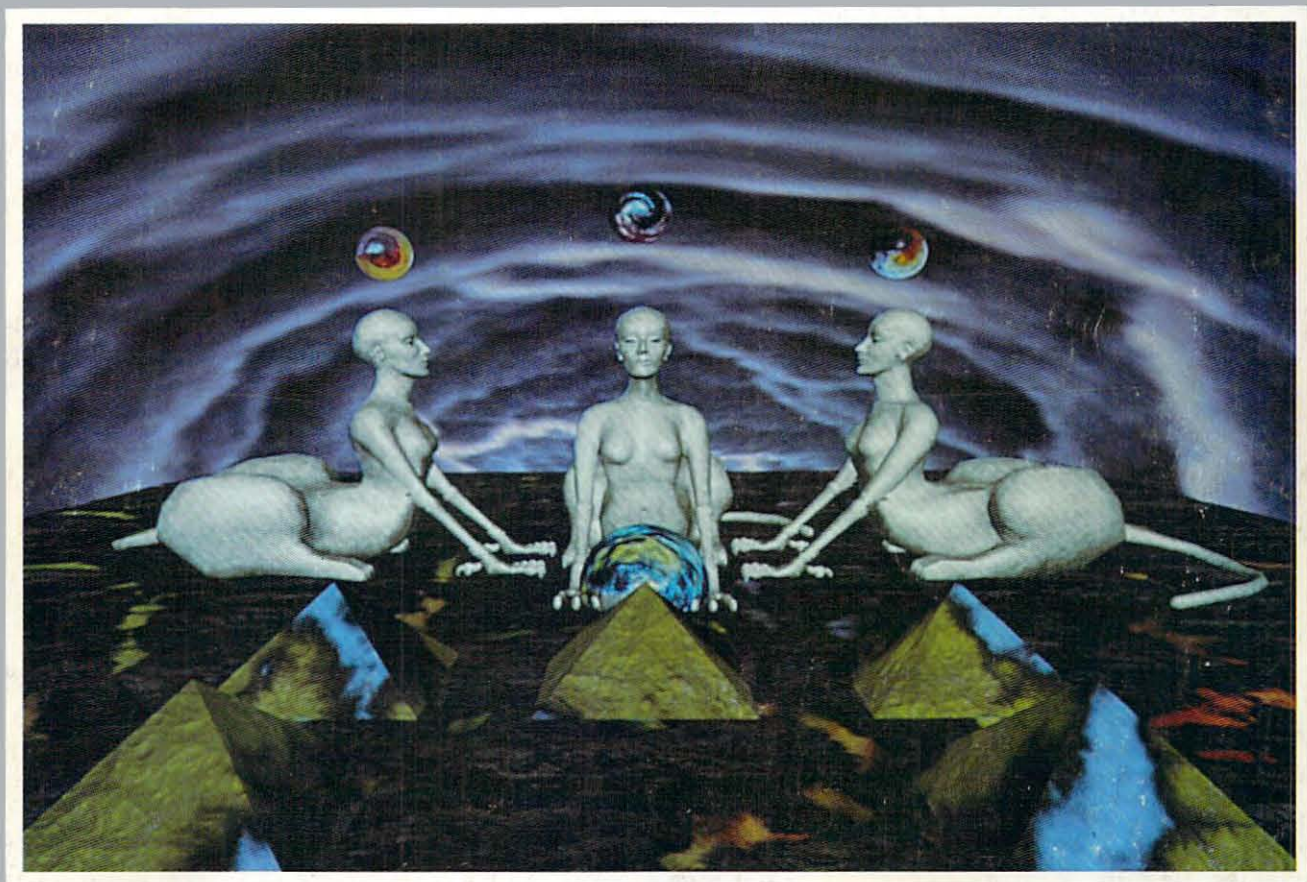


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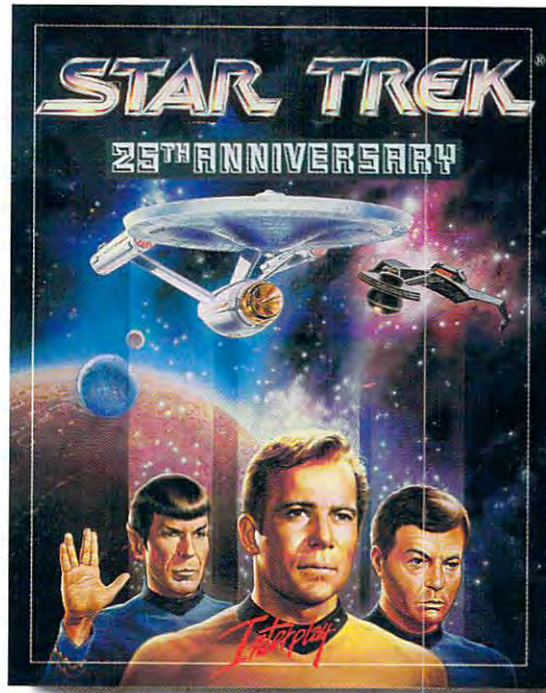
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WHY YOU SHOULD GO ONLINE

D A V I D E N G L I S H

In the 1970 movie, *Colossus: The Forbin Project*, the largest American computer demands to be connected to the largest Soviet computer so that the two computers can share their enormous data banks. It seems that curious computers and intelligent humans always want to know more about the world around them.

This urge to merge has grown even stronger over the last two decades. In the 1970s, we networked our dumb terminals by wire to the nearest large computer. In the 1990s, we can connect our personal computers by phone to just about any computer—large or small. With personal computers, you can have a network based on choice. The result is a series of global communities created not by geography but by interest.

- If you're a professional musician, you can chat about music with an electronic community of musicians on PAN (Performing Artists Network)—even though you live in a mountain lodge in Arkansas and your electronic neighbor lives in an apartment building in downtown Tokyo.

- If you're an animal-rights activist, you can organize an effective letter-writing campaign by leaving a message on GENie's Pets RoundTable—even though you have no idea where any of the members live.
- If you have to write a research paper and need information on the various federal agency libraries, you don't have to travel to Washington, D.C. You can stay where you are and use your modem to call the Library of Congress BBS.
- If you're a beginning poet, you can find other poets on the major online services who will gladly read and critique your writing.

No More Excuses

Whatever your interests—music, sports, investments, grassroots politics, movies, programming, science fiction—there are online communities devoted to the things that you're into. And now that modems and communications software are cheaper than ever, there's really no excuse for not getting involved in online communications. □

COMPUTE GOES ONLINE

Ever wish you could download an article from *COMPUTE* into your word processor or talk with a *COMPUTE* editor? Maybe you'd like to replace a lost disk from a back issue of *COMPUTE!'s PC Magazine* or find a *COMPUTE* book that's been out of print for several years. Now you can do all these things with a single phone call, 24 hours a day.

Starting immediately, you can go online with *COMPUTE* on either GENie or America Online. You'll find complete back issues of all the *COMPUTE* magazines for the years 1991, 1990, and 1989; previously published disk products for PC, Amiga, Commodore 64, and Atari ST computers; the complete text of out-of-print *COMPUTE* books; excerpts from currently published *COMPUTE* books; digitized NASA photos; special feature sections for *COMPUTE's Getting Started with . . .*

booklets and *COMPUTE's* Test Lab; and application macros and templates. You'll also be able to order *COMPUTE* products online.

Over the coming months, we'll be adding a submarine simulator game and back issues from years prior to 1989. On GENie, we'll also have a complete bulletin board, covering such topics as software tips, *Windows*, industry rumors, feedback to editors, programming, hardware care and maintenance, and much, much more.

To reach us on GENie, type *COMPUTE*. On America Online, make your way to the main menu, click on the Computer and Software icon, click on the Computer News and Magazines icon, and click on the *COMPUTE* icon.

Look for more information in the main part of this month's *COMPUTE*—including instructions on how to sign up for GENie and America Online.

—David English



HOW TO CHOOSE A MODEM

T O N Y R O B E R T S

If you're going to link up with bulletin boards and information services, you'll need a modem. For general telecommunications tasks, such as logging on to bulletin boards and downloading files, nearly any modem will do. The amount you should spend and the features you should look for depend on how much you'll use your modem. Consider these items when selecting a modem:

- Hayes compatibility. The Hayes command set is a group of commands that communications software uses to configure the modem. It was introduced in the early 1980s in modems produced by Hayes Microcomputer and has since become the standard. You'll want Hayes compatibility in a modem.
- Speed. Currently, there's no point buying any modem slower than 2400 bits per second (bps). Although information services such as GENIE and CompuServe are adding 9600-bps nodes, most casual users will find 2400 bps adequate.
- Error correction and compression. Once found only in the most expensive modems, error

- correction and compression capabilities are now available in many lower-priced models. Error correction protocols include Microcom Network Protocols (MNP) 2-4 and CCITT V.42. Compression schemes include MNP 5 and CCITT V.42bis. In order for error correction and compression to work, modems on both ends of the line must have the same capabilities.
- Internal versus external. The choice depends on your setup. An external modem needs a serial port, a data cable, and an AC outlet; it also occupies desk space. On the plus side, you can easily move an external modem from computer to computer. Because internal modems don't require a power supply or case, they're usually a little less expensive. In addition, you can usually configure an internal modem for COM3 or COM4 if your other serial ports are occupied.
- Fax options. Many modems include some fax capability. This can be a real convenience, letting you send faxes from your PC rather than having to wait in line for the office fax machine. □

HOW TO CHOOSE A COMMUNICATIONS PROGRAM

M I C H A E L A . B A N K S

While most of the features in communications programs are there because users need them, many others are added simply to keep up with the competition. Because of this, buyers are faced with a dizzying array of features and options—many of which they may not need. Here are some of the more important features to look for.

- Command set compatibility. A communications program must use a command set that's recognized by the modem with which it's used. This will, more often than not, be the AT command set—or a subset of it.
- Variable communications parameters. At the very least, you should be able to change these parameters: communications speed (bits per second), the number of data bits in each character, the number of stop bits used, parity, and echoplex (duplex).
- Automatic dialing support. Most modems can dial a number automatically. They can accept a number from the communications program (or one entered by the user) and dial the number without using a telephone set. If you use this kind of modem, you'll naturally want software that supports autodialing. It should issue the commands necessary to tell the modem to take the phone line "off hook" and dial a number.
- Originate/answer mode switching. If you plan to use your computer and modem to receive as well as make calls, your software must support switching between the originate mode (make a call) and answer mode (receive a call). Manual-dial modems usually have an external switch to perform this function. Autodial modems usually rely on software commands to switch between originate and answer modes.
- Telephone hangup. Most BBSs and online services automatically disconnect at sign-off. There are some systems, however, that rely on

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the calling system (your system) to disconnect. A remote system can also become stuck or go berserk and start displaying text or garbage on your screen. If the software can't hang up the telephone, you'll have to turn off your modem or unplug the telephone line.

- Autologon files. Signing on to a BBS or online service requires several steps, including ID and password entry. If you're accessing an online service via a packet-switching network, there are additional steps involving routing your call to the online service. Fortunately, the sign-on process can be automated if your software provides autologon files (also known as script files or command files). Programs such as *Crosstalk XVI*, *Crosstalk for Windows*, and *Mirror III* come with template files for various online services. All you have to do is supply your telephone number, user ID, and password.
- Parameter files. Programs that don't have a full scripting language may at least allow you to store telephone numbers and parameters in files that you can load into memory. Such files save you the trouble of entering communications parameters every time you dial a system, although you still have to go through the sign-on process manually.

- Dialing directories. A dialing directory may store telephone numbers and communications parameters, or it may store only telephone numbers. Numbers (and parameters, if included) are usually stored in a directory format, accessible by name. With the proper command, the program can retrieve a specified number from a directory file and direct the modem to dial it.
- Capture buffer. If you're a slow reader, you may spend more time than you wish online, pausing the screens of text. If your software provides a capture buffer, you can hold and temporarily store text. Most communications programs with capture buffers allow you to access the text in the capture buffer and store it in a disk file.
- Backscrolling. Many programs that provide a capture buffer also provide a feature called backscrolling. This feature allows you to view (scroll back over) text in the capture buffer. Backscrolling is handy when you need to review something that has scrolled off your screen.
- Binary-file transfer protocols. A binary-file transfer protocol (also called error-checking protocol) is necessary if you intend to transfer programs or binary data files. This is because some of the characters used in such files appear as end-of-file markers to a receiving system if

they're being transferred as straight ASCII files. Your communications software package should offer at least one binary-file transfer protocol. The most popular protocols are XMODEM, ZMODEM, and Kermit, although several others are in use on various systems, among them YMODEM and Windowed XMODEM.

Straight Versus Front-End

Communications software comes in two broad categories: straight and front-end. A straight program is a general-purpose telecommunications program, while a front-end program is designed to communicate with a specific online service.

Because a front-end program is dedicated to a single service, it's much easier to use it to automate such tasks as E-mail, bulletin board postings, and file transfers. Software packages in this category include *Aladdin* for GENie, *Lotus Express* for MCI Mail, and *CompuServe Information Manager* for CompuServe.

Menu Driven Versus Command Driven

Like most application programs, communications software is either menu driven or command driven. Which way a program operates can be very important in terms of your personal preferences.

A menu-driven program lets you select com-



Crosstalk for Windows 1.2 from DCA

mands from a menu or menus. It may provide one menu containing all the commands, or it may use a main menu from which you can select submenus.

Command-driven software displays no menus; rather, you issue commands on what is called a command or status line, or press a combination of keys (usually including the Ctrl or Alt keys) or special designated keys (such as the function keys).

A number of communications programs are both menu and command driven. This is the most efficient setup if you're new to telecomputing. □

HOW TO CHOOSE AN ONLINE SERVICE

M I C H A E L A. B A N K S

8 Perhaps you're new to online communications. Or maybe you've only used your modem to call your local BBS. Now that you've gotten your feet wet, you're probably wondering what the online services—such as CompuServe, GENie, Prodigy, and America Online—are all about.

An online service provides modem users with a variety of information, entertainment, education, and communication services. In most American cities, you can dial these services directly or through a third-party network (such as Tymnet).

Variety Pack

All these systems offer a mix of E-mail, databases of one type or another, special-interest groups, message bases, and realtime conferences. In addition, most of the consumer services offer some or all of the following:

- News and weather. These services include regional, national, and international news; weather by city, state, or region; and specialized news such as sports and financial news. The news is from the same sources that other media use—newswires and syndicates.
- Financial information and services. Stock and commodity quotes, market reports, and brokerage services are offered online by many of the big-name investment companies. Some systems can automatically update your portfolio.
- Entertainment. Online entertainment is very popular. There are single- and multiplayer games, played realtime or via postings in message bases. Most online games mirror the disk-based computer games, so you'll find a lot of role-playing and adventure games. You'll also find arcade games (most of these require special software or terminal emulation).

- Reference and education. Online encyclopedias head the list here. You can find products such as *Grolier's Academic American Encyclopedia* and *Compton's Encyclopedia* on just about every service. A variety of other references are also available, ranging from *Marquis Who's Who* to the *Magazine Index*. Education services include the *College Board* and *Peterson's College Guide*, as well as online tutoring, study, and degree programs.
- Special-interest groups (SIGs). These are the heart of many online services. Known variously as Forums, RoundTables, and conferences, SIGs host a variety of services, including message bases, databases, upload/download services, and online advertising and sales.
- Travel services. This usually takes the form of travel information that's sponsored by a carrier, destination, or travel agency.
- Shopping and online product support. Online shopping is just now coming into its own. Although specialty retailers and computer and software discount operations have enjoyed some success online over the years, it's taken the presence of major national retailers such as Waldenbooks and Sears to legitimize online shopping. Online product support—almost

exclusively for computers and software—has been fairly well received, although there seems to be competition among online services to be the only host for some companies' online product support.

- Specialized news and database services. As you might expect, there are a number of computer news services and columns online. Some are unofficial products in the form of special-interest newsletters, such as "PC Review Online." These are usually found in the public database areas. Others are official products, such as Charles Bowen's "A Networker's Journal" on CompuServe and GENie, that are presented in their own areas or as menu selections. Specialized newsletters that have nothing to do with computing are also showing up. Among these you'll find newsletters for occupations such as writing, public relations, and advertising.
- Full-text versions of magazines and newsletters. Selected computer magazine articles and program listings have been popping up within SIGs for some time, but it's only since the late 1980s that the complete contents of computer magazines have been online. Online versions of noncomputer magazines, such as *National Geographic*, are much less common. □

ONLINE SERVICE SAMPLER

M I C H A E L A . B A N K S

America Online

Introduced in October 1989, America Online (AOL) uses a graphical user interface based on *GeoWorks Ensemble*, complete with icons and pull-down menus.

America Online features a sophisticated E-mail system that lets you review messages you've already read, copy them to disk, attach files to messages, and check to see whether a message has been read. A systemwide member directory lets you see where a member is from and read the member's profile (if he or she has entered one).

Special-interest groups, called Forums, provide message bases and realtime conference areas. The conference areas are referred to as rooms and auditoriums. AOL's Forums cover specific computing, hardware, and software interests, as well as hobby, lifestyle, and personal interests that range from science fiction to veterans' concerns.

You can download files from the individual Forums or from a central area. AOL uses a proprietary binary file-transfer protocol.

The ability to search for software from within a central area makes it easy to find files. You can specify any combination of categories, range of time, or keywords. The search facilities in the message bases are similarly well designed.

Among AOL's other highlights are national news, weather, and sports; stock quotes; travel services such as Eeasy Sabre; shopping with Comp-U-Store online and other vendors; computing and consumer news features and columns; and access to *Grolier's Academic American Encyclopedia*.

Online gaming is popular on AOL. There are several play-by-mail games and single-player games. Of particular interest is *Rabbit Jack's Casino*, which lets you play blackjack, bingo, and other games in realtime with other players or against the house.

AOL's rates are \$5.00 an hour during nonprime time and \$8.00 an hour during prime time, with a \$5.95 minimum charge each month. (The minimum charge includes one hour of connect time.) You can contact America Online at (800) 227-6364.

BIX

BIX is an acronym for *Byte Information eXchange*. Established in 1985, BIX uses the UNIX-based COSY computer-conferencing system. (That's computer conferencing in the traditional sense of the term—meaning conferencing via message bases, not realtime conferencing.)

BIX has four main services: computer conferencing, electronic mail, realtime conferences, and software/file databases. An area called options lets you set up and change how BIX communicates with you. In addition, you can create an online résumé with information about yourself that other users can access from most prompts by typing *show resume <username>*.

The heart of BIX is its computer-conferencing system. The system is based on a series of message-base subject areas called conferences, each of which is a part of a group of related conferences. BIX currently hosts over 200 conferences. Individual conferences are further organized into topics that are appropriate for the conference subject.

The conference system is fairly sophisticated. In addition to letting you read, scan, post, reply to, and search for messages, BIX allows you to locate and follow message threads, and much more. You can participate in (join) as many or as few BIX

conferences as you like. And you can select specific topics within a conference to participate in. (A few conferences are closed, which means that you must ask or be invited to join them.)

BIX's CBix realtime conferencing system is a fairly easy-to-use multiband, multichannel CB simulator. Features include whispers and handles. The system makes interesting use of specific terminal features. If your software can emulate a VT-100 or any of a dozen or so other terminals, you can take advantage of screen clearing, a chat window, a window for whispers, and other special features.

You can find downloads of all types in special BIX areas called listings. ASCII, Kermit, XMODEM, XMODEM/CRC, YMODEM, and ZMODEM protocols are available for file transfer. (Billing is automatically turned off when you upload a file.)

BIX gives users their choice of per-minute billing or a flat rate. The flat rate is \$39 each quarter for unlimited access to BIX, 24 hours a day. The hourly rate is \$4, 24 hours a day, with an annual subscription fee of \$59. Neither plan includes the costs for access via a packet-switching network, such as Tymnet or BIXnet. You can contact BIX at (800) 227-2983.

CompuServe

CompuServe is one of the world's largest public online services. It was also one of the first commercial online services to cater to computer hobbyists. Established in 1979, CompuServe today has more than 750,000 subscribers.

The TOP menu is like the tip of an iceberg. While it shows in general what's there, there's much more than the TOP menu even implies. Literally hundreds of services exist on CompuServe—among them some extremely useful areas dealing with electronic communications. Beyond this menu lie general and specialized news and information services; special-interest groups (called Forums) for computer users, professionals, hobbyists, and others; online games and other entertainment; sophisticated research services; a free online tutorial; and more.

You'll find the standard newswires, including AP, UPI, and Reuters, as well as more exotic services, such as TASS. There's also a clipping service that delivers news stories to your E-mail box, based on the keywords that you specify.

CompuServe is particularly strong in online research facilities, among them *Grolier's Academic American Encyclopedia* and gateways to Dow Jones News/Retrieval Service and several special-

ized services—including IQuest, a collection of more than 700 specialized research databases.

The Forums feature sophisticated message bases, a reasonable database system, and realtime conferencing that's separate from the system's CB Simulator.

Also of interest are CompuServe Mail's two-way gateways to MCI Mail and Internet. CompuServe Mail can handle outgoing fax and telex messages, as well as paper mail. You can also use CompuServe Mail to transfer files to other CompuServe users.

File-transfer options in Forum databases, E-mail, and certain product areas include ASCII, XMODEM, XMODEM/CRC, CompuServe's own B and B+ protocols, and others.

CompuServe's basic rates are \$5.00 an hour at 300 bps and \$12.80 an hour at 1200 or 2400 bps, through CompuServe's own network, 24 hours a day. There are additional charges for higher speeds and for access through other networks. Various optional service plans are available, and gateways and certain other services have surcharges.

As of this writing, CompuServe is testing a plan whereby a specific group of monthly services is made available for \$7.95 a month. You can contact CompuServe at (800) 848-8199.

DELPHI

Established in 1982 as an online encyclopedia (the first of its kind), DELPHI has evolved into a full-service network, providing products and services of all types. It's an especially friendly system with a real sense of community and a good place to meet others who share your interests.

Like CompuServe's TOP menu, DELPHI's Main Menu is just the tip of the iceberg. DELPHI offers a variety of news and information services, online entertainment, special-interest groups, two online encyclopedias (*Grolier's* and the original *Kusmaul Encyclopedia*), a unique gateway to the DIALOG information service, and more.

DELPHI's special-interest groups are noteworthy for the BBS-style communication facilities they provide and for the software and information that are available to download. The SIG message bases are extremely sophisticated, letting you find messages based on almost any criteria imaginable, including content. The SIG database structure is equally sophisticated and lets you use multiple keywords to narrow or widen your searches.

Also of note on DELPHI are the weekly online realtime poker and trivia tournaments, a scrambled word game, and games that take advantage of VT-100 terminal emulation.

You get a personal online storage area, called Workspace, which you can use to store your files or to transfer your documents for E-mailing. File-transfer options in Workspace, SIG databases, and certain other areas include ASCII, Kermit, XMODEM, XMODEM/CRC, YMODEM, YMODEM/Batch, and ZMODEM.

Of all the E-mail systems offered by consumer online services, DELPHI's is the most powerful yet easiest to use (once you learn it). Not only can DELPHI members send fax and telex messages, but they can also receive incoming telex messages free of charge beyond normal connect-time charges.

The basic plan costs \$6.00 an hour during nonprime time, with a \$5.95 a month minimum (this covers your first hour online). DELPHI's 20/20 plan costs \$20.00 a month, for 20 hours of nonprime-time access. Under this plan, additional time costs only \$1.20 an hour. The 20/20 plan is available only for those who access DELPHI through Tymnet and includes the Tymnet charges. Unlike the flat-rate or alternative plans offered by some services, the 20/20 plan covers the entire service. A few areas, such as DELPHI's link to DIALOG, require a surcharge no matter which plan you use. There's also a \$39.00 sign-up charge. You can contact DELPHI at (800) 544-4005.

GENie

Established in 1985, GENie is the fastest-growing service of its kind. It enjoys a tremendous growth rate, thanks to its variety of services, aggressive advertising, and friendly price structure.

