program running on a computer on Omninet to communicate with a program running on the mainframe. List price: for each attached work station $495, Gateway processor $7500.

Lantech Network

Lantech Systems, Inc.
9635 Wendell Rd.
Dallas, TX 75243
214/340-4932
The Lantech cluster controller board links nine IBM PCs, XTs, Texas Instruments Professional computers, or serial devices, such as terminals and printers that have a serial port, in a network. Work stations on the network can communicate with mainframe computers using an asynchronous protocol. If an additional board is installed in one computer on the network, the network can communicate with an Ethernet network. uNETix, a single-user, multitasking operating system that works with the Lantech Network and other PC and XT networks, is sold separately. List price: board $1000.

PCnet

Santa Clara Systems, Inc.
1860 Hartog Dr.
San Jose, CA 95131
408/287-4640

Santa Clara Systems' PCnet allows up to 255 IBM PCs, XTs, and Santa Clara Systems terminals to link up in a network. A network interface board is installed in each PC or terminal on the network. Data is transmitted at 1 megabit per second. Cables between terminals are a maximum of 7000 feet in length. Work stations on the network can communicate with mainframe computers if a special interface board is installed in the personal computer or terminal. List price: two-work-station network $1490, for each additional attached work station $695.

PC-LNIM Adapter Board

Gateway Communications, Inc.
16782 Redhill Ave.
Irvine, CA 92714
714/261-0762

The PC-LNIM Adapter Board lets you integrate an IBM PC or XT into a multiuser system. Each PC on G/NET, Gateway's communications system, requires the PC-LNIM Adapter Board. Capable of connecting up to 255 devices, G/NET provides print spooling, electronic mail, and multiuser data base management, as well as optional file and communications servers. PC-LNIM contains a Z-80 processor, 64K RAM with parity checking, and a 4.77 MHz clock. List price: $595.

Netware

Novell, Inc.
1170 N. Industrial Park Dr.
Orem, UT 84057
801/226-8202

Netware is a family of networking products. Netware/S is a network file server based on the Motorola 68000 processor. The file server allows up to 24 work stations to share up to 300 megabytes (M) of storage and up to five printers. IBM PCs and XTs, Victor 9000s, and Texas Instruments Professional computers can act as work stations on the network. Diskless personal computers, such as a PCjr with no disk drive, can also be connected to the network. A Netware networking board must be installed in each computer on the network. The computers can communicate with mainframe computers if a second board is installed.

Netware/X allows an XT or a PC with a hard disk drive to act as the network file server. Up to 50 PCs and XTs, each with a Netware board installed, can be connected on the Netware/X network to share up to 150M of storage and three printers. The PC or XT designated as the network file server can also serve as a work station.

The Netware software series, which includes Netware/O, Netware/E, and Netware/P, allows computers using Corvus Omninet, 3Com's EtherLink, Proteon's ProNet, and other manufacturers' networking boards to operate on a Netware/X network. The Netware software makes software developed for one network compatible with another. List price: Netware/S file server with 20M and four attached work stations $13,000, for each additional work station $250; Netware/X with three attached work stations $2995, for each additional work station $695; Netware/O, Netware/E, Netware/P system software $1495 each.

10-NET

Fox Research, Inc.
7005 Corporate Way
Dayton, OH 45459
513/433-2238

10-NET consists of a networking board and software that allow up to 32 IBM PCs and XTs to share hardware, software, and data. The network uses the Ethernet standard and transmits data at 1 megabit per second. PCs on the network can operate as both file servers and work stations. The network software provides electronic mail, print spooling, a "chat" mode, a calendar mode for appointment management, and a Who command for displaying current network users. Personal computers on the network can communicate with mainframe computers if a mainframe communications board is installed. List price: $695.

ELAN

Tecmar, Inc.
6225 Cochran Road
Solon, OH 44139
216/349-0600

The ELAN network for IBM PCs and XTs is made up of an Ethernet board, Tecmar's Ethernet Companion board, and software. Up to 100 PCs per 300-meter segment of cable can be connected to the network, to a maximum of 1000 PCs. The Ethernet Companion allows voice messages to be transmitted over the network between computers or to dictation machines. ELAN is available in three levels. The first level, called the Secretary, is made up of the three basic network components. The Manager adds an internal modem to the system and turns the PC into a telephone when a separate handset is added. The Executive adds the modem, voice recognition capability, and a microphone. List price: Secretary $1695, Manager $1995, Executive $2995.

The IBM Personal Computer Cluster Program

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM PC Cluster Program allows as many as 64 IBM PCs, XTs, Portable PCs, and PCjrs to be connected to share information, programs, and messages. PCjrs linked to the cluster cannot have the PCjr disk drive, internal modem, or parallel attachment installed. The cluster is made up of software and a board, which is the IBM Cluster Attachment for the PCjr and the IBM Personal Computer Cluster Adapter for the PC, the XT, and the Portable PC. Work stations can share information and storage space from one hard disk drive on the cluster. Data is transmitted at 375 kilobits per second. List price: for cluster made up of one XT and four PCs, Portable PCs, or PCjrs $2540.

The Database Machine

Cogent Data Technologies, Inc.
P.O. Box 3902
Bellevue, WA 98009
206/455-3343

The Database Machine is a controller board that gives networked IBM PCs simultaneous access to shared data files without restricting use of the host PC. The board processes up to 128 simultaneous requests for the same file, and it transfers data at 1.5 megabytes per second. Acting as a file server, the board replaces the hard disk controller in computers with hard disk drives. The board has an 80186 processor, a 64K buffer, and 128K for multitasking. It works with 3Com, Orchid, Santa Clara, and AST networks. List price: $1500.

3Com EtherSeries

3Com Corporation
1390 Shorebird Way
Mountain View, CA 94043
415/361-9602

The 3Com EtherSeries network uses the Ethernet network standard to link IBM PCs and XTs and other personal computers such as the Texas Instruments Professional and the Hewlett Packard 150. Up to 100 computers can be connected per 1000 feet of network cable. Data is transmitted at a rate of 10 megabits per second. The network also allows ASCII terminals to communicate with mainframe computers. List price: network server $950, for each attached personal computer $950, EtherShare software $500.

MultiLink

Davong Systems, Inc.
217 Humboldt Ct.
Sunnyvale, CA 94086
408/734-4900

The MultiLink local area network allows up to 255 IBM PCs and XTs to communicate and share devices such as hard disk drives and printers. The computers on the network can act as computers or network servers. Data is transmitted at 2.5 megabits per second. The basic network is a four-computer system with personal computers located up to 200 feet apart. Distances between computers can be increased to 20,000 feet by using repeaters. Electronic mail, print spooling, and IBM 3270 terminal emulation software is available at additional cost. List price: for each attached personal computer $595, MultiLink software $500, repeater $100.

PCnet

Orchid Technology
47790 Westinghouse Dr.
Fremont, CA 94539
415/490-8586

PCnet is a set of two local area network boards that allows IBM PCs on a network to share hard disk drive units, high-speed or letter quality printers, and synchronous and asynchronous lines. All PCs connected to the network are free for independent processing since PCnet does not require a dedicated file server. PCnet transmits data at speeds up to 1 megabit per second over a distance of 7000 feet. Electronic mail software is optional. List price: $1490.

PerComNet

PERCOM DATA Corporation
11220 Pagemill Rd.
Dallas, TX 75243
214/340-7081

The PerComNet networking interface board allows an IBM PC or XT to communicate with up to 254 other PCs and XTs. The network control processor is Western Digital's WD2840 chip. Because both voice and data signals are transmitted through the network, users can send and store voice messages. The network communicates with other networks such as Ethernet and with IBM 3270 terminals. List price: for each attached personal computer $595.

Destek Network Interface Server

Destek
830 E. Evelyn Ave.
Sunnyvale, CA 94086
408/737-7211

The Destek Network Interface Server allows up to 350 computers, printers, or storage devices to communicate via a parallel or serial port, a modem attached to a serial port, or the manufacturer's network interface board. IBM PCs and XTs, terminals, and mainframe computers can be attached to the network. For PCs and XTs, Destek provides a special interface board. The network transmits data at 2 megabits per second over coaxial cable. The maximum cable length is 6562 feet. List price: for each attached work station $500 to $700 (depending on the number of stations attached).

PCnet

AST Research, Inc.
2372 Morse Ave.
Irvine, CA 92714
714/863-1333

The AST PCnet networking board connects up to 100 IBM PCs and XTs. The board is installed in every PC or XT on the network. Data is transmitted at 1 megabit per second, and the maximum cable length is 7000 feet. The PCnet software provides disk sharing, which enables PCs to share storage devices and printers, and file locking, which allows single-user applications to be converted to multiuser applications. List price: for each attached personal computer $695.

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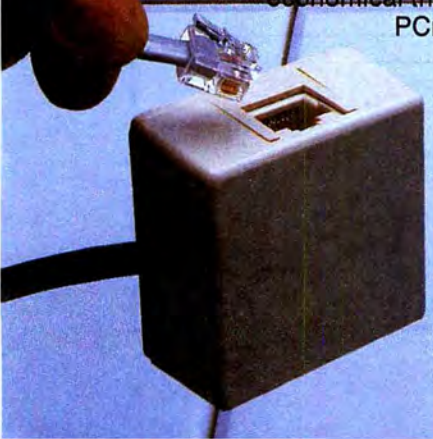

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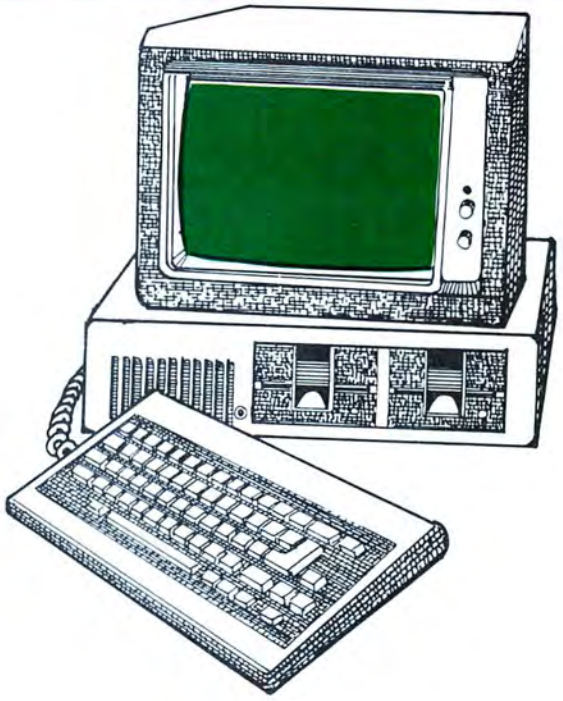

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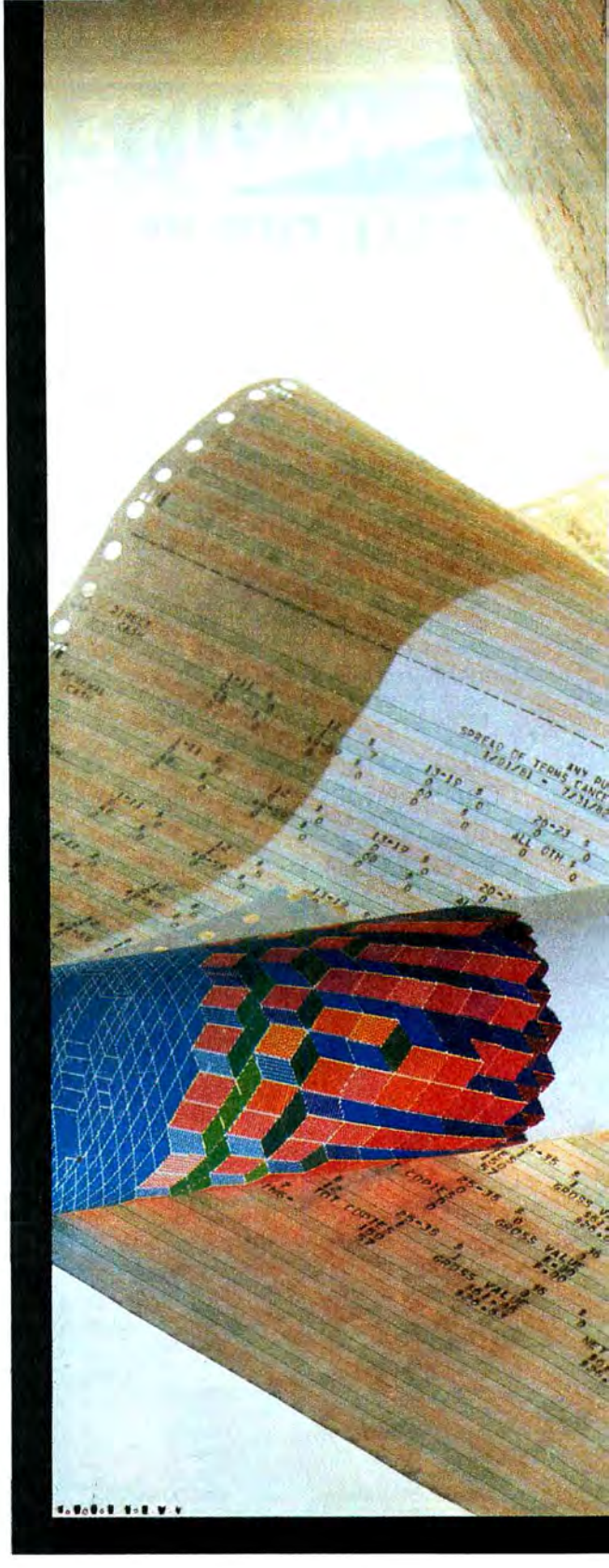
Printers



Bernard Horn

Technological visionaries periodically announce that the printed page may soon become obsolete. They anticipate a future in which all information is viewed on computer screens. The printed page, nevertheless, remains the most common way to document information; paper documents are easily transported, viewed, copied, handed out, and posted. Many people still prefer to send and receive communications in the form of a printed letter when formality or personal acknowledgement is required.

Printers enable you to take computerized information and print it faster than you can type. Several types of printers are available; they are suited for different kinds of work, such as printing letters of typewritten quality or quickly printing a rough draft. The two most common types of printers are letter quality and dot matrix printers. In the future we'll probably see more thermal printers, ink jet printers, and laser printers.

Letter quality printers produce fully formed characters like typewriters do—a quality that is desirable for business letters and reports. Letter quality printers work by positioning characters molded on the tips of a circulating wheel or thimble. After a character is positioned, a small hammer pushes it against a ribbon, making an impression on paper. Special print wheels or thimbles have character sets for scientific symbols and foreign characters.

Letter quality printers print at slower speeds than dot matrix printers. The average speed is between 18 and 80 characters per second (cps). Dot matrix printers are fast; some are capable of printing up to 400 cps. However, they do not produce the refined

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characters produced by letter quality printers. Dot matrix characters are formed by the impact of a group of needles on a ribbon. The printer selects specific needles within the matrix to imprint a pattern of dots corresponding to a desired character's shape. Passing over the same line twice with a slight shift in placement fills in gaps between dots to produce better-defined characters. When dot matrix printers use this procedure they produce "correspondence quality" print, which is still inferior to the well-defined characters produced by letter quality printers.

Besides having the advantage of speed, dot matrix printers are usually less expensive than letter quality printers. Another benefit of dot matrix printers is their ability to arrange dots in unlimited patterns. With appropriate software, these printers can produce graphics and change character size and style.

Unlike letter quality printers and dot matrix printers, thermal printers use heat to form characters on paper. The print quality is similar to that of dot matrix printers because specific pins in a thermal printhead are heated to form characters and images composed of dots. Thermal printers are quiet and fast; some are capable of printing up to six pages per minute. They can also combine text and graphics.

The biggest drawback of thermal printers has been their need for expensive, specially coated paper. Thermal printers that use plain paper are just becoming available. Another disadvantage of thermal printers (and other nonimpact printers such as ink jet and laser printers) is their inability to produce carbon copies.

Ink jet printers print vibrantly colored graphics and images to produce multicolored maps, charts, and three-dimensional pictures. These printers form characters and images by separating and controlling ink drops with an electric charge or by routing drops through several ink channels. Ink jet printers are quieter than dot matrix and letter quality printers, and some of them print up to 270 cps. Because ink jet printers do not use ribbons, print color quality and intensity do not fade.

Laser printers are quiet and extremely fast, capable of printing 12 pages a minute. They create type by exposing paper to a laser beam. Because laser printers are expensive, costing $17,000 to $20,000, they are suited for businesses that generate large volumes of printed material. As prices come down, laser printers will become an appealing alternative for general purpose office printing.

Each type of printer has qualities and advantages that meet different applications needs. Scientific applications, for example, frequently require a printer with color graphics capability such as an ink jet printer. If you need to produce large quantities of numerical printouts, a fast, draft quality dot matrix printer is a good choice. Before selecting a printer, determine the tasks you need it to perform and consider your requirements for speed, print quality, and special character sets. Make sure that the printer you choose prints files from software you use, and check that the hardware interfaces are compatible.

Whatever kind of printer you select, you'll find many occasions to use it. Most people who purchase computers do not ask whether they should buy a printer, but rather what kind of printer is best suited for their printing requirements.

Bernard Horn is vice president of sales and marketing for Diablo Systems, Inc.

Plotters

Brian Moore

Business people use computers to manage information ranging from market shares and financial forecasts to statistical comparisons and organizational structures. Once people have the computerized information, they need to review it, present it, discuss it, and decide how to act on it. One of the fastest and most efficient mediums for sharing information is a graphics presentation with charts and diagrams. Recent studies indicate that the human brain absorbs information 60,000 times faster in graphic form than in written form.

Plotters permit you to print computer graphics on paper or on transparency film for overhead projector presentations. Unlike graphics printers, which are raster devices that print horizontal lines of between 70 to 150 dots per inch, plotters are vector devices that draw up to 1000 line segments per inch. Plotters draw smooth, continuous lines, while graphics printers print broken lines. Also, plotters can fill with solid color the shapes that a printer would fill with a pattern of dots.

Graphics pen plotters were developed in the 1950s from analog recording devices such as seismographs and electrocardiographs, which record on paper from continuous electric input signals. Early plotters converted digital computer signals into analog signals to draw continuous lines. Contemporary plotters come with a variety of features that improve quality and convenience.

The refinement of a plotter's drawing depends on the plotter's ability to produce a series of accurate and detailed movements. To perform intricate work, a plotter must be able to produce the smallest possible pen movement, measured in thousandths of an inch. A detailed drawing requires that the plotter be capable of making not only one very small movement but also a series of quickly repeated, detailed movements without leaving gaps in a line.

How quickly a particular plotter produces drawings depends on how fast it accelerates and how much manual control it requires for changing pens and handling paper. A plotter needs fast acceleration in order to make a quick drawing; because each graphic is a series of starts and stops, the pen must accelerate and decelerate for every stroke. Acceleration is measured in multiples of gravity, called "g's"; most IBM PC-compatible plotters accelerate at a maximum of 2g.

Multicolor graphics require a change of plotter pens. Some plotters can change pen color automatically to permit unattended operation, eliminating the time required to change pen color manually. You'll find

plotters that can interchange two, four, or six pens. To decide how many pens you need, estimate the number of colors you expect to include regularly in your graphics.

Some plotters can plot multiple copies, automatically cap pens, and automatically feed cut sheets of paper. Some plotters use different types of pens and draw on many types and sizes of material, including paper, vellum, and transparency film.

Certain plotters have built-in processors to provide independent operation, which frees computers for other tasks and permits you to program plotter functions. Software is sometimes included to let the plotter perform independent operations, such as drawing arcs and circles, filling in rectangles, and choosing sets of characters for lettering. Whether or not software is included, make sure that the plotter you purchase is compatible with the graphics software you own or plan to buy.

The fullness and definition of shapes and lines drawn with a plotter provide clear contrasts, making bar and pie charts, graphs, and engineering drawings easy to understand. Plotters produce drawings that compare well with those made by graphics artists. The chief value of a plotter lies in its ability to help you prepare impressive and professional presentations.

Brian Moore is general manager of the Hewlett-Packard San Diego division in charge of plotter product development.

When you compare the number of printers available for the IBM PC with the number available even a year ago, the difference is overwhelming. While last year's problem was finding a printer with all the options you needed, this year's task will be ferreting out the right model from a wealth of comparable products.

Dot matrix printers offer multiple speeds, print modes (draft, enhanced, and near letter quality), and fonts (courier, prestige, and gothic). Daisy wheel printers come with many different character sets, including domestic, international, and extended, which contain more than the usual 96 characters per print wheel. Many daisy wheel printers also have color printing and graphics capabilities. Now thermal and ink jet printers have finally arrived for the PC.

Plotters use pens controlled by the computer to draw images on paper. For multicolored drawings, plotters with up to six pens are available. Also included in the Printers and Plotters category are print buffers. These devices store data you want to print, thus freeing the PC from controlling printing and allowing it to carry out other operations.

With the new technology, printers and plotters are reaching higher speeds at quieter noise levels and lower prices than ever before.

DS220 Multi-Mode Matrix Printer

Datasouth Computer Corp.
4216 Stuart Andrew Blvd.
Charlotte, NC 28210
704/523-8500

DS220 is a dot matrix printer with five print modes: draft quality, memo quality, near letter quality, microcharacter set, and graphics. Draft mode prints characters in a 9 by 7 dot matrix at speeds up to 220 characters per second (cps). Memo mode prints

in a 9 by 15 dot matrix at speeds up to 100 cps. Near letter quality mode prints in an 18 by 48 dot matrix at speeds up to 40 cps. The microcharacter set is a compressed type style that prints at speeds up to 90 cps. The graphics mode is dot addressable, and various type fonts are available for each print mode. DS220 accommodates paper up to 15 inches wide.

A keypad on the front of the printer console allows users to program up to 50 print features, such as forms feed, print mode, and pitch. DS220 stores print options programmed at the keypad in its nonvolatile memory so that when the printer is turned off, settings remain operational until reprogrammed. List price: $1995. Requirements: parallel port or serial port.

DX-15 Daisy Wheel Printer

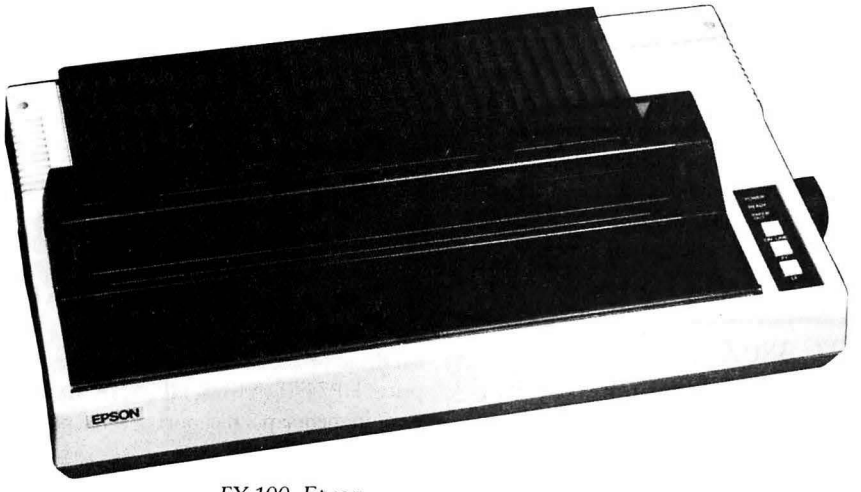
Dynax, Inc.
5698 Bandini Blvd.
Bell, CA 90201
213/260-7121

DX-15 is a letter quality daisy wheel printer available with several options, including a keyboard, a cut-sheet feed, and a tractor feed. DX-15 prints with bidirectional logic seeking at speeds up to 13 characters per second. Pitch can be set at 10, 12, and 15; proportional spacing also can be set. A console switch enables users to print multiple copies of a document. List price: parallel $599, serial $649, keyboard $195, cut-sheet feed $250, tractor feed $120. Requirements: parallel port or serial port.

FX-80 and FX-100 Printers

Epson America, Inc.
3415 Kashiwa St.
Torrance, CA 90505
213/539-9140

The FX-80 and FX-100 Printers are Epson's top-of-the-line dot matrix printers. FX-80 has a 9-inch carriage, and FX-100 has a 15-inch carriage; otherwise, both models have the same features. The FX series enables users to store custom-designed character sets in a 2K buffer. The printers also have a print mode that prints alphanumeric, control, and escape sequences in hexadecimal form for software debugging.



FX-100, Epson

The FX printers use a 9 by 11 dot matrix to form characters and print up to 160 characters per second. FX-80 and FX-100 operate in pin- or friction-feed modes. Each printer comes ready to attach to a parallel port, but RS-232C and IEEE-488 serial attachments are sold separately. List price: FX-80 $699, FX-100 $895. Requirements: parallel port or serial port.

"The FX-100 is easy to set up and produces high-quality print. The documentation is only fair." Ronald Q. Smith, St. Paul, Minnesota

"FX-100 is a fast, versatile printer that prints 160 characters per second with elite, pica, italic, enlarged, condensed, emphasized, and double-strike fonts." Keith P. Rhea, Missoula, Montana

RX-80 and RX-80-FT Printers

Epson America, Inc.
3415 Kashiwa St.
Torrance, CA 90505
213/539-9140

The RX-80 and RX-80-FT dot matrix printers share most features, but RX-80-FT uses either pin or friction feed, and RX-80 has a pin-feed mechanism only. Both printers produce boldface, superscript, subscript, and underlining. Using a 9 by 11 dot matrix to form characters, RX-80 and RX-80-FT print up to 100 characters per second. Both printers handle paper up to 8½ inches wide. Each RX printer comes with a parallel attachment, and serial RS-232C and IEEE-488 attachments can be purchased separately. List price: RX-80 $399, RX-80-FT $599. Requirements: parallel port or serial port.

DXY-100 Plotter

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180

DXY-100 is a single-pen plotter for paper up to 11 by 17 inches in size or overhead projector transparency film. The plotter attaches only to a parallel port. DXY-100 has a pen velocity of 7.9 inches per second, with resolution addressable in .004-inch increments. List price: $799. Requirements: parallel port.

Brother HR-1 Daisy Wheel Printer

Dynax, Inc.
5698 Bandini Blvd.
Bell, CA 90201
213/260-7121

Brother HR-1 is a letter quality daisy wheel printer with bidirectional print speeds up to 16 characters per second. The printer accepts paper up to 16½ inches wide. A front-panel control switch permits users to select 10, 12, or 15 pitch. A tractor feed is sold separately. List price: parallel $818, serial $848, tractor feed $130. Requirements: parallel port or serial port.