GENie offers the same categories of services as CompuServe and DELPHI. News, weather, sports, and travel information are particularly strong areas for GENie, as are its versions of special-interest groups, called RoundTables.

The RoundTables are fairly easy to use, even though the message bases aren't very sophisticated and you can't specify more than one keyword when you search a RoundTable's software library.

Online research facilities include *Grolier's Academic American Encyclopedia* and a gateway to Dow Jones News/Retrieval Service. GENie's news offerings include searchable headline news and columns by a number of well-known writers in the computer field. There's also a clipping service that delivers news stories of interest to your E-mail box, based on the keywords you specify.

With GE Mail—GENie's E-mail service—you can send letters to and receive them from other GENie users, and send paper mail and fax messages. GENie offers a unique option by which a GENie user can have his or her own telex number

for an extra fee. While GENie has no personal file system as such, you can upload messages to send to other GENie users via a special utility. GENie's mail address file features a flexible search system that you can use to find both GE Mail addresses and the names of people online.

In addition to trivia, parlor, sports, role-playing, and single-player adventure games, GENie has some very attractive realtime multiplayer action games. In particular, *Air Warrior* has attracted a large and extremely devoted following.

GENie offers 300/1200/2400 baud access through its own national network of direct-dial local numbers in several hundred U.S. cities. It also has an increasing number of 9600-bps and V.32 nodes, and even some V.42 nodes.

For just \$4.95 a month, you can have unlimited nonprime-time use of E-mail, news, and other selected services. GENie charges \$0.10 a minute during nonprime time for services that aren't included in the flat-rate plan (including the RoundTable software libraries and realtime conferencing). The prime-time rate is \$18.00 per hour with a surcharge for 9600-bps access.

Certain products, such as GENie's gateway to Dow Jones News/Retrieval Service, cost extra. You can contact GENie at (800) 638-9636.

Prodigy

This high-resolution graphics-based service is very different from the other consumer services in both how it's set up and what it offers. If you're a software junkie looking for downloads or you're a realtime conference maven, you won't find those things here. But Prodigy has virtually all the other trappings of a full-service consumer service. And you'll find some unique offerings among its more than 750 products and services.

Prodigy is a partnership of IBM and Sears that's intended to be a simple yet powerful online service for the general consumer market. Given its goals, Prodigy has done a good job in reaching its intended audience—those with computers who aren't technically oriented.

E-mail, news, weather, and travel information head the list of Prodigy offerings. Reading news on Prodigy is a lot like reading a newspaper; you can select news to read by headlines and jump to other articles whenever you wish. Like a newspaper, Prodigy offers pictures and charts—in the form of color graphics—along with the news.

Several nationally known magazines are Prodigy service providers. Among them is *National Geographic*, which provides an especially attractive and enlightening excerpt each month. You'll

also find *Billboard* music charts, *Changing Times* magazine, and magazines for young adults and children (including *Weekly Reader*).

Online gaming is also graphics intensive. Graphics-based games include *Police Artist* (a game that challenges children to combine different elements of faces to match a suspect's picture) and *MadMaze* (a role-playing/adventure game). There's even an online *Where in the World Is Carmen Sandiego?* with a new adventure each week.

Grolier's Academic American Encyclopedia heads the list of reference resources on Prodigy, which also includes columns and clubs on a variety of home, special-interest, and business topics, as well as information from computing and general-interest magazines.

Prodigy costs \$12.95 a month for unlimited access, day or night. You can have as many as six IDs per household—so you are, in effect, getting six accounts for the price of one. Prodigy's 6-, 12-, and 24-month memberships are available for \$65.70, \$119.40, and \$199.95, respectively.

Startup kits are sold for \$39.95 at Sears and computer stores nationwide. However, Prodigy runs constant promotions in which the software is given away, along with a month's free trial. You can contact Prodigy at (800) 822-6922. □

ONLINE COMMUNICATIONS GLOSSARY

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baud rate A measure of the speed that a modem can send and receive data—specifically, the number of events, or signal changes, that can occur each second. Because an event can contain more than one bit, a modem's baud rate and bps are not always the same. See also **bps**.

bps (bits per second) A measure of the speed that a modem can send and receive data—specifically, the number of bits that can be transferred each second. Often confused with baud rate. See also **baud rate**.

download The process of receiving a file by modem. See also **upload**.

duplex Communication that occurs in both directions at the same time between two computers. One-way communication is called simplex, and two-way communication taking place in only one direction at a time is called half-duplex.

E-mail (electronic mail) The transmission of messages from one computer to another by way of an electronic network. This network can be either a local area network (LAN) or a larger communications network, such as CompuServe or GENie.

MNP (Micom Network Protocol) A set of error-correction and data-compression standards that was developed by Micom and made available to other

modem manufacturers.

modem (modulator/demodulator) A device that allows a computer to send information over a standard telephone line.

parity An extra bit that a modem sends with each character to check the accuracy of that character. Common types of parity are even parity, odd parity, no parity, space parity, and mark parity.

stop bit The bit that signals the end of a character during an online transmission. The data bits that make up a character are usually followed by 1, 1.5, or 2 stop bits.

upload The process of sending a file by modem. See also **download**.

OUR NEXT ISSUE:

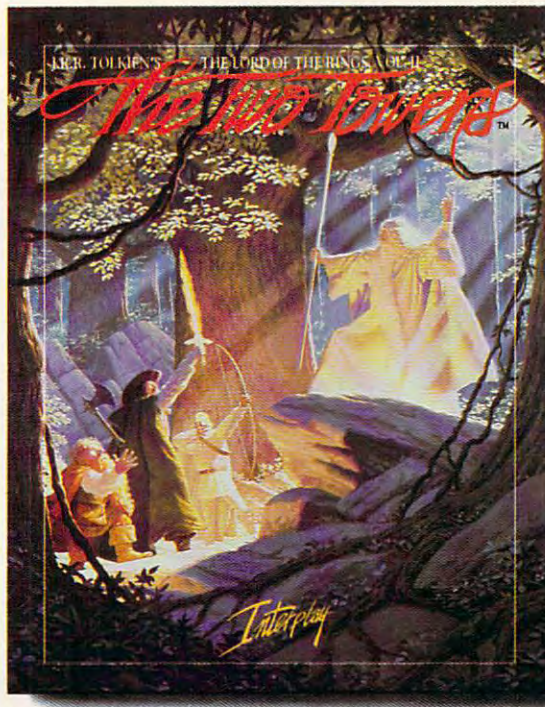
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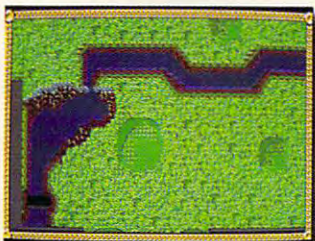
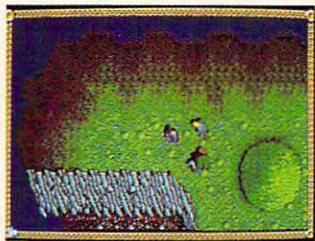
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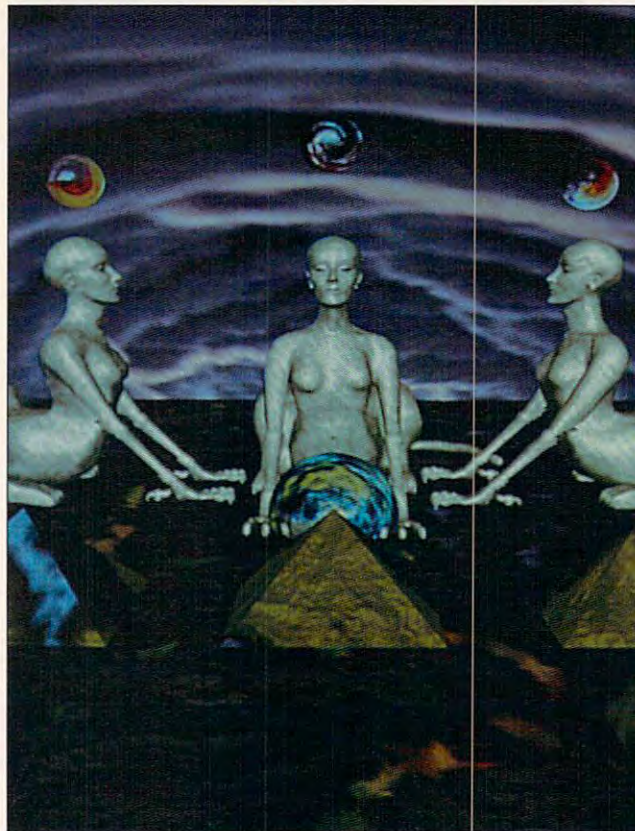
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The artwork on our October cover, *An Egyptian Dream*, was created by Marcel Achard at *STUDIOS TAARNA*. A computer artist since 1985, Achard used a software package called *Taarna*. The result provokes images of modern mystery and ancient history against a dark desert landscape.

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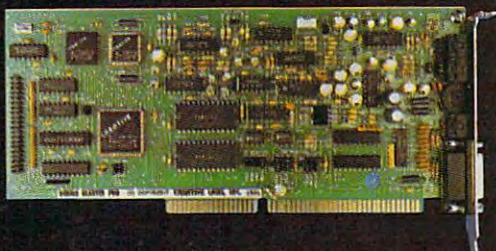
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August 1991



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"...Creative Labs is now turning up the volume with the Sound Blaster Pro. It's basically two Sound Blasters on a single card with additional multimedia features thrown in. It has twin FM chips capable of creating 22 individual voices, two DACs for stereo voice and sound-effects playback, a stereo microphone jack, and a built-in stereo mixer that can adjust the volume of all your Sound Blaster audio sources (stereo DAC, stereo FM, microphone, stereo line-in, CD-Audio and PC internal speaker).

The built-in mixer makes the Sound Blaster Pro fully compliant with Microsoft's Multimedia Level 1 Extensions to Windows. Multimedia software will be able to fade-in, fade-out and pan the various audio sources to create elaborate sound montages.

The Sound Blaster Pro includes a CD-ROM interface for either an internal or external CD-ROM player. There's also an internal connector for CD-Audio. The MIDI interface is compatible with the original Sound Blaster's MIDI interface but adds the MIDI time-stamp that's part of Microsoft's new multimedia standard.

All in all, the Sound Blaster Pro is chock-full of new features, yet it's fully compatible with its younger brother."

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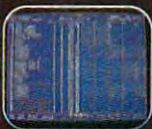
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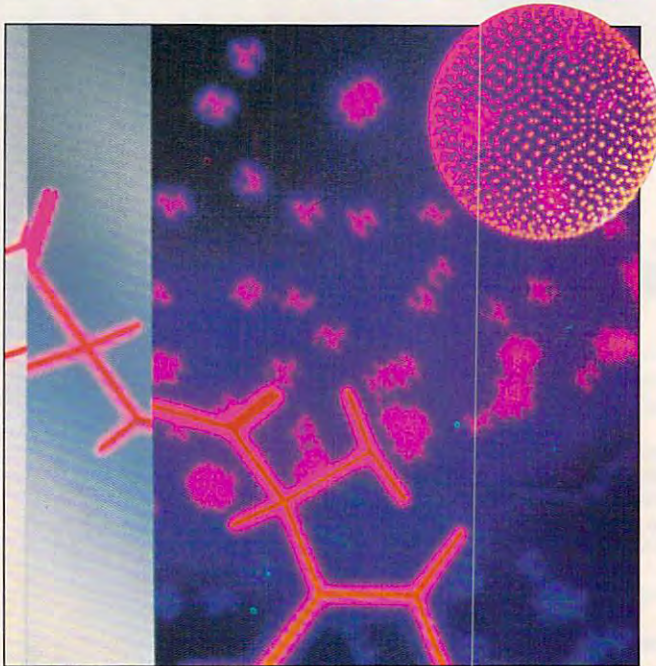
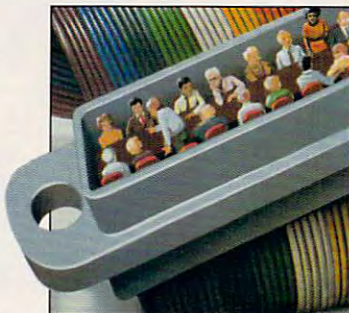
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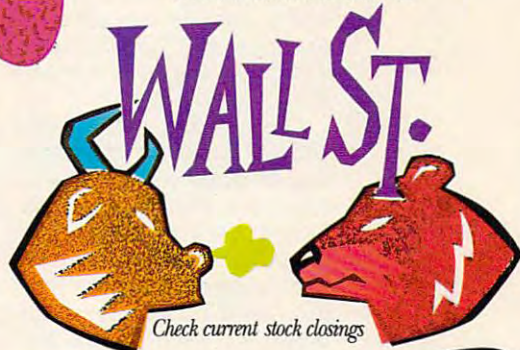
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EDITORIAL LICENSE

Peter Scisco

You've got a high-maintenance, high-tech rep that precedes you to every neighborhood cocktail party and backyard cookout. Hardly a night passes without your getting a call from a friend of a friend seeking advice about hardware or asking recommendations about good software for kids. You're known around the office as the resident PC troubleshooter, though the title never appears in your job description.

On the day you bought your PC and brought it home, you strapped yourself to a superoctane booster on a high-tech shuttle into the nether regions of information overload. The rarefied atmospherics of this newfound land have propelled you into frenzied, late-night flights across a galaxy of 0s and 1s.

On each successive voyage you get closer to the rim. Each trip into the digital night finds you flirting with full-throttle burnout that threatens to fling brain waves and electrons willy-nilly across the entire technospectrum.

You remember what it was like at first. After a few weeks, you had learned a little about batch files. You started writ-

ing a few of your own. You rewrote AUTOEXEC.BAT, and then you swung your sights onto CONFIG.SYS.

A couple of months later, that wasn't enough. You started to read all you could about PCs. You bought some software to optimize your hard disk. You bought a new word processor. You talked your boss into buying a copy of the spreadsheet program you use in the office so you could work at home.

A couple of months have passed. You've become an expert at using every XCOPY switch. But you're getting tired of lugging those floppies back and forth to work. You suspect that any day your data will self-destruct—the latest versions of the company budget will evaporate into a cloud of dissipated electrons. Anxiety begins to dull your technological edge. You start looking around for answers.

What you see are more computers. Your world is built of systems. Chips control your car's engine and your microwave oven. Your inexpensive pocket data card operates within a frame of silicon. Words like *bandwidth*, *crash*, *virus*, and *interface* creep into your speech. At home, your kids are running up tremendous bills on a cordless phone. Back in the city, lunch is served while conversations are channeled, corpuscular infobits navigating the net like synapses fired into the cerebral cortex.

Welcome to America. Technology is much more than a thread in the fabric of our late-twentieth-century society. It's irrevocably bound up with the way we see ourselves and our place in the world. Our history is a story of progress and setbacks underscored by a practically unwavering belief in the machines we have created. From the cotton gin to

the computer, Americans have embraced technology's benefits even as they have debated its effects.

The advent of the personal computer has furthered this uneasy alliance by placing powerful technological tools in the hands of individual citizens. The air fairly teems with ideas for new computing devices of every imaginable purpose.

This month, we examine some of those advances and the implications of the new technology in "The State of Computing: U.S.A." Writer Gregg Keizer looks at the rise of invisible machines, the advent of pen-based computing, and the roles computers play at work, at school, and in play. He explores the trend toward more powerful, less expensive computer systems that are beginning to fill American households. And he takes a hard look at why so many Americans have yet to open their homes to the personal computer.

For those of us who have adopted the newest in technology, it's sometimes amazing that more of our neighbors go without. Sometimes it's a matter of economics. Sometimes it's a matter of computerphobia. Sometimes it's a simple matter of priorities—why spend \$1,500 on a computer to balance a checkbook?

PCs are still underused, relegated to the role of fancy calculators and muscle-bound typewriters.

While it's not up to consumers to define what's needed, technologically, to enhance the quality of our lives, we can help by spreading the power of computing to our friends, relatives, and neighbors.

What can you do to further the cause of computing in America? Invite some folks over to see what the fuss is all about. After all, your reputation is at stake. □

From the cotton gin to the computer, Americans have embraced technology's benefits even as they have debated its effects.



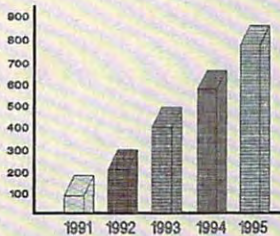
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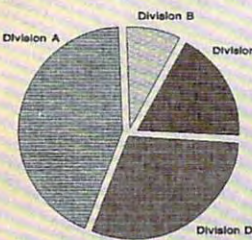
Why the sudden turn-around, you ask? It's simple. Ever since we switched to Citizen color printers, life has been rosy. (That was a pun.) Seriously, on every floor, down every hallway, it seems our staff has renewed energy and gusto.

Partly, it's due to how darned simple it is to use Citizen printers. With the touch of a button or the flip of a switch, you're in total control of countless impressive functions. That's pretty important to staffers who used to struggle with the endless maze of cryptic codes the other printer put us through. But here's the piece de resistance - color.

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Keep up the good work.

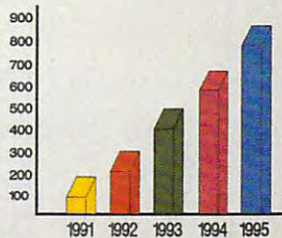
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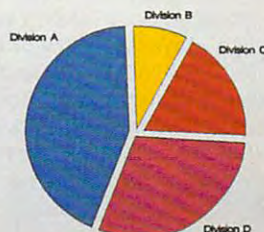
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NEWS & NOTES

Alan R. Bechtold

Proto Holo Deck

Claiming to have the "world's first three-dimensional holographic videogame," Sega of America started shipping *Time Traveler* to arcade halls across the country in July. While most PC game players might not take note of the local mall arcade hall, this game merits attention. With a self-contained Sony 12-inch laser disc player and 20-inch Trinitron monitor, and boasting digital stereo sound and full digital graphics, *Time Traveler* may be as close as we'll

Save the holographic universe in Sega's *Time Traveler* arcade game.



ever get to an interactive 3-D entertainment environment in this decade (unless virtual reality really takes off).

The game itself is straight game hall action—a rowdy shoot-'em-up that requires you to traverse time and battle renegade scientists, ninja warriors, streetwise punks, cowboys, cave dwellers, and every other brand of adversary imaginable to modern arcade game wizards in an attempt to (what else?) save the universe.

Time Traveler should be in your local arcade hall by now, if you're curious. It costs 75 cents a pop, and you can buy more time cubes to keep you alive and kicking—sort of an interactive wallet. A roll of quarters and a willing suspension of disbelief should buy you a couple centuries of fun.

Computing sans Keyboard

A new personal computer accessory can literally bring the world to those who are physically unable to operate a keyboard. IBM's VoiceType is a new multimedia speech recognition product that allows a person to use DOS along with familiar word processing, database, and spreadsheet applications simply by speaking a word or command into the device instead of typing it.

Developed jointly by the IBM Special Needs Systems group and Dragon Systems, VoiceType adjusts to each user's individual speech patterns and language usage and, once it recognizes a user's unique pronunciations, stores them for future speech recognition. The product is intended primarily for those who are unable to use a

keyboard, but anyone can use it as a keyboard alternative—especially if price isn't an issue with the user.

VoiceType uses IBM's M-Audio Capture and Playback Adapter and is supported on IBM PS/2 386 and 486 systems that run 16 MHz or faster. It comes with a user's guide, training videotape, online reference guide, programs on 3½-inch disks, and a headset microphone. The product is available through Dragon Systems for \$3,185.

For more information on VoiceType, contact Dragon Systems at 320 Nevada Street, Newton, Massachusetts 02160; (800) 825-5897.

Power Editing

You've heard of power lunches, power brokers, and power deals. Now there's power editing. Good writers know their best work requires a second pair of eyes to double-check—at the very least—for grammar, spelling, and those inevitable typing errors.

Artificial Linguistics says its new program, *PowerEdit*, is the first software product to intelligently read, manage, and manipulate text. To perform the functions of a human editor and proofreader, *PowerEdit* employs proprietary artificial-intelligence technology—a text engine—that produces a quantifiable database it uses to intelligently manipulate text. It finds and corrects problems associated with business writing—lack of clarity, wordiness, ambiguity, and incorrect grammar.

PowerEdit's text engine recognizes more than 1 million words and their usages and applies 200,000 rules of good writing to your writing. It works directly with word processing software, recommending changes to make writing powerful, clear, precise, and correct. Artificial Linguistics president Doug Kramp says the company plans to eventually license the text engine to software publishers for other applications needing intelligent text manipulation, making it a type of operating system or environment in which word processors and other software programs can run. The program sells for \$295.

For more information about *PowerEdit*, contact Artificial Linguistics, 2301 North Akard, Suite 200, Dallas, Texas 75201; (800) 800-4254.

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Touch Axxess

New from Oregon Scientific is Axxess, a small, lightweight LCD touchscreen that allows you to quickly and easily store and retrieve information. The large-character, easy-to-read screen features numerous layouts for entering data, including convenient QWERTY and alpha keyboards.

With the mere touch of a finger, you can store and retrieve more than 1000 "busi-

Touch the Axxess screen to speed-dial a phone number.



ness cards" of information, speed-dial any phone number stored, set an audible alarm that displays a two-line reminder message, print reports directly from Axxess when connected to a PC printer, transfer data to and from a PC or from another Axxess unit for memory backup, and perform numerous other handy functions. You can also enter a personal security code to prevent others from accessing your machine.

Axxess can speed-dial from most phone systems and print from most printers, so with the 3½-hour battery supply included, it's especially useful for business travelers. Axxess is priced at \$599.

For more information about Axxess, contact Oregon Scientific, 10950 SW 5th Street, Suite 275, Beaverton, Oregon 97005; (503) 646-9806.

Single Does It

Upgrading a personal computer by simply plugging in a single chip would certainly

make life easier for some of us, considering how fast computer technology changes. Thanks to Acer America's new ChipUp Technology, single-chip upgrades are now more than wishful thinking.

Acer's new system is actually an Intel 486SX-based CPU that allows you to upgrade your system's speed from 20 MHz to 25 or 33 MHz by simply adding a single chip. The ChipUp CPU will accept a 25- or 33-MHz Intel 486DX microprocessor in a low-insertion-force socket that also accepts the Intel 487SX 20-MHz math coprocessor.

Acer's first challenge in creating the ChipUp was how to effectively combine the design of three system boards into a single motherboard—a necessity for accommodating CPUs running at 20, 25, and 33 MHz. Since every CPU type has a different pin assignment and internal architecture, autoswitching and detecting CPU frequency were the biggest design hurdles.

Acer ended up designing a dynamic architecture with a built-in autodetection feature that senses the type of CPU in use and then automatically switches to the proper system speed to match it. The Acer design team then made the upgrade easy enough for users to implement themselves.

Because Intel's chips are readily available off the shelf from component dealers worldwide, Acer's new system gives those wanting to upgrade the opportunity to shop around for the best-priced chips available. Since the specially designed sockets allow users to easily insert the Intel chip of their choice, both users and dealers have an easy way to upgrade systems on their own without technical help. Suggested retail price for the ChipUp is \$2,745.

For more information, contact Acer America, 401 Charcot Avenue, San Jose, California 95131; (408) 922-0333.

Is OS/2 Losing?

The race between OS/2 and *Microsoft Windows* has been running for a long time, but the finish line may now be in sight. Gartner Group, a leading research firm that analyzes trends in the information technology industry, predicts IBM won't succeed in its efforts to encourage a majority of users to migrate to OS/2. According to Gartner, OS/2's market share will be only half that of *Windows* by 1995. *Windows* currently holds 12 percent of the market, which Gartner predicts will grow to 41 percent by that time.

The fate of OS/2's *Presentation Manager* is hotly debated. Gartner believes the operating environment has been dealt a severe, if not fatal, blow by *Windows*.

Although OS/2 is considered technically superior to *Windows*, it lacks third-party appeal, according to Jonathan Yarmis, vice president of personal computing at Gartner. "Without that appeal, it doesn't matter how well OS/2 performs. Users buy applications, not operating systems," Yarmis said.

200 Million Miles per Hour

It's hard to imagine, but IBM's newest multichip package is actually capable of speeding electric impulses between computer chips at the rate of 280 million miles per hour. The record-breaking package, which holds 121 silicon chips inside a densely packed ceramic module, is currently in production as part of IBM's new System/390 series of large computers.

To take advantage of the increasing speed of computer chips, computer architects

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must design equally speedy connections between chips. In IBM's new package, 121 chips are tightly packaged just three-eighths of an inch from each other, which is an industry record.

The chips are mounted directly on a new IBM material called glass ceramic, which effectively transmits signals from one chip to another. They're connected by tiny wires made of copper, an excellent conductor of electricity. The package resembles a multilayered sandwich.

Although the new IBM chip package isn't intended for use in microcomputers, once the technology is tried and true, it could eventually trickle down to the PC platform.

Still Alive and Kicking

The advent of *Microsoft Windows* actually breathed new life into BASIC. Visual Basic for *Windows* 3.0 is the latest version of the long-lived, popular programming language. It's a graphical application development system for *Microsoft Windows* 3.0 that combines visual-design tools with a powerful general-purpose programming language and *Windows*' EXE compiler.

Bill Gates, Microsoft founder and chief executive officer, forecasts that many thousands of *Windows* applications will be written in Visual Basic. Forty-five independent software developers have already announced and demonstrated more than 60 such products, ranging from custom controls to add-on DLLs for data access and multimedia applications.

Visual Basic for *Windows* is now available in the U.S. for \$199. Microsoft already started shipment of German and French versions and has also scheduled other language versions to follow.

For more information, con-

tact Microsoft, One Microsoft Way, Redmond, Washington 98052-6399; (800) 426-9400.

Shooting for a Longer Run

Running out of battery power in the middle of a laptop computing session can be frustrating. It can even wipe out the bountiful benefits of using a portable computer in the first place, which is why so many companies are diligently trying to come up with anything that will extend battery life for portable, laptop, and notebook PCs.

Appian Technology's PowerMizer is a new Power Manager Controller chip for laptop and notebook PCs that goes a long way toward achieving the long-life goal. The new chip controls circuits and peripherals during system operation, working in conjunction with Appian's System 90/SX local-bus-based 386SX chip set. Already available to manufacturers, the new chip should start showing up in laptop and notebook PCs soon.

For more information about the PowerMizer, contact Appian Technology, 477 Mathilda Avenue, Sunnyvale, California 94086; (408) 730-8800.

Not Just Nintendo

Super Mario, Princess Zelda, Link, and Donkey Kong. For the first time, these popular Nintendo characters will be hitting home television screens on a video system other than Nintendo. They'll be seen on Compact Disc Interactive (CD-I), a new multimedia technology Magnavox has planned for release this year. Nintendo of America and American Interactive Media (AIM) reached an agreement that will permit AIM to develop and market CD-I titles featuring the popular Nintendo characters.

AIM is the principal developer of software programs for CD-I systems planned for

sale through consumer electronics stores this fall. The Nintendo characters will join such familiar names as Time-Life, Rand McNally, the Smithsonian Institute, ABC Sports, Richard Scarry (of children's book fame), and others who have copublished software through AIM for use on CD-I systems. Other popular children's characters to be available on CD-I software are Big Bird, Elmo, Bert, and Ernie from "Sesame Street," who appear in Children's Television Workshop programs developed for the new system.

For more information on this software, contact American Interactive Media, 11111 Santa Monica Boulevard, Suite 700, Los Angeles, California 90025; (213) 473-4136.

FAX on the Go

Those eleventh-hour rushes to the fax machine only to wait in line for a leisurely transmission may soon become office history now that Ibis has developed a new software program which lets you send faxes with a modem.

On the GoFAX can transmit a one-page document in 20 to 30 seconds—from your computer. If the number you're calling is busy, AT&T's Service Bureau will redial it up to four times during the first half hour, leaving your computer free for you to work on something else. Transmission for the first page is \$3.00, and each additional page costs \$2.00. The product retails for \$69.95.

For more about *On the GoFAX*, contact Ibis Software, 625 Second Street, Suite 308, San Francisco, California 94107; (415) 546-1917.

Alan R. Bechtold is editor of *Info-Mat Magazine*, an electronic news weekly published by BBS Press Service. □

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Copywrong?

Regarding your answer in the June "Feedback," under federal copyright laws everyone who buys a piece of software has the right to make a backup copy for archival purposes. That's why programs like *Copy II PC* and *Twin Copy* are legal to use. You owe it to your readers to check your facts thoroughly before firing off a reply.

DAVID VIERTTEL
AUSTIN, TX

In your June issue, you told Travis May that even a non-working backup copy of commercial software was illegal. I, and the folks in the Computer Science Department of Southern Arkansas University, where I work, have been under the impression that the new copyright law says that it's legal to make a backup copy. As a matter of fact, everyone that I've talked to suffers from this same delusion. How about a clarification of the current copyright/backup situation?

JACK RYAN
EL DORADO, AR

Your point is well taken. Making personal backups of software constitutes "fair use," a loophole in the copyright law that allows a teacher to copy a page out of a magazine for a class, a reviewer to lift quotations from a novel, or (usually) a computer user to copy software for archival purposes. Although that right is extended by the law, you can at any time give up your rights voluntarily by consenting to a license agreement that prohibits making archival copies. The best way to discover whether it's legal to copy is to check your license agreement.

Our understanding of May's letter (only a small part of which was published) was that he had tried making back-

ups with the standard DOS commands and had not been successful, which indicates that he was trying to back up locked software. License agreements on locked software usually specify that no copies can be made. Use of the software constitutes acceptance of the terms of the license. For this reason, copies created by DOS or other means would be in violation of the license agreement—and therefore illegal—whether they worked or not. Thanks for the opportunity to expand and clarify our response to this question.

Hard Disks, Easy Decisions

"How to Choose a Hard Disk" in the May issue was great—clean, informative, and specific. I especially appreciated the warnings about IDE drives.

ARTHUR J. SOINSKI
SACRAMENTO, CA

Headstop

I use a Vendex Headstart III with a hard disk. I've heard a lot about a head-parking command that should be used whenever a computer is moved. What's the command, and when should I use it? Also, can I have two or more hard drives in the same machine?

WILLIAM D. WAGNER
APO NEW YORK, NY

Usually the command to park the heads of a hard disk is PARK. This command automatically moves the heads to a position where they won't do damage to the disk if a shock or sudden movement causes the heads to come into contact with the disk. Some people advise that if your hard disk requires parking, you should park it every time you turn off the machine. Others feel that you should only park your heads if you're transport-

ing your computer by car or freight. Some hard disks are self-parking, and so using the PARK command is unnecessary. On the other hand, if you're not sure whether your hard disk is self-parking or not, prudence would dictate that you should use the PARK command, if you have it. If you don't have it and you're determined to park your drive, SpinRite II includes a PARK command. It's sold by Gibson Research, 22991 La Cadena, Laguna Hills, California 92653.

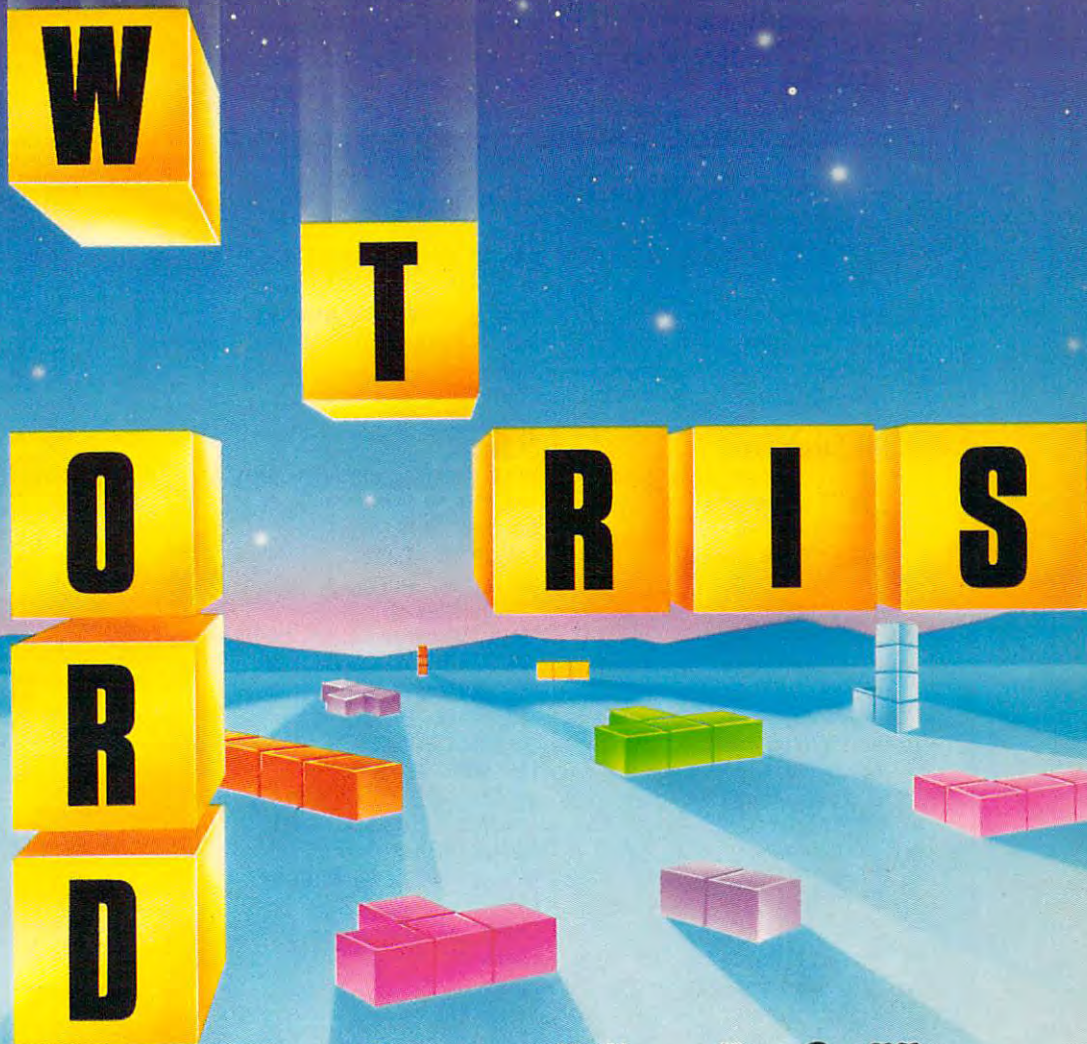
As for adding one or more hard disks, the primary problem with this is the extremely small size of your computer case. The half-height 5¼-inch hard disk you have takes up all the space available.

If you have some free slots, you could add a hard card—a hard disk mounted on a card designed to be installed in the expansion bus. Although the card itself only takes up one slot, most drives stick so far out from the card that the neighboring slot will be inaccessible. An external drive might be a solution.

Not the Same Old Same Old

The magazine that I've been getting for the last year isn't the magazine I started reading back in the early eighties. The last issue of my subscription was no different from at least half a dozen computer magazines on the market. There's very little in your magazine that's of interest to me anymore. I don't care what John Dvorak, Jim Seymour, or Clifton Karnes has to say about networks, laptops, or laser printers because I probably won't ever have one. Your magazine isn't a home computer user's magazine anymore.

EDWARD R. SALYER
DES MOINES, IA



Another Eastern block falls.

There's a new 'TRIS on the block. Its name is WORDTRIS. And if you love TETRIS, this latest fast-action, falling block, Soviet game will boggle your mind.

This time the falling pieces are letter blocks. Form them into words and score points. As each block falls, it pushes down the blocks below, producing an ever-changing kaleidoscope of letters where scoring opportunities appear - and vanish - at the blink of an eye.



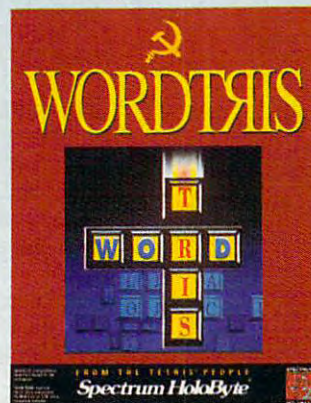
Go for XYLOPHONE if you dare.

Create words horizontally or vertically, but don't put all your E's in one BASKET. Because every time a word lines up, *poof!* those letters disappear, and the blocks below pop up to fill the spaces. So whenever you earn points you stir up the alphabet soup. And suddenly that falling M has no HOME to go to.

WORDTRIS keeps raining vowels and consonants until you've collected enough words to move to the next level, or the well fills up. Of course, each successive round ups the ante as the blocks fall ever faster. But you can choose your difficulty level to match your skills, and select from single player, cooperative, competitive, head-to-head or tournament modes. The built-in 30,000 word dictionary verifies even the most obscure word.

Set the difficulty level at 10 and you'll find WORDTRIS harder to keep up with than the changes in Eastern Europe.

WORDTRIS. Another great game from the TETRIS people.



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FEEDBACK

Thanks to all who write. We read all your letters and try to be responsive to our readers' interests and concerns.

Dir Straights

After I use the following QuickBASIC statement

```
SHELL "DIR > DIR.DAT"
```

I would like to be able to examine the entries in DIR.DAT for the subdirectory names and then change to those subdirectories in order to examine the files in each subdirectory. How can I use the various subdirectory names with a CD command within the BASIC program?

RICHARD KIRCHMEYER
UTICA, NY

The following set of QuickBASIC commands places the directory listing in a file and then reads the file, creating a second file containing only the names of the subdirectories. It then goes on to create a file called FILES in a subdirectory called TEMP that contains all the filenames in the current directory and all its subdirectories. You could use some recursive variation on this program to look farther down the tree.

```
dir1$=COMMAND$
IF dir1$="" THEN dir1$="*. *"
SHELL "md \temp"
SHELL "dir "+dir1$+"
">\temp\temp1"
OPEN "\temp\temp1" FOR INPUT
AS #1
OPEN "\temp\temp2" FOR OUTPUT
AS #2
OPEN "\temp\files" FOR OUTPUT
AS #3
DO WHILE NOT EOF(1)
LINE INPUT #1, a$
IF LEFT$(a$,1) << "." THEN
IF MID$(a$,14,1) = "<" THEN
GOSUB cleanup
IF a$ << "." THEN PRINT #2, a$
ELSEIF LEFT$(a$,1) << "." THEN
GOSUB cleanup
```

```
IF a$ << "." THEN PRINT #3, a$
END IF
END IF
LOOP
CLOSE #1
CLOSE #2
OPEN "\temp\temp2" FOR INPUT
AS #1
DO WHILE NOT EOF(1)
LINE INPUT #1, a$
SHELL "dir "+dir1$+"&"+a$+"
">\temp\temp4"
OPEN "\temp\temp4" FOR INPUT
AS #2
GOSUB cleanup:PRINT #3,:PRINT
#3,"&"+a$
DO WHILE NOT EOF(2)
LINE INPUT #2, a$
IF LEFT$(a$,1) << "." AND
MID$(a$,14,1) << "<" THEN
GOSUB cleanup
IF a$ << "." THEN PRINT #3, a$
END IF
LOOP
CLOSE #2
LOOP
CLOSE #1
CLOSE #3
SHELL "del \temp\temp*. *"
END
cleanup:
a2$=MID$(a$,10,3)
FOR i=1 TO 8
IF MID$(a$,i,1) = "." THEN EXIT
FOR
NEXT
a3$=LEFT$(a$,i-1)
IF a2$=CHR$(32)+CHR$(32)
+CHR$(32)
OR a2$="" THEN
a$=a3$:RETURN
a$=a3$+"."+a2$:RETURN
```

Readers whose letters appear in "Feedback" will receive a free COMPUTE's PC clock radio while supplies last. Do you have a question about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Write to COMPUTE's Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions. □

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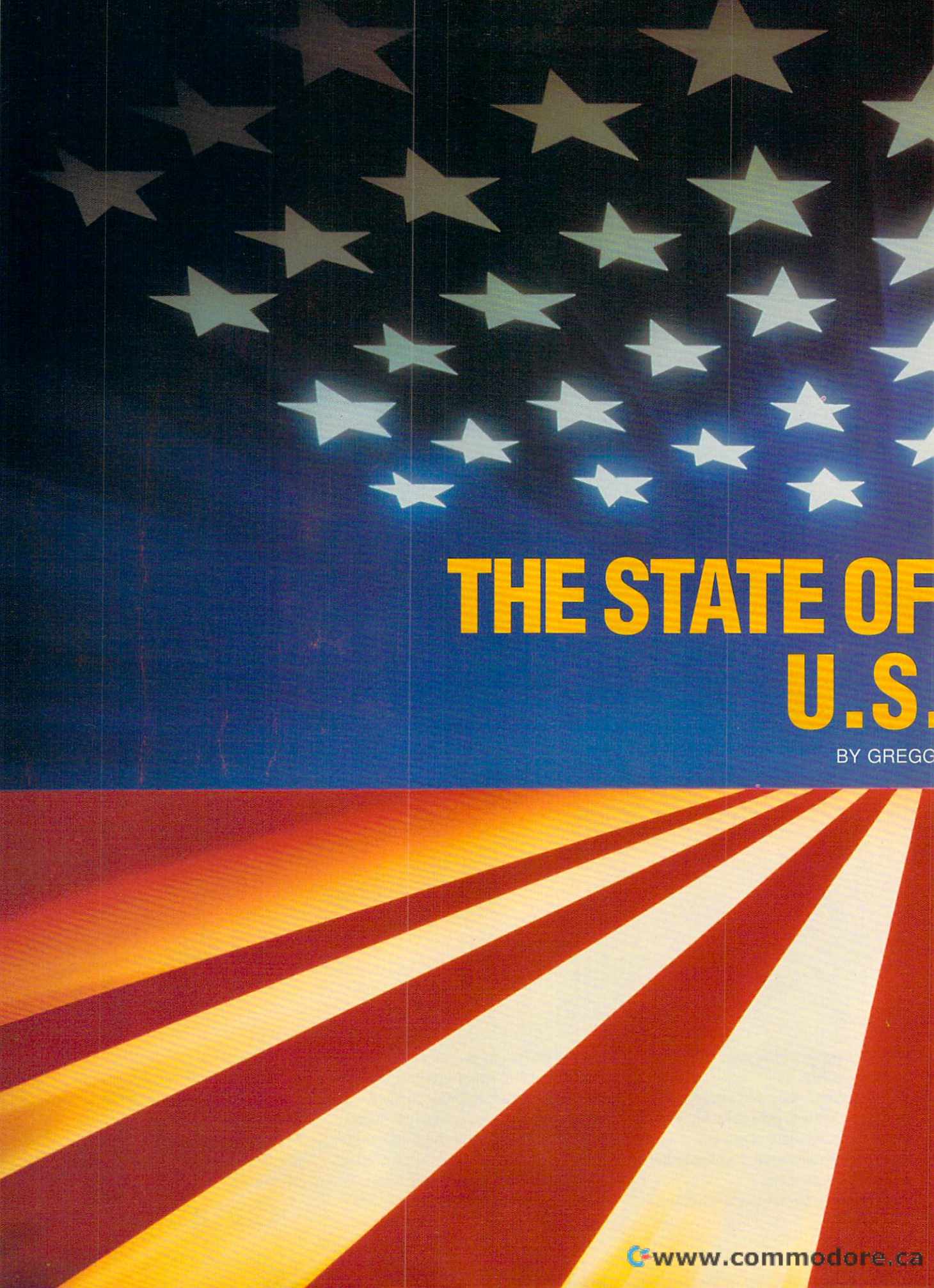
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Walk through the door and shout, "I'm home!" and you may get an answer from the kids, a spouse, and half a dozen computers. Computers hide all around your house. Touch the membrane panel of your microwave, and you call on a microchip-based controller. Your telephone-answering machine may record calls not on tape, but in silicon memory. That late-model car out in the garage is smarter than some of the kids you went to school with. And your videogame machine does graphics better than most business computers.

Even if you didn't have a personal computer in your home, you'd still live in a technologically advanced household. But because you do include a computer in your home's inventory, you're part of an important American minority that collectively owns more computing power than such global powers as the Soviet Union, China, and India.

Home computing, once the exclusive province of electronics hobbyists, is now being taken over by millions who might never have touched a soldering iron. As one of those millions, you've got a jump on most Americans. You know how important a PC is for working at home, for accessing immense amounts of information almost instantly, for learning and playing with—a tool and a toy that would have seemed magical only 15 years ago.

Grabbing a snapshot of home computing as it flies by is tough. You've got to lead it a bit, aiming not only where it is today, but where it will be, say, next year. So set your sights on the present *and* the future for a picture of home computing in America.

PC, Go Home

You're in good company. According to Link Resources, a New York-based market research firm, one in four American homes has a computer. Over 30 million computers work at home, not at the office or in the classroom.

Most of these machines run MS-DOS. A smattering of Macintosh, Apple, Amiga, Commodore, and Atari computers may sit at home, but the PC has clearly won on the home front. That's no surprise. The foremost reason new computer owners give for their spending spree is to do job-related work at home. We're most comfortable with what we know—the PCs we use at the office.

And those home PCs are getting more powerful. Where once a floppy disk-based PC with a slow microprocessor and a paltry 512K of memory served, now home PCs typically include a hard disk drive, a color monitor, a megabyte (or more) of RAM, and a 286 or 386SX brain.

HOW DID WE GET HERE?

The path to today's version of home computing, filled with false starts, dead ends, and half-witted ideas, is littered with machines that should never have seen the light of day.

The Handmade Tale

Millions may compute at home today, but less than 15 years ago only a handful of hobbyists had computers at home. Some people built their own from kits while others bought such behemoths as the Radio Shack Model I and the Commodore PET. They rejoiced when the first floppy disk drives replaced cassette tape drives.

Happy Days

Computers shoved their way into American homes by the millions during the early 1980s with games and classic machines like the Commodore 64, Atari 800, and Apple II. Ads played on our suspicions that families without computers produced kids who couldn't cut it at college, even though solid productivity and educational software was nearly nonexistent. The country woke up in 1984 to realize home PCs were one-dimensional appliances that were too temperamental, too hard to use, and too expensive.

The Dark Ages

Computers went home, but no one knew what to do with them. Games started shifting to dedicated machines like Nintendo, and everyone grew tired of filing Christmas-card lists and computing home budgets. PCs ruled the office, but they were still too costly and too tough to use at home.

Taking the Office Home

The late 1980s were a time of excess—including excess work—so people took work home and realized they needed PCs there. Low-priced clones helped. The Mac struggled to hang onto its under-10-percent share; older computers hit the closets.

The Multi Medium

Windows in 1990 and multimedia in 1991 redefined the PC as a graphical tool that could do at home what it could at the office, as well as integrate text, sound, music, video, and still images into stunning educational, reference, and entertainment programs.

The Future

Inexpensive PCs with CD-ROM work in four of ten American homes. Family workstations control notebook and slate computers. Home and office PCs talk to each other via modem and dedicated networks. Kids use slate computers to file homework. High-end simulations make up PC play, but most electronic entertainment comes from the duo of game machine and CD-I player, both connected to a TV.

This trend of high-powered, low-priced home computing is accelerating. Prices of fast 386 PCs have been dropping rapidly. IBM cut prices twice in less than a month. Brand-name compatible manufacturers like Compaq have slashed prices, too, in an attempt to keep profits up and box out the more marginal PC makers. Consumer electronic giants like Samsung and Magnavox are pushing PCs in the mass market, with discount clubs such as Sam's and computer superstores like CompUSA as their ready-made outlets. The recession may have hurt many PC sellers, but it was good news for anyone shopping for a computer. Today you can bring home an amazing machine for around \$1,800: a 20-MHz 386SX complete with two megabytes of RAM, Super VGA, a 40MB hard drive, *Windows*, and a mouse.

And it won't be long before the computer in your home will have even more power. Major-league companies like Digital promise workstationlike graphics in a PC, while AT&T-owned NCR has built a minicomputer based on the 80486 chip. Though your home computer won't be as powerful as these monsters, don't be surprised 12 months from now if you're able to buy a 486SX-equipped PC for what you'd now pay for a 386.