"Brother HR-1 is a heavy-duty daisy wheel printer for business use. It lacks enhanced features—cannot underline or boldface." Patrick Ong, Daly City, California

Gemini 10X and Gemini 15X Printers

Star Micronics, Inc.
3 Oldfield Rd.
Irvine, CA 92714
714/768-4340

The Gemini 10X and Gemini 15X dot matrix printers are compatible with Epson's MX and FX series printers. The Gemini printers have the same capabilities, except that the Gemini 10X carriage accepts paper up to 10 inches wide, and Gemini 15X can use paper as wide as 15 inches. They produce bit-image graphics and up to 96 user-defined characters. Each printer also has eight international character sets, selectable through switches or software. The printers produce boldface and underlining.

The Gemini printers use a 9 by 9 character matrix for alphanumeric characters. The programmable bit-image graphics mode can produce images ranging from low resolution (480 dots per 8½-inch horizontal line) to high resolution (1920 dots per 8½-inch horizontal line). The printers operate at speeds up to 120 characters per second and print bidirectionally or unidirectionally. Each is equipped with a parallel attachment, and a serial attachment can be purchased separately. List price: Gemini 10X $399, Gemini 15X $549. Requirements: parallel port or serial port.

Brother HR-25 Daisy Wheel Printer

Dynax, Inc.
5698 Bandini Blvd.
Bell, CA 90201
213/260-7121

Brother HR-25 is a letter quality daisy wheel printer that prints at speeds up to 23 characters per second. It features two-color printing by means of contrasting ribbons (available in various colors) and comes with a 3K print buffer. Brother HR-25 accommodates paper up to 16½ inches wide; it can print at 10, 12, or 15 pitch or use proportional spacing. Separately priced options include a tractor feed and a cut-sheet feed. List price: parallel $995, serial $1045, tractor feed $149, cut-sheet feed $269. Requirements: parallel port or serial port.

APIC-25, APTC-25, and APOC-25 Parallel Printer Switches

Advanced Systems Concepts, Inc.
435 N. Lake Ave.
Pasadena, CA 91101
213/793-8971

Advanced Systems Concepts makes three intelligent parallel printer switches that work with IBM PC-compatible printers, including those made by Epson, Diablo, NEC, Okidata, Florida Data, and Talley. APIC-25 allows as many as four computers or terminals to share a single printer. APTC-25 and APOC-25 can direct output from a single parallel port to any one of up to four printers. The stand-alone switches measure 3 by 9 by 5 inches and weigh approximately 3 pounds each. List price: APIC-25 $569, APTC-25 $459, APOC-25 $569. Requirements: parallel port.

DTC 380Z Daisy Wheel Printer

Data Terminals & Communications
590 Division St.
Campbell, CA 95008
408/378-1112

DTC 380Z is a letter quality daisy wheel printer that provides proportional spacing, shadow printing, superscripting, subscripting, and graphics plotting. It prints up to 32 characters per second and comes with both parallel and serial attachments as well as a 48K buffer. List price: $1499. Requirements: parallel port or serial port.

"DTC 380Z's printing is sharp, clean, and moderately fast." Patrick Ong, Daly City, California

Efazer Printer Buffer

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

The Efazer Printer Buffer comes in two models: the MEP8, which has 8K RAM, and the MEP64, with 64K. The buffer works with Epson RX, MX, and FX and IBM dot matrix printers. Efazer frees the computer for other uses while the printer is operating. The buffer plugs directly into the printer and receives data from the computer at speeds up to 4000 characters per second. The buffer stores this data, then transmits it automatically at the printer's maximum speed. List price: MEP8 $99, MEP64 $199.

HP7470A and HP7475A Plotters

Hewlett-Packard
16399 W. Bernardo Dr.
San Diego, CA 92127
619/487-4100

The HP7470A and HP7475A plotters have similar features. HP7470A, a two-pen plotter, plots on 8½- by 11-inch paper. HP7475A is a six-pen plotter that plots on either 8½- by 11-inch or 11- by 17-inch paper. HP7470A is available with either the RS-232C serial, the IEEE-488 serial, or the HPIL attachment. HP7475A comes with the RS-232C or the IEEE-488 attachment.

Both printers use a grit-wheel drive mechanism that moves the paper back and forth. Each has a pen velocity of 15 inches per second, with resolution programmable in .001-inch steps for producing fine lines and curves. HP7475A allows plotting with single- or double-wide lines; HP7470A permits only single-wide line plotting. Both plotters work with either bond paper or overhead projector transparencies. List price: HP7470A $1095, HP7475A $1895. Requirements: parallel port or serial port.

"Ordinary photocopier paper works just fine with the HP7475A. You don't need the HP heavy bond, but the HP transparency media is a must." Susan McGlynn, Irvine, California

MicroFazer Printer Buffer

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

The MicroFazer Printer Buffer works with any serial or parallel printer or plotter. The buffer comes in stand-alone or snap-on form and can be configured with up to 512K for data buffering. Two or more MicroFazers can be connected in a series to increase buffering capacity. Light-emitting diodes on the front panel indicate pause/copy, ready, and error-status information. Users can select serial data rates and handshake signals. A reset switch clears MicroFazer's memory. List price: 8K $169, 512K $1395.

"MicroFazer saves a lot of time when printing long reports. It will not operate, however, with an NEC 3550 equipped with a sheet feed." Dan Moore, Columbus, Indiana

InterFazer Controller/Buffer

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
The InterFazer Controller/Buffer controls output from up to eight output devices (such as computers or modems) that feed or share one or two read-only devices (such as printers). With 64K RAM boards installed, InterFazer buffers up to 128K of data. Light-emitting diodes on the front panel indicate activity status and errors. The controller/buffer operates on a first data in, first out basis. It also functions as a converter interface between incompatible devices. List price: controller/buffer $295, 16K board $195, 64K board $295, serial or parallel I/O board $65.

Genicom 3304 and 3404 PC Printers

Genicom Corp.
1 General Electric Dr.
Waynesboro, VA 22980
703/949-1188
Genicom 3304 PC and Genicom 3404 PC are dot matrix printers that emulate a variety of printer protocols, including ANSI X 3.64, Epson MX with Graftrax Plus, and Diablo 630. Genicom 3304 prints 300 characters per second (cps) in draft mode and 100 cps in single-pass near letter quality mode. Genicom 3404 prints 400 cps in draft mode and 100 cps in single-pass near letter quality mode. Both printers connect to parallel and serial ports on the IBM PC. List price: 3304 $2490, 3404 $2650. Requirements: parallel port or serial port.

DP-9000B and DP-9500B Dot Matrix Printers

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660
DP-9000B and DP-9500B belong to the Anadex Silent Scribe series of printers. The printers operate at noise levels of less than 55 dBA. They print 180 to 240 characters per second depending upon pitch (10, 12, or 13.3) with a resolution of 60 by 72 dots per inch in graphics mode. DP-9000B prints on paper up to 8½ inches wide, and the wider DP-9500B prints up to 132 columns at 10 pitch. A parallel attachment is included; a serial attachment can be purchased separately. A 3.5K print buffer is included, and additional buffering can be added in 2K increments. List price: DP-9000B $1200, DP-9500B $1280. Requirements: parallel port or serial port.

DP-9001B and DP-9501B Dot Matrix Printers

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660
The DP-9001B and DP-9501B printers print 150 to 250 characters per second at 10, 12.5, 15, or 16.4 pitch. Graphics are produced with a resolution of 75 by 72 dots per inch. DP-9001B handles paper up to 8½ inches wide, and DP-9501B accommodates paper up to 14 inches wide. Both printers come with a parallel attachment and a 3.5K print buffer. A serial attachment is sold separately. List price: DP-9001B $1200, DP-9501B $1280. Requirements: parallel port or serial port.

Infoscribe 500 Dot Matrix Printer

Infoscribe
2720 S. Croddy Way
Santa Ana, CA 92704
714/641-8595
Infoscribe 500 is a dot matrix printer that prints 150 characters per second (cps) in data processing mode and 75 cps in correspondence mode. The printer uses a 9 by 9 (draft mode) or an 18 by 9 (correspondence mode) dot matrix to form characters. Infoscribe 500 prints on paper up to 16 inches wide at pitches of 10, 12, and 16.5. An adjustable tractor feed and a 3.5K print buffer are included. The printer can be purchased with either a parallel or a serial attachment. List price: $1345. Requirements: parallel port or serial port.

DP-9620B Dot Matrix Printer

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660
DP-9620B is a 132-column (at 10 pitch) dot matrix printer that prints in two modes, high-speed draft or enhanced print. DP-9620B prints 120 to 197 characters per second at 10, 12, 15, or 16.4 pitch; noise levels are less than 55 dBA. The printer comes with a parallel attachment and a 3.5K print buffer. A serial attachment is sold separately. Additional buffering capacity can be added in 2K increments. List price: $1380. Requirements: parallel port or serial port.

Infoscribe 1000

Infoscribe
2720 S. Croddy Way
Santa Ana, CA 92704
714/641-8595
Infoscribe 1000 is a dot matrix printer that uses a 7 by 9 character matrix and prints at a noise level of 54 dBA. Print speeds are 200 characters per second (cps) for data processing and 100 cps for correspondence quality. Dot-addressable graphics have a resolution of 72 by 72 dots per inch. A tractor feed and a 3.5K print buffer are included. The printer holds paper up to 16 inches wide and prints at 10, 12, or 16.5 pitch. It comes with a parallel or a serial attachment. List price: $1645. Requirements: parallel port or serial port.

Infoscribe 1100

Infoscribe
2720 S. Croddy Way
Santa Ana, CA 92704
714/641-8595
Infoscribe 1100 is a dot matrix printer that has three character matrix sizes: 7 by 9, 14 by 9, and 19 by 18, with respective print speeds of 200 characters per second (cps), 100 cps, and 40 cps. Graphics are dot-addressable with a resolution of 72 by 72 or 144 by 144 dots per inch. A tractor feed and a 3.5K print buffer are included. The printer holds paper up to 16 inches wide and prints at 10, 12, or 16.5 pitch. It comes with a parallel or a serial attachment. List price: $1795. Requirements: parallel port or serial port.

DP-9625B Dot Matrix Printer

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660

The DP-9625B printer prints 60 to 197 characters per second at 10, 12, 15, or 16.4 pitch or with proportional spacing. The noise level is less than 55 dBA. Users can choose from several print modes: high-speed draft, one-pass enhanced, one-pass condensed, and two-pass correspondence quality. The printer comes with a parallel attachment and a 3.5K buffer. Additional buffering is sold in 2K increments. List price: $1500. Requirements: parallel port or serial port.

DP-9725B Dot Matrix Printer

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660

DP-9725B is a low-noise (less than 55 dBA) color impact printer. Print modes include high-speed draft, one-pass enhanced, one-pass condensed, and two-pass correspondence quality. Up to 15 colors are produced from a four-color ribbon by using special escape codes. The printer prints 60 to 197 characters per second at 10, 12, 15, or 16.4 pitch; proportional spacing is included. DP-9725B has 132 print positions at 10 pitch. Graphics are produced with a resolution of 72 by 72 or 144 by 144 dots per inch. DP-9725B comes with a parallel attachment and a 3.5K print buffer. A serial attachment is available, and buffering can be added in 2K increments. List price: $1625. Requirements: parallel port or serial port.

WP-6000 Dot Matrix Printer

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660

WP-6000 offers several print modes and character styles. The word processing print modes are letter quality and correspondence quality. In letter quality, 10 or 12 pitch or proportional spacing can be set, and the printer operates at speeds up to 150 characters per second (cps). With correspondence quality printing, users can set the pitch at 10, 12, or 16.7 at print speeds up to 285 cps. A draft mode allows printing at 10 or 12 pitch at 275 cps.

Dot-addressable graphics are printed at resolutions of 72 by 72 or 144 by 144 dots per inch. Character styles include Helvetica, Serifa, and Scientific. Users may define their own character sets and set up to 132 print positions per line at 10 pitch. A tractor feed or a single-sheet feed is optional. The printer comes with a parallel attachment and a 4.5K buffer; a serial attachment is available. Up to 16K can be purchased separately and added to the buffer. List price: $2700. Requirements: parallel port or serial port.

Infoscribe 700 Dot Matrix Printer

Infoscribe
2720 S. Croddy Way
Santa Ana, CA 92704
714/641-8595

Infoscribe 700 is a dot matrix printer specially designed to print checks, invoices, tickets, and receipts with one original and up to five carbon copies. The tractor feed and platen enable users to remove a printed form from the carriage without wasting the following blank form. Infoscribe 700 prints 150 characters per second (cps) in draft mode and 75 cps in correspondence mode. It handles paper up to 16 inches wide and operates at 10, 12, or 16.5 pitch. An adjustable tractor feed and a 3.5K buffer are included. The printer can be purchased with a parallel or a serial attachment. List price: $1895. Requirements: parallel port or serial port.

Infoscribe 1200

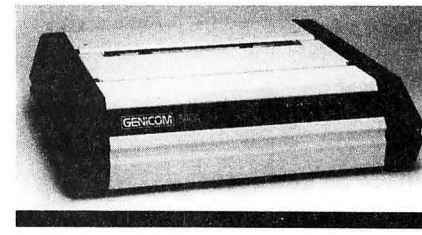
Infoscribe
2720 S. Croddy Way
Santa Ana, CA 92704
714/641-8595

Infoscribe 1200 is a dot matrix printer that uses a four-color cartridge ribbon to print images in up to eight colors. The printer uses a 7 by 9 or 14 by 9 character matrix and has three print speeds: 200 characters per second (cps), 100 cps, and 40 cps. Graphics are dot-addressable with a resolution of 72 by 72 or 144 by 144 dots per inch. A tractor feed and a 3.5K print buffer are included. The printer holds paper up to 16 inches wide and prints at 10, 12, or 16.5 pitch. It comes with a parallel or a serial attachment. List price: $1995. Requirements: parallel port or serial port.

Infoscribe 1400

Infoscribe
2720 S. Croddy Way
Santa Ana, CA 92704
714/641-8595

Infoscribe 1400 is a dot matrix printer with an 18-wire printhead that prints up to 100 characters per second in near letter quality mode. Graphics are dot-addressable with a resolution of 72 by 72 or 144 by 144 dots per inch. A tractor feed and a 3.5K print buffer are included. The printer holds paper up to 16 inches wide and prints at 10, 12, or 16.5 pitch. It comes with a parallel or a serial attachment. List price: $1995. Requirements: parallel port or serial port.



Genicom 3404, Genicom

Juki 6100

Juki Industries of America, Inc.
299 Market
Saddle Brook, NJ 07662
201/368-3666

Juki 6100 is a letter quality daisy wheel printer that prints 18 characters per second. Proportional spacing or 10, 12, or 15 pitch can be selected. The printer comes with a parallel attachment, a 2K print buffer, and a friction feed and is also available with a serial attachment. A tractor feed and a cut-sheet feed are sold separately. Juki 6100 uses Triumph-Adler print wheels and Selectric II ribbon cartridges. List price: parallel $699, serial $758. Requirements: parallel port or serial port.

"The Juki 6100 daisy wheel character printer is suited for people looking for high-quality printing at a reasonable cost." James Parsly, Linwood, New Jersey

NEC 3550 Spinwriter

NEC Information Systems, Inc.
5 Militia Dr.
Lexington, MA 02173
617/862-3120

NEC 3550 Spinwriter is a heavy-duty letter quality printer that uses a print thimble to print up to 33 characters per second. Pitch can be set at 10, 12, or 15, and proportional spacing is optional. The carriage accepts paper up to 16 inches wide. A bidirectional tractor feed, a cut-sheet feed, a dual-bin adapter that feeds two-page documents from the sheet feed into the carriage, and an envelope feed are sold separately. List price: $2295. Requirements: parallel port.

"NEC 3550 is extremely well built and is possibly the only affordable letter quality printer with a dual-bin cut-sheet feed." Dan Moore, Columbus, Indiana

"An excellent letter quality printer." George W. Jernstedt, Bolivar, Pennsylvania

Printek 910

Printek, Inc.
1517 Townline Rd.
Benton Harbor, MI 49022
616/925-3200

The Printek 910 dot matrix printer uses a 9-wire printhead to form characters. In draft mode the printer prints up to 200 characters per second (cps). In correspondence mode Printek 910 prints 45 cps using a 24 by 18 dot matrix. In graphics mode it prints up to 2000 dots per second using a matrix of 72 by 72 or 144 by 144 dots per inch. Pitches of 10, 12, 13.3 or 16.7 can be selected in normal or double-wide character printing. Up to 227 characters can be printed on one line. The friction-feed platen and the adjustable pin feed accept paper up to 16 inches wide. List price: $1595. Requirements: parallel port or serial port.

Printek 920

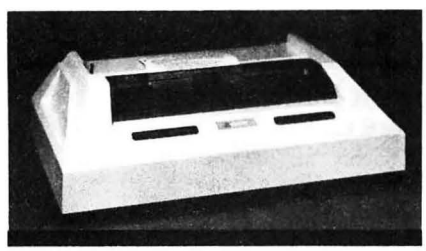
Printek, Inc.
1517 Townline Rd.
Benton Harbor, MI 49022
616/925-3200

Printek 920 is a multimode, 18-wire dot matrix printer that prints up to 340 characters per second (cps) in draft mode. Correspondence quality printing uses a 24 by 18 dot matrix and prints up to 80 cps. The high-resolution, raster-scan graphics mode prints 4000 dots per second using a matrix of 72 by 72 or 144 by 144 dots per inch. Pitches of 10, 12, 13.3, or 16.7 can be selected in normal or double-wide character printing. The carriage accepts paper up to 16 inches wide, and 227 characters per line can be printed. The printer comes with both serial and parallel attachments. List price: $2395. Requirements: parallel port or serial port.

NEC 2050

NEC Information Systems, Inc.
5 Militia Dr.
Lexington, MA 02173
617/862-3120

NEC 2050 is a letter quality character printer that uses a print thimble to print up to 20 characters per second at a noise level of 60 dBA. Pitch can be set at 10, 12, or 15, and proportional spacing is optional. The carriage accepts paper up to 16 inches wide, and up to 203 characters can be printed on a line. A tractor feed and a sheet feed are sold separately. The printer is available with a parallel or a serial attachment. List price: $1250. Requirements: parallel port or serial port.



DP-6500, Anadex

Riteman Personal Printer

Inforunner
1621 Stanford St.
Santa Monica, CA 90404
213/453-8731

The Riteman Personal Printer is a compact dot matrix printer that prints up to 120 characters per second. The printer is portable and weighs 11 pounds. A parallel attachment is included and a serial attachment can be purchased separately. A single-line buffer is also included. List price: $499. Requirements: parallel port or serial port.

DP-6500 Dot Matrix Printer

Anadex, Inc.
1001 Flynn Rd.
Camarillo, CA 93010
805/987-9660

DP-6500 is an impact printer with two vertical columns of nine needles each on the printhead. The printer prints 100 to 540 characters per second at 10, 12, 15, or 16.4 pitch or with proportional spacing. It has 132 print positions at 10 pitch. Print modes include high-speed draft (for data processing), enhanced, and correspondence quality (dual pass). DP-6500 comes with a 4.5K print buffer and a parallel attachment; a 16K buffer and a serial attachment are sold separately. List price: $2995. Requirements: parallel port or serial port.

Genicom 3014 and 3024 Printers

Genicom Corp.
1 General Electric Dr.
Waynesboro, VA 22980
703/349-1170

Genicom 3014 and Genicom 3024 are dot matrix printers that have multiple print modes. Users can set the printers to emulate popular printer protocols, such as Epson's MX with Graftrax Plus and Okidata's Microline 84 Step 2. Genicom 3014 prints at 160 characters per second (cps) in draft mode, 80 cps in emphasized mode, and 32 cps in near letter quality mode. Genicom 3024 is faster, printing at 200 cps in draft mode, 100 cps in emphasized mode, and 40 cps in near letter quality mode.

Both printers have four character styles: draft, italic, near letter quality, and italic near letter quality. Each printer comes with five pitches—10, 12, 13.1, 15, and 17—and proportional spacing. A tractor feed comes with the printers; an automatic sheet feed is sold separately. Each printer has two attachments to accommodate a parallel or serial port. List price: 3014 $1199, 3024 $1499. Requirements: parallel port or serial port.

Printek 930

Printek, Inc.
1517 Townline Rd.
Benton Harbor, MI 49022
616/925-3200

Printek 930 is a multimode, 18-wire dot matrix printer that emulates the Diablo 630 printer to create microjustified proportional spacing. An "executive quality" print mode can be used for letter quality printing. The executive print mode uses a 36 by 18 dot matrix to form characters at 80 characters per second (cps) in single-pass printing. In draft mode Printek 930 prints 200 cps; in graphics mode it prints 4608 dots per second. Proportional spacing or 10, 12, 13.3, or 16.7 pitch can be selected. A friction feed and a pin feed are included. Additional features sold separately include buffer expansion, graphics enhancement, additional fonts, user-defined fonts, a cut-sheet feed, and Epson printer emulation. List price: $1995. Requirements: parallel port or serial port.

Printer Switch

Intra Computer, Inc.
101 W. 31st St.
New York, NY 10001
212/947-5533

The Printer Switch directs data output from the computer to one of two printers. The computer and printers should be placed no more than 15 feet apart for proper operation. Cables are included. List price: $165. Requirements: parallel port.

Printer Sharing Switch

Intra Computer, Inc.
101 W. 31st St.
New York, NY 10001
212/947-5533

The Printer Sharing Switch allows two computers to share one printer. The cable from each computer's parallel port is plugged into the stand-alone switch, which is then attached to the printer. A switch that allows four computers to share one printer is also available. Computers should be placed no more than 15 feet from the switch. Cables are included. List price: $165, four-way switch $260. Requirements: one parallel port for each computer.

Prowriter 8510A

C. Itoh Electronics, Inc.
5301 Beethoven St.
Los Angeles, CA 90066
213/306-6700

Prowriter 8510A is a dot matrix printer that prints in data processing draft mode or correspondence quality mode. In draft mode, the printer prints up to 120 characters per second (cps). In correspondence mode, it prints 60 cps. Users can select 10 or 12 pitch, proportional spacing, and double-wide characters. A parallel attachment and a friction-feed platen are included; a serial attachment and a tractor feed are sold separately. List price: $500. Requirements: parallel port or serial port.

"This low-cost printer meets the needs of most personal computer users who are interested in draft and correspondence quality printing." S. S. Starr, Rose Valley, Pennsylvania

"The Jumper option for INPUT-BUSY logic provides the equivalent of complete handshaking even though the ACK signal is ignored. It's easy to change paper and ribbons. The friction grip, however, is barely adequate, and the documentation on font downloading is poor." A. G. Robison, Exton, Pennsylvania

Sup'R Buffer

M & R Enterprises
910 George St.
Santa Clara, CA 95050
408/980-0160

Sup'R Buffer is a stand-alone print buffer that provides 64K of data buffering and comes with an independent power supply and automatic self-test and data-compression capabilities. The buffer works with a parallel port, and parallel cables are included. The front panel has a ready indicator, push-button pause control, push-button copy control (for multiple copies), and a power/reset slide switch. Data transfer rates are 1500 to 2000 characters per second from computer to buffer. List price: $79.95. Requirements: parallel port.

Quadjet

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

Quadjet is a compact ink jet printer that prints color graphics in up to seven colors using disposable ink cartridges. The printer uses drop-on-demand ink jet technology to produce a 5 by 7 dot matrix to form characters. The dot resolution is 640 dots per line. The print speed is 37 characters per second and 2600 dots per second for graphics printing. Up to 80 characters can be printed on a line. Quadjet uses roll paper for printing and operates at 12 pitch. A sheet cutter comes attached to the printer; an accessory kit is sold separately. List price: $895, QJ9025 accessory kit $25.

ShuffleBuffer

Interactive Structures, Inc.
146 Montgomery Ave.
Bala Cynwyd, PA 19004
215/667-1713

ShuffleBuffer is a print buffer that works with most serial and parallel computer/printer combinations. The buffer allows either first in/first out printing or random access printing. ShuffleBuffer stores, mixes, and matches text and graphics data for printing in any order, any number of times. It compresses data to use buffer memory efficiently. List price: 32K $299, 64K $349, 128K $445.

Printer Optimizer

Applied Creative Technology, Inc.
2156 W. Northwest Hwy. #303
Dallas, TX 75220
800/433-5373

Printer Optimizer is a print buffer that performs other accessory tasks. The 256K buffer works as a remote controller for smart printers and as a printer switch to connect up to three printers to one computer. The buffer also enables a printer to print multiple copies of documents with selective reprinting. Printer Optimizer compresses character spacing and also sends printer output through a modem. List price: $499. Requirements: parallel port or serial port.

TTX-1014

Tetex Communications Corp.
320 E. Third Ave.
Foster City, CA 94404
415/341-1300
TTX-1014 is a letter quality daisy wheel printer that prints up to 14 characters per second. The printer features both pin feed and friction feed for handling continuous forms or single sheets of paper. Up to 173 characters can be printed on one line using 15 pitch. The carriage holds paper up to 14 inches wide. Users can select 10, 12, or 15 pitch. A sheet feed is sold separately. List price: $649. Requirements: parallel port or serial port.

Microbuffer

Inmac
2465 Augustine Dr. #134
Santa Clara, CA 95051
800/547-5447
Microbuffer is an external print buffer available in models that hold 32K or 64K of data. Users can install chips on the internal circuit board to increase buffer size up to 256K. Three buttons on the console control clear, copy, and pause operations. The buffer can be purchased with a serial or a parallel attachment. The parallel model comes with a 6-foot buffer-to-printer cable. The unit measures approximately 5½ by 1½ by 7¼ inches and weighs 1 pound. List price: 32K $320, 64K $379. Requirements: parallel port or serial port.

"Microbuffer allows you to send 64K of data from the computer to the printer so that the computer can be used for another task while the printer prints queued documents." David Riness, Glendale, California

Sprint 11/40-130 PLUS

Qume Corporation
2350 Qume Dr.
San Jose, CA 95131
408/942-4000
The Sprint 11/40-130 PLUS daisy wheel printer comes in standard and wide-track models. The standard model has a 15-inch carriage and prints up to 197 characters per line. The wide-track model has a 22-inch carriage for large spreadsheet applications and prints up to 293 characters per line. Print wheels for Sprint 11/40-130 PLUS have 130 characters, punctuation marks, and special symbols that permit printing in more than ten languages. Proportional spacing or 10, 12, or 15 pitch can be selected. Both models print up to 40 characters per second at 15 pitch. A bidirectional tractor feed and a single-sheet feed are sold separately. List price: $1990, wide-track model $2965, tractor feed $240, sheet feed $950. Requirements: parallel port or serial port.

Sprint 11/40 PLUS and Sprint 11/55 PLUS

Qume Corporation
2350 Qume Dr.
San Jose, CA 95131
408/942-4000
The Sprint 11/40 PLUS and Sprint 11/55 PLUS letter quality printers are identical except for their print speeds (40 and 55 characters per second, respectively). Both models print at 10, 12, or 15 pitch or with proportional spacing. They accept paper up to 15 inches wide and print up to 197 characters a line at 15 pitch. Sound ratings are between 63 and 65 dBA. A single-sheet feed and a bidirectional tractor feed are sold separately; so is DocuMinder, a forms collector that attaches to the back of the Sprint series printers and automatically collects and refolds continuous forms as they are printed. List price: 11/40 PLUS $1776, 11/55 PLUS $1990, tractor feed $240, sheet feed $950, DocuMinder $75. Requirements: parallel port or serial port.

Transtar 315

Transtar
P.O. Box C-96975
Bellevue, WA 98009
206/454-9250
Transtar 315 is a dot matrix printer that prints images in 7 basic colors and 30 shades. The printer uses impact printing technology and multicolor ribbons for color printing. Transtar 315 prints 50 characters per second and uses a 7 by 8 dot matrix for character printing with a resolution of 80 by 80 dots per inch for graphics printing. The carriage accepts paper up to 10 inches wide. Transtar 315 has two pitch settings, 10 and 13.3. The printer comes with a friction feed for single sheets of paper and a pin feed for continuous forms. List price: parallel $599, serial $719. Requirements: parallel port or serial port.

EXP 550

Silver Reed Corp. of America
19600 S. Vermont Ave.
Torrance, CA 90502
213/516-7008
The EXP 550 letter quality daisy wheel printer prints 17 characters per second (cps) and holds paper up to 17 inches wide. Proportional spacing or 10, 12, or 15 pitch can be selected. The printer emulates the Diablo 1610 printer protocol so that word processing program device drivers for the Diablo 1610 can be used. A tractor feed is sold separately. EXP 550 uses Olivetti ET series ribbons. List price: parallel $895, serial $995, tractor feed $159. Requirements: parallel port or serial port.

"At 17 cps, this printer does everything a printer that costs twice as much does, such as underline, superscript and subscript, and boldface. It's an excellent value for home use." Juliana Shei, Murrysville, Pennsylvania

EXP 500

Silver Reed Corp. of America
19600 S. Vermont Ave.
Torrance, CA 90502
213/516-7008
The EXP 500 daisy wheel printer prints 12 characters per second at 10, 12, or 15 pitch. The printer holds paper up to 12 inches wide and prints up to 150 characters per line. The printer emulates the Diablo 1610 printer protocol so that word processing program device drivers for the Diablo 1610 can be used. A tractor feed is optional. List price: parallel $599, serial $699, tractor feed $149. Requirements: parallel port or serial port.

Transtar 130

Transtar
P.O. Box C-96975
Bellevue, WA 98009
206/454-9250
The Transtar 130 letter quality printer prints at speeds up to 16 characters per second; users select 10, 12, or 15 pitch or proportional spacing. Transtar 130 holds paper up to 17 inches wide and prints up to 225 characters on a line. A 256K print buffer is included, and a tractor feed is sold separately. List price: parallel $895, serial $950. Requirements: parallel port or serial port.

CR-II

Comrex International Inc.
3701 Skypark Dr. #120
Torrance, CA 90505
213/373-0280

CR-II is a letter quality printer that prints at speeds up to 13 characters per second at 10, 12, or 15 pitch or with proportional spacing. CR-II holds paper up to 14 inches wide and prints up to 165 characters on a line. A tractor feed, a sheet feed, and a keyboard are sold separately. With the keyboard option, multicolor ribbons and correction tape can be used when the printer is employed as a typewriter. List price: parallel $599, serial $649. Requirements: parallel port or serial port.

Toshiba P1350

Toshiba America, Inc.
2441 Michelle Dr.
Tustin, CA 92680
714/730-5000

Toshiba P1350 is a multimode dot matrix printer that prints in draft quality and near letter quality modes. In draft mode, print speeds reach 160 characters per second (cps); in near letter quality mode, print speeds reach 100 cps. Three type styles are available: high-speed draft, prestige elite, and courier. Users select proportional spacing or 10, 12, or 15 pitch. Graphics and double-wide characters can be produced if software permits. The friction-feed carriage handles paper up to 17 inches wide. A tractor feed and a sheet feed are sold separately. List price: $2195. Requirements: parallel port or serial port.

"Toshiba P1350 is a fast, near letter quality printer designed for continuous use. The control sequence is identical to that of a Qume, and the printhead can be controlled to create high-resolution graphics." David Riness, Glendale, California

D100, D200, and D300

Smith-Corona
65 Locust Ave.
New Canaan, CT 06840
203/972-1471

D100, D200, and D300 are two-mode dot matrix printers that have high-speed draft and near letter quality capabilities. In high-speed draft mode D100 prints 100 characters per second (cps), D200 prints 120 cps, and D300 prints 140 cps. In draft mode the printers use a 9 by 8 dot matrix; for near letter quality printing they use a 17 by 16 dot matrix. Both parallel and serial attachments are included, as well as a tractor feed and a friction feed. List price: D100 $395, D200 $595, D300 $795. Requirements: parallel port or serial port.

TP-II PLUS

Smith-Corona
65 Locust Ave.
New Canaan, CT 06840
203/972-1471

TP-II PLUS is a letter quality character printer that prints 12 characters per second and comes with both parallel and serial attachments. The printer has a 570-character print buffer and prints bidirectionally. Pitches of 10, 12, or 15 can be selected, and a tractor feed is sold separately. List price: $645, tractor feed $149. Requirements: parallel port or serial port.

Ultrasonic III Messenger

Smith-Corona
65 Locust Ave.
New Canaan, CT 06840
203/972-1471

Ultrasonic III Messenger is an electronic typewriter that converts to a computer printer when Smith-Corona's Messenger Module is installed. The print speed is 12 characters per second. Pitches of 10, 12, or 15 can be selected. Daisy print wheels in ten type styles are available. List price: $635, Messenger Module $170. Requirements: parallel port or serial port.

PT88-T2 Ink Jet Printer

Siemens Corporation
240 E. Palais Rd.
Anaheim, CA 92805
714/991-9700

PT88-T2 is a nonimpact dot matrix printer that uses ink jet technology to print characters and graphics. The printer uses no ribbons or print elements; an ink-supply cartridge feeds ink to the printhead, which ejects ink onto the paper. PT88-T2 prints 150 characters per second with operating noise rated at less than 50 dBA. The parallel model comes with a 165-character print buffer; the serial model has a 2K print buffer. RAM can be added in increments of 4K at additional cost. Eight character sets come with the printer, including English, Swedish, Dutch, German, and French. Pitches of 10, 12, or 17 can be selected.

Special high-absorbency paper, available from the manufacturer, is recommended for best printing results. Paper comes in continuous forms or rolls, and a paper cutter attached to the printer can cut roll paper in any length. The printer handles paper up to 8½ inches wide. Each ink cartridge produces 5 to 6 million characters. The printer weighs 16 pounds. List price: parallel $895, serial $923, ink cartridge $15. Requirements: parallel port or serial port.

Spool/64

Apparat, Inc.
4001 S. Tamarac Pkwy.
Denver, CO 80237
303/741-1778

The Spool/64 print buffer supplies 64K of storage and is available in internal and external models. The external model is available with a parallel attachment or combined parallel and serial attachments. The internal model is available with a parallel attachment only. Cables are not included. A reset button on the front panel is used to empty the buffer. The external unit measures 6½ inches wide by 2½ inches high by 10½ inches deep. List price: external $299, internal $245. Requirements: parallel port or serial port.

MicroSpooler

Consolink
1840 Industrial Circle
Longmont, CO 80501
800/525-6705, 303/651-2014

MicroSpooler is a print buffer available in 16K, 32K, and 64K models with a variety of attachments. The buffer has pause and reset controls on the console and a multicopy button for printing up to 99 copies of a document. Light-emitting diodes display the number of copies to be printed and the amount of storage being used. MicroSpooler measures 6½ inches wide by 2½ inches high by 8 inches deep and weighs 4 pounds. Cables are not included. List price: $219. Requirements: parallel port or serial port.

2712-M203 Ink Jet Printer

Siemens Corporation
240 E. Palais Rd.
Anaheim, CA 92805
714/991-9700

The 2712-M203 nonimpact dot matrix printer uses ink jet printing technology to print at speeds up to 270 characters per second. No ribbons or print elements are used; an ink-supply cartridge feeds ink to the printhead, which ejects ink onto the paper. The printer's sound level is rated at less than 50 dBA. An 8K print buffer is included. Pitches of 10, 12, or 17 can be selected. A built-in tractor feed accommodates paper as wide as 15¾ inches. Special high-absorbency paper is recommended for use with 2712-M203 and is available from the manufacturer in continuous forms or rolls. List price: $2250. Requirements: parallel port or serial port.

TC1040 Color Ink Jet Printer

PrintaColor
5965 Peachtree Corners E
Norcross, GA 30071
404/448-2675

TC1040 is a nonimpact dot matrix printer that uses ink jet printing technology to produce multicolored images. No ribbons or print elements are used; an ink cartridge feeds different colors of ink to the printhead, which ejects ink onto the paper. Three primary colors—cyan, yellow, and magenta—produce 125 shades and hundreds of color combinations. TC1040 uses a 9 by 12 dot matrix to produce images at speeds up to 270 characters per second. A 512 by 512 pixel image can be printed in 60 seconds. Resolution is 120 horizontal by 85 vertical dots per inch. List price: $5495. Requirements: parallel port or serial port.

A.C.T. II Color Ink Jet Printer

Advanced Color Technology
21 Alpha Rd.
Chelmsford, MA 01824
617/256-1222

The A.C.T. II dot matrix printer uses nonimpact ink jet technology to produce characters and images in color. A multicolor ink cartridge feeds colored inks to the printhead, which ejects ink onto the paper. Three basic colors—cyan, yellow, and magenta—produce 125 shades and many color combinations. The printer uses a 9 by 12 dot matrix to form characters. Graphics print resolution is 140 horizontal by 85 vertical dots per inch. A.C.T. II prints up to 270 characters per second and prints a 512 by 512 pixel image in 35 seconds. List price: $6400. Requirements: parallel port or serial port.

SooperSpooler

Consolink
1840 Industrial Circle
Longmont, CO 80501
800/525-6705, 303/651-2014

SooperSpooler is an external print buffer that compresses data transferred from the computer to the buffer to maximize buffering capabilities. Compression is selected through a switch setting on the buffer or through software controlled at the keyboard. A single-sheet mode enables users to hand-feed single sheets of paper into the printer during printing. The buffer measures 10 inches wide by 3 inches high by 8 inches deep. List price: 16K parallel $349, 62K upgrade $159, serial option $95. Requirements: parallel port or serial port.

Series 200

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

Series 200 is a nonimpact printer with an ink transfer system that prints characters and graphics. The printer operates at noise levels less than 52 dBA. Series 200 prints about six 8½- by 11-inch pages per minute. It prints vertical or horizontal pages on smooth-surfaced paper. Print status detectors indicate out of paper, jammed paper, open cover, low ink, and transmission error conditions. Other features include a built-in sheet feed, an output paper stacker, and a manual input feature that allows transparencies, envelopes, labels, and other hand-fed forms to be printed. A cabinet and a paper stacker/collator are sold separately. List price: $3995. Requirements: serial port.

DP-35 and DP-55

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91365
818/887-3924

The DP-35 and DP-55 letter quality daisy wheel printers print 35 and 55 characters per second, respectively. Both models print 196 characters per line at 15 pitch. Other pitch selections are 10 and 12. Options include a tractor feed, a single- and a dual-bin sheet feed, and a bottom feed for continuous forms. DP-55's print status display is located on its front panel. List price: DP-35 $1995, DP-55 $2495. Requirements: parallel port or serial port.

M-100, M-120, and M-200

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91365
818/887-3924

The M-100, M-120, and M-200 dot matrix printers print 140, 180, and 340 characters per second, respectively. All models print a maximum of 132 characters per line at 10 pitch. Other pitch selections are 5 and 16.7. The M-100 model offers proportional spacing. The M-100L label printer, a variation of the M-100 dot matrix printer, prints bar codes with or without alphanumerics. List price: M-100 parallel $2950, serial $2982; M-100L parallel $4150, serial $4190; M-120 parallel $2650, serial $2682; M-200 parallel $2950, serial $2982. Requirements: parallel port or serial port.

B-300, B-600, and B-1000

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91365
818/887-3924

The B-300, B-600, and B-1000 band printers print 300, 650, and 1025 lines per minute, respectively. All models print up to 136 characters per line at 10 pitch. Six or eight lines per vertical inch can be printed. Separately priced options include a switch to select the length of forms, 15 pitch, and an acoustic cabinet. List price: B-300 parallel $6827, serial $6977; B-600 parallel $8642, serial $8792; B-1000 parallel $12,935, serial $13,085. Requirements: parallel port or serial port.

BP-1500 and BP-2000

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91365
818/887-3924

The BP-1500 and BP-2000 band printers print 1500 and 2000 lines per minute, respectively. Both printers use 10 pitch and print up to 132 characters per line. Either six or eight lines per vertical inch can be printed. The models come with a diagnostic status display, self-testing capabilities, a paper puller, and low paper sensors. An acoustic cabinet to reduce printing noise can be purchased at additional cost. List price: BP-1500 parallel $22,700, serial $23,095; BP-2000 price not available. Requirements: parallel port or serial port.

XY/749 Digital Plotter

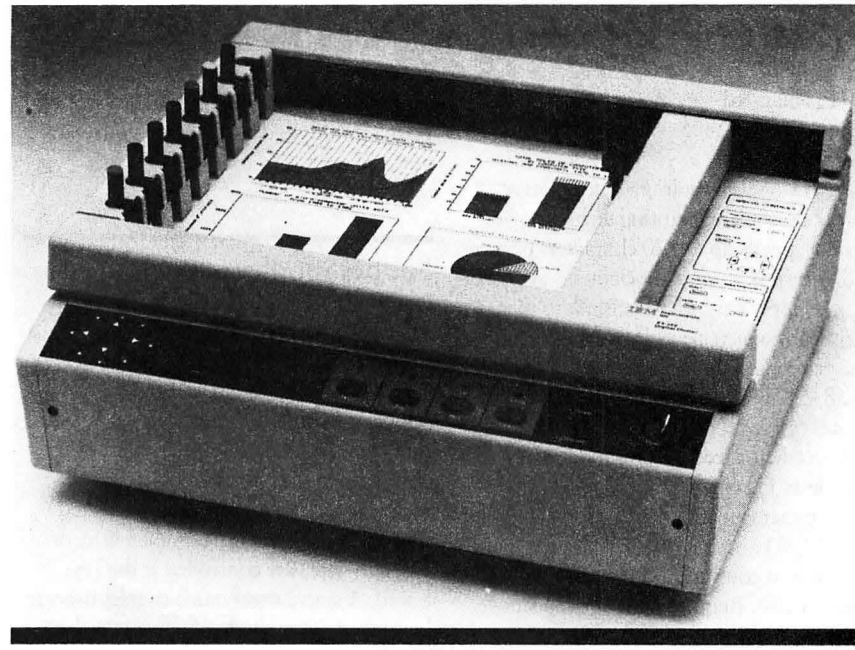
IBM Instruments, Inc.
Orchard Park
P.O. Box 332
Danbury, CT 06810
203/796-2507

The XY/749 Digital Plotter is a high-speed, eight-pen plotter that uses 8½- by 11-inch paper. The plotter command set is compatible with the XY/750 digital plotter from IBM Instruments so that software for the XY/750 can be used without modification. RS-232C and IEEE-488 serial attachments are included. List price: $1995. Requirements: parallel port or serial port.

Series C

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

The Series C nonimpact color printer uses ink jet printing to produce characters and graphics in up to seven solid colors and thousands of shades. The printer operates at noise levels less than 55 dBA and prints up to 20 characters per second. The character dot resolution is 120 dots per inch. Although 8½- by 11-inch bond paper can be used with Series C, a clay-coated paper available from Diablo Systems is recommended for best results. Low ink and low paper indicators, pause and feed switches, an ink purge switch, and a 4K print buffer are included. Domestic and international character sets are available. List price: domestic model $1250, international model $1350. Requirements: parallel port.



XY/749 Digital Plotter, IBM Instruments

LetterPro 20 Daisy Wheel Printer

Qume Corporation
2350 Qume Dr.
San Jose, CA 95131
408/942-4000

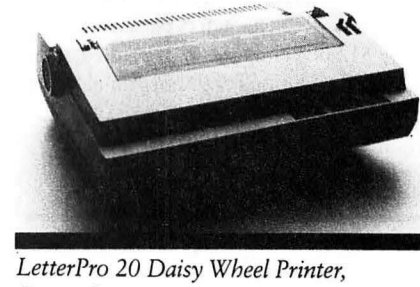
LetterPro 20 is a daisy wheel letter quality printer that prints at speeds up to 20 characters per second at 10, 12, or 15 pitch or with proportional spacing. The carriage accepts paper up to 13 inches wide. At 15 pitch the printer produces up to 165 characters per line. LetterPro 20 uses ribbon cartridges and print wheels for Qume's Sprint series printers. The printer's sound rating is 59 dBA. A tractor feed is sold separately. List price: $899. Requirements: parallel port or serial port.

Model 620

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

The Model 620 letter quality daisy wheel printer prints up to 25 characters per second (cps). Up to 198 characters can be printed on a line at 15 pitch, and 10 or 12 pitch can also be selected. The printer accommodates forms up to 15.2 inches wide. A 512-character buffer is included. Separately priced options include a bidirectional tractor feed and a single-tray sheet feed. List price: $1095, tractor feed $175, sheet feed $795. Requirements: parallel port or serial port.

"The Diablo 620 printer produces good quality print. However, I find 20 cps slow for long documents, and I have noticed that ribbons tend to get tangled in the ribbon feed wheel." Tom R. Thurmond, Vacaville, California



LetterPro 20 Daisy Wheel Printer, Qume Corp.

Model 630

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

The Model 630 letter quality daisy wheel printer prints up to 40 characters per second. The printer's friction feed handles paper 16½ inches wide, and paper 15 inches

wide can be used with a tractor feed. Pitch selections are 10, 12, and 15. Separately priced options for Model 630 include a dual-tray sheet feed and a dual-tray sheet and envelope feed. List price: $2340, dual-tray sheet feed $1660, dual-tray sheet and envelope feed $1860. Requirements: serial port.

Model 620 API

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000
The Model 620 API letter quality daisy wheel printer prints 21 characters per second at 10, 12, or 15 pitch. Up to 198 characters can be printed on a line at 15 pitch. The printer handles paper up to 15.2 inches wide. List price: $1095. Requirements: parallel port or serial port.

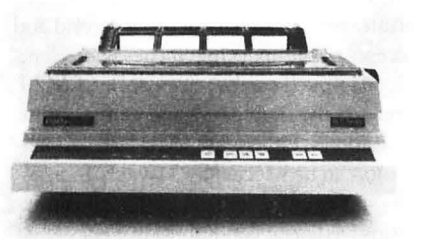
Series 150

Anacom General Corp.
1116 E. Valencia Dr.
Fullerton, CA 92631
714/992-0223
The Series 150 dot matrix printer prints up to 150 characters per second. The printer uses a 9 by 9 dot matrix to form characters and prints at 5 or 10 pitch. Series 150 is available with carriage widths of either 80 columns (for paper up to 8½ inches wide) or 132 columns (for paper up to 15 inches wide). Series 150 loads continuous forms from the front of the printer into adjustable pin-feed tractors on the carriage. A 256-character print buffer is included; a 4K print buffer is sold separately. List price: 80 column $1420, 132 column $1495. Requirements: parallel port or serial port.

Series 150Z

Anacom General Corp.
1116 E. Valencia Dr.
Fullerton, CA 92631
714/992-0223
The Anacom Series 150Z dot matrix printer prints up to 150 characters per second. Pitch selections include 5, 6, 8.3, 10, 12, and 16.5. Dot-addressable graphics are produced with a resolution of 67 vertical and horizontal dots per inch. Model 150Z accepts paper up to 15 inches wide in a 132-column carriage. An 80-column-carriage model is also available.

A pin-feed adjustable tractor is included; continuous forms can be loaded from the front of the printer. Front panel control switches and indicators set and show the following: power on, hold, reset, forms feed, testing, on line, out of paper, and line error. A 4K print buffer is included. List price: 80 column $1820, 132 column $1895. Requirements: parallel port or serial port.



Diablo 630 ECS, Diablo Systems

Series 160

Anacom General Corp.
1116 E. Valencia Dr.
Fullerton, CA 92631
714/992-0223
The Series 160 dot matrix printer prints 150 characters per second using a 9 by 9 matrix to form characters. Five or 10 pitch can be selected. A 132-column model accepts paper up to 15 inches wide; an 80-column model handles paper up to 8½ inches wide. Adjustable pin-feed tractors are included. A 256-character print buffer comes with the printer; a 1K to 4K print buffer is sold separately. List price: 80 column $1675, 132 column $1750. Requirements: parallel port or serial port.

Series 160Z

Anacom General Corp.
1116 E. Valencia Dr.
Fullerton, CA 92631
714/992-0223
The Anacom Series 160Z dot matrix printer prints 150 characters per second and uses a 9 by 12 matrix to form characters. Pitches of 5, 6, 8.3, 10, 12, or 16.5 can be selected. A two-pass overprinting mode permits text quality printing. The printer produces dot-addressable graphics with a resolution of 70 vertical and horizontal dots per inch. Series 160Z is available with a 132-column or an 80-column carriage. Adjustable pin-feed tractors are included. Front panel switches and indicators set and show the following: power on, hold, reset, forms feed, testing, and out of paper. List price: 80 column $2075, 132 column $2150. Requirements: parallel port or serial port.

Model 351

Centronics Data Computer Corp.
1 Wall St.
Hudson, NH 03051
603/883-0111
The Centronics Model 351 dot matrix printer prints up to 200 characters per second in draft or correspondence quality mode. Users can select 5, 6, 8.25, 10, 12, or 16.5 pitch or proportional spacing. The 132-column carriage holds paper up to 15 inches wide. The front panel has an out-of-paper indicator and control switches. List price: $2195. Requirements: parallel port or serial port.

Model 353

Centronics Data Computer Corp.
1 Wall St.
Hudson, NH 03051
603/883-0111
The Centronics Model 353 dot matrix printer prints 200 characters per second (cps) in data processing mode and 50 cps in correspondence mode. Data processing mode uses a 7 by 9 matrix to form characters, and correspondence mode uses a 15 by 16 matrix. Pitches include 10, 12, 13.2, 15, and 16.5; expanded characters can also be printed. Dot-addressable graphics are printed with a resolution of 66 by 72 dots per inch. The 132-column carriage holds paper up to 15 inches wide. Indicators and switches show and set the following: out of paper, forms feed, and line feed. List price: $2495. Requirements: parallel port or serial port.

Model 358

Centronics Data Computer Corp.
1 Wall St.
Hudson, NH 03051
603/883-0111
The Centronics Model 358 dot matrix printer prints 400 characters per second (cps) in data processing mode and 100 cps in correspondence quality mode. Users can select 10, 12, 13.3, 15, or 16.7 pitch; the printer also prints expanded characters. Model 358 prints four to seven colors with multicolor ribbons. Dot-addressable graphics are printed with a resolution of 67 by 72 dots per inch. Controls and indicators on the front panel set and show the following: out of paper, override forms feed, and line feed. List price: $3150. Requirements: parallel port or serial port.

CI-300 and CI-600

CIE Terminals
2505 McCabe Way
Irvine, CA 92714
714/660-1421
The CI-300 and CI-600 dot matrix line printers offer high-speed line printing in two print modes. CI-300's variable speeds range from 85 lines per minute (lpm) in letter quality mode to 300 lpm in data processing quality mode. CI-600's variable speeds range from 170 lpm in letter quality mode to 600 lpm in data processing quality mode. Both printers handle paper up to 16 inches wide and print up to 220 characters per line. Paper is loaded from the front or bottom of the printers. A 2-digit display on the front panel indicates print conditions such as out of paper, jammed paper, open platen, and out of ribbon. List price: CI-300 $4500, CI-600 $5900. Requirements: parallel port or serial port.

CR-III

Comrex International Inc.
3701 Skypark Dr.
Torrance, CA 90505
213/373-0280
The CR-III letter quality daisy wheel printer prints 23 characters per second. CR-III comes with a 132-column carriage for printing wide forms. Two-color ribbons provide color printing. A 5K buffer is included, and multiple-copy selection allows multiple printing of documents in the buffer. CR-III emulates the Diablo 630 protocol. Separately priced options include a cut-sheet feed and a tractor feed. List price: not available. Requirements: serial port or parallel port.

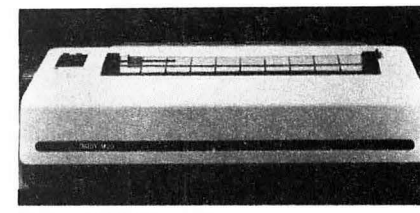
Daisy M20

Daisy Systems
P.O. Box 1010
Torrance, CA 90505
800/423-2479, 800/441-5273 California
The Daisy M20 letter quality daisy wheel printer prints 20 characters per second and accepts paper up to 16½ inches wide. Ten, 12, or 15 pitch can be selected. Daisy M20 emulates the Diablo 630 and Qume Sprint 5 protocols. Either parallel or serial attachments can be selected by a switch. Indicators show ribbon and paper out, pause, and forms feed print conditions. List price: $999. Requirements: parallel port or serial port.

CI-300, CIE Terminals

Model 630 ECS and 630 ECS with WordPlus PC

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000
The Model 630 ECS letter quality daisy wheel printer, also called an extended character set printer, uses print wheels with as many as 192 characters each as well as standard 96-character print wheels. Model 630 ECS prints up to 40 characters per second at 10, 12, or 15 pitch and accommodates paper up to 16½ inches wide. Model 630 ECS with *WordPlus PC* software prints the 128 special characters in the IBM PC's extended character set. However, the printer with this software uses fewer types of print wheels than the regular Model 630 ECS. List price: $3495, with *WordPlus PC* $2595. Requirements: parallel port or serial port.