More power for less money. That's one trend you won't have to wait for.

Mobile Clones

We love to take it with us. Even if we're not on the move, we like to pretend that we soon *will* be.

No part of the PC business bloomed as quickly during the last year as the portable computer market. A blizzard of laptop and notebook computers debuted during 1990 and 1991, enticing on-the-go professionals in sales, real estate, insurance, and financial fields to computerize.

The average portable computer is a no-features featherweight, but recently the market has grown to include 286, 386SX, and even 386 microprocessors; VGA graphics; multiple megabytes of RAM; large capacity hard drives; and long-running batteries. Briefcase-size computers compete with desktop systems in almost every performance area.

Notebooks, the under-seven-pound category, are the hottest draws. Such notable examples as the Sharp 6220, the Texas Instruments TravelMate 2000, and the ZEOS 286 all tip the scales at around five pounds. These machines, and others, are light enough to take everywhere you go.

The rush to faster processors has spun down the prices of older, but still

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capable, portables such as the Toshiba 1000 SE and the low-end Bondwell machines. Portables can be found for under \$1,000 and make attractive second-computer alternatives to home-bound desktop PCs. Laptops already account for almost 10 percent of home computers.

One portable trend seems clear, and one more muddled. Notebooks will get slightly lighter, much less expensive, and more powerful, and will have longer battery life. Hand-held computers, called palmtops, probably won't work their way into many homes, but further ahead, slate-like computers (with pen operating systems) built from inexpensive components may.

As laptops, notebooks, palmtops, and slates become better able to handle your computing chores, their impact on home computer purchases will be striking. If so many computers are bought for at-home work, why would you buy a desktop computer for the house when you can take your office machine home with you in your briefcase or your pocket?

Portable computers freed us from the desktop. Will they also be able to free us now from the separation of office and home computing?

We're All Gutenbergs

First impressions are important. They must be, or we wouldn't spend so much time on our home computers churning out slick office documents, school reports, and family newsletters.

The notion that almost anyone equipped with a computer can produce high-quality printed materials is such a powerful idea that millions have bought it—along with the necessary hardware and software. Home office workers in particular like how desktop publishing has made their firms seem larger than life.

A laser printer, the crucial component of good document generation, is a great equalizer. It's difficult to tell whether a letter was printed with a Hewlett-Packard LaserJet III at a business or with a LaserJet IIP at home. Once too expensive for any but the most fanatical home publisher, laser printers have dropped in price and expanded in features nearly as fast as computers.

Several laser printers broke under the \$1,000 list price barrier last year. Leader Hewlett-Packard aimed its LaserJet IIP at the single user and in the process discovered a ready market in homes and home offices. Companies like Okidata, Canon, Toshiba, and Epson all carry laser printers that commonly sell for around \$800. Analysts predict that the popular IIP will sell for as little as \$700 next year.

Other printer technologies are making an impression on the home market as well. Inkjet printing technology, even less expensive than laser, is especially well suited for the home, where high volume and high speed are less important. Portable printers such as the tiny two-pound Citizen PN48 illustrate the trend in miniaturization. Printer additions that transform your laser printer into a plain-paper fax machine are already available.

With price competition so stiff, home computer owners can expect personal laser printers—machines that pump out four pages or less per minute—to settle in the \$600–\$700 range during 1992. More featurebound printers, those with PostScript, for instance, will remain above the \$1,000 mark, but they'll close on that magic number. The Texas Instruments Microlaser PS-17, for example, often sells for \$1,350. Look, too, for laser printers to keep shrinking in size and for specialty printers to include fax reception and printing.

Beaucoup Bits

The promises of CD-ROM entice even the most jaded home computer user. Who wouldn't like an entire encyclopedia on a disk? By packing hundreds of megabytes of data on a platter that looks just like an audio CD, CD-ROM puts vast amounts of information at your fingertips.

CD-ROM may finally find a way home if several computer makers are successful in selling their player-equipped models. Tandy, a giant in the home and home office markets, recently introduced a series of computers with CD-ROM capabilities. With base machines that stretch from a bottom-end 16-MHz 286 model (Tandy M2500 XL/2) to a powerhouse 33-MHz 386 machine (Tandy M4033 LX), this line does much to legitimize home CD-ROM. Magnavox's HeadStart/SX-20 CD computer, part of another CD-ROM series, is especially attractive to the home user; it includes not only a CD-ROM player but also several discs.

Software has been slow to arrive for reference and education, two major applications for CD-ROM in the home, but there are some excellent discs available. Grolier's *Illustrated Encyclopedia* and Bureau Development's *U.S. History on CD-ROM* are outstanding discs that by themselves justify the price of a player. National Geographic's *Mammals: A Multimedia Encyclopedia* teaches kids about animals with 700 color photographs, 150 maps, and 45 full-motion video clips.

The shallow software pool and the added price of players will keep the lid on the CD-ROM market at least through

1991. After that, all bets are off. That's because multimedia, a hot new complex of technology, will push CD-ROM into the limelight and possibly generate some software that home computer users won't want to do without.

An unknown in all of this is how non-computer players like Commodore's CDTV and Philips's Magnavox CD-I model will affect CD-ROM. These players, controlled by hand-held navigators and featuring entertainment and educational software aimed right at the home, are touted by some as the next VCR. With no keyboard or computer to intimidate, their strategy is to infiltrate millions of homes and leave CD-ROM computers in the dust. Will they? Experts are waffling on that question. Only one thing is certain: Some form of CD is in your home computer's future.

Someone's Buying the Stuff

You'd be hard pressed to tell that the economy is in a slump if you looked at the software sales charts. According to the Software Publisher's Association (SPA), North American software sales were 26 percent higher in 1990 than in 1989. Lee Iacocca would kill for a growth rate like that.

Some interesting stories hide among those numbers. Naturally, PCs dominated the software side of the business just as dramatically as they did the hardware, with nearly 80 cents of every software dollar spent on MS-DOS or *Windows* packages during 1990.

Other systems simply tagged along, if they succeeded at all. Macintosh ran a very distant second, accounting for only 13.3 percent of total software sales. The Apple II and Commodore 64 software droughts so evident on store shelves were borne out by the SPA data, which showed a 16.5-percent drop in the former and a whopping 42-percent decline in the latter during the year. And Amiga software couldn't climb out of its small (2-percent) market share.

Meanwhile, *Microsoft Windows* and *Windows* applications ended the year as winners, growing nearly 160 percent over the previous year and cornering over 10 percent of worldwide software sales.

Clearly, PCs rule the software roost now, and with the *Windows* explosion only a little more than a year old, they'll continue to crow for years to come.

Working Hard at Home

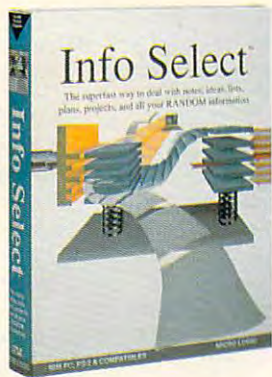
Work is work, no matter where you do it. Increasingly, home computers run the same software and perform the same tasks as machines in the office.

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and much more. INFO SELECT™ will not only give you instant access to this important information ... it will help you make better decisions and see important new relationships. Try INFO SELECT risk-free and discover a whole new dimension of computing.

Photographic memory

INFO SELECT is like having a 'photographic memory' that gives you perfect superfast recall of up to 64,000 items of information.

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Thinking tool

Have you ever worked on a complex project and felt lost? With INFO SELECT you'll group, scan, and cross search through all your notes so fast you'll see the big picture in seconds.

Will I be better off doing this now or that later? Keeping priorities straight can make or break your career or your business. INFO SELECT lets you keep on top of what's hot.

Should you use an east or west coast supplier? To make decisions you need facts. Now you can view the facts any way you like ... as fast as you can think. You'll make the best decisions ever -- and fewer expensive mistakes.



Phone notes



Client info



Decisions



Management

The #1 PIM

What's all the fuss about PIMs (Personal Information Managers)?

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386 PC, you can crunch numbers with 1-2-3, pound out reports with *WordPerfect*, or compile charts with *Harvard Graphics* long after the kids are in bed. This power can also form the foundation of your home business, letting you compete with larger companies because you're using the same hardware and software tools they use.

Productivity is king at home. The top two home computer uses, reports Link Resource, are word processing (69.6 percent of those with a home computer say they use word processing software) and file keeping (62.4 percent). Not far behind are graph and chart making (41 percent), budgeting (40.2 percent), and spreadsheet work (38.6 percent).

Home computer work is changing, though. Integrated software—affordable all-in-one packages combining word processing, spreadsheet, and database modules—once were the home computer user's dream. The gleam's gone, it seems, since integrated software was the only PC category to post a drop from the previous year. One possible reason: It's easy to integrate several separate, full-featured programs with a graphical environment like *Windows* or *GEOS*.

But financial and tax applications show no signs of loosening their grip on home computers. Of people who are looking to buy their first home computer, one out of every four indicates budget making and tax preparation are the reasons for their purchase. The result? *Quicken*, an easy-to-use personal accounting program, appears on virtually every bestseller chart. Conveniences such as electronic bill paying and tax filing will become the rule, not the exception, at home.

Although stripped-down versions of corporate productivity packages are often perfect for the home—*LetterPerfect* instead of *WordPerfect*, *Personal R:BASE* instead of *R:BASE*—the trend is to equip the home with the same software functionality as the office.

What else would you expect when so much work is done at home?

Go Ahead—Teach Me

We only pay lip service to educational computing. We say we're buying a computer for the kids, but we don't often put our money where our mouth is. Prospective home computer owners rank their children's schoolwork as the second most popular reason for wanting to buy a machine. More than half of current owners claim they use their computers for educational applications. But we spend less than a third as much on PC educational software as we do on games.

What's the problem?

Maybe it's the wretched state of

much of what's labeled as educational by software publishers. With many packages crippled by boring and repetitive play, crude graphics, and lack of sound effects, it's no wonder kids turn off the computer and hit the Nintendo instead. Fortunately, a few educational software publishers are waking up to the fact that kids want some sizzle with their electronic schoolwork.

Eduainment, as some call the category, mixes traditional game elements with carefully crafted educational ideas to subtly teach things to kids. Its origins can be found in such long-running lines as Broderbund's Carmen San Diego games, which successfully combine learning geography and history with detective-style gameplay. More recent examples come from the Learning Company and its Super Solver series.

These efforts are paying off. According to the SPA, 1990 was the first year that PC educational programs outstripped the combined sales of Apple II and Macintosh learning software. Educational software sales grew by 48 percent from 1989 to 1990, beating out such stalwart categories as games, word processing, and desktop publishing in the growth race. And though much of this increase is undoubtedly due to an increased emphasis on the PC in the classroom, MS-DOS is the first priority of every major publisher that sells home education software.

Home learning's future depends on more and better CD-ROM software, even more gamelike style, and superior speech. The last may be most important, as impressive new text-to-speech capabilities—like those pioneered by First Byte and now utilized by Davidson & Associates—create entirely new types of educational software.

Pick your packages carefully, and your kids won't know they're learning.

Fun Against All Odds

The numbers are staggering. Over 42 million Nintendo videogame machines sit in American homes. Nintendo sold approximately 8 million copies of its *Super Mario Brothers II* cartridge. Videogame systems and cartridges rang up a whopping \$3.4 billion in sales during 1990.

By comparison, computer software publishers sold only \$355 million worth of disk-based games last year. Computer game makers count themselves lucky if a program sells 50,000 copies.

One of the most significant home computing developments in the last five years is the steady erosion of entertainment. At least one type of game is already lost to the cartridge machines. Arcade games, traditionally built on quick joystick action and rapid fire, are all but

gone from the computer scene. Other categories of computer games are in danger. Sophisticated sports games now show up on cartridge, as do a handful of role-playing games and simulations, such as *Ultima* and *SimCity*.

Game developers fight back with increasingly complex products, especially high-end simulations like *SimEarth*, hybrid arcade/role-playing games like *Strike Commander*, and long-length adventure games like *King's Quest V*. PC entertainment sales climbed slightly faster than the overall average, but cartridge systems returned fire with more powerful machines like Nintendo's Super NES and the CD-equipped NEC TurboGrafx. Looming behind these are players based on CD-I (Compact Disc, Interactive) technologies, which might spell the end of most computer games.

Because PC developers compete for a finite number of electronic entertainment dollars, they must look for new ways to play off the home computer's strengths. The Sierra Network, an online amusement park where you play against opponents via a modem, is an area that shows promise. Another is an increasing reliance on the PC's powerful processor and 256-color VGA graphics to handle games that cartridge systems simply can't duplicate.

Watch for a small flood of CD-ROM games in 1992. Expect to hear more involved soundtracks and digitized speech, see more photographic-style graphics, watch more Disney-style animation, and play more sophisticated simulations in the areas of electronic life, military weapons, and sports.

You'll keep playing on the screen. But unless home computer games fight back, that screen may be your television, not your PC's monitor.

Eyes on the GUI Prize

The Macintosh is on a roll. Last year's lower-priced models—particularly the Classic for under \$1,000—literally sold faster than they could be built. Surprising nearly everyone, the success of the Classic and its color cousin, the LC, will put new Macs in at least half a million homes by the end of 1991.

The Mac's biggest drawing card is its graphical user interface (GUI), the desktop metaphor where icons represent applications and files, mouse clicks launch software, and programs look and often work alike. Apple's new System 7.0 recaptures the lead in GUI expectations from *Microsoft Windows*.

Windows 3.0 is only a year and a half old, and already it's selling half as many programs as those for the Macintosh. The intense interest in *Windows* applications demonstrates that at least some PC owners are drawn to the

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prospect of a graphical environment.

But is *Windows* something important for the home? Right now? Hardly.

Windows' hardware requirements leave out all but the best-equipped home computer users—those with a 386SX or 386 machine, two megabytes of RAM, and a VGA display. But that's not to say that home computer users aren't casting eyes on GUIs.

GeoWorks Ensemble—a graphical environment complete with minimalist applications—sits atop DOS and provides an elegant solution for anyone with an 8088, 8086, or 286 PC. In some ways slicker than *Windows*, this GUI is perhaps best demonstrated by America Online, a new telecommunications service that simplifies sending E-mail and downloading software.

That's today. What about tomorrow?

Perhaps one in ten home computer users looks at a graphical environment, with most of them seeing a Macintosh. But the trend toward GUIs seems irreversible, especially for the home user. More and more computer makers bundle *Windows* or *GeoWorks Ensemble* with their machines, particularly those sold as just another piece of consumer electronics. And GUI ease of use makes perfect sense in the home, where there isn't always someone around to show you what to do.

Computers must be simpler to use if they're to climb out of their one-out-of-four-households ghetto. GUIs will be a crucial part of the catalyst that takes millions more computers home.

Just Around the Corner

Home computing rarely stands still long enough for anyone to form a complete picture. In a few years, that picture may be nearly unrecognizable.

"I see a division of computing and game playing," says Ken Williams, president and CEO of Sierra On-Line, one of the country's biggest computer game producers. "There'll be something that will sit on top of your TV—maybe it's CD-ROM based—that looks just like a stereo component." That's what we'll play with, says Williams, while we relegate our at-home work to a more familiar personal computer. "The next big leap [in games] will be to get away from text," Williams says. "If the motion picture industry had to depend on silent pictures, it wouldn't be much."

Speech is vital to the future of education on the home computer, too, according to Jan Davidson, president of Davidson & Associates. "I think there will be huge movements in speech technologies," she says, adding, "I'm sure there will be educational applications using very interactive video in

very compelling ways." Unlike Williams, Davidson isn't bullish on players without keyboards. "I don't believe the keyboard is going to go away as quickly as other people think. Players certainly will have their appeal with entertainment, but I wonder if they'll be useful tools for things like education."

Brian Dougherty, CEO of GeoWorks, looks ahead and sees a multicomputer home. "There'll be an under-\$500 slate computer by 1995," he says. Based on a pen approach, where you navigate on a flat screen with a stylus and write by hand, these slate computers are "very plausible," says Dougherty. "It's something that you can throw in your purse. Several people in a home will have these, and they'll link them up with the home's multimedia PC."

These three people—and most others who follow home computing—agree on one thing: Home computing in 1995 will be different, very different.

Home for Some, Not for All

Optimists like to think of the computer as the VCR of the 1990s, a consumer electronic device that soon will end up in virtually every home. That's clearly not in the cards, not soon anyway. At the current rate of growth, it'll be the turn of the century before even 40 percent of America's homes have a person-

al computer. VCRs blink 12:00 in nearly twice as many homes today.

A home computer is a powerful tool all members of the family can use—if they'll use it. Barely half the adults and a quarter of the kids with a computer in their homes use the machine.

People avoid buying computers because they're still too expensive. People avoid using the computers they have because the machines are still too complex. Lower-priced, simple-to-work computers are the key to any dramatic upswing in home computer ownership.

Some progress glimmers in the distance. Graphical user interfaces make many computing chores easier and cushion new users from the arcane ways of computers. Multimedia—if by that you mean integrating sound, graphics, and text into a coherent whole—may shove ease of use up another notch. And prices are slipping, if not tumbling. Whether you're buying a laser printer, notebook computer, or desktop system, you'll spend less this year than last.

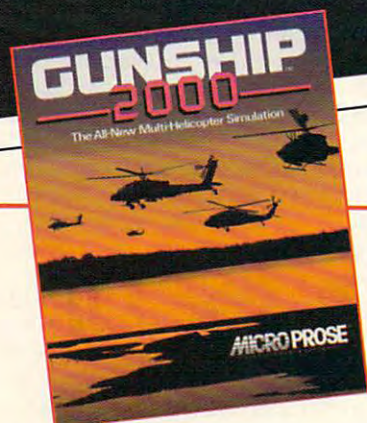
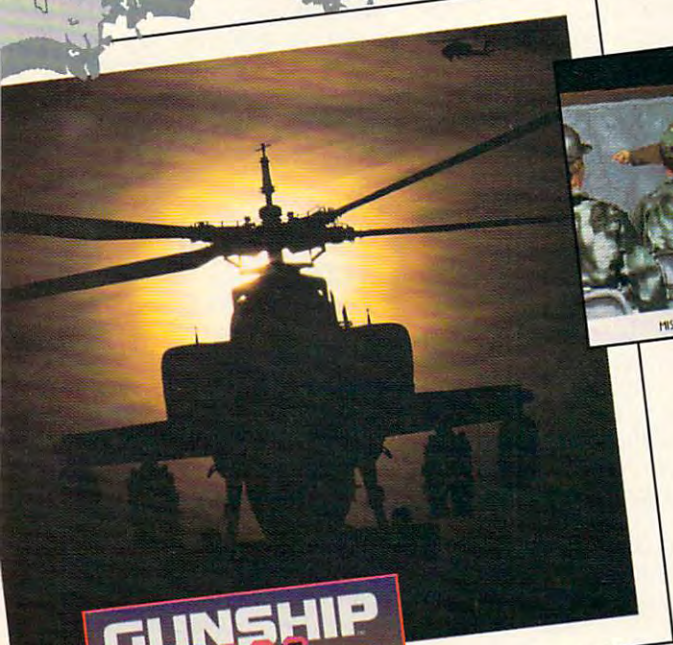
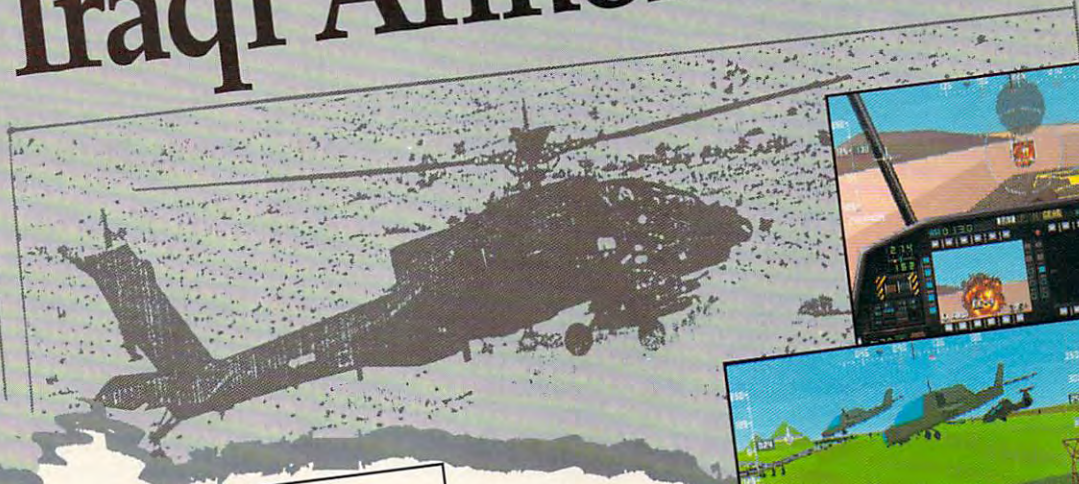
Maybe computers will never occupy space in every home. Maybe they shouldn't. Not in their current form, not in their current roles. But to an increasing number of Americans, today's home computer is as indispensable as the television and the telephone.

America—what a country! □



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Khafji



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Circle Reader Service Number 157

www.commodore.ca

SHAREPAK

Richard C. Leinecker

FOUR HITS MADE IN THE U.S.A.

Since this month's editorial theme covers the state of computing in the U.S., we bring you four excellent, state-of-the-art shareware products that push the techno envelope.

Straight out of sci-fi flicks, *SPEAK* will give your computer a voice all its own. With *NorthCAD-3D*, you can design and view complex 3-D objects. *Conquest* gives board-game lovers the chance to conquer the world. And finally, *WAXMAN* challenges you to a chess game that pits you against the most formidable opponent of all—your computer.

If you're new to *COMPUTE* and *SharePak*, you'd probably like to know how we select the programs that appear each month. First, we look for shareware programs that match the theme for this month's issue. Second, we spend time downloading files from the online services, saving you the cost of expensive connect time, which would amount to many times the cost of buying a *SharePak* disk. Then, we evaluate every program, choosing those we think will interest you the most. Finally, we work with program authors to fix any bugs and change any features that we feel are necessary to make the programs the best they can be.

You'll be glad to know that every program and disk is carefully checked for viruses. Also, we provide technical support during our regular business hours. Finally, we offer a money-back guarantee—if you don't like your *SharePak* disk, just return it for a full refund.

SPEAK

This program will make your computer "come alive" and speak to you. Use any text editor or word processor to cre-

ate an ASCII file of the text you want your PC to speak. Then, from the DOS prompt, just type *SPEAK filename*. This creates a self-contained COM file that holds all the speech information. Then to listen, you simply type *filename*, and your computer does its thing, "speaking" whatever you've typed in the ASCII file.

Although fun to play with, *SPEAK* is much more than a novelty program. For instance, you can create batch files that speak, and the program is really invaluable for young children or those with reading difficulties and for the visually impaired.

Speak runs on any IBM compatible with 256K of available RAM and any monitor. No special hardware is required for playback.

NorthCAD-3D

NorthCAD-3D is a design and modeling program that lets you create, view, and edit 3-D objects and images. The program is completely menu-driven, which makes it a snap to learn, and it has a versatile command set that emphasizes conceptual design and illustration.

NorthCAD-3D allows you to create drawings from any viewpoint, or you can view the same drawing from several simultaneous viewpoints—even while using the drawing functions. Plenty of sample files are included that illustrate just what you can create with the program—and how.

To run *NorthCAD-3D*, you'll need an IBM compatible with 512K of available RAM and a CGA, EGA, or VGA monitor. Math coprocessors are supported. We suggest one to really speed things up.

Conquest

I'd love to count the hours I've spent playing world-conquest board games. Now I might

have to add to that number since I got a copy of *Conquest*. It's a great continuation of the world-conquest board-game tradition. And should some of your opponents happen to be remote, you can play through a modem—which is a real boon to board-game addicts like me.