Daisy M20, Daisy Systems

Model 630 API

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000
Model 630 API is a letter quality daisy wheel printer that prints 40 characters per second and uses Diablo metal or plastic print wheels. Print features include proportional spacing, format control, graphics, plotting, underlining, boldfacing, shadow printing, and centering. Paper is fed from the top or bottom of the printer through a sheet feed. A 1.3K buffer is included. List price: $2340. Requirements: parallel port or serial port.

Series 38

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000
The Series 38 dot matrix printer reaches speeds of up to 400 characters per second and prints at 5 or 10 pitch. The printhead has 14 needles that print a 7 by 7 dot matrix to form characters. The printer handles paper from 4 to 15 inches wide in single sheets or continuous forms. A 256-character print buffer is included. List price: parallel $2195, serial $2345. Requirements: parallel port or serial port.

Series 11CQ and Series 32CQ

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

The Series 11CQ and Series 32CQ dot matrix printers print 100 characters per second (cps) and 150 cps, respectively, in draft mode. Series 11CQ prints 30 cps in correspondence quality mode, and Series 32CQ prints 60 cps. Both printers have 5, 6, 8.3, 10, 12, and 16.6 pitch selections. Series 11CQ is an 80-column printer; Series 32CQ is a 132-column printer. Both models have built-in rear, front, and bottom feed options. List price: Series 11CQ parallel or serial $749; Series 32CQ parallel $1095, serial $1195. Requirements: parallel port or serial port.

Series 11, Series 31, and Series 32

Diablo Systems, Inc.
901 Page Rd.
P.O. Box 5030
Fremont, CA 94537
415/498-7000

The Series 11 and Series 31 dot matrix printers print 100 characters per second (cps) and use a 9 by 7 dot matrix to form characters. Series 11 is an 80-column printer; Series 31 is a 132-column printer. The Series 32 dot matrix printer prints 150 cps using a 9 by 9 dot matrix to form characters. List price: not available. Requirements: parallel port or serial port.

Sweet-P Model 100 Plotter

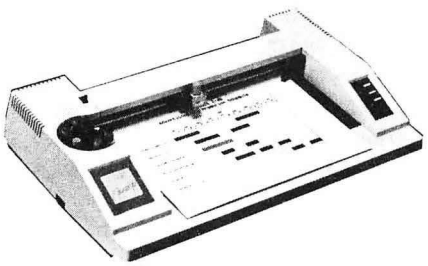
Enter Computer, Inc.
6867 Nancy Ridge Dr.
San Diego, CA 92121
619/450-0601

The Sweet-P Model 100 Plotter is a single-pen plotter that plots on 8½- by 11-inch paper or transparencies. Pen velocity is 6 inches per second; resolution is in .004-inch increments. A separately sold support pack includes cables, software with demonstration programs, four pens, and paper. List price: $695, support pack $120. Requirements: parallel port.

Sweet-P Model 600 Six Shooter Plotter

Enter Computer, Inc.
6867 Nancy Ridge Dr.
San Diego, CA 92121
619/450-0601

The Sweet-P Model 600 Six Shooter Plotter uses six pens to plot on 8½- by 11-inch or 11- by 17-inch paper and transparencies. Pen velocity is 14 inches per second; resolution is in .004-inch increments. A 2K buffer



Sweet-P Model 600 Six-Shooter, Enter Computer

is included and can be expanded to 8K. Sweet-P Model 600 uses three pen widths: fine, standard, and wide. The plotter weighs 8 pounds. List price: $1095. Requirements: parallel port or serial port.

Single and Dual Cassette Sheet Feeders

Gradco Systems, Inc.
3421 W. Segerstrom Ave.
Santa Ana, CA 92704
714/549-9175

The Single and Dual Cassette Sheet Feeders can be used with daisy wheel and dot matrix printers. All models have a bottom-feed design. The sheet feeds handle letter- and legal-size paper in either vertical or horizontal positions. The single-cassette feed holds 250 sheets of paper, and the dual-cassette feed holds 500 sheets. List price: not available.

The Sprinter

Micro Peripherals, Inc.
4426 S. Century Dr.
Salt Lake City, UT 84123
800/821-8848

The Sprinter is a portable 16-pound dot matrix printer that prints up to 160 characters per second and has an 8-inch print line. Sprinter prints in high-speed draft and high-density near letter quality modes. Single sheets and continuous forms are fed into the tractor feed from the front of the printer. Users can select 5, 6, 7.2, 7.5, 8.5, 10, 12, 14.4, 15, or 17 pitch. A 4K print buffer is included and can be expanded to 68K. The Sprinter's control panel enables users to set print selections including font, length of form, character density, top of form, and line feed. List price: parallel $795, serial $905. Requirements: parallel port or serial port.

PrintMate 99

Micro Peripherals, Inc.
4426 S. Century Dr.
Salt Lake City, UT 84123
800/821-8848

The PrintMate 99 dot matrix printer prints up to 100 characters per second in high-speed mode and also features near letter quality mode. Users can select 10, 12, or 17 pitch or double-wide character printing. The maximum print line is 8 inches. Single-sheet paper and continuous forms are fed into either the friction feed carriage or the built-in tractor feed from the front of the printer. Other separately priced options include a single-bin sheet feed and a noise reduction cover. List price: $599. Requirements: parallel port or serial port.

PrintMate 150

Micro Peripherals, Inc.
4426 S. Century Dr.
Salt Lake City, UT 84123
800/821-8848

The PrintMate 150 dot matrix printer prints 150 characters per second in draft mode. The printer also offers near letter quality mode. Graphics are dot addressable with a resolution of 72 vertical by 50, 60, 75, 80, or 85 horizontal dots per inch. The printer handles forms up to 15 inches wide and prints a maximum of 231 characters per line. PrintMate 150 offers a front panel keypad option that allows users to set print selections such as length of form, print density, and character set. A parallel attachment is included; a serial attachment is also available. List price: with keypad $1150, without keypad $1045. Requirements: parallel port or serial port.

IBM PC Color Printer

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM PC Color Printer for the IBM PC and XT is a multimode color dot matrix printer that prints text and graphics. In data processing mode the printer prints 200 characters per second (cps), in text quality mode 110 to 150 cps, and in near letter quality mode 30 to 40 cps. Pitches of 10, 12, or 17.1 or proportional spacing can be selected in all print modes. The printer produces up to 226 characters per line using 17.1 pitch. The IBM PC Color Printer uses three types of cartridge ribbons: process ribbon (eight colors), primary ribbon (four colors), and black ribbon. List price: $1995. Requirements: parallel port.

Starwriter F-10

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150

The Starwriter F-10 daisy wheel printer (from C. Itoh) prints 40 characters per second and holds paper up to 15 inches wide. The printer is 6 inches high and weighs 30 pounds. Starwriter F-10 prints multiple-part forms with up to three copies each. A 256-character print buffer comes with the printer, and a 2K print buffer is available. A bidirectional tractor feed, available separately, handles continuous forms. List price: $1795, tractor feed $325. Requirements: parallel port or serial port.

Printmaster F-10

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150

The Printmaster F-10 daisy wheel printer (from C. Itoh) prints 55 characters per second. The printer is 6 inches high and weighs 30 pounds. Printmaster F-10 accepts paper up to 15 inches wide and prints a maximum of 163 characters per line. It handles single and multiple-part forms (the original and five copies) in a friction-feed carriage. A bidirectional tractor feed, sold separately, handles continuous forms. A 256-character print buffer comes with the printer; a 2K buffer is a separately priced option. List price: $1995, forms tractor $325. Requirements: parallel port or serial port.

MT 660

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524

The MT 660 dot matrix line printer prints 600 lines per minute (lpm) in draft mode and 280 lpm in letter quality mode. Dot-addressable graphics have a resolution of up to 100 by 255 dots per inch. Separately priced options include a 2K or 4K print buffer and industrial graphics. The industrial graphics option prints forms, bar codes, OCR-A or OCR-B fonts, and characters up to 10 inches high. List price: parallel $7995, serial $8245. Requirements: parallel port or serial port.

Pixy 3

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524

The Pixy 3 graphics plotter produces graphics on paper and transparencies in up to eight colors with three plotting pens. Resolution is in .004-inch increments, and pen velocity is 8 inches per second. A Greek (scientific) character set is included. Separately priced options include a five-pen watercolor set and a five-pen oil color set. List price: parallel $795, serial $885. Requirements: parallel port or serial port.

MT 420/440

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524

The MT 440 dot matrix printer prints 400 characters per second (cps) in draft mode and 100 cps in letter quality mode. MT 420 prints more slowly than MT 440. Features include dual-pass printing for near letter quality and bidirectional logic seeking printing. List price: MT 420 $2295, MT 440 $2995. Requirements: parallel port or serial port.

MT 1600/1800

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524

The MT 1800 dot matrix printer prints 200 characters per second in draft mode and also prints in letter quality mode. MT 1800 features Orator and Sans Serif fonts. Both MT 1800 and MT 1600 produce dot-addressable graphics with 50 by 72 to 100 by 72 dots per inch resolution. The operating noise level is 53 dBA. List price: MT 1600 $1695, MT 1800 $1995. Requirements: parallel port or serial port.

MT 160 Series

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524

The MT 160 Series dot matrix printer prints 160 characters per second (cps) in draft mode and 40 cps in letter quality mode. The printer features expanded and compressed characters, emphasized print, superscript and subscript, and scientific characters. Dual attachments for parallel or serial use and a tractor or friction feed with a tear bar are included. Separately priced options include a paper roll holder and a power supply. List price: $698. Requirements: parallel port or serial port.

DTC Style Writer

Data Terminals & Communications
590 Division St.
Campbell, CA 95008
408/378-1112

The DTC Style Writer daisy wheel printer prints up to 130 words per minute. Two colors (red and black) can be printed using special ribbons. The printer comes with a 35K print buffer; a 67K buffer is sold separately. Additional pitch selections, proportional spacing, and multiple fonts can also be purchased at an extra cost. Other options include a single-bin sheet feed that holds up to 150 sheets of paper and an adjustable tractor feed. List price: $899. Requirements: parallel port.

8600 B

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150

The 8600 B dot matrix printer (from C. Itoh) prints 180 characters per second (cps) in high-speed draft mode, 90 cps in high-*density* mode, and 60 cps in near letter quality mode. Pitch selections include 10, 12, and 17; proportional and compressed spacing are also included. The 10-inch carriage allows an 80-column line at 10 pitch. The printer handles multiple-part forms with up to three copies. A red and black ribbon permits two-color printing. A 2K print buffer is included with the parallel printer model, and a 4K buffer comes with the serial model. List price: parallel $1295, serial $1395. Requirements: parallel port or serial port.

Microline 93

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Microline 93 dot matrix printer prints 160 characters per second (cps) in high-speed draft mode, 80 cps in emphasized and enhanced modes, and 40 cps in correspondence quality mode. The printer offers 5, 6, 8.5, 10, 12, and 17 pitch. Graphics are dot addressable with 60- by 72-dots-per-inch resolution. Paper up to 15 inches wide fits in the carriage when you use a friction feed, and 16-inch-wide paper fits with a tractor feed. Microline 93 feeds single-sheet or continuous forms paper from the back or bottom of the printer. List price: parallel $999, serial $1098. Requirements: parallel port or serial port.

Microline 80

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

Microline 80 is an 80-column dot matrix printer that prints up to 80 characters per second. Up to 132 characters per line can be printed when condensed print is used. The printhead movement is unidirectional. List price: $299. Requirements: parallel port or serial port.

Circle 685 on reader service card

IMP-3 and IMP-4

Axiom Corp.
1014 Griswold Ave.
San Fernando, CA 91340
213/365-9521

The IMP-3 and IMP-4 dot matrix printers print 100 characters per second at 10, 12, or 16.5 pitch. IMP-3 accepts single sheets or roll paper. IMP-4 accepts single sheets, roll paper, or tractor-fed continuous forms. Double-pass printing on both models gives a near letter quality image. Dot-addressable graphics are printed with a maximum resolution of 137 horizontal by 144 vertical dots per inch. A 512-character buffer is included, and a 2K buffer is sold separately. List price: IMP-3 $699, IMP-4 $749. Requirements: parallel port or serial port.

8510 SP

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150

The 8510 SP dot matrix printer (from C. Itoh) prints 180 characters per second (cps) at 5, 6, 8.5, 10, 12, or 17 pitch or with proportional spacing. Printing speeds in correspondence mode reach 120 cps. The 10-inch carriage accommodates 132 characters per line in compressed pitch on paper 8½ inches wide. The printer prints in seven colors using multicolor ribbon. List price: parallel $795, serial $840. Requirements: parallel port or serial port.

Sprinter

The Alien Group
27 W. 23rd St.
New York City, NY 10010
212/741-1770

Sprinter is a 62K print buffer whose buffered data can be viewed on a monitor. A 12-button keypad attached by cable to the buffer allows bidirectional scrolling and displays data stored in the buffer's memory. Sprinter displays data on a monitor in an 80-column by 24-row or 64-column by 16-row format. The unit measures 1 by 9 by 12 inches. List price: parallel $580, serial $680. Requirements: parallel port or serial port.

Sprinter, The Alien Group

Alphacom 42

Alphacom, Inc.
2323 S. Bascom Ave.
Campbell, CA 95008
408/559-8000

Alphacom 42 is a 40-column nonimpact thermal printer. The printer prints two 40-column lines per second and features bit-mapped graphics. Cables are sold separately. List price: $79.95, cables $20 each. Requirements: parallel port or serial port.

A100 Sheet Feeder

LQ Corporation
180 Research Pkwy.
Meriden, CT 06450
203/237-7311

The A100 single-bin automatic sheet feed handles paper for daisy wheel and dot matrix printers and electronic typewriters. A100 works with printers including NEC 3500, NEC 2050, CI Daisywriter 200, and C. Itoh F-10. A100 handles up to 200 sheets of 8½- by 11-inch or 8½- by 14-inch paper at a time. A100 accepts 16 to 24 pounds of paper. List price: $595.

P-80 and P-132

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91365
818/887-3924

The P-80 and P-132 dot matrix printers print in high-speed draft and near letter quality modes. P-80 is an 80-column printer and P-132 is a 132-column printer. Speeds range from 100 to 200 characters per second. Both models print double-wide characters and include 10, 12, and 16.8 pitch selections. A tractor feed that handles continuous forms is included. Single sheets can be manually fed into the friction feed. A cut-sheet feed, color graphics capabilities, and a Greek (scientific and mathematical) character set are also available at additional cost. List price: P-80 $1299, P-132 $1499. Requirements: parallel port or serial port.

Transtar 140

Transtar
P.O. Box C-96975
Bellevue, WA 98009
206/454-9250
The Transtar 140 letter quality daisy wheel printer prints 40 characters per second. The printer emulates the Diablo 1610 printer protocol. Transtar 140 is available in a serial model only. List price: $1695. Requirements: serial port.

MT 180

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524
The MT 180 dot matrix printer prints 160 characters per second (cps) in high-speed draft mode or 40 cps in letter quality mode. The 132-column printer includes a friction feed for single-sheet printing and a built-in tractor feed for continuous forms printing. The printer produces proportional spacing and expanded and emphasized print. MT 180 comes with a dual attachment for parallel or serial ports. List price: $998. Requirements: parallel port or serial port.

Colorwriter

Gould Electronics, Inc.
Recording Systems Division
3631 Perkins Ave.
Cleveland, OH 44114
216/361-3315
The Colorwriter plotter plots 16 inches per second in up to ten colors. Resolution is in .001-inch increments. The plotter has a 16K buffer. List price: $1995. Requirements: parallel port or serial port.

Transtar 120

Transtar
P.O. Box C-96975
Bellevue, WA 98009
206/454-9250
The portable Transtar 120 daisy wheel printer prints up to 14 characters per second. Users select 10, 12, or 15 pitch. Transtar 120 emulates the Diablo 1610 printer protocol. The printer weighs less than 19 pounds. List price: $599. Requirements: parallel port or serial port.

AMT Office Printer

Advanced Matrix Technology, Inc. (AMT)
1157 Tourmaline Dr.
Newbury Park, CA 91320
805/499-8741
The AMT Office Printer is a dot matrix printer with multimode, multifont print capabilities and a color printing option. In high-speed draft mode, the printer prints 250 characters per second (cps), in memo mode 100 cps, and in letter mode 45 cps. Fonts such as Courier 72, Letter Gothic 12, and Gothic 17 can be selected. Optional features include proportional spacing, scientific OCR-A, and bar coding. A separately priced option allows color graphics and text to be printed on paper or transparencies by using multicolor ribbons. List price: $2895, color option $100. Requirements: parallel port or serial port.

Prowriter 2-1550

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150
The Prowriter 2-1550 dot matrix printer (from C. Itoh) has a 15-inch carriage and prints up to 120 characters per second in high-speed draft mode. The printer also has a correspondence quality mode. Prowriter 2-1550's print options include pitch settings of 5, 6, 8.5, 10, 12, and 17, proportional spacing, and double-wide characters. The printer accepts single sheets of paper in a friction-feed carriage and continuous forms paper in pin-feed tractors. Graphics resolution is 144 by 160 dots per inch. List price: $995. Requirements: parallel port or serial port.

MT 1612

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524
The MT 1612 dot matrix printer prints 200 characters per second at 10, 12, or 16.5 pitch. The printer is available with or without a full ANSI keyboard. A light-emitting diode feature displays column and line positions on the keyboard model, and the keyboard has a numeric keypad. Separately priced options include a noise reduction kit, a bottom feed, and short-form, quick-tear features. List price: without keyboard $1945, with keyboard $2295. Requirements: parallel port or serial port.

Spirit

Mannesmann Tally
8301 S. 180th
Kent, WA 98032
206/251-5524
The Spirit dot matrix printer prints 80 characters per second in draft mode. Double-strike and emphasized printing modes can be selected. The 80-column printer produces italic, compressed, and double-wide characters. Adjustable tractor feeds are included for continuous forms printing, and single sheets can be fed into the friction-feed carriage. Dot-addressable graphics resolution is 80 by 82 dots per inch in regular mode and 160 by 82 dots per inch in high-density mode. Separately priced options include a paper roll holder and a noise reduction device that lowers sound levels to 53 dBA while printing. List price: parallel $399, serial $494. Requirements: parallel port or serial port.

Gorilla/Banana

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150
The Gorilla/Banana dot matrix printer (from C. Itoh) is an 80-column printer that prints 50 characters per second and weighs 12 pounds. Users can select 5 or 10 pitch. The printer's dot-addressable graphics have a resolution of 63 by 60 dots per inch. Gorilla/Banana prints only on continuous forms paper fed into the tractor feed. List price: $249. Requirements: parallel port or serial port.

Thermagrafix 600

Quality Micro Systems (QMS)
1 Magnum Pass
Mobile, AL 36618
205/633-4300
Thermagrafix 600 is a high-speed thermal matrix printer that produces up to six pages in 1 minute. Resolution is 203 dots per inch, and a variety of fonts can be produced. A built-in sheet feed accepts 250 sheets of plain paper. Users can feed single sheets into the printer or use 8½- by 11-inch roll paper to speed output. List price: not available. Requirements: parallel port or serial port.

Sellum Printers

Intek Manufacturing Co.
780 Charcot Dr.
San Jose, CA 95131
408/946-9041

The Sellum Printers are letter quality printers. Model N-35 prints 33 characters per second (cps), and Model N-77 prints 55 cps. Each printer comes with a 16K print buffer; a 48K buffer is optional. Protocols for NEC, Diablo, or Qume printers can be selected. Data transmission rates can be set from 50 to 19,000 bits per second. List price: N-35 parallel or serial $1995, N-77 parallel or serial $2495.

TIP-800

Martec Int'l Electronics Corp.
3285 Scott Blvd.
Santa Clara, CA 95054
408/727-8447

The TIP-800 thermal printer uses a 9 by 9 dot matrix at 80 characters per second (cps) or a 25 by 19 dot matrix at 40 cps. This 80-column printer uses thermal paper for nonimpact printing or normal paper with a ribbon for impact printing. During nonimpact printing, TIP-800 prints with bidirectional printhead movement; during impact printing, TIP-800 prints with unidirectional printhead movement. List price: not available. Requirements: parallel port or serial port.

Pacemark 2410

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Pacemark 2410 dot matrix printer prints 350 characters per second (cps) in high-speed draft mode, 175 cps in high-density draft mode, and 85 cps in correspondence quality mode. The printer includes a friction feed for single sheets of paper and a tractor feed for continuous forms. The tractor feed handles paper up to 16 inches wide. Dot-addressable graphics have resolutions of 72 by 72 and 144 by 144 dots per inch. The printer prints in two colors: red or black. An optional sheet feed holds 200 sheets of 7.2- or 14.3-inch by up to 15-inch paper. List price: parallel $2995, serial $3075. Requirements: parallel port or serial port.

Pacemark 2350

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Pacemark 2350 dot matrix printer prints 350 characters per second in high-speed draft mode using bidirectional logic-seeking printhead movement. Character and graphics images are formed with a 9 by 9 dot matrix. The printer prints in two colors: red or black. Dot-addressable graphics are produced with a resolution of 72 by 72 dots per inch. Pacemark 2350 includes a 2K print buffer. List price: parallel $2695, serial $2775. Requirements: parallel port or serial port.

Microline 84 Step 2

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Microline 84 Step 2 dot matrix printer prints 200 characters per second (cps) in high-speed draft mode, 100 cps in enhanced overstrike mode, and 50 cps in correspondence quality and graphics modes. Users can select 5, 6, 8.5, 10, 12, or 17 pitch or proportional spacing. Both a friction feed and a tractor feed are included for handling single sheets or continuous forms. Paper 2 to 16 inches wide can be used. The printer produces dot-addressable graphics with resolutions of 60 by 72, 72 by 72, and 103 by 72 dots per inch. List price: parallel $1395, serial $1495. Requirements: parallel port or serial port.

Microline 92

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Microline 92 dot matrix printer prints 160 characters per second (cps) in high-speed draft mode, 80 cps in emphasized and enhanced print modes, and 40 cps in correspondence quality mode. Pitch selections include 5, 6, 8.5, 10, 12, and 17. Dot-addressable graphics are produced with resolutions of 60 by 72 and 72 by 72 dots per inch. The friction feed accepts paper up to 8½ inches wide, and the tractor feed handles paper up to 9½ inches wide. Paper can be fed from the bottom or the back of the printer. List price: parallel $599, serial $698. Requirements: parallel port or serial port.

Microline 83A

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Microline 83A dot matrix printer prints 120 characters per second (cps) in high-speed draft mode. Pitch selections include 5, 8.3, 10, and 16.5. The carriage holds paper up to 16 inches wide. Friction and tractor feeds are included. The printer produces block graphics; an option that provides dot-addressable graphics capability is sold separately. List price: parallel or serial $749. Requirements: parallel port or serial port.

Microline 82A

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
609/235-2600

The Microline 82A dot matrix printer prints up to 120 characters per second (cps). Pitch selections include 5, 8.3, 10, and 16.5. Paper up to 9½ inches wide can be used with the tractor feed. The printer produces block graphics; an option that provides dot-addressable graphics capability is sold separately. Other separately priced options include an adjustable tractor feed, a roll paper stand, and an acoustic cover. List price: parallel or serial $349. Requirements: parallel port or serial port.

Qantex Model 7065

North Atlantic Industries, Inc.
Qantex Division
60 Plant Ave.
Hauppauge, NY 11788
516/582-6060

Qantex Model 7065 is a multimode dot matrix printer compatible with Epson and IBM printer escape codes. The printer includes both a serial and a parallel port and features proportional spacing, right justification, and automatic underlining, overprinting, and boldfacing functions. Model 7065 operates at 300 characters per second (cps) in draft mode, 250 cps in compose mode, 125 cps in near letter quality mode,

and 65 cps in letter quality mode. The printer stores up to three fonts, and it performs a self-diagnostic test before operating. List price: $1995. Requirements: parallel port or serial port.

Primage I

Primages Inc.
620 Johnson Ave.
Bohemia, NY 11716
516/567-8200
Primage I is a letter quality daisy wheel printer that includes serial and parallel ports. Primage I prints 45 characters per second and provides eight variable type fonts and multiple-language capability. By using ten character sets in firmware, users can print special characters from 30 different languages without changing the print wheel. An automatic sheet feed is available. List price: $1695. Requirements: parallel port or serial port.

CR-1810 ComScriber I

Comrex International Inc.
3701 Skypark Dr.
Torrance, CA 90505
213/373-0280
CR-1810 ComScriber I is a plotter that produces charts, graphs, and illustrations in several colors. The plotter produces graphics on transparencies and 8½- by 11-inch paper. Graphics can be extended up to 120 inches in length. The CR-1810 plotter is accurate to ¼000 inch, draws at 6 inches per second, and has a pause feature for changing pen colors. The unit is controlled with 12 keys and includes a self-testing feature. CR-1810 requires the Comrex support pack, which includes pens, paper, parallel attachment cable, and tutorial software. List price: $695, support pack $100.

Canon PJ-1080A

Canon USA Inc.
One Canon Plaza
Lake Success, NY 11042
516/488-6700
Canon PJ-1080A is an ink jet printer that prints up to seven colors on paper or transparencies. It prints 37 characters per second in four character types; international fonts are available. The printer provides high-resolution color graphics of 640 dots per line on a black or white background and includes a tricolor and a black ink cartridge. List price: $595. Requirements: parallel port.

Wizard Spooler

Wesper Microsystems
14321 New Myford Rd.
Tustin, CA 92680
714/730-6250
Wizard Spooler is a board that operates as a printer controller and buffer that holds 16K of print data. Wizard Spooler is also available with a 32K or 64K buffer. The board comes in two versions: a parallel printer controller and a parallel/serial version that lets you switch from a parallel to a serial printer. The boards come with cables. List price: 16K parallel version $289, 64K version $413; 16K parallel/serial version $349, 64K version $473.

VP-6801P and VP-6802P

Panasonic Industrial Co.
One Panasonic Way
Secaucus, NJ 07094
800/222-0584
VP-6801P and VP-6802P are flatbed electrostatic plotters with six and eight color pens, respectively. They feature resolution of .0003 inch with 250 steps per inch. Firmware options include character sets, curves, scaling, grids, and rotation. VP-6802P also offers optional italics and zoom firmware. List price: VP-6801P $1565, VP-6802P $3200. Requirements: parallel port or serial port.

Amplot II Plotter

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
312/364-1180
Amplot II is a six-pen flatbed plotter that comes with selectable parallel and serial attachments. The plotter has a pen velocity of 7.9 inches per second and handles 11- by 17-inch paper or overhead projector transparencies. Resolution can be programmed in increments of .004 inch. List price: $1299. Requirements: parallel port or serial port.

"Amplot II's speed leaves a lot to be desired and its pens get mushy quickly. However, the simple command language, compact size, and reasonable price make it a versatile plotter." Dan Moore, Columbus, Indiana

Messenger Module

Smith-Corona
65 Locust Ave.
New Canaan, CT 06840
800/448-1018
Messenger Module is a typewriter interface that turns the Smith-Corona Memory Correct III Messenger into an electronic printer. The interface allows the Memory Correct III Messenger to print 12 characters per second and produce a set of 93 ASCII characters and automatic underlining. Keyboard commands can be used to interrupt printing, change pitch size, or input new data from the keyboard and then resume printing. List price: $170. Requirements: parallel port or serial port.

MVP 150B

Printronix
17500 Cartwright Rd.
P.O. Box 19559
Irvine, CA 92713
714/863-1900
MVP 150B is a desktop matrix line printer that offers selectable print quality and print size for word processing, data processing, and compressed print applications. Adjustable tractors accommodate forms-feed paper up to 16 inches wide. Depending on the print size and print quality you select, MVP 150B prints between 80 and 200 lines per minute. It measures 10.5 by 24.6 by 20.7 inches and weighs 60 pounds. An optional graphics processor, IGP-20, enables the printer to produce bar codes, logos, labels, and business forms. List price: $3745, IGP-20 $1195. Requirements: parallel port or serial port.

CX-4800

Leading Edge Products, Inc.
225 Turnpike St.
Canton, MA 02021
800/343-6833, 617/828-8150
The CX-4800 four-color printer plotter (from C. Itoh) prints 8 characters per second. The printer plotter is 4 inches high and weighs 13 pounds. CX-4800 combines letter quality printing with plotting capabilities. Pen velocity is 4.8 inches per second, and four changeable pens are available in black, red, blue, and green. List price: $695. Requirements: parallel port or serial port.

Comprint 912-GO Graphics Printer

Comprint, Inc.
340 E. Middlefield Rd.
Mountain View, CA 94043
415/969-6161

Comprint 912-GO is a nonimpact electrosensitive graphics printer that prints 32 dot rows per second. Resolution is 100 by 100 dots per inch. The printer requires neither ribbons nor ink. Instead, the replaceable electroresistive printhead emits electrical charges that color the paper in graphic images. Comprint 912-GO requires electrosensitive aluminum-coated paper, which can be photocopied to produce black-and-white hard copy. The paper is available in 300-foot by 8½-inch rolls. The printer has a 2K print buffer. List price: $995. Requirements: parallel port or serial port.

Comprint 912 Series Alphanumeric Printer

Comprint, Inc.
340 E. Middlefield Rd.
Mountain View, CA 94043
415/969-6161

Comprint 912 is a nonimpact, electrosensitive dot matrix printer that uses a 9 by 12 character matrix and prints up to 225 characters per second (170 lines per minute). The printer requires neither ribbons nor ink. Instead, the replaceable electroresistive printhead emits electrical charges that color the paper to form character images. Comprint 912 requires electrosensitive aluminum-coated paper, available in 300-foot by 8½-inch rolls, that can be photocopied to produce black-and-white hard copy. A 256K buffer comes with the printer; a print buffer is sold separately. List price: $595. Requirements: parallel port or serial port.

Daisywriter 2000 Printer

Computers International, Inc.
Daisywriter Division
3540 Wilshire Blvd.
Los Angeles, CA 90010
213/386-3111

Daisywriter 2000 is a character printer with a 48K buffer. The printer has protocol emulation for the Diablo 630 and 1600 series; the Qume Sprint 9 and 11; the NEC 3500, 5500, and 7700 series; the Centronics 737; and the IBM printers. Daisywriter 2000 includes four attachments: parallel, serial, IEEE-488, and 20MA current loop. The printer prints up to 40 characters per second bidirectionally. The printer has variable pitch settings of 10, 12, 15, and 20 as well as proportional spacing. It uses IBM Selectric ribbon cartridges. Compatible print wheels are available in a variety of styles and pitches. A tractor feed and a sheet feed can be purchased separately. List price: $1495. Requirements: parallel port or serial port.

"A terrific letter quality printer." Steven P. d'Adolf, Poway, California

"Daisywriter 2000 is cost-effective and reliable. The quality of characters formed with the carbon single-strike ribbon is unsurpassed by any printer in this price range." George Huczek, Prince Albert, Saskatchewan, Canada

DS180 Matrix Printer

Datasouth Computer Corp.
4216 Stuart Andrew Blvd.
Charlotte, NC 28210
704/523-8500

DS180 is a draft quality dot matrix impact printer with a programming keypad located on the front panel of the printer console. The keypad permits selection of 50 print options for features such as pitch, tabs, and form-feed length. Options programmed using the keypad are stored in memory when the printer is turned off and remain operational until reprogrammed. DS180 uses a 9 by 7 dot matrix to form characters and prints up to 180 characters per second. The printer's dot-addressable graphics have a resolution of 75 by 75 dots per inch. A tractor feed and a 2K print buffer are included. List price: $1595. Requirements: parallel port or serial port.

GP-980

Martec Int'l Electronics Corp.
3285 Scott Blvd.
Santa Clara, CA 95054
408/727-8447

The GP-980 dot matrix printer prints 120 characters per second and 80 characters per line. GP-980 prints an original and two carbon copies in single or continuous form format using a friction feed carriage or a tractor feed. List price: not available. Requirements: parallel port or serial port.

KX-P1090, KX-P1092, and KX-P1093

Panasonic Industrial Co.
One Panasonic Way
Secaucus, NJ 07094
800/222-0584

KX-P1090, KX-P1092, and KX-P1093 are bidirectional dot matrix printers that print at 96, 180, and 160 characters per second, respectively. They each have a matrix array of 9 by 9 dots, and KX-P1092 also prints 6 by 8 dots. KX-P1093 comes with a 4K print buffer, and KX-P1092 comes with a 16K buffer. KX-P1093 comes in a serial version and serial attachments are available for the other two models. List price: KX-P1090 $499, KX-P1092 $599, KX-P1093 $899. Requirements: parallel port or serial port.

SP320

Fujitsu America, Inc.
3055 Orchard Dr.
San Jose, CA 95134
408/946-8777

SP320 is a letter quality daisy wheel printer that operates bidirectionally at 48 characters per second. It includes both a serial and a parallel port. SP320 accommodates both 96- and 127-character print wheels and offers proportional spacing, superscripting and subscripting, and bold and shadow printing. It measures 6.3 by 21.7 by 15 inches and operates at a 57 dBA sound level. Options include tractor and cut-sheet feeds. List price: $1499.

4695

Tektronix, Inc.
Marketing Communications Dept.
Mailing Station 63-635
P.O. Box 1700
Beaverton, OR 97077
503/627-7111

The 4695 color ink-jet printer generates transparencies and paper copies up to ten inches wide. The 4695 copies the screen in 2 to 3½ minutes with a two-key command. The printer prints 20 characters per second in text mode, and it has a resolution of 120 dots per inch in graphics mode. Four distinct jets with sealed, snap-in ink cartridges provide 125 half-tone shades. The optional parallel image enhancer expansion board allows the 4695 to produce high-resolution prints while working independently from the display. List price: $1595, parallel image enhancer $950. Requirements: parallel port.

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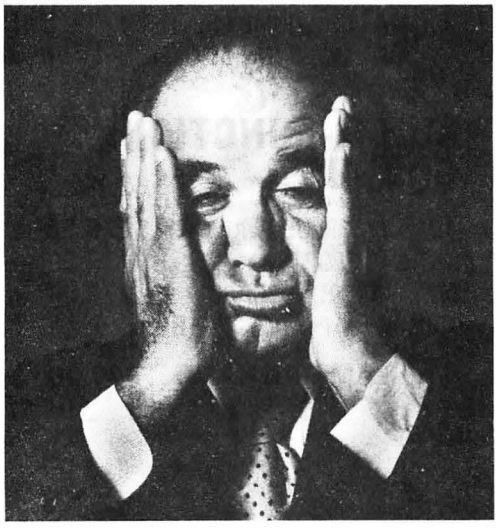

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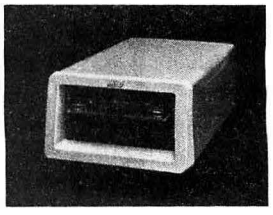

ALLOY
Computer Products, Inc.

Alloy Computer Products, Inc., 100 Pennsylvania Ave., Framingham, Massachusetts 01701. Tel: (617) 875-6100, TWX: 710-346-0394
In Europe: contact: Alloy Computer Products (Europe) Ltd., Cirencester, Gloucestershire, England. Tel: 0285-68709, Tlx: 43340

Circle 315 on reader service card

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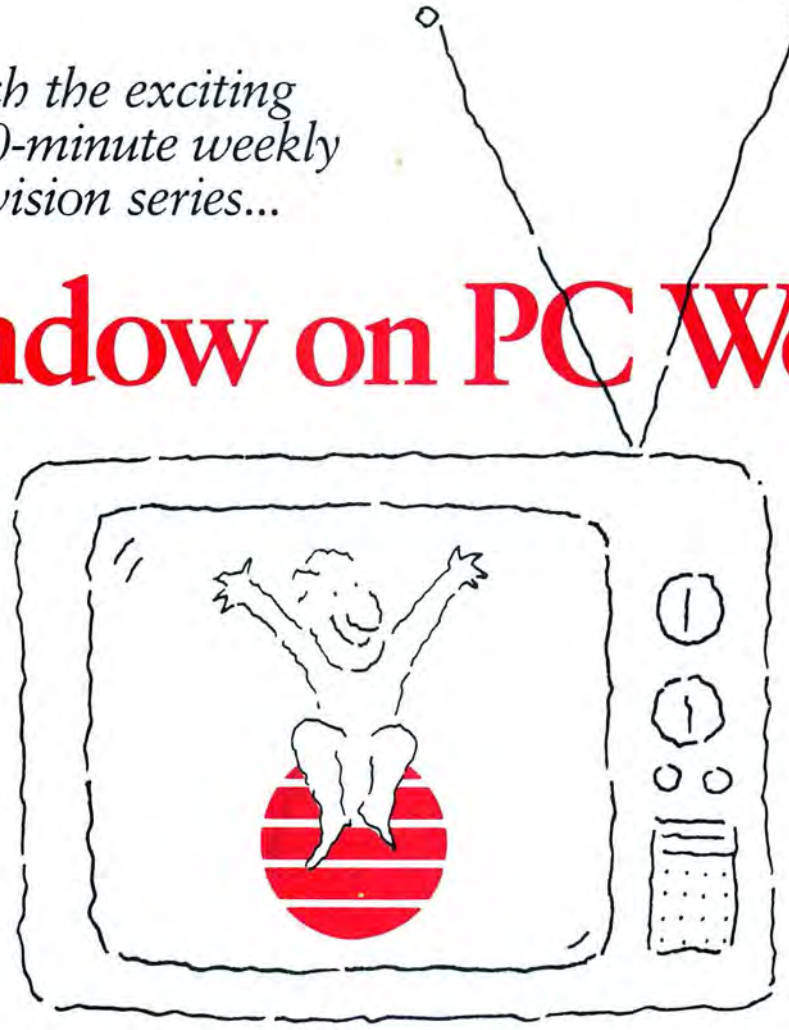

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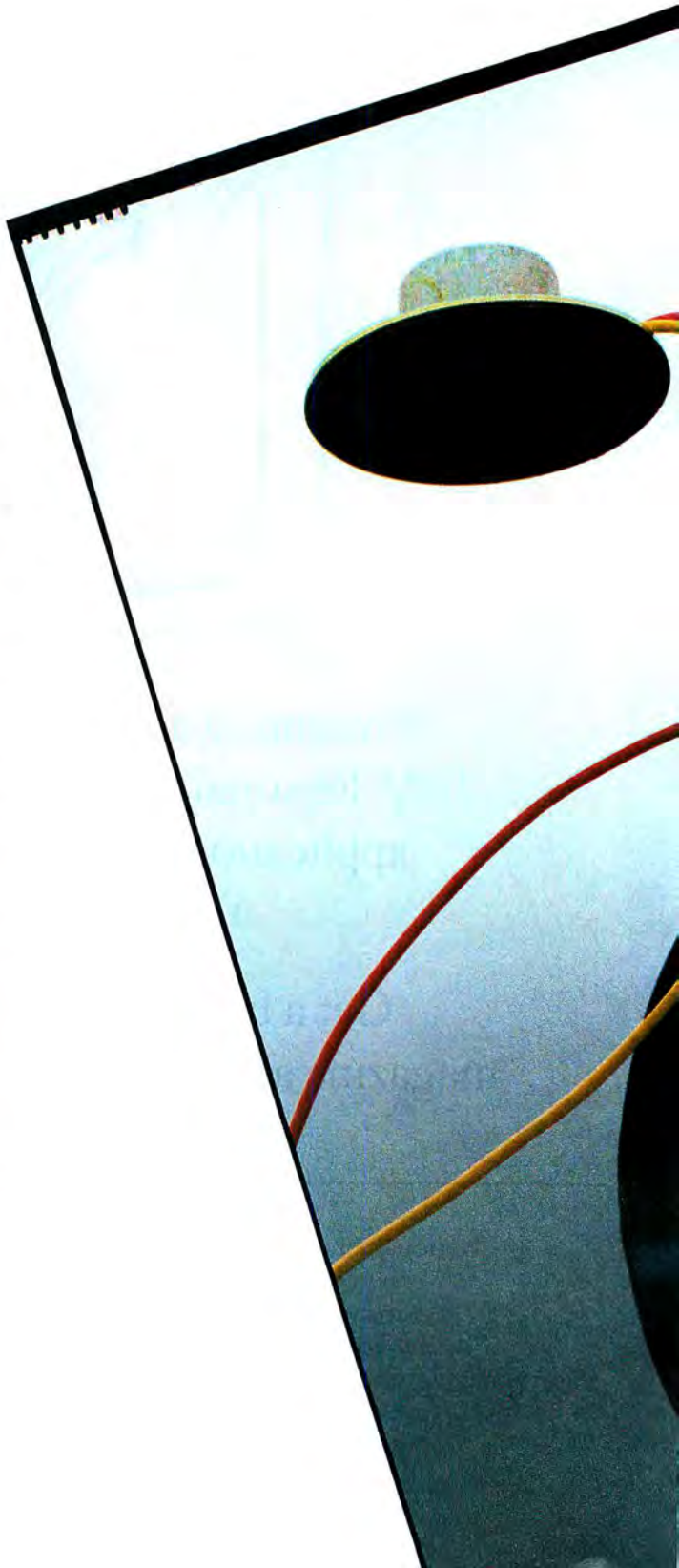
Special Purpose

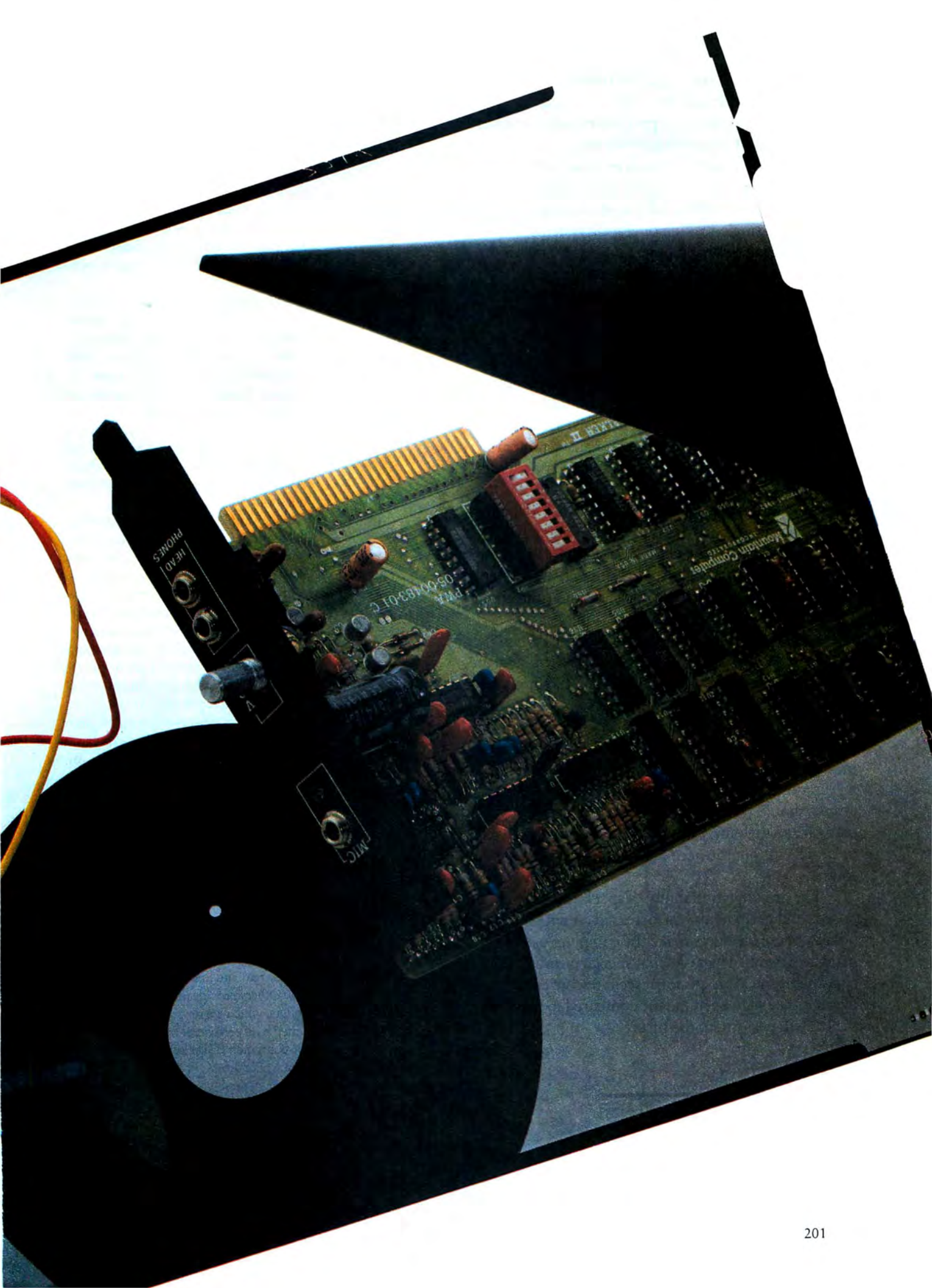
Martin Alpert

Special purpose boards and peripherals are the hardware with which the IBM PC adapts to new and unconventional applications. The variety of special purpose products reflects the many needs of PC users and points out the chameleon-like adaptability of the PC to business, scientific, industrial, home, and educational needs.

Special purpose products take up where the PC leaves off. Expansion chassis add extra expansion slots to the PC, and other special purpose products such as floppy and hard disk drive controller boards surpass their IBM counterparts in features and performance.

Special purpose boards and peripherals are most often used in science and industry. Analog-to-digital (A/D) and digital-to-analog (D/A) converters record and exert voltage fluctuations at precise intervals for experiments and data acquisition. IEEE-488 interfaces enable peripheral devices controlled by the PC to transfer data to disk. Video digitizers convert video input from a television camera into digitized information that the PC can process. Programmers for erasable or electrically erasable programmable read-only memories (EPROMs and EEPROMs) let you program and read ROM chips so that you can design a chip for specific purposes. Complementary metal oxide semiconductor (CMOS) memory boards with battery backup prevent the loss of important data in the event of a power outage. Other boards perform such functions as measuring distance and operating stepper motors.

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Special Purpose

Coprocessor boards run alternate operating systems such as CP/M on Z-80 coprocessors, or UNIX on 68000 coprocessors. Coprocessor boards provide large amounts of computing power because certain operations are delegated to each processor, decreasing the work load and increasing the speed of both. Some boards also allow multitasking operations to be performed with single-tasking operating systems.

People who use computers in their homes or offices can buy controller boards that switch electrical outlets on or off through building wiring and that regulate the operation of lights, alarms, and appliances to save energy, provide security, or start the coffee pot in the morning.

Special purpose products for educational applications include videocassette controllers and speech synthesis and voice recognition peripherals. Video and speech products allow question-and-answer interaction with users as well as video picture or speech output. Speech and sound synthesizers enable the PC to generate speech, music, and sound effects. Video imaging with computer control is useful for interactive learning, computerized sales presentations, and information storage/retrieval systems, and will undoubtedly be a rapidly growing part of the game and educational markets.

The most important points to consider when shopping for a special purpose board or peripheral are software, customer support, reliability, and price. You should be able to operate most special purpose boards and peripherals without knowing engineering or programming. Keep in mind that many special purpose products require specialized software that the manufacturer may not provide. Speech synthesizers, for example, should provide text-to-speech conversion software so that any word or phrase on the screen can be heard without the need for writing sophisticated routines.

The growing availability of special purpose boards and peripherals has increased computer sales because these products make the computer useful in many new ways. The tasks that special purpose products enable the PC to perform seem unconventional today, but they may be mundane compared to the tasks the PC will perform in the future.

Martin Alpert is president of Tecmar.

How do you react when your IBM PC doesn't do everything you'd like it to? You've been using it to write letters and figure next year's taxes, and perhaps you now want it to control electronic instruments or play music. Maybe you'd like to be able to use it in an electrically noisy environment, such as a machine shop, or have it compute payrolls. Do you trade in your computer or buy a specialized machine? Don't do either; the answer to these needs is special purpose hardware.

That label *special purpose* camouflages the real value of these accessories. Special purpose hardware gives your computer a variety of roles to play. Examples of hardware included in this category are an expansion chassis, a battery backup unit, and a plug-in encryption board.

Special purpose devices serve diverse interests. Before choosing a device, you must decide what specific qualities and features you need. Each application raises its own questions.

For example, several boards enable the PC to produce speech. Before you choose one of them you need to ask questions like, does my computer need an unlimited vocabulary? What about an on-board speaker or a power amplifier to drive an external speaker? Do I want voice recognition as well? How about pitch and volume control for more realistic speech? Keep in mind that each board has a different combination of features at a different price.

If you really want to turn your PC into a general-purpose tool, you'll quickly run out of expansion slots in the main chassis. An expansion box adds slots to the PC, but the number of additional slots depends on the product. Some expansion units contain their own power supply, and some have a cooling fan. Before you order an expander, count your boards and add up their power demands.

Power protection is a must for people who can't afford to lose their data. Some products simply filter the alternating current (AC) power coming into the PC to keep surges and line noise from scrambling bits. Others provide independently filtered outlets, which prevent electrical noise generated by a peripheral from getting back to the computer. If you keep your PC in an area where the AC line voltage fluctuates, you might want your protector to regulate the voltage, too. A battery backup unit will keep your machine running when the power fails altogether— at least long enough to get your valuable work-in-progress safely transferred to disk.

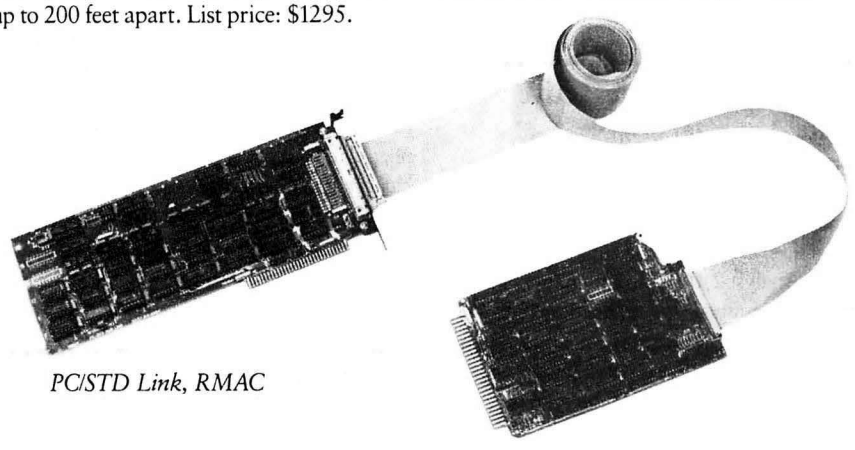
The proper hardware can help your PC perform specialized tasks such as processing video images, weighing mail, designing and diagnosing other computers and logic circuits, or connecting several PCs to peripheral devices.

The unique features of each special purpose product are described in the following section. Compare the descriptions of different products that serve a similar need. Figure out the questions you should ask before making a purchase, and you will have done most of the work to guarantee that the hardware you purchase has the qualities your application demands.

PC/STD Link

RMAC
716 Capitola Ave., Ste. G
Capitola, CA 95010
408/476-9637

PC/STD Link consists of two disk controllers that allow an IBM PC to tie in with an STD BUS device. STD BUS-controlled devices are widely used in industrial applications such as data acquisition and conversion, servo and pneumatic control, or specialized measurements. PC/STD Link includes two circuit boards linked by a ribbon cable. One board is installed in the PC, and the other in any STD BUS enclosure. PC/STD Link serves as a disk controller for the two systems and provides communications with parity checking through a parallel port. Data is transferred between the PC and the STD BUS enclosure at speeds up to 500K per second. The two systems can be up to 200 feet apart. List price: $1295.



PC/STD Link, RMAC

Program Execution Analyzer

Micro Integrations Engineering, Inc.
11 Clearbrook Rd.
Elmsford, NY 10523
914/592-8989

Program Execution Analyzer (PXA) is a program debugging board that provides a step-by-step picture of all program operations that lead up to and follow a program error. PXA is a single add-on board containing a logic-state analyzer that monitors and records all the address, data, and relative status lines of the IBM PC's bus. The board monitors 31 channels of bus information through its expansion connector, eliminating the need to attach separate leads to each system element.

PXA supplies users with a nonintrusive "window" on code execution. Users can gather, display, and analyze address and data information relating to stack operations, variable handling, direct memory accesses, and system interaction with peripheral devices. List price: $750.

Parallel Interface Card

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

The Parallel Interface Card (IPIC) is an IBM PC printer interface board that operates most parallel printers, including all Epson MX and SX series printers and all IBM parallel printers. IPIC has a parallel port and includes an 8-foot cable. List price: $110.