The game looks terrific with a lot of colorful screens to portray the world and territories. An easy-to-use menu-driven interface lets you play with no hassles. Optional mouse support adds a nice, professional touch, too, for those who would rather not fool with a keyboard. If you want to know more, you'll have to get the disk and check out *Conquest* for yourself. You'll love it.

To play *Conquest*, you'll need an IBM compatible with 256K of free RAM. You'll need a Hercules, CGA, EGA, MCGA, or VGA monitor.

WAXMAN

This is a great chess program you'll find hard to beat—in more ways than one. First of all, the game itself is a formidable opponent. Even chess enthusiasts will have a hard time beating *WAXMAN*. Second, you can run the game as a stand-alone or as a memory-resident program. For example, you can start a game and then work in your word processor for a while. Then, when your intuition kicks in and you know what the next move should be, you just hit the hot key, make your move, see what the computer does in response, and return to your word processing while thinking of the next move.

WAXMAN runs on any IBM compatible computer with at least 65K of available RAM. The program runs in text mode, which means if you're inside a graphics application, *WAXMAN* won't pop up. □

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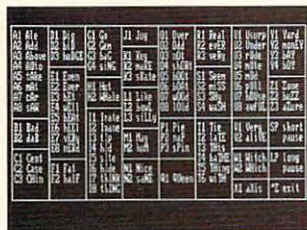
We carefully select and test all programs for you

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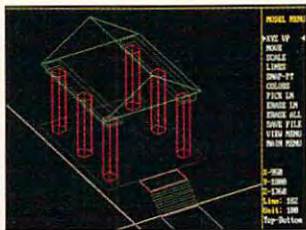
Each disk includes two to five programs for one low price

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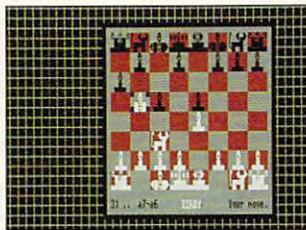
SPEAK



NorthCAD-3D



Conquest



WAXMAN

COMPUTE's SharePak disk contains the best of shareware—handpicked and tested by our staff—to complement this month's focus. You'll sample entertainment, learning, and home office software at a great savings. Each *SharePak* disk includes two to five programs plus complete documentation for one low price:

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TEST LAB

Access hundreds of megabytes of data. That's the promise of CD-ROM technology, and it's here today, faster and more affordable than ever. This month's Test Lab examines ten capable CD-ROM drives and gives you the information you need to understand the technology and make wise buying decisions. In addition to benchmark test results and instructive sidebars, this month's Test Lab offers hands-on reviews that explore everything from installation and documentation to special features and software bundles. So whether you plan to consult an online encyclopedia, find a business address, play a game, or take advantage of the educational benefits of multimedia CD-ROM software, read on. This month's Test Lab will help you find the CD-ROM drive that's right for you.



CD TECHNOLOGY PORTA-DRIVE

CD Technology's Porta-Drive does its job well. Whether you're playing a game with your children, researching a report, or learning about the world around you, this CD-ROM drive takes only a reasonable amount of time and effort to accomplish what you've asked it to do.

I found it to be slightly slower

than my hard drive, an adequate speed considering the wealth of sounds (on computer CDs—it doesn't play music discs), sights, and data it allowed me to access. To increase the drive's speed, CD Technology uses a 64K memory buffer.

The Porta-Drive itself is remarkably compact, about the size of a hardcover novel, though heavier at 3.8 pounds. Its two controls—an eject button and a volume slide for the headphone jack—make the Porta-Drive by itself much easier to use than an audio CD player. CDs enter and exit the machine in an accompanying CD caddy.

Installing the Porta-Drive takes little technical knowledge or mechanical skill. After removing your PC's cover, you simply plug the card into an expansion slot and then hook up the cable to the card's port. A separate power

CD TECHNOLOGY
766 San Aleso Ave.
Sunnyvale, CA 94086
(408) 752-8500

List Price: \$895

Street Price: \$849*

Warranty: 12 months
(no extended warranty)

Service Plan: through
the company
(shipping the
product as an
authorized return)

box simply plugs into the back of the device. The software driver provided with the Porta-Drive installs itself on a hard drive, automatically altering your AUTOEXEC.BAT and CONFIG.SYS files so the machine is ready to go every time you boot up. The driver allows you to lock and unlock the player and eject the CD caddy using only keyboard controls.

If you run into trouble, the user manual for the Porta-Drive provides adequate information. It's

well organized and generally clear, though it lacks both an index and a section of troubleshooting tips. The machine comes with a two-year warranty. Technical support is available either through a 24-hour bulletin board service or by calling the company directly, though neither call is toll-free. As simple to install and operate as the machine is, though, most people will probably have little trouble.

Despite the cost of CD-ROM drives and their inability to accept data from your computer, their storage potential will obviously appeal to a great number of computer enthusiasts. If you're in the market for one of these mass-storage marvels, the Porta-Drive has a lot to offer in a little package.

EDDIE HUFFMAN

Circle Reader Service Number 301

CHINON CDX-431

A solid performer from setup to shutdown, the Chinon CDX-431 opens the door to laser disc storage at a reasonable price.

This particular Chinon unit comes with the CD-ROM drive housed in a slim case, a CD caddy for loading your discs, a SCSI interface card, an interface cable, and software that includes Microsoft's CD-ROM extensions and the Chinon device driver.

Installation is straightforward and rather simple, provided you're comfortable opening up your computer's case. (If you aren't experienced in this area, ask someone to help you or take your PC to a local technician for assistance.)

Software installation is also easy. You can install either to your hard disk or to a second floppy disk. The setup program will copy the CDX-431 device driver and Microsoft extensions to the directory of your choosing.

*Test Lab street prices are an average of prices advertised in computer magazines and national newspapers during July 1991.



CHINON AMERICA
660 Maple Ave.
Torrance, CA 90503
(800) 441-0222
List Price: \$795.00
Street Price: \$564.33
Warranty: one year
Service Plan: through the
company (customer ships)

In addition to its CD-ROM capability, the CDX-431 gives you the ability to play audio CDs by means of its CDPLAY program. After you invoke CDPLAY, you can program the player as you would a CD deck connected to your stereo. The CDX-431 includes audio jacks for connecting speakers (using standard RCA plugs) or for connecting the drive to a stereo system. There is also a headphone jack.

In several months of use, I had virtually no problems running the CDX-431, and those few problems I did encounter turned out to be related to various third-party CD-ROM applications and not to the hardware system.

I used the drive with a variety of text-based and graphics-based CDs. The caddy and loading mechanism worked smoothly and without any noticeable degradation in performance throughout my use of it. I was able to launch applications both from the DOS prompt and from within *GeoWorks Ensemble* and *Microsoft Windows*.

The CDX-431 offers 150-kilo-bytes-per-second continuous throughput, which makes it standard with what Bill Gates has defined as the minimal per-

formance criterion for a multimedia CD device.

The company rates the disc's access time at 350 milliseconds, which is many times slower than that of a hard disk. But keep in mind that the advantage of CD-ROM technology isn't in the speed of the access; it's in the volumes of information available to you at any one time and the potential for providing innovative means for presenting and using that information. This coming year may indeed be the year of the CD, as prices drop and manufacturers like Tandy, Sony, and Magnavox bring CD-ROM drives and CD-ROM-equipped computers to the consumer market.

Whether you want access to extensive databases, the ability to play the latest and most comprehensive entertainment and education programs, or the pleasure of playing audio CDs as you complete your office work, the CDX-431 will meet those needs.

PETER SCISCO
 Circle Reader Service Number 302



GENESIS GENSTAR 2000

Setting up the GenSTAR 2000 turned out to be an exercise in plug-and-play simplicity. I just popped the SCSI interface card into an open slot in my PC, connected the cable from the card to the CD-ROM player, and turned the machine on.

To install the software, I ran GenSTAR's setup program, which configured my computer to automatically load two CD-ROM drivers at boot-up. I'm using DOS 5.0, and after a little tweaking, I was able to load both drivers into high memory.

The whole installation process took less than 15 minutes. But I was lucky. The interface's default interrupt, I/O port, and DMA channel didn't conflict with any other hardware devices in my PC. If there had been a conflict, I would've had to know exactly how my current equipment was configured and be able to adjust the SCSI card accordingly. The GenSTAR manual, despite its modest appearance (20 loose-leaf pages stapled together), contained clear instructions and illustrations on reconfiguring the card and would've been an excellent guide had I needed it.

After installing the GenSTAR, I was able to start using it immediately because of its gaggle of bundled CD-ROM software. In-

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55426

(800) 325-6582
List Price: \$499
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Service Plan: repair
or replacement
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within 2 working days



PIONEER COMMUNICATIONS OF AMERICA

600 E. Crescent Ave.
Upper Saddle River, NJ
07458

(800) 527-3766

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Street Price: \$1,199

Warranty: one year,
including technical
support

Service Plan: through
shipment to Pioneer's
service center

cluded are four titles from the Software Toolworks—*Reference Library*, *Illustrated Encyclopedia*, *U.S. Atlas*, and *World Atlas*—plus *Mammals* from the National Geographic Society and *Languages of the World* from the Sony CD-ROM series.

I found *Reference Library* to be extremely useful. It boasts a spelling checker, dictionary, thesaurus, quotation index, general reference, history, listings of business addresses and phone numbers, a legal and corporate handbook, and a concise writing guide. You can run *Reference Library* either as a stand-alone program or as a TSR. Either way, its easy-to-use interface with pull-down menus and mouse support makes browsing a pleasure.

The other bundled titles were nearly as interesting, useful, and entertaining as *Reference Library*. And it's comforting to know that if I ever get tired of accessing this huge chunk of the world's accumulated knowledge, I can take advantage of the fact that the GenSTAR is also a functional music CD player by popping in a disc, plugging in my earphones, and tuning in to Mozart.

CLIFTON KARNES

Circle Reader Service Number 303

PIONEER DRM-600

Pioneer's DRM-600 CD-ROM changer can add volumes of data retrieval power to your system.

The shoebox-size DRM-600 holds up to six discs, inserted together in a special magazine. The configuration software gives each of these discs a drive name. You can switch to these discs, access information, and run programs just as you would from any ordinary disk. The only difference is that you can't write to the read-only CD-ROMs.

Once the interface board is installed inside the PC, the drive itself is connected via the supplied SCSI cable. With only four feet of cable to work with, though, I had difficulty locating a spot to park the rather large DRM-600 while still leaving workspace on my desk.

Installation of the device drivers went smoothly, despite sketchy documentation. The setup program is conscientious about documenting the changes it makes to startup files.

Once you've installed the DRM-600 CD-ROM changer, it's simple to operate. I found that the hardware worked without a hitch. Text searches were fast, and graphics screens drew quickly, though not seamlessly.

In addition to being useful as a computer drive, the Pioneer DRM-600 also plays audio CDs. The music brightened up our office, but the software to control the sound was inconvenient and poorly documented.

The DRM-600 includes a stereo earphone jack as well as RCA jacks so that output can be directed to a stereo amplifier. The drive package includes a set of RCA cables, but again, the short length required me to add my amplifier to an already crowded desk.

Two programs are provided to handle audio CDs. *Multi-Play Control* allows you to select discs or tracks to play, and once the music is underway, you can execute other programs on your PC. Sadly, I found no way to program more than one musical selection at a time.

The other program, *Juke*, allows you to create tables of contents for your audio discs and to select a program of music that can include any or all tracks from any or all of the discs in a magazine. But, since *Juke* isn't a TSR, you can't exit and work with other software while the music plays. The brief documentation for both programs, unfortunately, doesn't fully explain the software.

Being able to insert as many as six discs is convenient, but the magazine that holds them is difficult to manage. The discs must be loaded upside down, which feels awkward and makes it impossible to read the labels.

The Pioneer DRM-600 is a sound piece of hardware. As a SCSI device, it can be daisy-chained with a second drive or other devices, and it's a good bet to remain compatible as the CD-ROM software and hardware evolve. Its great capacity makes it a candidate for networked environments where volumes of resource material could be made available to many users.

TONY ROBERTS

Circle Reader Service Number 304

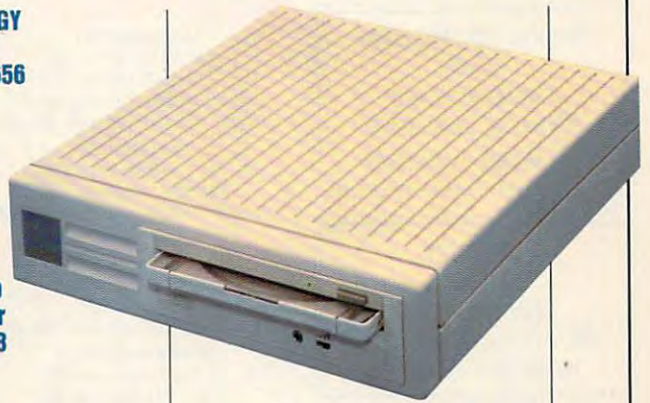
PROCOM MCD-ROM 650/E

The Procom MCD-ROM 650/E drive offers flexibility that makes it a good choice if you've got more than one type of computer.

The drive that I reviewed included software for both the PC and Macintosh, cables for both units, and a SCSI AT-bus interface card for the PC (CC16 Enabler—\$349). The drive itself is housed in a nicely styled, light-gray external case with the power supply beside the drive. This makes the Procom somewhat wider than some other drives, so you may have trouble fitting it next to your PC on a crowded desk. It's actually large enough to place under most monitor stands, but the plastic case seems a little too thin to support a heavy monitor. Small rubber supports allow you to place the case vertically, but in that position it can be difficult to insert and remove discs—the case can slide around when you push the disc in.

If you lack experience installing hardware and software or if you're just intimidated by such installations, you might want to call on an experienced friend for help. Depending on what other cards you have installed in your

PROCOM TECHNOLOGY
 200 McCormick
 Costa Mesa, CA 92656
 (800) 800-8600
List Price: \$895
Street Price: \$747
Warranty: one year
(extended warranty available)
Service Plan:
through shipment to
the company (repair
and return within 48
hours)



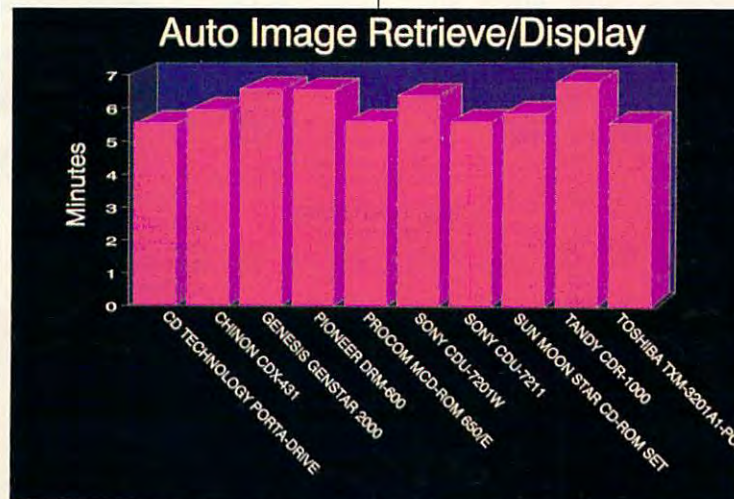
PC, you may find yourself changing jumpers on the board to alter its IRQ numbers and memory addresses, not an easy task for beginners. I found the software easier to install than the hardware, but because there's no installation program, I had to modify my CONFIG.SYS and AUTOEXEC.BAT files myself.

Procom's software and board also support SCSI hard drives, removable media drives, and two standard PC floppy drives; so this setup is a good choice if you need to attach other SCSI devices to your computer. Procom also includes drivers that allow you to use this CD-ROM drive on a Novell network.

Music lovers will appreciate

PlayCD, an included program that you can use to play regular music CDs through the drive's headphone plug. While you're running *PlayCD*, you can program tracks in any order. It's even possible to listen to a CD while you're working with another program.

Although the documentation for the Procom MCD-ROM 650/E doesn't mention support for the Amiga, I was able to use the Mac cable and a third-party driver disk to connect the Procom drive to an Amiga and access the Fred Fish collection public domain disc and run a CDTV game. The Procom drive is definitely a good choice if you're a family with more than one kind of computer. I didn't have any compatibility



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2. All LIM 4.0 expansion boards are not created equal. Make sure the board you wish to purchase can run your applications and has the capacity you need.
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List Price: \$800
Street Price: \$699
Warranty: one year, covering parts and labor
Service Plan: through calls or shipment to Sony service centers (listed on the warranty card)

problems with the MS-DOS CD-ROM discs that I tried on the Procom. If you're looking for a drive that has software support for the PC and Macintosh, and that can be used with other SCSI computers like the Amiga, the Procom drive is a good choice.

KIM HORN

Circle Reader Service Number 305

SONY CDU-7201W

The Sony CDU-7201W CD-ROM drive offers solid performance and some attractive features in a long, slim case less than half the width of most system boxes. And while CD-ROM technology isn't brand new, I couldn't help feeling just a bit like a kid at Christmas as I explored the capabilities of this CD-ROM drive.

The CDU-7201W performed without a hitch, whether the disc contained games, information about the Civil War, sounds, images, or just plain music (you can use it to play your audio CDs). The only problem I experienced—not enough memory for one of the games—was not the fault of the Sony drive at all. I was simply trying to load too many things into memory at once, a problem solved by creating a special boot disk for when I use the CDU-7201W.

On the front of the drive, you'll find a jack for headphones and a

volume wheel, as well as an eject button, an emergency eject hole, the caddy insertion slot, and a light to tell you when disc access occurs. I did wish for a light in front to indicate when the drive is on, though. Unless you power on all your computer equipment with an outlet strip, you'll need to check the power switch in back of the box to see if it's on. Behind the box you'll also find stereo phono jacks, DIP switches for assigning a drive number, a ground terminal, and two ports—one to connect you to the proprietary controller card and the other to daisychain with as many as three more drives.

Installing the card and the software to run it is fairly straightforward, thanks to good documentation. Sony gives you the option of installing to your hard drive or to a floppy. If you choose the former, the installation program will replace your startup files and rename the old ones, so I recommend installing to a floppy. Once the program is installed and you boot up, the software tells you what drive letter gives you access to the CDU-7201W. In my case, it's drive S (for Sony?).

There's also a fairly straightforward program allowing you to listen to audio CDs (but scant documentation for it). I like being able to listen to my Bach CD in background mode while using an ap-

plication on one of my other drives. Thanks to the headphone jack, I can listen without disturbing nearby coworkers.

To protect the drive during transportation, Sony employs automatic locking of the optical pickup every time the caddy (the device that holds the disc) is ejected. Also, whenever you load or eject the caddy, the drive automatically cleans the objective lens of the optical pickup. This automatic maintenance proves particularly important when you realize that CD-ROM drives, unlike your stereo turntable and stylus, are not user serviceable. The laser beam used to access disc information could harm your eyes, so Sony cautions you not to open the drive's cabinet.

Sony has established itself as a leader in television and audio technologies. With its CD-ROM drives, Sony is well on the way to making quite a name for itself in computer technologies as well.

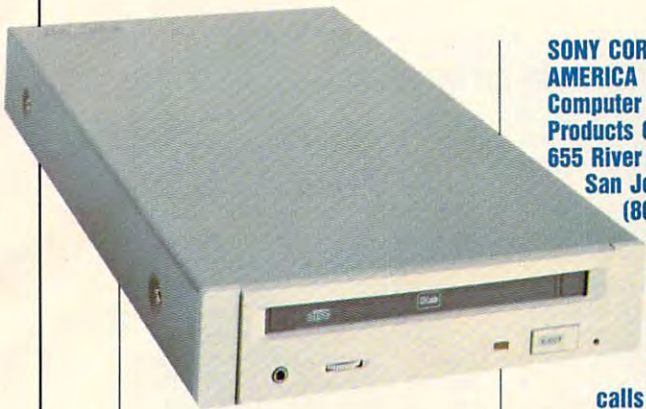
MIKE HUDNALL

Circle Reader Service Number 306

MANAGING YOUR MEMORY

Adding a peripheral such as a CD-ROM player can complicate memory management. If you're using DOS 4.01 and a mouse and if you have SHARE loaded, you'll sometimes have so little memory left after loading your CD-ROM driver that you can't run the CD-ROM applications. My experience has taught me to use a memory management program like *386Max*, *QEMM-386*, or *TurboEMS* to place device drivers into high memory areas. The Microsoft extensions will allow you to use extended memory, but even that option may not be enough to free your CD-ROM drivers for use. Another solution would be to update your DOS to version 5.0, which includes the capability of placing device drivers into upper memory blocks, leaving low memory free for applications.

—PETER SCISCO



SONY CORPORATION OF AMERICA

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covering parts
and labor**

**Service Plan: through
calls or shipment to Sony
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the warranty card)**

SONY CDU-7211

CD-ROM technology is rapidly entering the world of computing. The drives, or players as they're sometimes called, can access enormous amounts of data from compact discs (CDs). They operate quietly, and though CD-ROM drives are slower than hard drives, their performance is quite acceptable. This is my first time using one, and I'm impressed with what they can do, as well as with what they can offer us in the computing world.

The unit I reviewed is a Sony model CDU-7211 SCSI CD-ROM drive. With it, I received Future Domain's TMC-850 SCSI adapter. Installation is fast and trouble-free.

Plug the SCSI adapter card into a computer slot first. The manual that comes with the adapter clearly explains the setup procedure and provides easy-to-follow diagrams. Next, use the supplied cable to connect the CD-ROM drive to the SCSI adapter, and plug in the power cord.

The last step in the setup procedure is to install the software drivers, which are conveniently provided on both 3½- and 5¼-inch disks. To install the drivers, you simply run the SETUP program on the disk. Everything is taken care of for you. All the necessary files are copied, and changes are made to the AUTOEXEC

.BAT and CONFIG.SYS files. When the program is finished, you're ready to go. That's all there is to it.

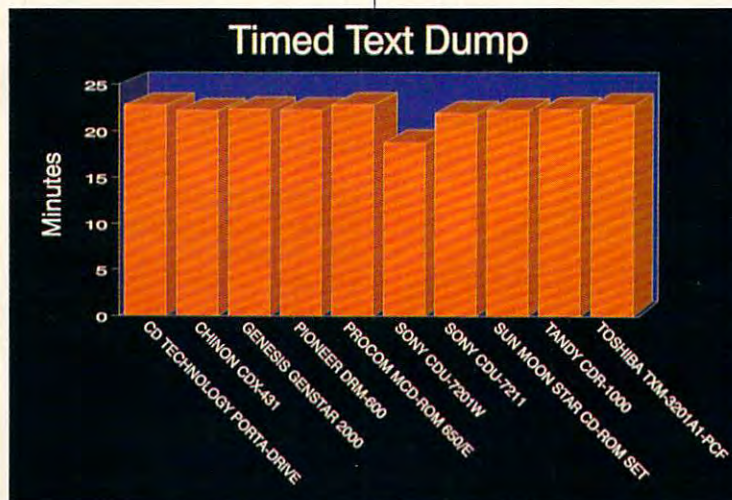
The CDU-7211 is a half-height drive, so it easily fits almost anywhere on your desktop. It features two SCSI bus connectors which conform to ANSI standards, allowing you to daisychain other SCSI devices. The controller has a 64K buffer memory. You place your disc in a caddy before inserting it in the slot in the front of the drive.

This CD-ROM drive is capable of audio playback and provides audio line outputs on the back and a stereo headphone jack on the front. You also get a program that allows you to play your music CDs on the drive. In addition to being able to eject a caddy with the eject button and an emergency eject hole on the front of the unit, you can also use an eject program to eject the disc using only a software command.

If you're considering a CD-ROM drive, the Sony package is a good choice. It contains everything you need to get started except CDs. It's very easy to install, and since it's a Sony, you can bet that it'll be around for a long time.

TROY TUCKER

Circle Reader Service Number 307



UNDERSTANDING THE TIMED TEXT DUMP

How quickly can these CD-ROM drives handle text? The Timed Text Dump Test uses our *TIME_IT* program to show the actual elapsed time in minutes, seconds, and hundredths of seconds required to "type" a huge text file (2,551,206 bytes) from a CD-ROM disc file to the PC screen. The source file is PHRASE.CON from Alde Publishing's *The Amazing Moby Lexicon* CD.