Turn-On

Skyland Systems, Inc.
150 Green Valley Rd.
Scotts Valley, CA 95066
408/438-5007

Turn-On is a power controller that provides unattended remote access to a computer by turning on the power during incoming phone calls. The controller provides power protection and filtering for a computer and peripherals. You can designate a peripheral to turn on the entire system automatically when you manually switch on the peripheral. Software provided with Turn-On specifies modem communications parameters and provides system security. List price: $189. Requirements: 128K for software.

Selecto-Switch, Auto-Switch, and Auto-Scan

Giltronix, Inc.
3780 Fabian Way
Palo Alto, CA 94303
415/493-1300

Selecto-Switch, Auto-Switch, and Auto-Scan are switching devices for peripherals. Selecto-Switch lets you connect two printers to one serial or parallel port and manually switch between them. Auto-Switch lets you switch between three devices from your computer. Auto-Scan polls up to seven computers and connects them to a shared peripheral, such as a modem or a printer. List price: Selecto-Switch $159.99, Auto-Switch $449, Auto-Scan $289.

Microbuffer In-Line Serial

Practical Peripherals
31245 La Baya Dr.
Westlake Village, CA 91362
213/991-8200

Microbuffer In-Line Serial is an external serial device that provides a 32K buffer, expandable up to 256K. The buffer holds data transmitted or received at high speeds and relays the data at the correct speed. When transmitting, you can turn off the computer and Microbuffer In-Line Serial will continue until all data has been sent. Touch-sensitive controls let you make multiple copies without using the computer. No software modifications are necessary. List price: 32K $299, 64K $349, each additional 64K $179. Requirements: serial port.

Battery Backup Unit

SemiDisk Systems, Inc.
P.O. Box GG
Beaverton, OR 97075
503/642-3100

The SemiDisk Battery Backup Unit (BBU) provides backup power for SemiDisk memory boards. The backup unit powers a SemiDisk board for up to 6 hours. The BBU has its own power supply; if it is plugged into an unswitched outlet, the BBU continues to supply power to a SemiDisk board, even when the computer is turned off. List price: Model 4951-BBU $150.

Super Isolator

Electronic Specialists, Inc.
171 S. Main St.
P.O. Box 389
Natick, MA 01760
800/225-4876

The Super Isolator is a multiple-outlet power box that provides individually filtered power outlets to protect equipment from AC power line noise. Two versions are available; each Super Isolator handles a total of 1875 watts. The ISO-3 has three outlets, each with its own separate power filter. The ISO-11 has two separately filtered outlet banks, each with three outlets. One outlet handles up to 1000 watts. List price: each box $122.95.

PC Probe

Atron Corporation
20665 Fourth St.
Saratoga, CA 95070
408/741-5900

PC Probe is a debugging tool consisting of a printed circuit board that plugs into an IBM PC slot, a probe that plugs into the PC's 8088 IC socket, and debugging software. PC Probe accesses all PC bus signals and the 8088 processor. It monitors and traps interrupts and direct memory access requests as well as standard processor operations. PC Probe can implement eight breakpoints simultaneously. Once a breakpoint is reached, PC Probe executes a real-time trace of the previous 1024 instructions. The unit also includes a serial port that lets users connect an external CRT and keyboard without disturbing the PC's display. List price: $1895.

I-Bus Six Slot System Enclosure

I-Bus Systems
8863 Balboa Ave.
San Diego, CA 92123
800/382-4229, 619/569-0646

The I-Bus Six Slot System Enclosure is the frame for a complete OEM computer that is IBM PC compatible. The Enclosure comes with a six-slot board cage, housing, a fan, and a 40-watt switching power supply. The Enclosure is designed primarily for systems built around the I-Bus R188 Single Board computer. The remaining five slots can be used for any PC expansion boards. List price: bare board cage $325, complete enclosure with fan $695, R188 board $795.

IBM PC Expansion Unit

IBM
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
800/447-4700, 800/322-4400 Illinois,
800/447-0890 Alaska, Hawaii

The IBM PC Expansion Unit is an eight-slot expansion chassis for the IBM PC. It contains six full-size slots and two special slots, which are restricted to small option boards. One of the full-size slots is reserved for a hard disk controller, and another is used to connect the IBM PC Expansion Unit to a similar slot in the main PC chassis. The unit has its own 130-watt power supply and cooling fan. It comes with a 1-meter connecting cable. List price: $3390.

μAnalyst 2100 Interactive State Analyzer

Northwest Instrument Systems, Inc.
P.O. Box 1309
Beaverton, OR 97075
503/645-5151

The μAnalyst 2100 is a multichannel logic analyzer designed for an IBM PC. It provides from 16 to 80 separate channels with a memory of up to 4000 data items per channel. Complex clocking, triggering, and event states are programmed into the analyzer through menus displayed on the PC. The μAnalyst 2100 mainframe has six expansion slots to hold instrument boards such as the manufacturer's Option 001, which adds 16 input channels to the basic system. List price: 16 channels $1595, Option 001 (additional 16 channels) $895.

Cygnet

Cygnet Technologies, Inc.
1296 Lawrence Station Rd.
Sunnyvale, CA 94089
408/734-9946

Cygnet is a communications system designed to work with a personal computer. Based on the Z-80 processor, Cygnet provides voice and data communications and a telephone interface. Cygnet handles electronic mail, speed dialing, automatic redialing from an extended directory, and automation of special PBX calling functions.

Cygnet is a stand-alone unit measuring 13 by 11 by 6 inches. It has a telephone handset and offers a choice of touch-tone or pulse dialing. A speaker allows hands-free dialing and group listening. Cygnet connects to the IBM PC through a serial port. One or two telephone lines can be attached using telephone jacks. Cygnet comes in two models: one connects to a 300-bits-per-second (bps) modem, and the other connects to a 1200 bps modem. List price: 300 bps $1495, 1200 bps $1845. Requirements: serial port.

Payrollmation

Automating Peripherals, Inc.
1567 E. Sumner St.
Hartford, WI 53027
414/673-6815

Payrollmation is a combined hardware and software system that connects an IBM PC XT to Panasonic or Simplex electronic time clocks. Employee identification and work times are sent to the PC, which computes payroll, attendance, and labor distribution. Payrollmation handles all paycheck, W-2, and quarterly government report production. Up to 100 time clocks can be connected to a single system. Each system has a battery backup in case of power failure. List price: 1 time clock terminal $5500, 20 time clock terminals $110,000. Requirements: RM/COBOL.

The MailScale

K-Tron Arizona, Inc.
7955 E. Redfield Rd.
Scottsdale, AZ 85260
602/991-0990

The MailScale is an electronic weighing scale that connects to a serial port. The scale comes with the software needed to support it. The MailScale handles packages

weighing up to 70 pounds and functions as a counting scale. The scale's digital weight sensor is self-leveling and insensitive to vibration or temperature changes. The MailScale software generates cost breakdowns by client, department, or operator. It automatically computes shipping costs for United States Mail, United Postal Service, and Federal Express. K-Tron's rate change service provides prompt software updates when mail carriers make rate changes. List price: $1195.

Clarke Kent Protection Kit

Hooker Tech/Eteria
P.O. Box 461
Lawrence, NY 11559
The Clarke Kent Protection Kit guards against unauthorized people removing IBM PC boards or changing internal switch settings. The kit consists of a "Clarke" screwdriver and "Kent" screws that replace the normal cover-mounting screws on the PC. These screws cannot be installed or removed without the Clarke screwdriver. A spare screw is included; additional screws may be purchased separately. List price: $18.95, extra screws $2.

"The Clarke Kent kit has eliminated thefts of adapter boards that were occurring throughout my organization." Marshal Salomon, Providence, Rhode Island

Data-Defender

PICOtronics, Inc.
820 E. 47th #B-10
Tucson, AZ 85713
800/431-5007, 602/624-8771
Data-Defender is an alarm system with a control module and pressure-sensitive mats. Equipment to be protected is placed on a mat, and Data-Defender sounds an alarm if the equipment is moved. Each mat is connected to the control module; up to ten mats can be connected to the same module. If the pressure on any mat is released, the module responds with a loud alarm. The control module plugs into any 110-VAC outlet and is activated or deactivated with a key. In case of power failure, an internal 9-volt battery powers the control module for two days. Data-Defender attaches to any 12-volt security system. It also attaches to an optional auxiliary horn, which can be mounted outdoors. List price: $198.50, additional mats $42.90, auxiliary horn $32.95.

PC-Mate Expansion Chassis

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600
The PC-Mate Expansion Chassis adds six expansion slots to give the IBM PC a total of eleven slots after the connector board is plugged in. The unit has two 110-VAC outlets for attaching other peripherals. It comes with its own power supply and cooling fan. PC-Mate accepts a connecting cable up to 30 feet long. List price: $495.

Bi Directional Data Switches

Terminal Data Corporation
11878 Coakley Circle
Rockville, MD 20852
301/881-7655
The Bi Directional Data Switches enable two IBM PCs to share one printer or one PC to use two printers. The Model 1220 switch connects two parallel printers to one PC port with 3-foot cables. A toggle switch on the Data Switch front panel controls which printer is in use. The Model 1221 connects two PCs to a single printer. Both switches allow a full range of bits-per-second data transfer rates. List price: each model $179.

Bi Directional Serial Data Switches

Terminal Data Corporation
11878 Coakley Circle
Rockville, MD 20852
301/881-7655
The Bi Directional Serial Data Switches let multiple computers connect to one serial peripheral or vice versa, depending on the switch model. The Model 1200 switch has one input line and two output lines, all with 2-foot cables. A front panel switch controls which output line is connected. Model 1232 has three switched output lines. Model 2203 has two switched lines that can be connected to three unswitched lines. The prices listed are for switches with male connectors, but versions with female, 37-pin, or BNC connectors are also available. List price: Model 1200 $129, Model 1232 $179, Model 2203 $239.

524 Series Multiport Controllers

Bay Technical Associates, Inc.
Hwy. 603
P.O. Box 387
Bay St. Louis, MS 39520
601/467-8231
The 524 Series Multiport Controllers let one computer communicate with several serial devices. Model 524 connects one IBM PC to four peripherals. The computer controls which peripheral it is connected to by sending the desired port number to Model 524. Model 524A is identical to Model 524, except that each port has a 256-byte data buffer. The 524D controller continuously polls the peripherals for requests to connect to the PC. It automatically connects the PC to the peripheral if the computer is free; if the PC is busy, the controller saves the port number(s) until the PC is available. Model 524F connects all five serial ports in a "star" network—any port can connect to any other port or combination of ports. List price: Model 524 $249, Model 524A $279, Model 524D $269, Model 524F $289.

AMI Port Contender

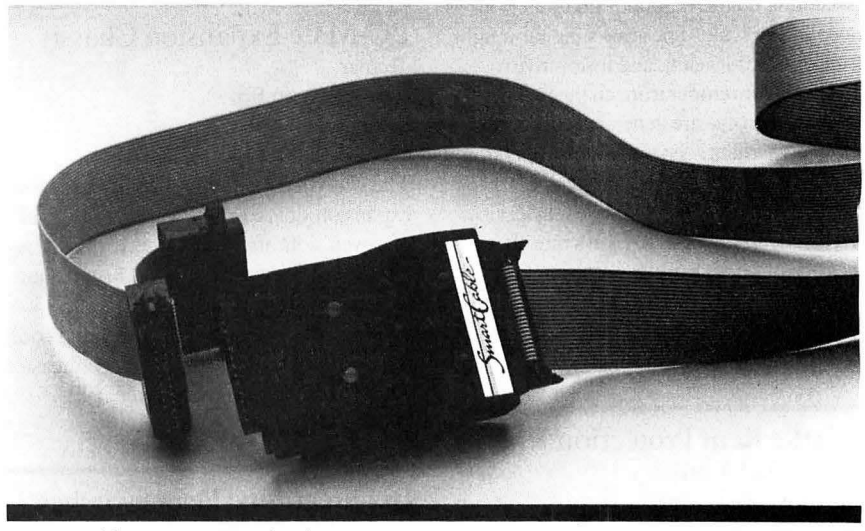
Advanced Systems Concepts, Inc.
435 N. Lake Ave.
Pasadena, CA 91101
213/793-8971
AMI Port Contender connects from 8 to 32 serial ports to 1 output port. For example, multiple terminals can hook up to one IBM PC, or several PCs can attach to a single printer. Port Contender monitors all data ports simultaneously, preventing hookup delays caused by the polling order. List price: 8 ports $1843, 16 ports $2643, 32 ports $4395.

Sup'R Extender

M & R Enterprises
910 George St.
Santa Clara, CA 95050
408/980-0160
Sup'R Extender is an expansion chassis that adds six slots to the IBM PC and has its own 50-watt power supply and cooling fan. It connects to the host board in the PC with a screwdriver. Sup'R Extender comes with an 18-inch cable. List price: $495.

Smart Cable 817 R

IQ Technologies, Inc.
11811 N.E. First St.
Bellevue, WA 98005
800/232-8324, 206/451-0232
The Smart Cable 817 R is a universal serial port cable that analyzes the communications needs of the computer and the peripheral the cable connects. The cable turns on light-emitting diodes next to two switches on the plug-in module. When the switches are set to the positions indicated by the diodes, the cable automatically connects all data, control, and handshaking lines in the proper configuration for a particular application. The module comes with either a male or female output connector. List price: $89.95



Smart Cable 817 R, IQ Technologies

Universal I/O Board

John Bell Engineering, Inc.
1014 Center St.
San Carlos, CA 94070
415/592-8411
The Universal I/O Board is designed as an interface for data acquisition and control applications. The Universal I/O Board circuitry allows external hardware to interrupt the IBM PC's 8088 processor. Sixteen analog inputs calculate temperature and measure voltage from zero to five volts. Users can set the nine parallel ports for input or output; all ports connect through 16-pin ribbon cables. List price: $299.95.

PC MUX

Solana Electronics
742-K Genevieve
Solana Beach, CA 92075
619/481-6384
PC MUX is an expansion board that enables from one to eight serial communications devices to communicate with an IBM PC. Data is routed from the PC through the PC MUX board to an external interconnection module that connects with eight serial ports. Possible applications include PC control of or communications with keyboard display terminals, numerically controlled machinery (such as milling machines or lathes), scales, printers, or other computers. List price: $395.

Quadvue

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
Quadvue is a six-function monochrome display board that lets you display characters in up to four fonts. The board includes a serial port, a parallel port, and a clock/calendar. *QuadScriber* software included with Quadvue allows you to switch back and forth between the standard font and three alternative fonts and to create fonts. List price: $345.

Quadlink

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666
Quadlink is a conversion board that enables you to run most Apple-compatible software on the IBM PC. Functionally equivalent to an Apple computer, the board has a Motorola 6502 processor, 64K, a disk controller, and circuitry to support three screen modes (standard text, low-resolution graphics, and high-resolution graphics). Quadlink also provides keyboard input and audio output, a parallel port, a serial port, and a game adapter. The board enables you to use IBM enhancements, such as printers and buffers, while running Apple-compatible software. You can switch from Apple to PC operation and vice versa simply by pressing a function key. List price: $680.

DiskMaster P/N 0185

Vista Computer Company, Inc.
1317 E. Edinger
Santa Ana, CA 92705
714/953-0523
DiskMaster is a disk controller that supports up to four floppy disk drives. DiskMaster controls 5¼- or 8-inch disk drives in single- or double-density, single- or double-sided modes. The board also handles the Vista V1200, the DriveTec 320, and the Amlyn 5850, 5855, and 1860 drives, as well as sub-5-inch formats. List price: $159.

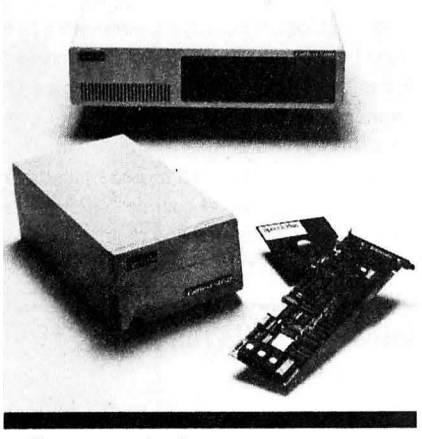
SoftBoard

Raytronics
4901 Morena Blvd., Bldg. 900
San Diego, CA 92117
619/270-4000
SoftBoard is a ROM board that can be programmed with software requiring up to 256K of memory. The program and the operating system are written onto included ROM chips that fit into sockets on the board. With the board installed, users turn on the IBM PC, boot up the operating system, and begin work with the program without having to enter program names. SoftBoard works by creating an emulated A: drive with the program loaded and renaming the PC's B: and C: drives. The board is sold with 64K of programmed ROM chips and is socketed for up to 256K of additional ROM. List price: $339, each additional 64K ROM $65.

CallText

Speech Plus Inc.
461 N. Bernardo Ave.
Mountain View, CA 94043
415/964-7023

CallText consists of three communications products. The CallText 5000 board converts ASCII text to speech in real time and transmits it to a speaker, through its own serial port, or to a telephone network via a modular phone jack. CallText 5000 includes automatic answering and dialing functions. CallText 5050 is a stand-alone serial unit with the features of CallText 5000. The 5050 unit connects directly to a modular phone line and is controlled by commands from an IBM PC. It has its own power supply and on/off switch. CallText 5100 is a separate unit that supports up to six CallText 5000 boards and serves all six channels simultaneously. CallText 5100 provides an automatic greeting message for incoming calls, transfers calls, accumulates statistics on the activity of each channel, and provides a dedicated serial port for each channel. List price: CallText 5000 $2700, CallText 5050 $2975, CallText 5100 $9800 for one channel.



CallText, Speech Plus

DS2

Byad, Inc.
95 W. Algonquin Rd.
Arlington Heights, IL 60005
312/228-3400

DS2 is a Z-80 processor board that gives an IBM PC the ability to use CP/M-80 software. The board comes with 64K RAM, a serial port, and controller software on two floppy disks. List price: $760.

Integrated Control Instrumentation System

Western Telecomputing Corporation
202 E. Kagy Blvd.
Bozeman, MT 59715
406/586-1511

The Integrated Control Instrumentation System is a stand-alone unit that operates as a data acquisition system. The unit enables the IBM PC to interpret analog data and send control commands to analog devices. The basic system comes with two boards: a control board and an analog-to-digital/digital I/O board. The control board includes a clock with battery backup. The analog-to-digital/digital I/O board provides 32 analog and/or frequency inputs and 24 digital I/O lines governed by the control board. List price: $1500.

Floppy Drive Controller

Maynard Electronics
400 Semoran Blvd.
The Greater Mall #207
Casselberry, FL 32707
305/331-6402

The Floppy Drive Controller controls up to four 5¼-inch floppy disk drives or two 5¼-inch drives and two 8-inch drives. The board plugs into one expansion I/O slot and is buffered to IBM PC specifications. Serial and parallel ports are sold separately. List price: $265.

"The controller works superbly, has excellent documentation, and is easy to install and configure." Robert Frischer, Wichita Falls, Texas

DT2808

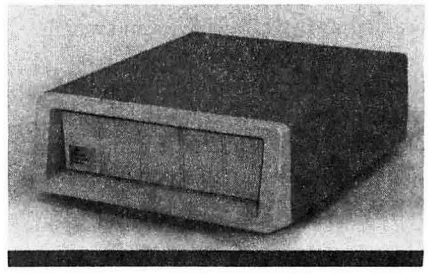
Data Translation, Inc.
100 Locke Dr.
Marlboro, MA 01752
617/481-3700

DT2808 is a data acquisition and control board that handles analog and digital I/O signals. DT2808 provides 16 analog-to-digital channels with 10-bit resolution, 2 digital-to-analog channels with 8-bit resolution, and 16 lines of digital I/O. The board is intended for applications ranging from industrial control, data logging, product testing, and quality assurance to home energy management and security systems. List price: $495.

EM 103 Bus Expansion Module

Desert Technologies
P.O. Box 41628
Tucson, AZ 85717
602/882-1741

EM 103 is a six-slot expansion chassis with its own power supply and cooling fan. It attaches to the IBM PC via a 20-inch shielded cable and an interface board that occupies one slot in the PC. EM 103 includes an enclosed 40-watt power supply; its cooling fan provides constant airflow over the backplane and expansion boards. EM-103 accepts all PC-compatible boards. List price: $645.



EM 103 Bus Expansion Module, Desert Technologies

Proto Board

GM Enterprise, Inc.
485 E. Granville Ave.
Roselle, IL 60172
312/893-1171

Proto Board is a blank printed circuit board to which you can add custom circuits. Proto Board has over 2500 .042-inch plated-through holes and gold-plated fingers. List price: $25.

The Encryptor

Futurex Security Systems
9700 Fair Oaks Blvd.
Fair Oaks, CA 95628
800/251-5111

The Encryptor is a plug-in board that encrypts data stored on a floppy disk to prevent data tampering and theft. The Encryptor encodes data at a stand-alone IBM PC, from one PC to another, or from a PC to a mainframe. The board features machine language programming and an internal encryption/decryption key. List price: $395.

VideoSlide 35

Lang Systems, Inc.
1010 O'Brien Dr.
Menlo Park, CA 94025
415/328-5555

VideoSlide 35 is a computer graphics camera that hooks up to an IBM PC directly without special software. Slides can be made using standard Ektachrome or Polachrome 35mm auto-process slide film. The system includes an electronically controlled 35mm single lens reflex fixed camera with a motor winder and a ready/out-of-film indicator. A camera back with adapter that permits the use of Polaroid SX-70 film is available. VideoSlide 35 provides 512-line vertical resolution on a self-contained, 7-inch, flat-face CRT. The unit measures 29 by 11 by 9 inches and weighs 31 pounds. A remote control unit is optional. Lang Systems' interchangeable plug-in interface module is required. List price: camera unit $2599, interface module $200 to $500 depending on the computer's color graphics board.

IEEE-488 Interface

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The IEEE-488 Interface board has three addressing modes that let the IBM PC operate as the controller, the talker, or the listener on an IEEE-488 bus. The board offers direct memory access and controlled data transfer for high-speed operation. It allows data to be transferred from a general purpose interface bus to any IBM-compatible peripheral. Software written in BASIC is included, and an assembly language software package is sold separately. List price: $395, assembly language software $95.

Prototype/Decoder

Real Time Devices
1930 Park Forest Ave.
P.O. Box 906
State College, PA 16801
814/234-8087

Prototype/Decoder (PD100) is a blank circuit board for computer hobbyists or engineers who want to build a prototype board according to a specific design. PD100 provides the means to interface prototype circuitry for the IBM PC with several features. A switch-selectable address decoder frees users to concentrate on design. Selector switches permit up to four boards to be used in one PC system.

Two areas are available for the circuit prototype, one of which is situated for installation of I/O connectors. Each prototype area consists of a grid of over 1600 pads on .1-inch centers suitable for soldering and installing up to 40 wire-wrap sockets. PD100 uses plated-through holes, gold-plated sockets, and edge-card connectors. The board comes with documentation that shows detailed circuits of I/O ports, analog-to-digital and digital-to-analog converters, and transducers. BASIC applications programs that illustrate control of the devices are also included. List price: $99.

Z/Plus

California Computer Systems
250 Caribbean Dr.
Sunnyvale, CA 94086
408/734-5811

Z/Plus is a Z-80 processor-based board that allows users to run programs requiring the CP/M operating system. Z/Plus comes with CP/M and up to 192K of parity-checked RAM. Parity is supported under the Z-80B and Intel 8088 processors and is bank-selected by the Z-80B. List price: 64K $645, 192K $825.

SBC-88

OWL Electronic Laboratories, Inc.
233 Boston Post Rd.
Old Saybrook, CT 06475-0246
203/388-0841

SBC-88 is a PC-compatible computer system board designed for industrial and office uses. SBC-88 does not have a system box, a keyboard, or a monitor; it is a separate system board that can be built into any hardware component that requires computing power. The board features 256K of parity-checked RAM, two serial ports, three parallel ports, and an on-board controller for up to four 5¼- or 8-inch single- or double-density floppy disk drives.

SBC-88 supports CP/M-86, MS-DOS, and PC-DOS operating systems directly with BIOS in an EPROM. The board has nine expansion slots, four independent direct memory access channels, and 16 levels of vectored interrupts. List price: $1800.

CEC 01000

Capital Equipment Corporation
10 Evergreen Ave.
Burlington, MA 01803
617/273-1818

The CEC 01000 interface board supports up to 15 IEEE-488 computer peripherals and instruments. The board uses a firmware interpreter, which enables you to write programs using English language statements such as "transmit" and "receive" for data transfer. Interpreter routines are written in assembly language and may be called from BASIC, Pascal, C, FORTRAN, and other languages. CEC 01000 also provides a printer driver that supports all BASIC print statements and several word processing and spreadsheet programs on IEEE-488-compatible printers. List price: $395.

Octacom

Star Gate Technologies
P.O. Box 764
Chesterland, OH 44026
216/292-5390

Octacom is a serial communications board that provides up to eight serial ports, enabling several modems, mice, printers, and plotters to be connected to the IBM PC. All 8 channels go out to one 25-pin connector on the back of the board; a separately priced I/O distribution panel with connecting cable provides multiple connectors for peripherals. Octacom is available in 4-, 6-, or 8-channel models; the 4- and 6-channel models can be upgraded if more serial ports are needed. List price: 4 channel $595, 6 channel $645, 8 channel $695.

Baby Blue CPU Plus

Microlog, Inc.
222 Rt. 59
Suffern, NY 10901
914/368-0353

Baby Blue is a Z-80 processor board that provides 64K RAM and gives the IBM PC and PC compatibles the capability to run CP/M-80 software. Baby Blue executes all standard CP/M operations except I/O operations, which are performed by PC-DOS, thus preserving disk file compatibility. Baby Blue's software includes a file transfer program called *Convert*, which enables you to import files from a number of CP/M-80 formats. List price: $600.

GPIB-PC

National Instruments
12109 Technology Blvd.
Austin, TX 78727
512/250-9119

GPIB-PC (general purpose interface bus) provides an IEEE-488 port on a board that fits into the short slot on the IBM PC or XT. GPIB-PC enables the PC to accept data from up to 15 instruments, such as spectroscopes or oscilloscopes, in order to record and analyze information. An optional bus extender lets GPIB-PC support up to 28 devices. GPIB-PC can also connect computer systems in a local area network. Direct memory access permits data transfer rates of 300K per second between GPIB-PC and the PC memory. An interactive control program included with the board helps users learn to write GPIB-PC programs or locate a malfunctioning device on GPIB-PC. Subroutines can be called from applications programs in BASIC, C, Pascal, FORTRAN, and assembly language. List price: $385.