—TOM BENFORD, PRESIDENT
COMPUTER PRODUCT
TESTING SERVICES

SUN MOON STAR CD-ROM SET

If you're looking for a capable CD-ROM drive with an impressive bundle of discs, you owe it to yourself to check out Sun Moon Star's CD-ROM Set.

Connecting the drive to the computer was a breeze, but installing the software proved more of a challenge. The installation process alters your CONFIG.SYS and AUTOEXEC.BAT files, and this seemed to be where my problems were. Luckily, the manual explains what you should find when you examine these files, and I found that the default base address of the controller card was the same as the address for another of my peripherals. To correct the problem, I used one of the card's eight jumper settings for different addresses.

I placed the drive between my system box and the monitor to save space on my crowded desk—a convenient setup. The only other challenge I faced in setting up this drive involved the drive door, which apparently popped out of place during shipping. I managed to fish it out easily, however, and loaded and ejected discs normally without the door.

Once I had the drive up and running, trying out the software bundled with the Sun Moon Star was as exciting as opening packages on Christmas morning.



CHOOSING AN INTERFACE

An interface card lets your CD-ROM drive communicate with the host PC, but which kind of card should you choose?

The decision between a SCSI (Small Computer Systems Interface—called scuzzy for short) and a proprietary interface is a personal one, since many manufacturers offer their drives interfaced either way. For example, the Hitachi CDR-3600 comes with a Hitachi proprietary interface, while the Hitachi CDR-3650 (virtually the same drive except for buffer size) is configured for a SCSI interface. Proprietary interfaces are commonly sold separately, adding to the cost of the drive (typically \$100–\$150 more). The SCSI interface allows daisy-chaining of up to eight SCSI devices, such as additional CD-ROM drives or hard drives, all using the same single interface card. It's not uncommon, however, to have daisy-chaining capability with many proprietary-interface drives as well. For example, the Sony proprietary bus allows for daisy-chaining four CD-ROM drives.

Performance differences between the proprietary and SCSI models of the same drive are negligible (if any exist at all), and in some cases, the proprietary interface actually performs better since it is a custom fit rather than a universal solution.

The "mated pair" proprietary approach very often optimizes the features of a particular drive, such as internal buffer size, and extracts the best performance from both the interface card and the CD-ROM drive itself. The installation/setup procedure is often highly automated with proprietary-interface drives as well.

The SCSI interface provides a standard that is ostensibly hardware independent, thus allowing dealers to sell the same CD-ROM drive to a Macintosh owner (since the Mac has its own built-in SCSI port) or to a PC owner with a SCSI interface kit. Several external drives are *only* available as SCSI models, so that should be taken into consideration when shopping for a drive.

—TOM BENFORD

One disc contains popular games from the Software Toolworks: *Black Hole*, *Life & Death*, *Bruce Lee Lives*, *Chessmaster 2000*, *Gin King/Cribbage King*, *Hunt for Red October*, *Bad Street Brawler*, *Crossword Mania*, *221B Baker Street*, and *Alternate Reality: The City*. Also from Toolworks you'll find *World Atlas* and *Illustrated Encyclopedia*.

Both are topnotch, fun-to-use reference works.

You also get *Microsoft Bookshelf*, which includes *The American Heritage Dictionary*, *Roget's II: Electronic Thesaurus*, *The World Book* and *Book of Facts*, *Bartlett's Familiar Quotations*, and half a dozen other reference aids to writers. Microsoft's *Small Business Consultant & Stat Pack* comes with the package, too.

SUN MOON STAR
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Music fans will appreciate *CD Guide*, an up-to-date listing of almost everything that has to do with CD music.

The Sun Moon Star comes with an earphone jack and volume control that make it convenient for listening to your favorite musical disc while working at your computer.

In all, despite its large footprint and somewhat flimsy door, the Sun Moon Star CD-ROM drive works well and faster than I expected. The amount of software that accompanies this drive is truly awesome, making the total value of this package something to consider when shopping for a CD-ROM drive.

TOM NETSEL

Circle Reader Service Number 308

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(817) 390-3300
List Price: \$399.95
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Warranty: one year,
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Service Plan:
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TANDY CDR-1000

The Tandy CDR-1000 CD-ROM is easy to install if you have a spare 5¼-inch half-height bay in your PC, an empty slot in your expansion bus, a Phillips-head screwdriver, and an adventurous spirit. (If you have all but the screwdriver or the adventurous spirit, your local Radio Shack will install the CD-ROM for you.)

It provides the advantages of CD-ROM for a bargain price of only \$399.95. Tandy isn't known for its price leadership, preferring to make a name for itself providing the widest availability of products and service. Still, the under-\$400.00 price is a breakthrough, particularly when you consider



that this CD drive is one of the few that meet or exceed Microsoft's multimedia standard of 150K per second data transmission.

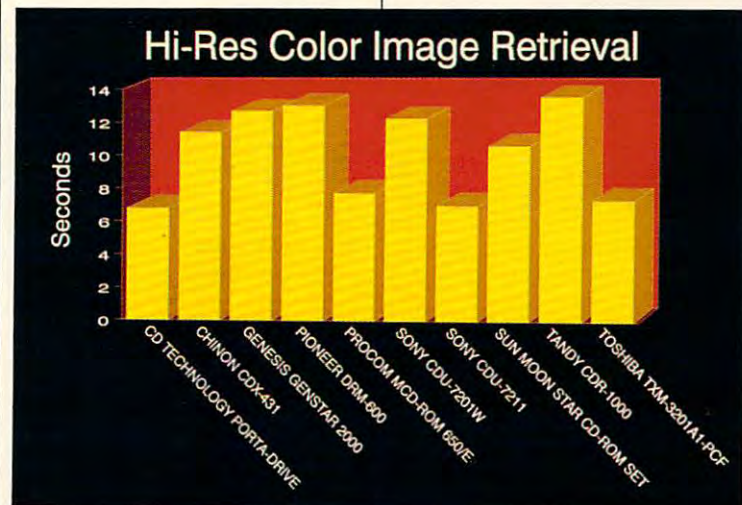
Though the data transmission is very rapid, the CDR-1000 access time is 800 milliseconds—almost a full second to find a particular piece of data on the CD, which means that if you are using your CD for heavy-duty database access, you should look for a faster (and more expensive) unit. Since the CDR-1000's forte is streaming information quickly to the computer once it is found, it's particularly suited to playing games and other applications where animation is important.

To load a CD, you slide the entire unit forward like a bureau drawer. When it's nearly all the way out of the machine, you can lift a

UNDERSTANDING THE HI-RES COLOR IMAGE RETRIEVAL TEST

The Hi-Res Color Image Retrieval Test shows the actual elapsed time, in seconds and hundredths of seconds, required to retrieve three high-resolution scanned color images. Each bar represents an average of three image retrieval times. U.S. postage stamps from Nimbus Information Systems' *Romware Magazine* CD are the source of images used in this test.

—TOM BENFORD, PRESIDENT
COMPUTER PRODUCT TESTING SERVICES



TEST LAB

hinged lid to expose the CD area. Unlike many CD-ROMs, the CDR-1000 doesn't use a CD caddy. You simply place the CD in the unit as you would in a portable CD player. One less piece of cyberjunk to clutter your office.

Recognizing that the CDR-1000 will be the first upgrade many users make to their basic machine, Tandy put the manual/installation guide together with the novice in mind. It covers installation and use of the CD-ROM very gradually in step-by-step procedures.

The CDR-1000 is capable of playing audio CDs as well as reading data CDs. It features a headphone minijack and volume control in the front panel. The back of the expansion card features two female RCA jacks, allowing you to connect the player to your stereo. The audio CD can be controlled from the command line or from the control panel that supports a mouse. It will continue to play when you start up another application, so you won't have to make a choice between playing music and using your computer productively.

The performance, features, and price of Tandy's CDR-1000 are sure to attract attention in today's increasingly important CD-ROM drive market.

ROBERT BIXBY

Circle Reader Service Number 309

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Warranty: one year

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TOSHIBA TXM-3201A1-PCF

Now's a great time to buy a CD-ROM drive. By the time you read this, Microsoft will have released its multimedia extensions for *Windows*, and the number of new CD-ROM titles will be growing exponentially. Manufacturers are falling all over each other as they try to gain the edge on price and features.

If you're the kind of person who buys conservatively—who wants a product to have a proven track record before you'll consider buying it—take a good look at Toshiba's TXM-3201A1-PCF. It's considered by many to be the workhorse of the currently available CD-ROM drives and is one of the first drives that fully meet Microsoft's multimedia specifications.

It's also a highly versatile drive—you can buy an internal version (XM-3201B, \$600) or an external version is available with either a PC interface kit (TXM-3201A1-PCF, \$950) or a Mac interface kit (TXM-3201A1-MAC, \$850). The PC kit includes a SCSI card and requires an available slot, but you can also plug the TXM-3201 into a standard parallel port with a MiniSCSI (Trantor Systems, 5415 Randall Place, Fremont, California 94538; 415-770-1400; \$179).

If you're new to CD-ROM drives, you'll appreciate that this one is easy to install. You simply run a setup program that writes the necessary drivers to your hard drive and adds a few lines to your AUTOEXEC.BAT and CONFIG.SYS files. The PC interface kit is manufactured by Future Domain for Toshiba and includes a half-slot SCSI adapter card and a special SCSI cable. A word of warning—although the Future Domain SCSI cable looks like a standard Macintosh SCSI cable, it isn't wired the same way. If you

THE HISTORY OF SCSI

SCSI was originally based on the architecture of the block-multiplex channel commonly used on the early IBM mainframe computers. This channel had the ability to communicate with several peripherals simultaneously. The SCSI specification for personal computers was approved in 1986 (ANSI X3.131-1986). After Apple's and Commodore's adoption of SCSI, IBM finally offered a SCSI bus as standard equipment on some PS/2 models in 1989.

The SCSI standard has provided outlines for several commands pertaining to different device types

such as hard drives, printers, and tape backups. It also defined physical characteristics such as pin assignments and cable types. While it all looked good on paper, in reality there were often conflicts when several SCSI-interfaced peripherals were simultaneously accessed. The main problem stemmed from too much flexibility in the specification. The result—some peripherals significantly deviated from what was intended to be a "standard." Device conflicts and compatibility problems cropped up frequently.

—TOM BENFORD

All Benchmark/Performance Testing is conducted by Computer Product Testing Services (CPTS), an independent testing and evaluation laboratory based in Manasquan, New Jersey. Every effort has been made to ensure the accuracy and completeness of this data as of the date of testing. Performance may vary among samples.

hook the cable to a Mac, you could damage your computer.

The drive worked fine with every CD-ROM disc that I tried—there was never any loss of data, the sound was clear and steady (a stereo headphone jack is located on the front of the unit), and the SCSI software drivers were always able to locate the drive.

It's not covered well in the manual, but you can also play audio CDs on the TXM-3201. In order to do this, you have to set the last DIP switch (in the back of the unit) to the up position. Place an audio-CD disk in the caddy—just as you would a CD-ROM disk. To move to the next audio track, press the Open/Close button for less than a second. Unfortunately, you can't go backwards or move randomly through the tracks. To eject the disk, press the Open/Close button for more than a second.

For a solid and reliable CD-ROM drive that has weathered the test of time, Toshiba's TXM-3201A1-PCF is an excellent choice.

DAVID ENGLISH

Circle Reader Service Number 310

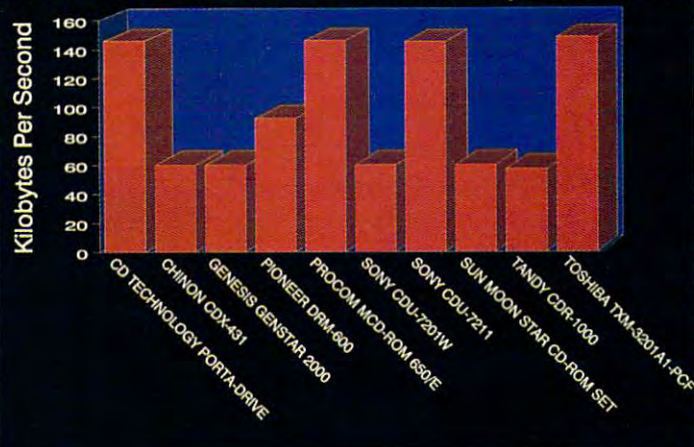
SCSI-2

SCSI-2 (still a draft as of this writing—not yet an officially adopted standard) seeks to alleviate compatibility problems by providing more stringent hardware design guidelines, additional device commands, better error handling and recovery, and enhanced logic for signal routing and device sharing. It should be noted that not all SCSI adapter cards can support newer peripherals built to conform with SCSI-2 protocols, so check the compatibility with your dealer before purchasing to avoid problems and headaches.

If you'd like more information on SCSI and SCSI-2, you can contact ANSI (American National Standards Institute), 1430 Broadway, New York, New York 10018.

—TOM BENFORD

Actual Transfer Rate for the Speed Test



UNDERSTANDING THE SPEED TESTS

We ran these and the other tests using a 16-MHz 386 SX with 2MB RAM and a 512K VGA card attached to a high-resolution monitor.

The speed tests provide two kinds of statistically significant data: the actual transfer rate of the CD-ROM system and the elapsed time for a transfer of a CD-ROM file to the screen.

Here's how the tests worked. We transferred the CAPTIONS.NAM file (1,257,344 bytes) on the Compton's Multimedia Encyclopedia disc to the screen using our CD-SPEED program while at the same time running our TIME_IT program (a stop-

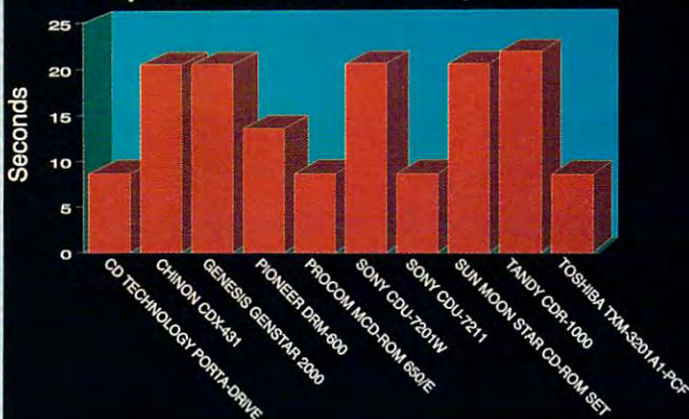
watch program).

The bar graph for actual transfer rates shows the speeds achieved by particular drives as they transferred the CAPTIONS.NAM file to the screen in 16K blocks. The industry standard transfer rate is 150K per second. There are differences in these actual rates because of differences in controller technologies, buffers, and software.

The elapsed time bar graph shows how long it took to make the transfer.

—TOM BENFORD, PRESIDENT
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Elapsed Time for the Speed Test



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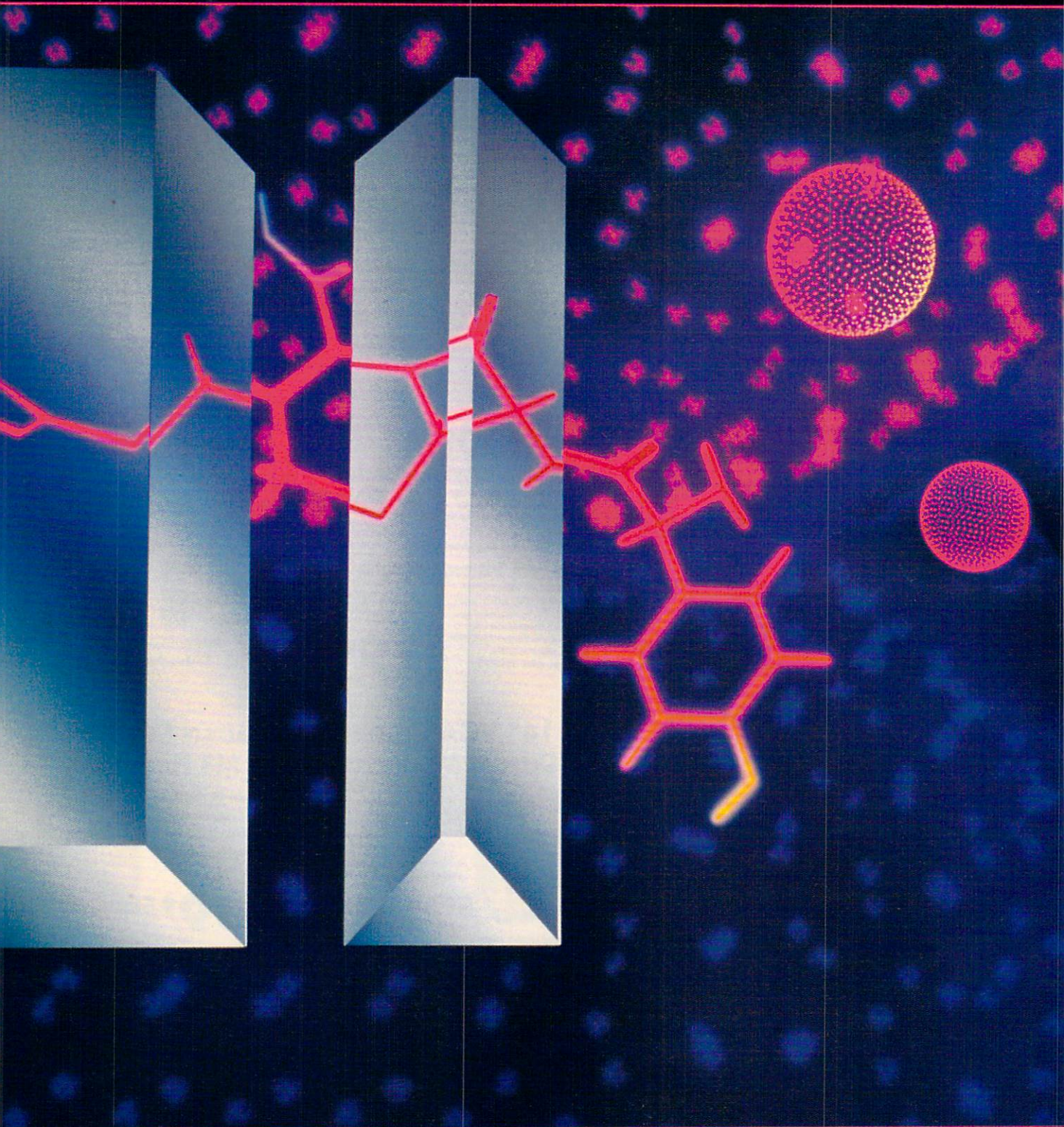
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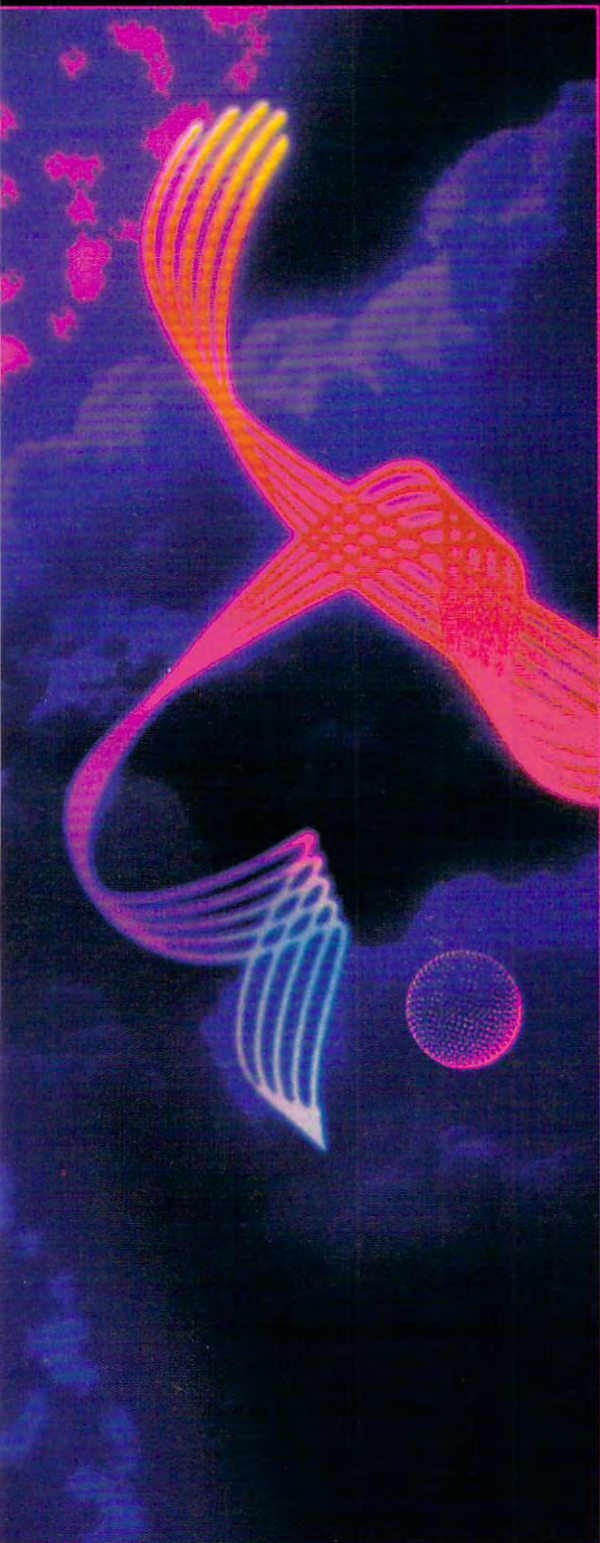
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C O M P U T E R VIRUSES F R O M A T O Z

By Mark Minasi

You've heard about computer viruses—those mysterious, malevolent programs that enter your computer in the dead of night and zap all of your data. Some virus experts say we'll see thousands of different viruses floating around the computer world in the next few years. Like Chicken Little, these pundits predict the computer sky will fall, ending computing as we know it. Others say that these virus experts *need* users to be afflicted with virus hysteria so they can keep their jobs. What's going on? Here's the who, what, why, where, and how of viruses.

Virus is a term in popular use that refers to any of a group of unwanted programs—the weeds in your computer garden. By the way, the term is a metaphor only—you can't catch a virus from your computer.

Why are there viruses? Simply put, a virus is a form of computer crime, and often it's not even a particularly inspired crime. Microcomputing has grown up in an atmosphere of trust and cooperation, freeing PC operating environments from the clutter of security systems—much like a rural neighborhood that hasn't had to lock its doors for years.

This open environment has left an opportunity for a few cowardly programmers to create these destructive programs. Believe me—there's not much to writing a virus that runs on DOS machines. There's no more ingenuity in writing one of these than there would be in robbing houses in the aforementioned neighborhood.

The media-inspired vision of virus authors as a class of super programmers is misinformed. They're just maladjusted twerps looking for some attention in a particularly destructive way.

Parts of a Virus

A virus has two parts, which I'll call the infector and the detonator. They have two very different jobs. One of the features of a computer virus that separates it from other kinds of computer programs is that it replicates itself so that it can spread (via floppies transported from computer to computer, or networks) to other computers. That's what the infector does.

After the infector has copied the virus elsewhere, the detonator per-

forms the virus's main work. Generally that work is either damaging data on your disks, altering what you see on your computer display, or doing something else that interferes with the normal use of your computer.

Here's an example of a simple virus, the Lehigh virus. The infector portion of Lehigh replicates by attaching a copy of itself to COMMAND.COM (an important part of DOS), enlarging it by about 1000 bytes.

So let's say you put a floppy containing COMMAND.COM into an infected PC at your office—that is, a PC that is running the Lehigh program. The infector portion of Lehigh looks over DOS's shoulder, monitoring all floppy accesses. The first time you tell the infected PC to access your floppy drive, the Lehigh infector notices the copy of COMMAND.COM on the floppy and adds a copy of itself to that file.