8087 Package

Seattle Computer
1114 Industry Dr.
Seattle, WA 98188
800/426-8936

The 8087 Package features an Intel 8087 math coprocessor chip that plugs into a socket on the IBM PC system board and performs math calculations up to 25 times faster than the 8088 processor. The 8087 Package also includes BASIC Compiler 8087 run-time libraries and 8087 extensions to the IBM Macro-86 Assembler; these require the separate purchase of Microsoft's BASIC Compiler and Macro-86 Assembler. List price: $395.

Micro Saver

Kensington Microware Ltd.
919 Third Ave.
New York, NY 10022
212/486-7707

Micro Saver is a four-outlet power strip that filters out power line noise. The power strip protects equipment that uses up to 1000 watts. Micro Saver responds within 50 nanoseconds to power transients. It has an on/off switch and an 8-ampere fuse. Micro Saver comes with a mounting bracket for attaching the strip to the underside of the computer table. List price: $69.95.

Serial RS-232C Asynchronous Adapter

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
404/923-6666

The Serial RS-232C Asynchronous Adapter is a single-function board that enables users to operate one serial-port-linked device from a system expansion board. A separately sold board provides two serial ports. List price: one-port board $110, two-port board $155.

Time Master

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Time Master is a single-function board that contains a clock/calendar/alarm with battery backup. The battery is capable of supplying power to the board for up to five years. List price: $135.

Video Cassette Recorder Controller

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Video Cassette Recorder (VCR) Controller board handles video for interactive learning, computerized sales presentations, and information storage/retrieval systems. The VCR controller board is designed to work in conjunction with a Sony SL-2700 videotape recorder. The board first adds frame numbering information to the signals recorded on videotape. Software can then read frame numbers as they flash by, stop at the desired frame, and display it. List price: $495.

PC-101

American Interface
P.O. Box 310
Clackamas, OR 97015
503/631-2501

The PC-101 power controller controls and filters AC power for computer equipment. The power controller responds to power transients in 1 nanosecond. An IBM PC and peripherals plug into any of four separate outlets on the back of the unit. Four front panel switches control these outlets, allowing you to turn off individual peripherals when they are not needed. PC-101 also has two continuously powered rear outlets for accessories such as a clock or a lamp. PC-101 provides 1200 watts of filtered power. List price: $129.95.

Kleen-Line Conditioner

Electronic Specialists, Inc.
171 S. Main St.
P.O. Box 389
Natick, MA 01760
617/655-1532

The Kleen-Line Conditioner provides regulated and filtered power for computer equipment. The Conditioner holds its output voltage to within 5 volts of 117 VAC over a line voltage of 90 to 140 volts. Two independently filtered outlets provide protected sine wave power for equipment. Four models are available with output ratings of 250, 500, 1000, and 2000 watts. List price: 250 watts $292, 500 watts $391, 1000 watts $562, 2000 watts $977.

RAMLOK Model 250B, Model 500, and Model 1000

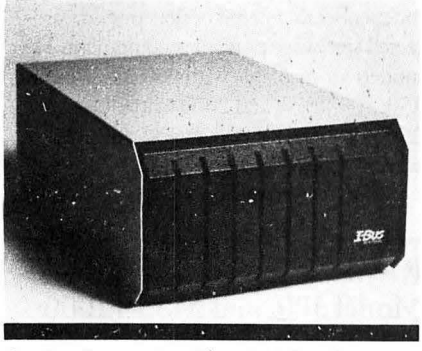
Ladco Development Co., Inc.
P.O. Box 464
Olean, NY 14760
716/372-0168

The RAMLOK power controller comes in three versions. Model 250B protects computers against AC power problems; it filters out power line noise and provides 10 minutes of internal battery backup power. If the AC line voltage varies by more than 10 volts, Model 250B switches to battery power and sounds an alarm. Model 250B is a 250-watt model; 500-watt and 1000-watt models are also available. The higher power models come in domestic versions (115 VAC, 60 Hz) and foreign versions (230 VAC, 50 Hz). These models do not include internal batteries; instead, the customer provides an external automobile battery to attach to the built-in RAMLOK battery charger. List price: Model 250B-115-UV $545, Model 500-115-60 $685, Model 1000-230-50 $945.

Six-Pac Expansion Chassis

I-Bus Systems
8863 Balboa Ave.
San Diego, CA 92123
800/382-4229, 619/569-0646

The Six-Pac Expansion Chassis offers five additional expansion slots and an extra-long cable. The six-slot unit is available in two versions. Model 104601 connects to the IBM PC through an 18-inch shielded cable and a connector board; Model 104602 connects via a 4-foot shielded cable and a connector board. The connector board takes up one slot in the PC. The Six-Pac Expansion Chassis has its own 40-watt power supply that runs coolly so no fan is needed. The cover lifts off vertically, which allows boards to be added or removed in a confined space. List price: Model 104601 $695, Model 104602 $755.



Six-Pac Expansion Chassis, I-Bus Systems

Datasaver

Cuesta Systems, Inc.
3440 Roberto Court
San Luis Obispo, CA 93401
805/541-4160

Datasaver is a battery-powered AC backup unit that protects against power loss and power transients. When power fails, the 200-watt unit switches to internal battery power in 10 milliseconds. The unit has sufficient backup energy to power an IBM PC for up to 15 minutes. When a power outage occurs, Datasaver sounds a buzzer and flashes a warning light. The unit contains a battery charger and a sealed lead acid battery. Datasaver also has an auxiliary 14-volt output to charge an external battery for extended backup time. Datasaver models are available for domestic power (120 VAC, 60 Hz) and foreign power (240 VAC, 50 Hz). List price: Model 20012060 (domestic) $695, Model 20024050 (foreign) $730.

IEEE-488 Controller

Frontier Technologies Corporation
P.O. Box 11238
Milwaukee, WI 53211
414/964-8689

The IEEE-488 Controller lets you interface the IBM PC with frequency generators, digital multimeters, power supplies, disk drives, speech synthesizers, and most other IEEE-compatible equipment. The IEEE-488 Controller handles up to 15 devices with a single board, supports direct memory access, and provides an IEEE-488 bus connector. A clock/calendar with battery backup, a serial port, and an EPROM programmer are sold separately. List price: $395.

Word Processing Board

NBI, Inc.
3450 Mitchell Ln.
P.O. Box 9001
Boulder, CO 80301
303/444-5710

The Word Processing Board enables the IBM PC to perform like a dedicated word processor. The board fits into one expansion slot and provides 64K to 192K additional RAM. Its word processing functions include text and cursor movement, insert/delete, page formatting, search and replace, tabs and decimal alignment, document merge and copy, print options, and help screens. List price: $695.

Advanced Communications Board

MNC International
511 11th Ave. #429
Minneapolis, MN 55415
612/333-4303

The Advanced Communications Board provides synchronous and asynchronous communications for smart terminal applications, IBM synchronous high-speed terminal emulation, networking, electronic mail, TWX and Telex, and other applications in which communications capability is needed. The board is powered by an 8088 chip accessible from the main processor. It has a software-controlled clock, a modem, automatic phone dialing and answering capabilities, and 8K RAM for applications control. List price: $895.

Transcryptor

Cryptext Corporation
P.O. Box 425
Northgate Station
Seattle, WA 98125
205/364-8585

Transcryptor is an encryption board that prevents unauthorized access to data being transmitted between computers. All data passing between computers connected to Transcryptor is automatically encrypted when transmitted and decrypted upon receipt. Transcryptor automatically adjusts to data rates from 300 to 9600 bits per second, detects line errors, and resynchronizes when errors occur. List price: $945.

PC-SPI

Adams OEM Products
P.O. Box 8339, Station A
Greenville, SC 29604
803/233-4342

PC-SPI is an interface board that allows users to connect industrial serial and parallel data acquisition and control peripherals to the IBM PC and XT. PC-SPI provides users with one RS-232C or RS-422 serial port and three 8-bit parallel I/O ports. List price: $219.

ZT 1488

Ziatech Corp.
3433 Roberto Court
San Luis Obispo, CA 93401
805/541-0488

ZT 1488 is a general purpose interface bus (GPIB) board that provides the IBM PC with an IEEE-488 port. The board enables a PC to monitor over 2000 GPIB-compatible instruments and peripherals for scientific and industrial measurement-recording purposes. Data transfer rates range from 80K to 200K per second. A 14-inch cable with an IEEE-standard connector is included with the board. ZT 1488 also features a clock/calendar with battery backup, and an I/O socket allows multifunction expansion with small, snap-on piggyback modules. Optional ZT 1488 software enables computer novices to implement their own measurement control programs. List price: $485, software $35.

Maverick SMD PC-80

Interphase Corporation
2925 Merrell Rd.
Dallas, TX 75229
214/350-9000

Maverick SMD PC-80 is a disk controller that supports drives from many manufacturers. Storage capacities range from 16 to 1600 megabytes. The board controls any combination of two disks, hard or floppy. Maverick SMD PC-80 offers high-speed direct memory access, automatic error correction, and bad track and bad sector replacement. List price: $1895.

Lab Tender

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Lab Tender board provides data acquisition capabilities for industrial, scientific, and other laboratory and control environments where 8-bit accuracy is sufficient. Lab Tender accepts analog-to-digital, digital-to-analog, or digital-in/digital-out inputs. The board has five 16-bit timer/counters and three 8-bit parallel ports. List price: $495.

V102-I

Vynet Corp.
160B Albright Way
Los Gatos, CA 95030
408/370-0555

V102-I is a voice communications board that can be configured to allow voice response, remote control of the IBM PC, and data communications over the phone. The V102-I board serves as a base onto which you can add any of six Vynet voice response and data communications modules to suit specific business needs. V102-I provides two voice channels that let you call or be called by the computer without the necessity for hardware such as terminals, modems, or dedicated lines. With the proper modules and Vynet software, two callers may simultaneously receive information stored in the computer. The computer may also retrieve information from a remote data base and "speak" directly to a caller on another line. One caller may direct the computer to place a call on the other line and either speak information or—if the call is to another computer—transmit the data using a modem board. List price: $495.

Palette

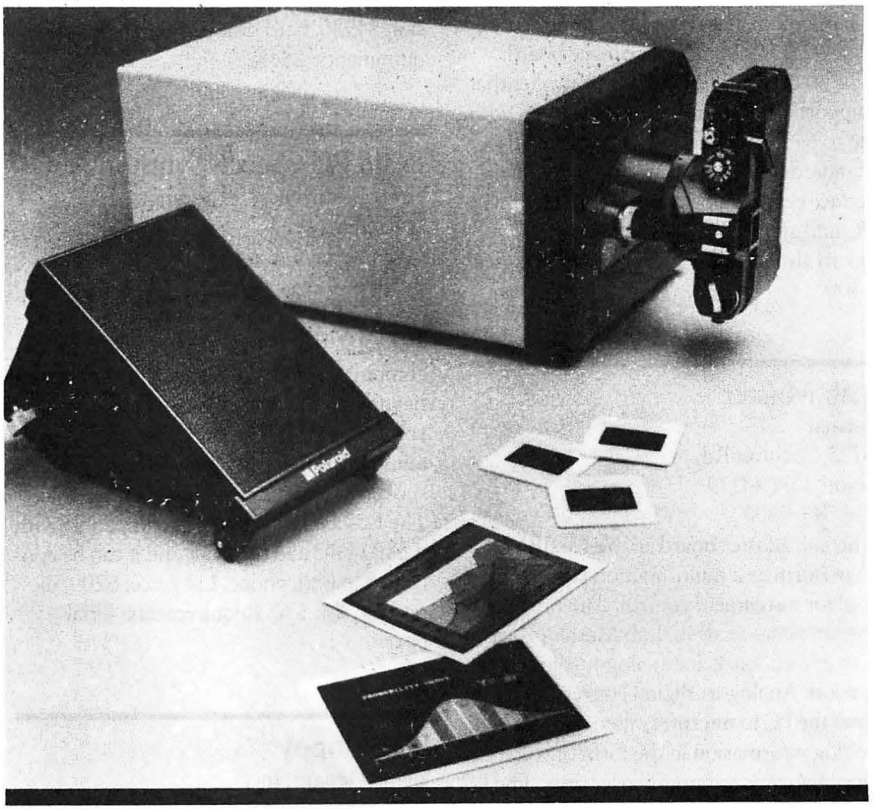
Polaroid Corporation
575 Technology Square #2-M
Cambridge, MA 02139
800/225-1618

The Palette computer image recorder produces color prints or slides, even with monochrome IBM PC systems. Because Palette generates its own images, it is not limited by television resolution; it generates images with a resolution of up to 600 by 400 pixels with 72 colors, depending on the applications software. Palette works with bit-mapped graphics images, and it contains its own monochrome CRT and color filter wheel to generate color pictures. Palette comes with utility software that is compatible with the graphics produced by programs such as *Graphplan* and *1-2-3*. The recorder includes an image generator, 35mm and 3¼- by 4¼-inch film backs, a Polachrome 35mm Autoprocess system, and connecting cables. List price: $1499.

Universal Speech and Sound Synthesizer

Educational Microcomputer Systems
P.O. Box 16115
Irvine, CA 92713
714/553-0133

The Universal Speech and Sound Synthesizer (USM-1) gives the IBM PC speech, sound, music, and I/O capabilities. The board generates speech through an onboard Z-80 processor, a text-to-speech algorithm, and the Votrax SC-01 speech synthesizer. It pronounces letters, words, sentences, and paragraphs, and it accepts input in the form of Votrax phoneme codes. USM-1 generates sound and music through two 3-channel sound generators and produces eight octaves of music. Speech synthesizer and sound generator outputs can be mixed to combine sound effects and speech. USM-1 includes two parallel ports, a game adapter, and a clock/calendar with battery backup. List price: $445.



Palette, Polaroid

MSI-VS01 Voice Synthesizer Card

Microcomputer Systems, Inc.
1814 Ryder Dr.
Baton Rouge, LA 70808
504/769-2154

The MSI-VS01 Voice Synthesizer Card produces vocal messages from command sequences stored in memory. The board forms words by using 64 speech sounds, called phonemes, that are stored in its Votrax SC-01 Speech Synthesizer chip. The MSI-VS01 board incorporates a 4-watt audio amplifier for direct speaker connection with standard tip jacks. An RCA jack provides low-level auxiliary output for direct input to an amplifier. List price: $185.

Combination Peripheral Board

MNC International
511 11th Ave. S #429
Minneapolis, MN 55415
612/333-4303

The Combination Peripheral Board combines three I/O functions on one board. The board has a floppy disk controller that supports up to four floppy disk drives with up to 640K of storage each. An industry-standard (SASI) connector provides an interface between the controller in the IBM PC and an external hard disk drive. The board also includes a serial port. List price: $300.

Lab Master

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

The Lab Master board enables an IBM PC to perform as a multifunction laboratory tool for instrument control, data processing, and data analysis. Lab Master provides 8 to 256 channels for analog-to-digital conversion. Analog-to-digital conversion allows the PC to interpret, alter, and store analog information in the form of voltages that change continuously over time. The PC regulates external devices by using Lab Master to transmit analog signals in the form of controlled voltages. The board enables the PC to accept, supply, sample at precise intervals, and systematically count digitally expressed data. Lab Master has five 16-bit timer/counters and three 8-bit parallel ports. List price: $995.

DASH-1

FutureNet Corp.
21018 Osborne St.
Canoga Park, CA 91304-7112
213/700-0691, TWX: 910-494-2681

DASH-1 is a schematic designer that consists of a graphics controller board, a mouse, and graphics software. The graphics controller provides 640- by 360-pixel resolution and a mouse port that does not require a hardware interface. The three-button mechanical mouse positions the cursor and permits graphics selections.

The software consists of a graphics editor and library programs that give an initial listing of circuit parts such as memory, processor, and peripheral chip descriptions. These descriptions can be pulled from the library and manipulated on screen to create electronic diagrams. The library can be updated by adding new symbols and part designations. The programs automatically check for and warn users of common errors such as dangling interconnects or inputs with no outputs. List price: floppy disk version $4980, hard disk version $6280. Requirements: 256K.

Echo PC Speech Synthesizer

Street Electronics Corporation
1140 Mark Ave.
Carpinteria, CA 93013
805/684-4593

The Echo PC Speech Synthesizer is a stand-alone unit that contains a speaker. Using combinations of phonemes, the synthesizer has an unlimited vocabulary in robotic voice mode. An optional floppy disk contains a dictionary of 800 words, which are spoken in a natural-sounding female voice. The Echo PC synthesizer is compatible with the IBM PC and the PCjr, and it can be connected to a telephone. List price: $200, dictionary disk $30. Requirements: serial port.

SDI-Floppy

Sigma Designs, Inc.
2990 Scott Blvd.
Santa Clara, CA 95050
408/496-0536

SDI-Floppy is a floppy disk controller that lets you run up to four single- or double-density 5¼-inch floppy disk drives. List price: $220.

CAD 1000 and CAD 2000

Chancellor Computer Corporation
1101 San Antonio Rd.
Mountain View, CA 94043
415/969-5000

CAD 1000 and CAD 2000 are engineering work stations that include an IBM PC XT with an Intel 8087 coprocessor, a graphics board, an optical mouse, and integrated computer-aided design software. CAD 2000 comes with a high-resolution, 19-inch, 1024- by 768-pixel color monitor; CAD 1000 comes with a medium-resolution, 13-inch, 640- by 400-pixel color monitor. Users can design their own schematic diagrams and printed circuit boards. Each work station can be used as a stand-alone computer, or it can be incorporated into an Ethernet local area network. List price: CAD 1000 $13,500, CAD 2000 $23,000.

Speech Master

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Speech Master is a speech synthesis board that provides a voice output capability for the IBM PC. The board can be used for artificial speech, sound effects generation, or other applications in which speech output is needed. The board has amplitude, balance, and pitch controls that can be adjusted to yield a wide variety of voice, tone, and sound effects. Speech output emits from a speaker located on the board, and a jack for an external speaker is included. List price: $395.

Device Master

Tecmar
6225 Cochran Rd.
Solon, OH 44139
216/349-0600

Device Master is a controller board that regulates up to 16 devices such as thermostats for energy management or alarm systems for security. It turns the devices on and off according to a preset schedule. Designed to work with the BSR X10 remote controller, Device Master links to the BSR X10 with an ultrasonic interface instead of direct AC connections. The board has a clock/calendar with a five-year battery backup capable of activating an alarm whether the power is on or off. List price: $245.

Clipper and Clipstrip

Dymarc Industries
21 Governor's Court
Baltimore, MD 21207
800/638-9098

Clipper is a power line protector that plugs directly into a wall socket. The protector has three outlets that provide a total of 1800 watts of power. Clipper protects equipment from power transients in 5 nanoseconds. The unit includes a warning beeper and a light-emitting diode that indicate when the protector is not functioning properly. Also available is Clipstrip, a six-outlet power strip with an on/off switch. Clipstrip provides 1800 watts of protected power. List price: Clipper $49.95, Clipstrip $112.

Clip-Cube

Dymarc Industries
21 Governor's Court
Baltimore, MD 21207
800/638-9098

Clip-Cube provides computers with protection from radio and electromagnetic interference, as well as from power transients. Clip-Cube is available in models ranging in power from 200 watts to 1500 watts. The 200-watt model has two outlets; higher power units have four outlets. List price: 200-watt model $300, 1500-watt model $995.

Big Blue

Quality Computer Services
3 Quces Dr.
Metuchen, NJ 08840
201/548-2135

Big Blue is an auxiliary processor board with a Z-80B processor that allows an IBM PC to execute programs written for the CP/M-80 operating system. Big Blue features 64K of parity-checked RAM, a clock/calendar with battery backup, a serial port, a parallel port, and a hard disk controller. List price: $595.

"Big Blue has well-written, easy-to-understand documentation and powerful disk-format-conversion capability. Quality Computer Services shows genuine concern for users who may have problems." A. G. Robison, Exton, Pennsylvania

68000 MicroCard

Sritek
6615 Snowville Rd.
Cleveland, OH 44141
216/526-9433

The 68000 MicroCard is a processor board that uses the Motorola 68000 32-bit processor and 16-bit bus to provide high-speed data processing. The 68000 MicroCard must be used with Sritek's VersaCard, a 256K RAM expansion board onto which the 68000 Microboard is stacked. With an additional 256K RAM module, the three boards provide, in one expansion slot, 512K of parity-checked RAM and a paged memory management unit that serves multiple users and performs address relocation.

The 68000 MicroCard features dual-port memory access through the IBM PC's 8088 8-bit bus and the 68000's 16-bit bus. The 8088 handles I/O tasks, and the 68000 runs applications programs. The board can be used with three operating systems—UNIX/XENIX System III, UCSD p-System, and RM/COS—and eight programming languages, including FORTRAN, BASIC, COBOL, ADA, Pascal, C, APL, and assembly. An 8 MHz or 10 MHz clock is included. List price: 68000 MicroCard $795, VersaCard $995, RAM module $595.

TYPE-'N-TALK

Votrax, Inc.
1394 Rankin Dr.
Troy, MI 48083
800/521-1350, 313/588-0341

TYPE-'N-TALK is a stand-alone speech synthesizer that converts ASCII data into robotic voice speech. The synthesizer uses Votrax's SC-01 chip, which incorporates a text-to-speech algorithm. List price: $249. Requirements: serial port.

USM-1 (Universal Speech Module)

Educational Microcomputer Systems
1 Clear Spring
P.O. Box 16115
Irvine, CA 92715
714/553-0133

USM-1 is a music and voice synthesizer board. USM-1 has an on-board Z-80 processor that controls text-to-speech conversion and music generation. The board uses the Votrax SC-01 speech synthesizer chip and a six-voice sound generator. USM-1 requires external speakers and has two output channels that accept phono jacks. The board also includes an on-board clock/calendar with battery backup, a standard 15-pin game adapter, and two parallel ports. It requires external speakers. List price: $445.

PC-SSI

Adams OEM Products
P.O. Box 8339 Station A
Greenville, SC 29604
803/233-4342

The PC-SSI is an I/O board with two communications ports that function as either RS-232C or RS-422 serial ports. Each port has four selectable addresses, including COM1 and COM2, and software-controlled data transfer rates up to 19.2 kilobits per second. List price: $219.

DSI-Asynch + RAM

Davong Systems, Inc.
217 Humboldt Court
Sunnyvale, CA 94086
408/734-4900

The DSI-Asynch + RAM board provides terminal emulation and RAM for the IBM PC. The board comes with 64K RAM that can be upgraded in 64K increments to 256K. DSI-Asynch + RAM includes two serial ports. Data transfer rates can be set from 110 bits to 19.2 kilobits per second. Users also select one or two stop bits and word length of 5, 6, 7, or 8 bits. List price: $385.

Votrax Personal Speech System

Votrax, Inc.
1394 Rankin Dr.
Troy, MI 48083
800/521-1350, 313/588-0341

The Votrax Personal Speech System is a self-contained text-to-speech synthesizer that connects to the IBM PC through a serial port. The synthesizer contains a Z-80 processor, Votrax's SC-01 chip with a text-to-speech algorithm, and a speaker. It produces robotic voice speech from any ASCII data input. The Personal Speech System also produces sound effects and music. It has a real-time clock that announces the time on request. The unit requires cable. List price: $395. Requirements: serial port.

PC Saver

Kensington Microware Ltd.
919 Third Ave.
New York, NY 10022
212/486-7707

The PC Saver line cord is a computer power cord with built-in power protection. It replaces the standard power cord for the IBM PC. PC Saver responds in 50 nanoseconds to protect against power line noise, power transients, and electronic noise generated by other equipment plugged into the same outlet. PC Saver handles 500-watt loads and is available in 120-VAC and 240-VAC versions. List price: 120 VAC $49.95, 240 VAC $60.

μAnalyst 2200

Northwest Instrument Systems, Inc.
P.O. Box 1309
Beaverton, OR 97075
800/547-4445, 503/645-5151

The μAnalyst 2200 interactive timing analyzer can collect 16 channels of 100 MHz timing information. It detects timing errors as small as 5 nanoseconds. μAnalyst 2200 consists of a trigger board and a data acquisition/memory board that plug into two slots in the μAnalyst 2100 mainframe. The memory board stores up to 500 bits per channel, which can be displayed as bit-mapped waveforms on the IBM PC. The μAnalyst system lets the Model 2100 trigger the 2200 or vice versa, when conditions predefined by users are met. List price: $2995.

Pixtik

Pixel-Plus Ltd.
31 Barton Ln.
Nailstone, Nuneaton, Warks
CV13 0PY United Kingdom
Phone: 0530-62565

Pixtik is an external real-time clock that plugs into the IBM PC parallel port. Pixtik is about the size of a microcassette and does not interfere with the normal functions of the parallel port. A printer can be plugged into the attached Pixtik module. Pixtik contains its own battery and continues recording the date and the time for up to two years even when the computer is turned off. Pixtik includes software to update the PC-DOS internal clock automatically. List price: $75.

Sup'R Mod

M & R Enterprises
910 George St.
Santa Clara, CA 95050
408/980-0160

Sup'R Mod is an RF modulator that takes an NTSC composite video signal from a computer and sends it to a television (TV). The Sup'R Mod comes with connecting cables and plugs and its own power supply. It can be set for either channel 3 or 4 on the TV. A built-in switch lets you connect the TV to the computer or a conventional TV antenna without having to disconnect cables. List price: $69.95.

Micro D-Cam

Micromint, Inc.
561 Willow Ave.
Cedarhurst, NY 11516
516/374-6793

Micro D-Cam consists of a digital television camera and an interface board that plugs into a slot in the IBM PC. Micro D-Cam produces a 256- by 128-pixel image. The solid state sensor in the camera only interprets black and white light levels, but software routines that come with Micro D-Cam produce up to 16 gray levels. The software menus let you control exposure and picture format. Once a picture is captured, it can be saved to disk or printed by a dot matrix printer. List price: $295.

PDS-11 Kleen-Line Modem Protector

Electronic Specialists, Inc.
171 S. Main St.
P.O. Box 389
Natick, MA 01760
617/655-1532

The Kleen-Line Modem Protectors guard phone modems and attached computer equipment against electrical surges on phone lines. Model PDS-11 suppresses noise on phone lines 3 and 4 (the red and green lines); the other two lines are passed through. The unit connects the modem and the phone outlet with standard modular phone connectors. Another version, Model PDS-11/SUP, has the same features as Model PDS-11, in addition to a piggyback line power outlet that provides up to 1250 watts of filtered AC power. List price: PDS-11 $56.95, PDS-11/SUP $81.95.