Then you take the floppy home to your PC and boot from the floppy. (In this case, you've got to boot from the floppy in order for the virus to take effect, since you may have many copies of COMMAND.COM on your hard and floppy disks, but DOS only uses the COMMAND.COM located on the boot drive.)

Now the virus has silently and instantly been installed in your PC's memory. Every time you access a hard disk subdirectory or a floppy disk containing COMMAND.COM, the virus sees that file and infects it, in the hopes that this particular COMMAND.COM will be used on a boot disk on some computer someday.

Meanwhile, Lehigh keeps a count of infections. Once it's infected four copies of COMMAND.COM, the detonator is triggered. The detonator in Lehigh is a simple one. It erases a vital part of your hard disk, making the files on that part of the disk no longer accessible. You grumble and set about rebuilding your work, unaware that Lehigh is waiting to infect other unsuspecting computers if you boot from one of those four infected floppies!

The Worm That Turned

The term for any program that replicates itself, like the infector part of a virus, is a *worm*. Some viruses are pure worms, like the much-publicized Internet worm. This worm ran on minicomputers linked on the Internet network. It made multiple copies of itself in a minicomputer, forcing the computer to waste time executing the worms, slowing down response time for legitimate users. It also copied itself to other computers on Internet, spreading so quickly that it brought the entire network to a halt.

Such a program will not affect PC users, since there are no PC-based networks that can call your computer up and dump messages on it automatically. The kinds of worms found in viruses generally work by injecting copies of themselves into executable programs.

This one fact simplifies the task of antiviral programs. A virus can only infect either an executable program—ones with a COM, EXE, SYS, BIN, or OVL extension—or the area of a disk called the boot sector. We can then talk about two kinds of viruses: program infectors and boot sector infectors.

DOS Boot

A boot sector is a program and data area on a disk that contains a small program that is essential to the initial boot-up process. The unusual thing about the boot sector is that it is not a file. In fact, it lies completely outside the part of the disk that contains files.

The only way to become infected from a boot sector infector virus is to boot from an infected floppy. Think about that for a moment. The only disk you should ever boot from anyway is the original DOS floppy, and that's write-protected, so it couldn't contain a virus unless the Microsoft original was infected. You really never have to boot from any other floppies except for a few old games, so being careful not to boot from floppies is one simple way to avoid virus infections.

That simple advice is quite powerful. More than 70 percent of the viruses out there are boot sector infectors rather than program infectors. Of the five most common viruses found in the U.S., three are boot sector infectors.

Merely making a habit of keeping the floppy drive door open when you boot will instantly make you invulnerable to more than half the viruses out there. (What should you do about the other kind, the program infectors? They're a bit tougher, so hang on for a few more column inches, and I'll get to them.)

Whether a boot sector or program infector, all infectors' *modi operandi* are similar. When you turn your computer on, the virus is not active until the infected portion is loaded. In the case of a boot sector infector, that's immediately upon boot-up, since that's when the boot sector is executed.

For a program infector, the virus becomes active when you run the infected program. For example, if 1-2-3 were the only infected program on your PC, the virus would only be active from the time you ran 1-2-3 until you turned the PC off.

Once active, the virus looks for pro-

grams or boot sectors to infect. While your hard disk has only one boot sector, a program infector may slowly infect every program on your hard disk. Boot sector infectors will infect boot sectors on floppies inserted in your floppy drives, and program infectors will infect any programs on those floppies. The infection process—a sort of COPY command—is very quick, and it generally won't be noticed by the PC's operator.

Note that because viruses can only be spread by booting from floppies with infected boot sectors or by running infected programs, you cannot become infected by a data file—that is, a 1-2-3 spreadsheet, a *WordPerfect* document, or a *dBASE* database cannot spread viruses.

Tick, Tick, Tick

The detonator is usually called a time bomb or logic bomb. It's a piece of code embedded in a program or the operating system itself that waits for a particular event to occur. When that event occurs, the bomb goes off, doing some kind of damage.

Logic bombs have been around nearly since the beginning of computing. An early one showed up in a mainframe payroll program. The program's creator had inserted a clause in the payroll program that said, in effect, "If you find I'm not on the payroll, erase all payroll files."

A time bomb is based on a related idea, but it detonates according to the clock. For example, the detonator portion of the most common virus in the U.S., one called Jerusalem-B, goes off every Friday the 13th. Whenever you try to run a program, it erases the program instead. On other days, it only does minor annoying things to your screen. The detonator program in the Lehigh example is a logic bomb. It says, "Once you've made four copies, do the damage."

Many detonators are fairly harmless, although an annoying intrusion on the use of your PC. The Cascade virus causes letters on your screen to fall to the bottom of the screen. No data's been damaged, but it does make using the computer difficult.

The New Zealand virus, also known as Stoned or Marijuana, occasionally keeps your computer from booting, displaying the message *Your PC is now Stoned*. (There's also a message in the virus saying, *Legalize Marijuana*, but due to a bug in the virus, this message never gets displayed.)

The Fu Manchu virus makes childish, obscene comments whenever you type *Reagan*, *Thatcher*, or *Botha*.

Yankee Doodle, from Bulgaria, plays "Yankee Doodle" on the PC

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speaker at 5:00 p.m.—freeing the workers, as it were.

Bouncing Ball or Italian causes a character to dislodge itself from its original location on the screen and bounce around the screen, Pong-style. A few viruses have no apparent detonators at all, making them pure worms.

Other detonators are quite destructive. Erasing the FAT is a popular virus pastime. Additionally, the extra time required by the infection process when performing disk reads or writes may cause some PCs to erroneously report a timeout error on the floppy drive.

If you'd like to see what some of the flashier viruses look like, get a copy of VIRSIMUL.ZIP, a harmless simulation of several viruses. You can find it on the bulletin board of the National Computer Security Association (NCSA). NCSA's BBS number is (202) 364-1304; its voice number is (202) 364-8252. NCSA also sells books on viruses and computer security.

Vectors of Infection

First of all, don't worry too much about viruses. You may never see one. There are just a few ways to become infected that you should be aware of. The sources seem to be service peo-

ple, pirated games, putting floppies in publicly available PCs without write-protect tabs, commercial software (rarely), and software distributed over computer bulletin board systems (also quite rarely, despite media misinformation).

Call up computer repairpersons, and what's the first thing they'll probably do? Boot your system from a diagnostic disk. I've seen three cases in the past year of clients being infected by third-party service people with diagnostic disks that were infected. Of course, the serviceworker didn't know the disks were infected. But be sure to ask that any service personnel run their diagnostic disks through a virus checker like VIRUSCAN (I'll discuss virus checkers in a minute) before putting them in your machine.

Many viruses have spread through pirated—illegally copied or broken—games. This is easy to avoid. Pay for your games, fair and square. I've toured many software companies, and believe me—these are not large faceless corporations. Most are small operations with fewer than thirty employees.

If you use a shared PC or a PC that has public access, such as one in a college PC lab or a library, be very careful about putting floppies into that PC's

drives without a write-protect tab. Carry a virus-checking program and scan the PC before letting it write data onto your floppies.

Despite all the media hype, computer BBS systems are usually free of viruses. To be really sure, you could download files only from big services like BIX, GENie, or CompuServe.

Now and then you'll see viruses accidentally included with shrink-wrapped software. Scary as that sounds, it's not really something to worry about—the number of cases of that in the PC world can be counted on one hand, with fingers left over.

Search and Destroy

Despite the low incidence of actual viruses, it can't hurt to run a virus checking program now and then. There are actually two kinds of antivirus programs: virus shields, which detect viruses as they are infecting your PC, and virus scanners, which detect viruses once they've infected you.

Virus shields sound attractive—keeping the virus from infecting your PC in the first place—but they suffer from a major flaw that makes them useless in many cases. There's no real way to detect virus behavior; a shield can only detect *viruslike* behavior, such as soft-

The Dental Flossopher
Vol. I No. 1

Well, I have finally gotten around to writing my own newsletter. This is not a professional printer's job by any stretch of the imagination, but I hope to inform and entertain those who are precious to me, my patients.
Thank you,
Dr. Jeff Ausen

Something to Cheer About?

I think so, but that is the question surrounding the current debate in dentistry over whether amalgam (things) tired materials of a technology - these composites. Amalgam has served the dental profession for many years, and there are more reasons of the mercury level would a hard to imagine any technique or could approach of both longevity performance. Now, however, I think it is time that to an end. Why do this? Because sites do not definition

After all the decay has been removed from a tooth, it is weaker because it has a hole in it. If amalgam is to be placed, that hole must be made even larger, which further weakens the tooth. The amalgam that is then placed does nothing to strengthen the tooth that is filled. With composites the opposite is true. In fact, because composites are bonded into place the finished restored tooth is stronger than it was before it was decayed! In other words, the result is stronger virgin tooth. This is absolutely revolutionary.

Concerning the esthetics, or how all seen how those "silver" fillings does not seem important to some patients don't think anyone is looking in their mouth. But, there are the occasional smiles that you notice the black or silver guys. In these situations the preference that can be effected by mixed amalgams, when they fail, composites.

The mercury content of amalgam sensitive issue. The American Dental Association believes that amalgam is safe and that to harm because of the mercury level but there are scientists that disagree. strong movement in the Scandinavian countries to have amalgam outlawed. There have even been demonstrations and marches promoting such a ban. In this country there are presently 14 states that have had.

"This is absolutely revolutionary!"

EXPRESS PUBLISHER DOS
Winter 1991

How Dr. Jeff Ausen keeps his patients smiling between fillings.

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DOS VERSION

ware that directly controls your disk hardware. Unfortunately, there is a lot of legitimate software that directly controls disk hardware, leading to many annoying false alarms. After a while, you'll get tired of the false alarms, and you'll get rid of the software.

Virus scanners, however, are much more convenient. You just run them now and then, and they detect any viruses that your disks are harboring. There are two potential problems with scanners, but both are surmountable.

The first is the sheer number of viruses out there—more than 500, at last count. A virus scanner must be able to detect any of these monsters, a process that makes scanners big, slow, and potentially expensive. At minimum, it means that you'll be buying updates to your virus scanner program a few times per year.

This issue of *COMPUTE's PC Disk* contains a terrific scanner from McAfee Associates, a California firm specializing in antivirus information, software, and consulting. Its program is called *VIRUSCAN*, and it's now at version 77. You can be sure that the McAfee folks stay on top of this market!

For more information on *PC Disk*, see "On Disk" elsewhere in this issue. McAfee requests a \$25 registration fee

for the use of *VIRUSCAN* if you're a household or home office business—not an unreasonable price for a little computer peace of mind.

Larger businesses and government agencies must get in touch with McAfee to negotiate a registration fee. You can reach McAfee at (408) 988-3832 (voice), or you can get *VIRUSCAN* directly from its BBS at (408) 988-4004.

The second potential problem for virus scanners comes from a class of viruses called stealth viruses. In order for a virus to exist on a PC, it must reside somewhere, generally in the boot sector or a program file on the PC's hard disk. So virus scanners look in those areas for distinctive signatures that characterize particular viruses.

But stealth viruses foil scanners. They monitor attempts to read the part of the disk that the virus lives in. They then intercept the read attempt and hand the scanner program the image of the disk as it would be if it weren't infected. "Nobody here but us chickens," the stealth virus says.

How do you get around stealth? Simple. Stealth only works if the virus is active—if it's been loaded from the infected hard disk. Just cold-boot from a write-protected floppy before running any virus scanner, and you're safe

from stealth. Ensure that the boot floppy was made with *DISKCOPY* using your original write-protected DOS startup disk after cold-booting from that original startup disk.

What do you do if you find that you are infected? If a program file is infected, simply erase it from your hard disk and restore a clean copy from your backups. If you have an infected boot sector, most virus scanners will create a clean, uninfected boot sector, eliminating the virus; if worst comes to worst, you could remove an infected boot sector by backing up your disk, then low-level formatting, partitioning, and high-level formatting the disk, although measures that drastic shouldn't be necessary.

Viruses are something to worry about, but not a lot. A little common sense and the occasional virus scan will keep you virus-free. Remember these four points:

- Viruses can't infect a data or text file.
- Before running an antivirus program, be sure to cold-boot from a write-protected floppy.
- Don't boot from floppies except reliable DOS disks or your original production disks.
- Stay away from pirated software. □

May 1991
Mike's Airline and Fun Schedule

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 Fix Sprinklers	2 Bil Anzaboh Basin	3 Bil Croyer Mtn.	4 Kinetic Sculpture Race in Boulder
5 San Jose State "Aero-Crash" Beach Party Santa Cruz	6 3:11pm DEN-RTL :35 STL-DEN 8:13pm	7 3:11pm DEN-RTL :35 STL-DEN 8:13pm	8 3:11pm DEN-RTL :35 STL-DEN 8:13pm	9 3:11pm DEN-RTL :35 STL-DEN 8:13pm	10 OFF	11 Work on Car
Home each night			Los Angeles			
12 Target Practice	13 9:40am DEN-SEA :34 SEA-LAX 3:54 LAX-PDX 8:47pm	14 3:40pm FOX-LAX 1:30 LAX-DEN 10:42pm	15 3:11pm DEN-RTL :35 STL-DEN 8:13pm	16 3:11pm DEN-RTL :35 STL-DEN 8:13pm	17 Limousine, Tarasco, Burmuda Shorts night on the town!	
Los Angeles			OFF			
19 Rozel	20 9:40am	21	22 3:11pm DEN-RTL :35 STL-DEN 8:13pm	23 3:11pm DEN-RTL :35 STL-DEN 8:13pm	24 John in Town for 3 days	
OFF			OFF			
27 Suzanne in Town for 3 days	28 3:11pm DEN-RTL :35 STL-DEN 8:13pm	29 3:11pm DEN-RTL :35 STL-DEN 8:13pm	30 3:11pm DEN-RTL :35 STL-DEN 8:13pm	31 Train for 150mi bike ride in July		
OFF			each night			

CALENDAR CREATOR PLUS

How pilot Mike O'Neal keeps on schedule between flights.

Before he takes off, Mike uses his PC and Calendar Creator Plus* to merge his busy flight and ground schedules into one great-looking calendar. So he and his friends and associates always know what he's up to. **Time management is a breeze.** Schedule personal appointments, departmental meetings and the office

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ON DISK

Tony Roberts

DEBUG YOUR COMPUTER WITH VIRUSCAN

This issue's edition of *COMPUTE's PC Disk* includes a variety of programs that nearly everyone will find useful. These programs were selected from among hundreds we downloaded from bulletin boards and online services.

You can get all the programs on this month's disk or subscribe to a year's worth of *COMPUTE's PC Disk* (which in-

The wide open spaces are yours with Big Desk. It turns your Windows desktop into a huge virtual workspace that's eight screens wide by eight screens high.



cludes a subscription to *COMPUTE*) by sending in the coupon you'll find on the second page of this column.

Please note that the shareware programs featured on our disks are yours to test and evaluate, but if you find the programs useful, you should send the registration fee to the author.

Registering shareware has several benefits. First, registered owners receive notification of program updates and often are entitled to free upgrades. Also, many shareware authors send additional programs as a bonus when you register. Finally, by supporting shareware authors, you encourage them to continue making high-quality, low-cost, try-before-you-buy software available for PC users everywhere.

VIRUSCAN

In every facet of our lives these days, we're forced to be more security conscious. Computers are no exception, especially if they hold thousands of dollars' worth of data or hundreds of hours' worth of your work.

You can read all about computer security in this issue's feature called "Viruses From A to Z" by Mark Minasi on page 44. With *VIRUSCAN* you can take the first steps to protect yourself against possible disaster.

VIRUSCAN, from McAfee Associates, is one of the most widely respected virus detection utilities available today. This program checks your disks for the presence of more than 243 known computer viruses. McAfee works hard to continually update the software to identify newly discovered viruses.

With options for checking files, disks, or memory for viruses, *VIRUSCAN* also sets exit codes, so you can run it from batch files, and its reports can be directed to data files for later reference.

Registration for home use of *VIRUSCAN* is \$25 and includes free downloads of updated versions from McAfee Associates' BBS for one year. In addition, McAfee offers registered home users free information on removing viruses.

If you trade disks with your friends or associates, or download files from bulletin boards, you increase the risk of introducing a virus into your system. Running *VIRUSCAN* regularly can eliminate your fears that a hidden virus

may lurk within your PC. The small registration fee is well worth that peace of mind.

Useful Notes

Here's an information manager that can help you organize the scraps of paper that accumulate on your desk and in your pockets.

Useful Notes, which can run as a stand-alone program or as a memory-resident utility, could be described as a freeform database of computerized Post-it Notes. Notes can range in size from a word or two to thousands of characters.

Need to remember a phone number? Create a note and jot it down. Keep doing this, and soon you'll have a pile of notes that you can sort, edit, and organize. If *Useful Notes* is running memory resident, you can pop it up with a keystroke, locate that phone number, and pop back to your main application in a flash.

Useful Notes allows you to create as many piles of notes as you like, so you can separate business notes from home notes; or if you share your computer, you can separate Mary's notes from Tom's.

Michael Gardi's *Useful Notes* is shareware and carries a \$20 registration fee. Registered users receive an update with the most recent version of the program, plus a version of *Useful Notes* that includes EMS support.

Mr. Filter

This is a program for the toolbox. You won't need *Mr. Filter* every day, but you'll be glad it's there when you do need it. Programmer Jim Gillespie describes *Mr. Filter* as "the first line of defense in dealing with corrupted text files." His goal was to create a quick and easy way to fix files that won't print or can't be called up in your word processor.

POINT & CLICK

Clifton Karnes

NEW ENSEMBLE, HOT NEW DOS

There's good news this month for *GeoWorks Ensemble* users. GeoWorks has released an update that adds features many of us have been waiting for (GeoWorks, 2150 Shattuck Avenue, Berkeley, California 94704; 415-644-0883).

The biggest story with *Ensemble 1.2* is that *GeoWrite*, the program's word processor, has been transformed from a desk accessory into a full-fledged writing tool that comes with a search-and-replace engine and a 100,000-word spelling checker.

Both writers and designers

more of *Ensemble* in the future. GeoWorks has announced deals with Laser Computer, Philips, Samsung, Everex, and others to bundle the package with these companies' PCs. Added up, this will mean more than 600,000 additional copies of *Ensemble* in circulation. More *Ensemble* users mean more incentive for publishers to develop programs for the environment.

DOS 5.0

Windows, *Ensemble*, and *DESQView* have one thing in common: If you look below the fancy windows and dialog boxes, you'll find DOS. These environments sit on top of DOS and use DOS services, and so in a sense, they're DOS enhancements. That's why they're called interfaces or environments rather than operating systems.

Does it matter which version of DOS you're using with your GUI?

If you're running DOS programs, it matters a great deal. That's why Microsoft's release last June of DOS 5.0 (Microsoft, One Microsoft Way, Redmond, Washington 98052; 206-882-8080; \$99.95) isn't just important news for command line addicts; it's significant for GUI aficionados, too.

From the first, you'll sense that this version of DOS is different. DOS 5.0 comes with the best installation program I've seen. It walks you through each step of setup and even saves information about your previous DOS configuration so you can *uninstall* 5.0 and return to your older version if you want.

You won't want to go back,

though. Just a few minutes with 5.0 will convince you it's the wave of the future. Here's a rundown of what's new.

First, 5.0 has impressive memory management facilities that allow you to load DOS itself into high memory on 286 and 386 machines and load device drivers and TSRs into high memory on 386 computers. When you're running a DOS app from *Windows* or *Ensemble*, you'll have *much* more room for your programs. After installing 5.0, I have about 615K free left over in *Windows* that I can use to run my DOS programs.

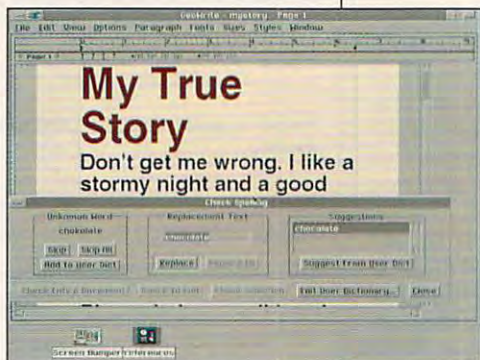
Programmers will be glad to find that an interpreter-only version of *Microsoft QuickBASIC* has replaced *GW-BASIC*. And everyone will be glad to see *EDLIN* finally made obsolete by *EDIT*, an excellent text editor with pull-down menus and full mouse support.

DOS 5.0's *DIR* command is actually useful. Instead of the bleak display option served up by previous versions, this *DIR* comes with a ton of switches that allow you to display directory information in almost any shape or form. There's even an option that displays files in all of a directory's sub-directories. Plus, you can set these switches as an environment variable so you don't have to type them each time you issue the command.

Last, there's *DOSKEY*, a new command line retriever. It stores your most recently used commands in a buffer for quick recall. This kind of program is necessary for extensive command line work, and it's great that DOS finally has this type of command.

All in all, DOS 5.0 is *very* impressive. No matter which GUI you're running, 5.0 will give it more elbow room and make the time you spend at the command line more productive and enjoyable. □

**GeoWorks
shouts out one
message
loud and clear:
Upgrade now!**



will be glad to hear that printer support has been beefed up for this new release, too, with drivers for more than 300 additional printers.

Topping the list of other enhancements are an *Ensemble* version of the Russian game *Tetris*, more than 50 added icons for the DOS room, and more screen savers.

All this certainly sounds good, but here's the best news: This upgrade is being sent *free* to registered users of *Ensemble*. Now that's class! If you're a first-time buyer, the updated retail version, which lists for \$199.99, should be available in stores by the time you read this.