Screenshooter

NPC Photo Division
1238 Chestnut St.
P.O. Box 245
Newton Upper Falls, MA 02164
617/969-3487

Screenshooter produces color or black-and-white prints or slides from the IBM PC monitor. The system includes a light-tight hood and a camera adapter, which fit over the front of the CRT. Screenshooter includes a Polaroid OneStep 600 camera for making instant color prints of CRT displays. The unit can also be used with a regular 35mm camera loaded with conventional or Polachrome film. List price: $169.

SAFT Standby Power Supply

SAFT America Electronics Div.
2414 W. 14 St.
Tempe, AZ 85281
602/894-6864

The SAFT Standby Power Supply protects against power line noise, surges, and power loss. If line voltage varies by more than 15 percent, the unit switches to internal battery power and flashes an alarm. Model 200, which is recommended for small systems with floppy disks, has two outlets and provides 175 watts of backup power for 24 minutes. Model 400, with four outlets, provides 350 watts of power for 12 minutes. Model 400 is recommended for larger systems with hard disk drives or printers. Each model requires 12 to 16 hours to recharge its internal battery. Foreign versions (230 VAC, 50 Hz) are available at the same prices. List price: Model 200 $549, Model 400 $749.

"SAFT Standby Power Supply performs as advertised. It has saved my data several times." Joseph E. Darsey, Houston, Texas

The Protector

Protection Technology
2 E St. #660
Santa Rosa, CA 95404

The Protector transient suppressor provides 1800 watts of filtered AC power and responds to power transients in 5 nanoseconds. The suppressor comes in two versions: a board that wires directly into the IBM PC, and a four-outlet junction box. The junction box is fuse-protected. List price: $349.95.

CP-50 Contrast Enhancement Filter

Polaroid Corporation
575 Technology Square #2-M
Cambridge, MA 02139
800/225-1618

CP-50 is a polarizing filter that eliminates ambient reflections from television screens. The filter uses a circular polarizer that traps light that has entered from outside and bounced off the screen. The filter attaches with self-adhesive mounts; no tools are needed to install or remove it. List price: $49.95.

PC-XTRA Bus Exansion Chassis

P.C. Horizons, Inc.
200 N. Tustin Ave.
Santa Ana, CA 92705
714/953-5396

The PC-XTRA Bus Expansion Chassis has six expansion board slots and an internal power supply. The power supply is controlled by the IBM PC's main power supply, so the expansion power cannot be left on accidentally. The 18-inch shielded cable and connector board take up one slot in the PC; the remaining combined system capacity accommodates ten boards. PC-XTRA runs on either 110 or 220 VAC, 50/60 Hz. List price: $549.

Port-eXtendor

Automating Peripherals, Inc.
1567 E. Sumner St.
Hartford, WI 53027
414/673-6815

Port-eXtendor connects 16 serial ports to 1 IBM PC serial port. The PC controls which port it is connected to by sending a software command to Port-eXtendor. Each port can be programmed for a different bits-per-second rate. A built-in battery enables Port-eXtendor to retain settings when the power is off. Port-eXtendor includes a real-time clock and calendar. Time-programmable relays, sold separately, activate special circuits such as bells or modems and send the time of day to each port. List price: $2800, programmable relays $75 each.

ZT 1444

Ziatech Corp.
3433 Roberto Court
San Luis Obispo, CA 93401
805/541-0488

ZT 1444 is an IEEE-488 controller board that supports direct memory data access rates of up to 450K per second and is small enough to fit in the short slots of the IBM PC XT or the Portable PC. The board can control several IEEE-488 devices, such as stimulus and measurement instrumentation, data acquisition equipment, and other peripherals. ZT 1444 supports programming in BASIC, Pascal, FORTRAN, C, and assembly language. The board comes with a diagnostic program and a utility for software customization. List price: $375.

DP-11

Visualtek
1610 26th St.
Santa Monica, CA 90404
213/829-6841

DP-11 is a large-print display processor that automatically enlarges displayed letters for people who have limited vision. Without special programming or software, DP-11 displays clear, solid, high-contrast letters up to 5½ inches high. The system operates as a peripheral and includes a control panel, a joystick, a 19-inch monochrome monitor, and a display processor with 8K and its own processor. You select the reading rate and cursor control, pause, and review functions at the control panel. The joystick controls movement around the screen and speed. DP-11 comes with its own controller board and does not use any of the computer's program memory. List price: $2470. Requirements: IBM Color/Graphics Adapter.

CR200-PC

Cardamation Company
446 Lancaster Ave.
Frazer, PA 19355
215/647-8260

CR200-PC is a punched-card reader for the IBM PC that processes 200 80-column cards per minute. Optional software enables CR200-PC to enter data, tabulate election data, and score tests. List price: $4100, software $150. Requirements: serial port.

Speak Easy

CMC International
1720 130th Ave. NE
Bellevue, WA 98005
206/885-1600

Speak Easy is a digitized voice management system, made up of a printed circuit board and software, that enables the IBM PC to speak and perform telephone functions. Speak Easy detects ringing, answers calls in a prerecorded voice, and replays messages to callers who identify themselves with touch-tone telephone codes. Speak Easy can call one or more programmed phone numbers and deliver a prerecorded message. The software stores incoming messages on disk; you can review them later over a remote telephone or by programming Speak Easy to call a number and deliver messages. List price: $795. Requirements: 256K.

Bug Catcher

Emulation Technology
422 Ives Terrace
Sunnyvale, CA 94087
415/960-0652

Bug Catcher is an extended socket that connects test devices such as logic analyzers to processors. Each pin's function is labeled on the socket to ensure nonshorting connections. The product accommodates 40-, 48-, and 64-pin DIPs for the following processors: Z-80, 6502, 6800, 6809, 8035 series, 8648, 8748, 8085, 8086, 8088, and 68000. List price: 40-pin $45, 48-pin $52, 64-pin $67.

Model 100-2124-00

Power-R Inc.
4016 Interlake N
Seattle, WA 98103
206/547-8000

Model 100-2124-00 is a video enhancer that connects a color graphics board and a high-resolution monochrome monitor. The device eliminates grainy texture and highlights text by converting an RGB color signal to 16 shades of one color. The video enhancer amplifies the video signal for parallel operation of up to six monitors. The enhancement circuit sits inside a 9-pin connector that connects to the monitor and takes its power from the light pen connector. Model 100-2124-00 cannot be used with the IBM monochrome monitor. List price: $79.95.

I-Bus Nine Slot Card Cage

I-Bus Systems
8863 Balboa Ave.
San Diego, CA 92123
800/382-4229, 619/569-0646

The I-Bus Nine Slot Card Cage is similar to the I-Bus Six Slot System Enclosure but provides room for nine expansion boards. It does not come with a power supply. An OEM system starts with a single-board computer, leaving eight slots for all IBM PC expansion boards. List price: with fan $525, without fan $425.

Series 500

Keithley DAS
349 Congress St.
Boston, MA 02210
617/423-7780, Telex: 706-920

Series 500 is an external measurement and control system for scientists and engineers that allows the IBM PC to interpret analog signals and control remote instruments. The basic 500 system unit holds a power supply and a base board with ten expansion slots that enable the unit to perform a variety of functions. Up to 11 expansion boards, called analog input modules, are available. The boards permit direct connection of analog devices such as thermocouples, photodetectors, and strain gauges. The offset and gain of each signal channel are programmable, and the range is switch-selectable.

An interface board, which requires one slot in the PC system unit, and software are included with the 500 system. The software is an extension of the BASIC operating environment and includes a library of machine language subroutines. The software permits applications development using BASIC that takes advantage of the speed of machine-language operations, which is essential for real-time measurement and control procedures. Statistical and graphics functions and conversion to engineering units are additional features of the software. Individual modules for specific configurations and three preconfigured systems, the 510, the 520, and the 530, may be purchased separately. List price: 500 system $2100, 510 measurement system $3300, 520 measurement and control system $4300, 530 high-accuracy measurement system $5500.

DataShield

PTI Industries
320 River St.
Santa Cruz, CA 95060
408/429-6881

DataShield is a rechargeable, battery-operated backup power source with a built-in surge protector to guard against peaks, surges, and line noise. The power source is available in a 200-watt version, the PC-200, and a 300-watt version, the XT-300. List price: PC-200 $359, XT-300 $499.

Supertalker II

Mountain Computer, Inc.
300 El Pueblo Rd.
Scotts Valley, CA 95066
408/438-6650

Supertalker II is a speech digitizer that enables the IBM PC to store and reproduce words and sounds. The board comes with a loudspeaker, a microphone, and software. The board's 32K can be used for other programs when it is not needed for voice applications. The digitizer works with the supplied software or runs on user-developed BASIC programs. Supertalker II enables 2 minutes of words or sounds to be entered via the microphone, digitized, and stored on one disk for playback. The speech digitizer reproduces the human voice and voice inflection. List price: $595. Requirements: 64K.

PC Weighmate

Micro General Corporation
1929 S.E. Main St.
Irvine, CA 92714
800/482-3184, 714/863-1684

PC Weighmate is a scale system that converts the IBM PC into an electronic postal, shipping, and counting scale for business and office use. It includes an electronic scale, an interface board, cables, and software. The interface board uses one built-in expansion slot. The scale has a weight range of 1/32 ounce to 25 pounds. The software contains rate tables and zone charts for all classes of United States Postal Service domestic and international mail, Express Mail, United Parcel Service, and Federal Express. The software also includes *Rate Shopper,* which compares postal rates. To cover postal rate changes, Micro General offers a package that covers 18 months of rate changes. A new disk with rate changes is also available. List price: $695, rate-change package $98, rate-change disk $39.

PROM-2000

Advanced Microcomputer Systems, Inc.
3501 University Dr. #211
Coral Springs, FL 33065
305/755-2291

PROM-2000 is a programmer board based on the IBM PC bus. The board programs EPROM chips, 16-, 20-, and 24-pin bipolar PROM chips, and 20- and 24-pin programmable gate arrays. The board includes software that helps read, duplicate, verify, and program PROM chips. List price: $335.

DC-6

Sigen Corporation
1800 Wyatt Dr. #6
Santa Clara, CA 95054
408/988-2527

DC-6 is a disk controller for the IBM PC or XT. The controller lets you choose either the disk manufacturer's driver or IBM's BIOS. XT configuration options include automatic start-up from a hard disk drive, a direct memory access channel, and a port for a second hard disk drive. DC-6 has an error-correction system that detects hard disk errors, flags them as permanent bad sectors, and replaces them without intervention by the operating system.

The board encodes private files in shared-user systems by means of encryption and decryption utilities. You can also transmit the files to remote systems in encrypted form. Other features include a 512-byte sector buffer and selectable I/O control register address and interrupt assignments. DC-6 is compatible with hard disk drives and other storage media. List price: $395.

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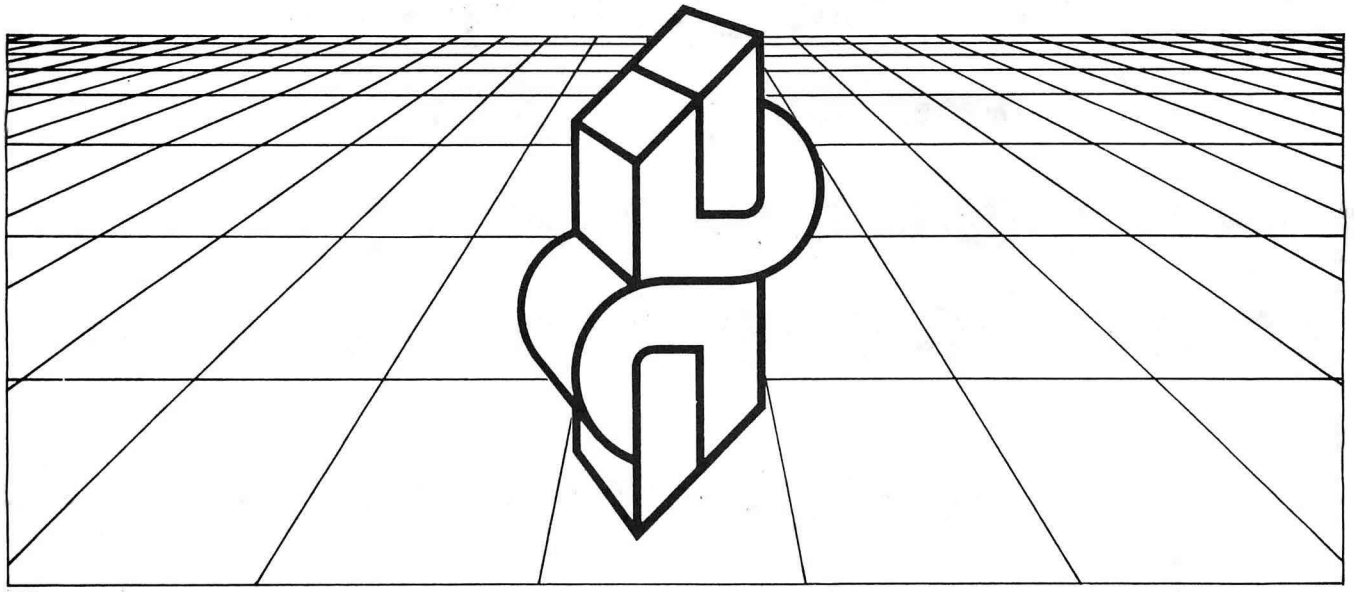

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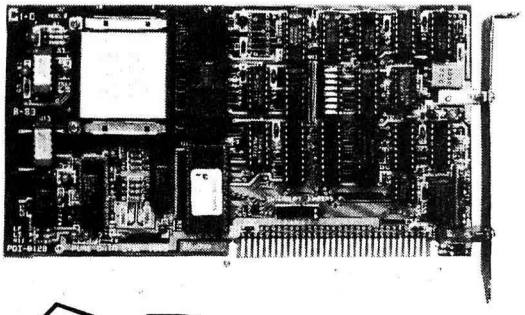
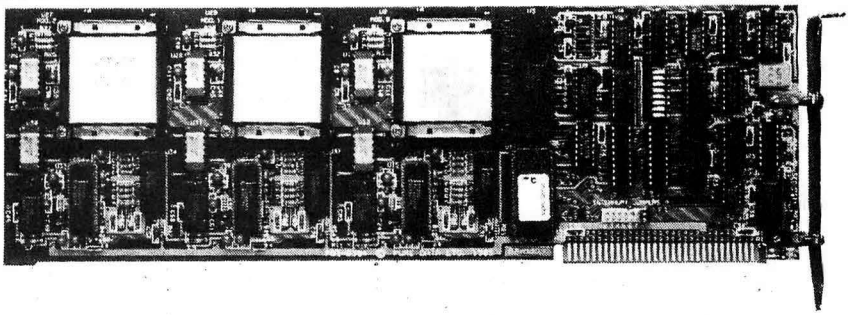


PDIB-384



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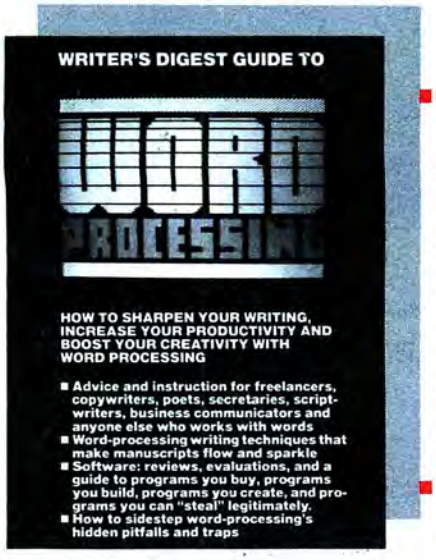

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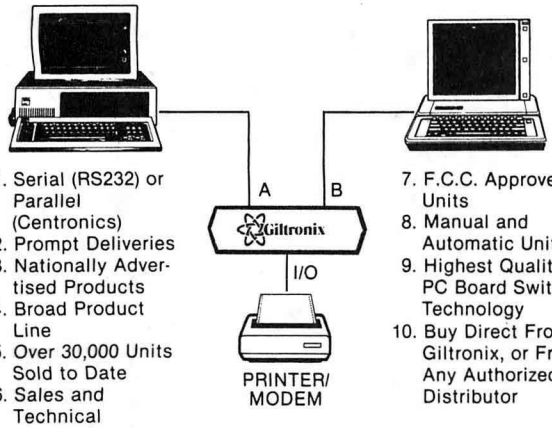

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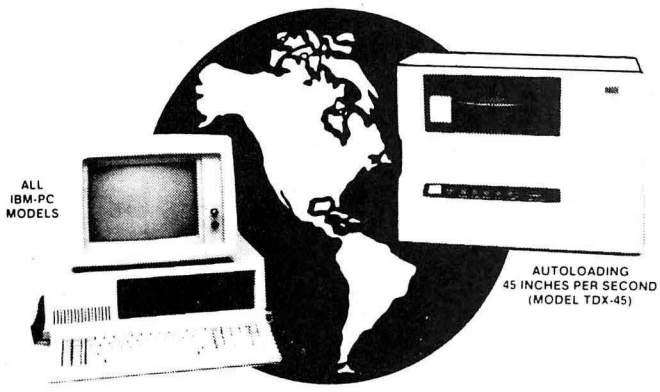

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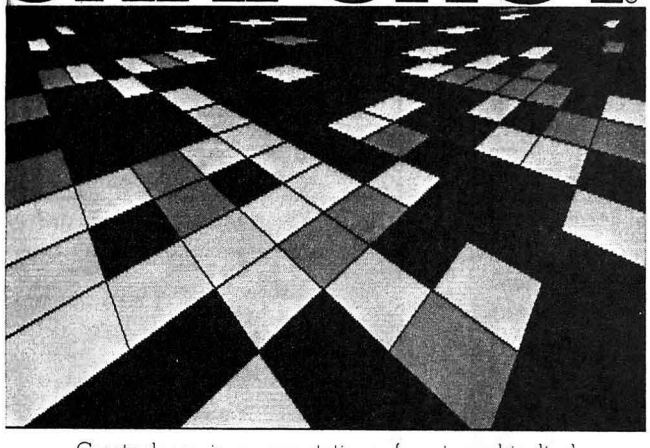

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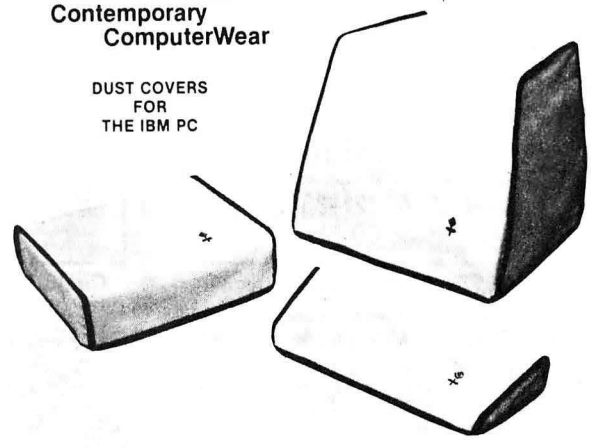

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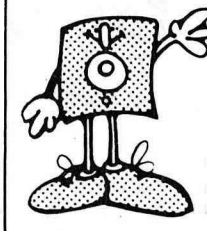

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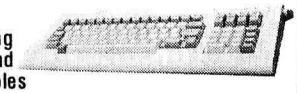

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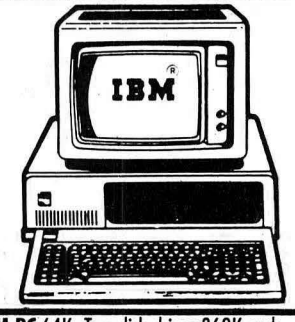

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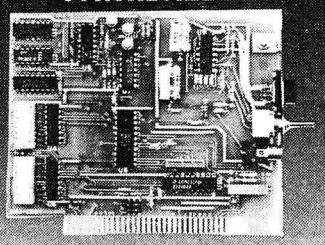

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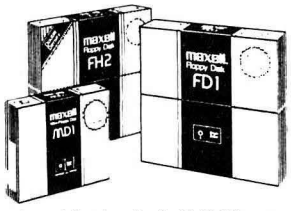

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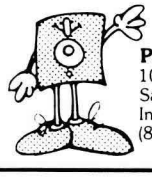

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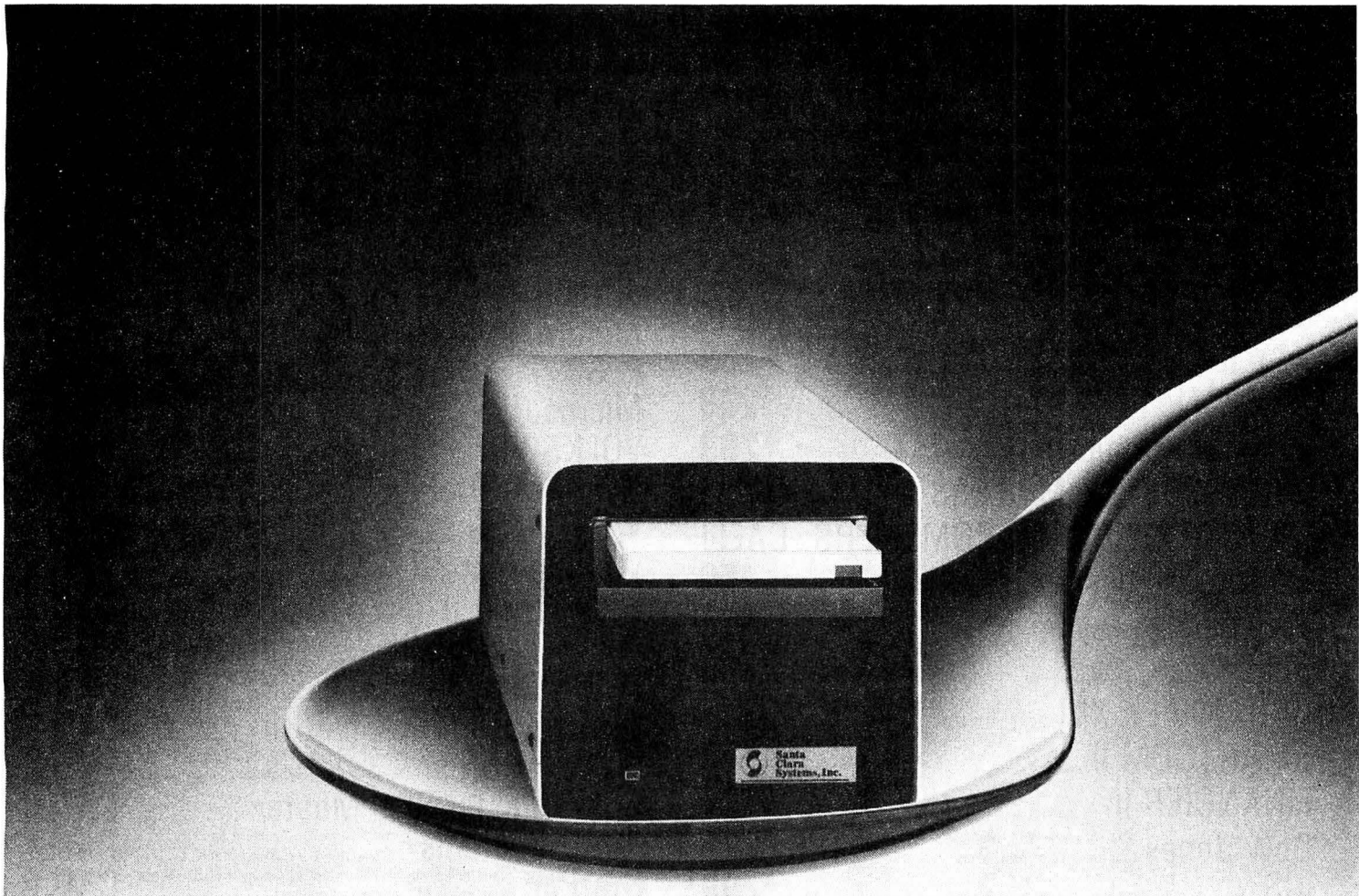

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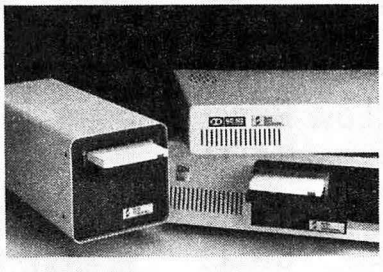

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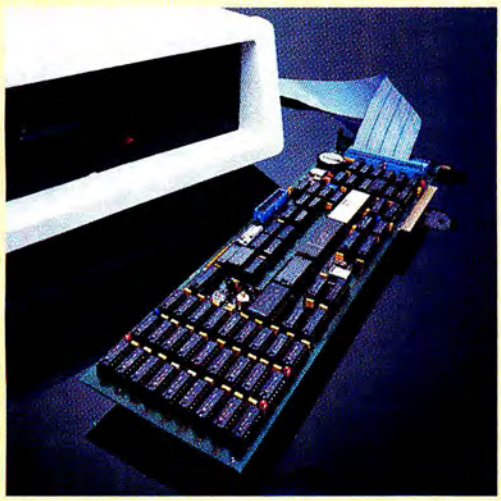

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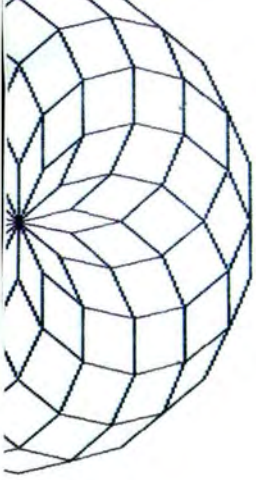

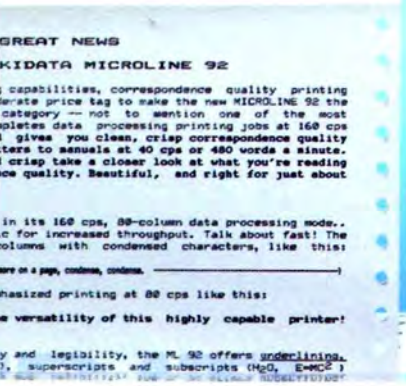

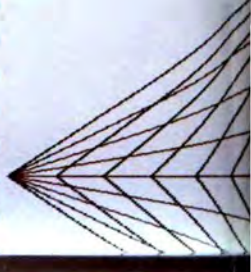

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