We're going to be seeing

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The Oregon Trail: Regular Price: \$49.95 Travel with a pioneer family across the 19th century wilderness, learning how to survive. Available for IBM and Apple II, ITEM NUMBER 6



The New Print Shop: Regular Price: \$59.95 The most popular graphics software in history. Print your own cards, banners and signs. Printer required. Available for IBM and Apple II, ITEM NUMBER 7



Mixed-Up Mother Goose: Regular Price: \$39.95 Help Mother Goose find the missing pieces to her rhymes. Available for IBM and Apple II, ITEM NUMBER 8



Stepping Stones I & II: Regular Price: \$49.95 From early reading to addition, spelling and vocabulary. Colorful graphics. Available for IBM (enhanced version) and Apple II, ITEM NUMBER 9

SOFTWARE SELECTION GUIDE

Key to Colors:

- Ages 3-7
- Ages 7-10
- Ages 10-13+



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925 Oak Street, Scranton, PA 18515 Dept. TARA A1

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Name _____
Address _____
City _____ State _____ Zip _____
Telephone () _____

1. Please send me item number _____ to preview. (Please fill in identification number of program shown above.)

2. AGE of child (check one):
 3-7 7-10 10-13+

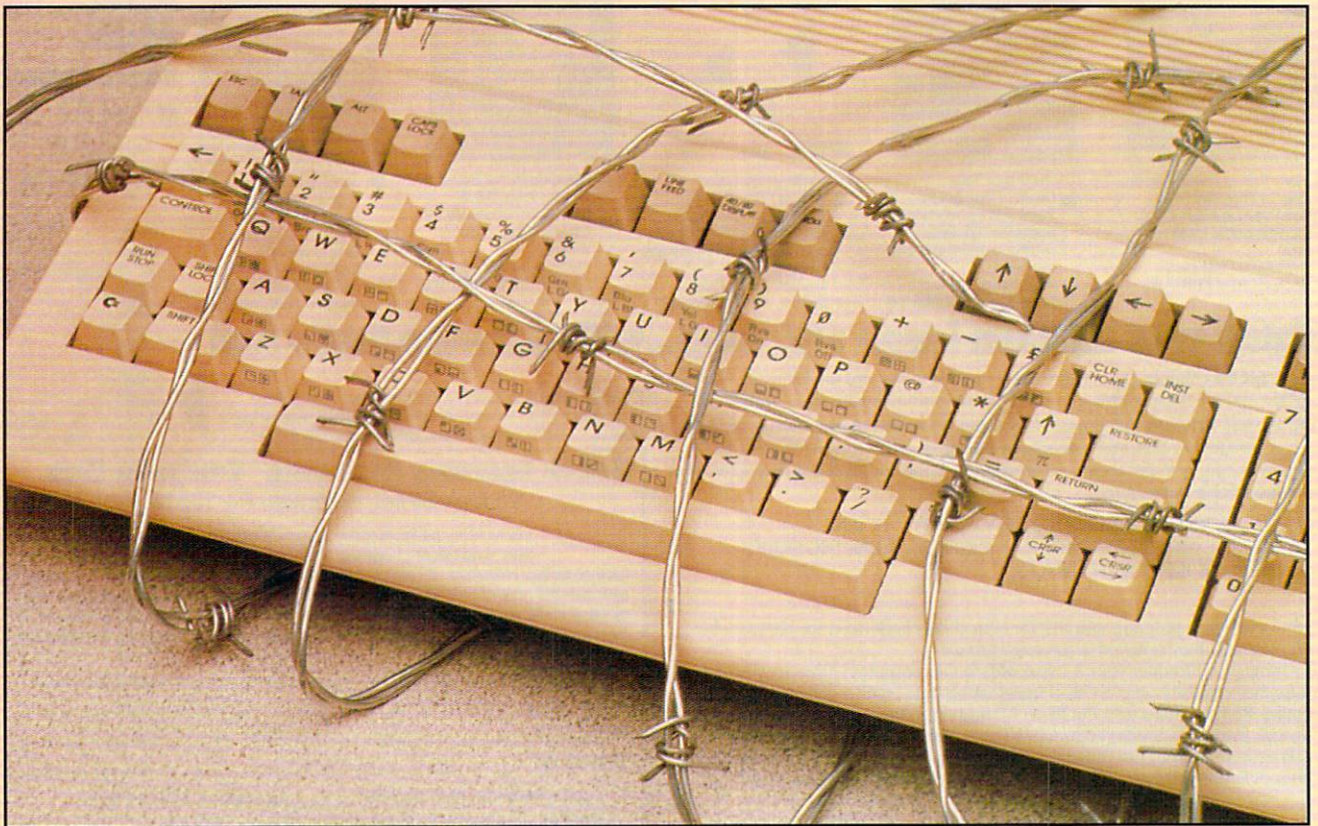
3. Computer you own and size of disk required (check one):
 IBM/Tandy & Compatibles with 5 1/4" disk drive
 IBM/Tandy & Compatibles with 3 1/2" disk drive
 Apple II Family & Compatibles with 5 1/4" disk drive

4. Child's name _____
Child's birthdate: Month _____ Day _____ Year _____

5. Please check below if you have a:
 Printer Modem Color Monitor

6. Parent's Signature _____
We reserve the right to request additional information or reject any application or cancel any membership. Limited to new members in the continental USA only excluding AK. Sales tax will be added in PA. We'll send you details of the club's operation with your enrollment shipment, and you have a 15-day no-obligation privilege to decide if you wish to continue as a member.

BUYER'S GUIDE TO VIRUS PROTECTION SOFTWARE



BY
CHANTELLE OLIGSCHLAEGER
AND
ERIN RICHTER

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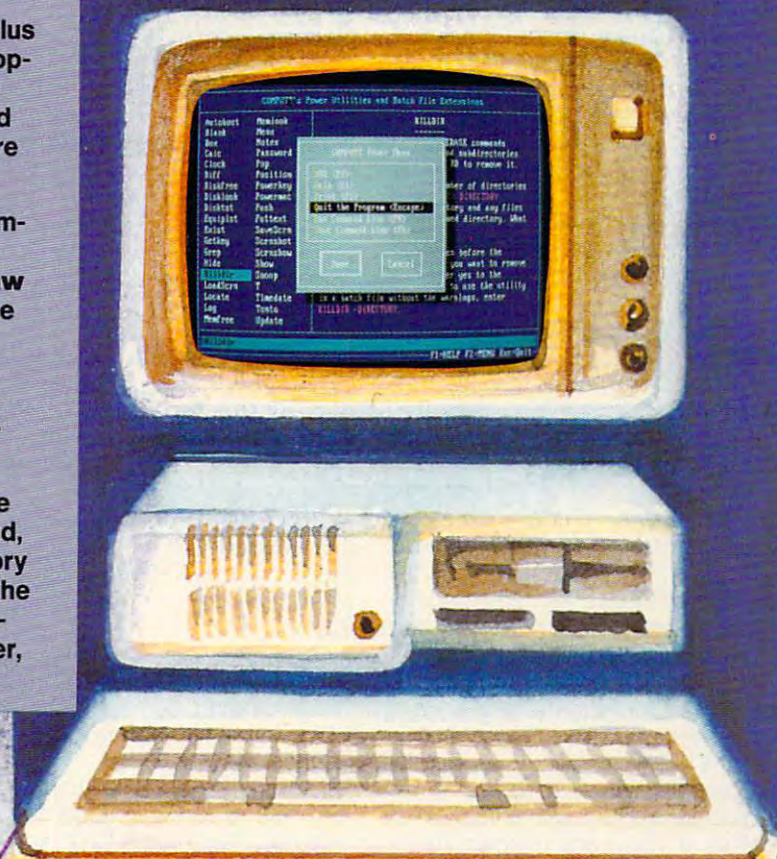
The power utilities alone are worth many times the cost of this disk. Imagine! Programs to speed up your keyboard, edit disk files, edit and search memory, find a specific text string in disk files—plus memory-resident programs such as a pop-up calculator, a programmer's reference tool, an editable macro key program, and a graphic screen-capture utility, and more all included on this jam-packed disk.

Our batch-file extensions add new commands to standard batch-file language. Now you can easily create menus, draw boxes, and write strings in your choice of colors anywhere on the screen—all with simple, easy-to-use commands. Then, add some zest to your batch files with a command that lets you play a series of notes!

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www.commodore.ca

Although your chances of encountering a computer virus are slim, protecting yourself with the right software can give you peace of mind. You may opt to use a resident program that continually monitors your system; you may want to scan new software before you install it. No matter what level of virus protection you're after, you'll find the software you need in this buyer's guide.

Anti-Virus 1.0

Requirements: DOS 3.0 or higher, 512K. *Windows* supported.

Spectrum of viruses: Protects against 400 viruses.

Defense: Memory-resident program removes 95 percent of viruses that it recognizes from infected files, boot sector, or memory. Also immunizes files, giving them their own antivirus capabilities to notify user of any changes and to "heal" themselves.

Network support: Yes.

Customer support: Central Point Software offers a 24-hour virus hotline, quarterly mailings on new virus signatures and upgrade offers, online support on BBS and CompuServe (GOCENTRAL), and a free virus-protection software update coupon.

Comments: Virus Update command allows users to enter newly discovered virus signatures into *Anti-Virus*.

CENTRAL POINT SOFTWARE

15220 NW Greenbrier Pkwy., Ste. 200
Beaverton, OR 97006
(800) 445-4208—customer service
(503) 690-8080—technical support
\$129

AntiVirusPlus

Requirements: DOS 3.0 or higher, 256K.

Spectrum of viruses: Not applicable.

Defense: Memory-resident program prevents any penetration of viruses into files and disks. It does not detect individual virus signatures, but it does send a warning if there is hostile activity. *AntiVirusPlus* also monitors DOS function calls, allowing the user to run an infected program without activating the virus. It scans and removes the virus code from the infected files as it reconstructs the original data.

Network support: Yes.

Customer support: Telephone, fax, and BBS.

Comments: Site licenses available.

TECHMAR COMPUTER PRODUCTS

97-77 Queens Blvd., Ste. 812
Rego Park, NY 11374
(800) 922-0015
(718) 997-6666
\$99.95 (Network prices differ.)

Certus 2.1

Requirements: DOS 3.1 or higher, floppy drive and 128K needed for installation, 3K to 10K needed when resident. Compatible with *Windows* 3.0.

Spectrum of viruses: Protects against more than 300 viruses and variants.

Defense: Memory-resident program detects, identifies, and removes viruses and variants in the computer's memory, boot tracks, and files. Can be configured to prevent infected files from running or to prevent infected files from being copied to or from a system.

Network support: Yes.

Customer support: Toll-free telephone and BBS support. Free quarterly upgrades included with purchase of maintenance program (cost depends on purchase price). Otherwise, upgrades cost \$25 each.

Comments: Corporate licensing is available.

CERTUS INTERNATIONAL

13110 Shaker Sq.
Cleveland, OH 44120
(800) 722-8737
\$189 (LAN version for \$1,399.)

CLEAN-UP

Requirements: DOS 2.0 or higher, 256K.

Spectrum of viruses: Protects against 62 viruses as of June 20, 1991.

Defense: Stand-alone program disinfects by removing the viral code and re-writing the cleaned program.

Network support: Yes.

Customer support: Telephone.

Comments: *CLEAN-UP* is shareware.

MCAFFEE ASSOCIATES

4423 Cheeney St.
Santa Clara, CA 95054-0253
(408) 988-3832
\$35

Dr. Solomon's Anti-Virus Toolkit

Requirements: DOS 2.0 or higher, 512K. Supports *Windows* and OS/2 by booting from DOS.

Spectrum of viruses: Detects more than 450 viruses and variants.

Defense: Stand-alone program guards against duplicate infections, protects from outside infections, and inoculates against specific viruses. Checks all the executable files, boot sector, and hard disk partitions. Looks for the patterns that viruses create, enabling it to check for unknown viruses.

Network support: Yes.

Customer support: Telephone and fax support. Includes first year of quarterly upgrades.

Comments: Site licensing available. Software supplied on read-only disks.

ONTRACK COMPUTER SYSTEMS

6321 Bury Dr.
Eden Prairie, MN 55346
(800) 752-1333
\$279.95 for one year, Virus Immunization Program available for an additional \$395.00 per year.

Flu-Shot+ 1.82

Requirements: 256K. Compatible with *Windows*.

Spectrum of viruses: Protects against more than 500 viruses.

Defense: Memory-resident and stand-alone programs monitor system and stop operation if anything suspicious occurs. Does not disinfect.

Network support: Yes.

Customer Support: Free support is available by telephone, BBS, and CompuServe E-mail. Discounts on upgraded software are available for registered users.

SOFTWARE CONCEPTS DESIGN

594 Third Ave.
New York, NY 10016
(212) 889-6431
\$19 (Includes shipping and handling.)

HardDrive Overlord!

Requirements: DOS 3.0 or higher, 275K. Compatible with *Windows* 3.0.

Spectrum of viruses: Not applicable.

Defense: Memory-resident program detects viruses on disks and hard drives by monitoring activity and notifying the user if any problems occur that could be virus related. Authenticators validate programs to ensure that they have not been damaged by a virus. They also check a program's footprint to ensure that it matches the one on file.

Network support: Yes.

Customer support: Telephone.

Comments: Site licenses available.

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Requirements: DOS 3.0 to 4.0, 640K. Compatible with *Windows* 3.0.

Spectrum of viruses: Not applicable.

Defense: Memory-resident program protects files from any unauthorized changes and keeps unauthorized files from running on computer.

Network support: *NetAssure* is available for each workstation; *NetServer* is available for the file server.

Customer support: Toll-free telephone.

Comments: *PC/Assure* offers security features in addition to virus protection.

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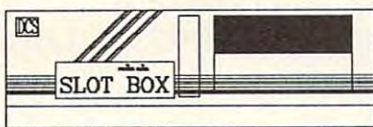
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11400 Commerce Park Dr.
Reston, VA 22091-1506
(703) 758-7000
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PC-cillin 3.0

Requirements: DOS 2.1 or higher, 6K, one 25-pin parallel port.

Spectrum of viruses: Four-stage program detects and prevents all known and future viruses, quarantines viruses coming from external sources. Hardware Immunizer provides automatic boot-sector damage recovery. Supplies option to remove infected file but does not repair it. Hardware Immunizer contains 1Kb of nonvolatile EPROM memory.

Defense: Device driver and memory-resident program check files, file allocation tables, and the system RAM. Allows a choice of three virus detection sensitivity levels, user definable virus warning messages, and automatic on-line scan for boot sector viruses. Contains built-in self-check.

Network Support: Yes.

Customer support: Toll-free telephone, fax, and BBS support. Updates free for first year through BBS. At the end of first year, upgrades will cost 15 percent of the list price.

Comments: One-year warranty. Site licensing available. Fully compatible with newly developed or upgraded memory management systems, including QEMM, 386Max, and DR DOS 5.0.

TREND MICRO DEVICES

2421 W. 205th St., Ste. D-100
Torrance, CA 90501
(800) 228-5651

\$139 (PC Rx, a software-only version of PC-cillin, is available for \$69. Package includes discount coupon to upgrade with hardware.)

SENTRY

Requirements: DOS 2.0 or higher, 256K.

Spectrum of viruses: Not applicable.

Defense: Stand-alone program creates a log file of system and compares it to the computer's current state. It displays a warning if there's a discrepancy.

Network support: No.

Customer support: Telephone.

Comments: This is a shareware program.

MCAFFEE ASSOCIATES

4423 Cheeney St.
Santa Clara, CA 95054-0253
(408) 988-3832
\$25

Vaccine Toolkit 4.0

Requirements: DOS 2.0 or higher, 256K. Compatible with Windows 3.0.

Spectrum of viruses: Scans for and detects more than 400 viruses. When a virus is detected, it offers options to delete the file, leave the file as is, or provide description of the virus for reference.

Defense: Combined memory-resident and stand-alone programs check boot sector files, executable-type files, and overlays. The software utilizes a listing of virus signatures to detect the presence of known viruses and warns user of potential virus activity through creation of executable file checksum. To avoid false alarms, the software can be "taught" which programs on the system are safe.

Network support: VacNet is similar to Vaccine Toolkit but specifically designed for networks. Retail price \$99.95.

Customer support: Toll-free telephone, fax, and BBS support. Updates released approximately monthly on BBS.

Comments: Site licensing and volume discounts available.

WORLDWIDE SOFTWARE

20 Exchange Pl., 27th Floor
New York, NY 10005
(212) 422-4100
\$99.95

Virex-PC

Requirements: DOS 2.1 or higher, 512K. Compatible with Windows 3.0 and Novell networks.

Spectrum of viruses: Detects more than 70 viruses.

Defense: Memory-resident program repairs files damaged by the most common viruses. Once a system is disinfected, the program monitors it to prevent any other virus attacks. The program creates a signature for each file and notifies the user if any changes have been made.

Network support: Yes.

Customer support: Microcom offers virus upgrades on a quarterly basis. Users can subscribe for \$75 or buy each update for \$25. Microcom can be accessed through America Online; it also offers a free file analysis through that network.

Comments: Site-license discounts available; Virex-PC also detects any activities of the Trojan Horse program. Virex is also available for Macintosh computers.

MICROCOM

3700-B Lyckan Pkwy.
Durham, NC 27707
(919) 490-1277
\$129.95

Virucide 2.2

Requirements: DOS 2.11 or higher, two floppy disk drives or a hard disk drive, any monitor or printer, 256K.

Spectrum of viruses: Detects and destroys all currently known viruses as of May 1991, a total of 490 boot, file, and stealth viruses, including those that reside in memory.

Defense: Stand-alone program scans floppy, hard disk, and network drives. Restores affected files to normal whenever possible. Provides descriptions of all known viruses. Able to run unattended. Lets users add to default extensions for scanning overlays.

Network support: Yes.

Customer support: Telephone and fax support. Includes an online reference file containing detailed descriptions of all known viruses. Includes the availability of upgrades (approximately quarterly) as new strains develop. If an upgrade is released within 60 days after purchase, the upgrade is free. After that it costs \$12.

Comments: Site licensing available. Runs in less than a minute under most circumstances. Menu-driven format.

PARSONS TECHNOLOGY

375 Collins Rd. NE
Cedar Rapids, IA 52402
(800) 223-6925—direct sales
(800) 369-5000—dealer sales
\$49

Virusafe 4.02

Requirements: DOS 3.0 or higher, 512K. Compatible with Windows and DESQView.

Spectrum of viruses: Recognizes over 260 known viruses, removes over 160. Updated regularly.

Defense: Memory-resident program seeks, identifies, and removes known viruses in programs. Also checks programs for virus-related changes and guards against new virus attacks.

Network support: Yes. A special feature notifies users of virus in any part of the network.

Customer support: Telephone and fax.

Comments: Site licenses are available for Virusafe. Multisafe, which gives the user control over who uses the computer, is also available for \$180.

XTREE

4330 Sante Fe Rd.
San Luis Obispo, CA 93401
(805) 541-0604
\$99

VIRUSCAN

Requirements: DOS 2.0 or higher, 256K.

Spectrum of viruses: Detects 760 viruses as of June 20, 1991.

Defense: Stand-alone program scans all drives for known viruses. It identifies and locates the virus on the system.
Network support: *NETSCAN* is the network file-server version of *VIRUSCAN*. It checks the file server only, while individual stations require *VIRUSCAN*. Its price depends upon the number of units using this program.
Customer support: Telephone.
Comments: *VIRUSCAN* is shareware.

MCAFEE ASSOCIATES
4423 Cheeney St.
Santa Clara, CA 95054-0253
(408) 988-3832
\$25

Virus Checker

Requirements: IBM PC or compatible.
Spectrum of viruses: Approximately one-third of all viruses.
Defense: Stand-alone program checks disks to see if they have been infected. If it finds a virus, it will alert the user of the infection. It can only detect viruses in EXE files.
Network support: No.
Customer support: Telephone and mail.
Comments: This is a freeware program that can be backed up with *Super Virus Checker* for \$25. *Super Virus Checker* uses six programs that more thoroughly detect or remove 99 percent of known viruses.

LEITHAUSER RESEARCH
4649 Van Kleeck Dr.
New Smyrna Beach, FL 32169
(904) 423-0705
Free

VirusCure Plus

Requirements: DOS 2.1 or higher, 256K.
Spectrum of viruses: Detects more than 500 viruses and removes more than 240.
Defense: Memory-resident program scans memory and prevents viruses from entering the system. If a virus is detected, the program will destroy it before it infects any files. It also repairs and restores damaged files.
Network support: Yes.
Customer support: Telephone, BBS, 24-hour Virus Helpline. Registered users may have free upgrades for two years after purchase. Afterwards, users can buy four upgrades for \$30.
Comments: Site licenses available.

INTERNATIONAL MICROCOMPUTER SOFTWARE
1938 Fourth St.
San Rafael, CA 94901
(800) 833-4674
\$99.95

Virus Prevention Plus

Requirements: DOS 3.1 or higher, 512K.
Spectrum of viruses: Detects more than 400 viruses.
Defense: Stand-alone program prevents unauthorized use of the PC, "fingerprints" all approved programs to tell if program has changed, prevents unapproved programs from running, prevents writing to the boot and partition sectors, detects viruses, scans new and existing programs, and removes viruses.
Network support: Yes.
Customer support: One hour of free telephone support, upgrades for six months after purchase.
Comments: This program uses McAfee Associates' *VIRUSCAN* for detection of viruses. It can also be used with McAfee's *NETSCAN*.

PC GUARDIAN
118 Alto St.
San Rafael, CA 94901
(800) 288-8126
(415) 459-0190—inside CA
\$124.95 (With *VIRUSCAN*, add \$25.00.)

VIRUS-PRO

Requirements: 512K.
Spectrum of viruses: Not applicable.
Defense: Stand-alone program detects any changes to installed software. It also maintains records and checks new scan files against old scan files.
Network support: Yes.
Customer support: Telephone.
Comments: *Corporate VIRUS-PRO* assigns an identifier to each PC and also has a Baseline to compare software with the corporate standard.

INTERNATIONAL SECURITY TECHNOLOGY
515 Madison Ave., Ste. 3200
New York, NY 10022
(212) 288-3101
\$49.95 per copy, single-PC version. Volume discounts available. *Corporate VIRUS-PRO* costs between \$5 and \$15 per PC depending on the number of PCs using the program.

Virus Secure

Requirements: DOS 3.0 or higher, *Windows* 3.0, 1MB.
Spectrum of viruses: Guards against more than 300 varieties of known computer viruses as well as unknown ones, expandable to over 500 through free BBS.
Defense: Stand-alone program scans every file, selected file types, specific directories, or any combination for changes in files. Drives may be included or excluded from disk scans.

Network support: No.
Customer support: Telephone and BBS support. Updates will be available through data information networks, as well as other more traditional means.
Comments: Site licensing available.

ABACUS
5370 52nd St. SE
Grand Rapids, MI 49512
(616) 698-0330
\$95

Virus Stopper 2.01

Requirements: IBM PC or compatible.
Spectrum of viruses: 99 percent of all viruses.
Defense: Memory-resident program helps prevent the spread of viruses from one disk to another. The program also prevents any damage to the system by displaying a warning to the user so that action can be taken.
Network support: No.
Customer support: Telephone and mail.
Comments: This is a shareware program.

LEITHAUSER RESEARCH
4649 Van Kleeck Dr.
New Smyrna Beach, FL 32169
(904) 423-0705
\$10

Vi-Spy 6.0

Requirements: DOS 2.0 to 4.0, 128K.
Spectrum of viruses: Identifies 20 known viruses.
Defense: Memory-resident program checks for known and unknown viruses by showing a map of the system's memory and checking each area for any differences that could be viruses. It also checks disks when they are first entered into the drive.
Network support: Yes.
Customer support: Telephone. Registered users are notified of any updated information; emergency support is available using an ASCII text file.
Comments: Site licenses available. Version 7.0 will soon be available, but the price was not known at press time.

RG SOFTWARE SYSTEMS
6900 E. Camelback Rd., Ste. 630
Scottsdale, AZ 85251
(602) 423-8000
\$250

VSHIELD

Requirements: IBM PC or compatible, DOS 2.0 or higher, 256K.
Spectrum of viruses: Protects against 760 viruses as of June 20, 1991.
Defense: Memory-resident program scans for known viruses and then monitors all program load requests.

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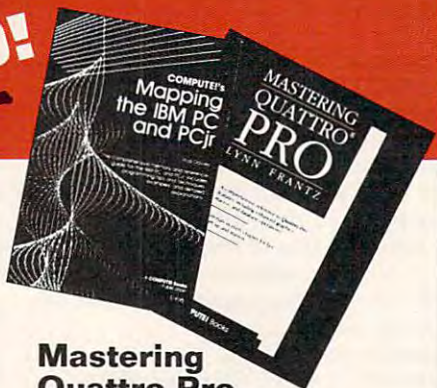
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VSHIELD prevents infected programs from being loaded and infecting the system.

Network support: It does support workstations, but not file servers.

Customer support: Telephone.

Comments: This is a shareware program.

MCAFFEE ASSOCIATES

4423 Cheeny St.

Santa Clara, CA 95054-0253

(408) 988-3832

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WATCHDOG PC Data Security

Requirements: IBM PC, PS/2, or compatibles with a hard disk drive and one floppy disk drive. DOS 2.1 or higher or IBM OS/2 1.1 Standard and 1.1 Extended required. Also compatible with *Windows 3.0*; 17K required for Basic Security; 0K to 50K required for Maximum Security depending on EMS memory available.

Spectrum of viruses: Detects, thwarts, and reports common computer viruses.

Defense: The program (device driver in CONFIG.SYS) prevents a virus from altering or destroying any DOS system file, including the files used to boot the PC from the hard disk and the files used to operate the PC. Protects disk drives, directories, program and data files, and utilities by placing them within the security environment.

Network support: Yes.

Customer support: Toll-free telephone support. One major upgrade per year with other upgrades released when necessary. Upgrades are free with membership (\$35 per year) in the maintenance program. Otherwise, upgrades are \$50 each.

Comments: Site licensing available. (Virus protection is one part of overall security software that features ID and password control, multiple user permission levels, automatic file encryption, and audit trails.)

FISCHER INTERNATIONAL SYSTEMS

4073 Merchantile Ave.

Naples, FL 33942

(800) 237-4510

\$295 (Standard retail; 1/2 card option, called WATCHDOG Armor, \$445.)

Chantelle Oligschlaeger and Erin Richter worked with *COMPUTE* this past summer as participants in the American Society of Magazine Editors 1991 Magazine Internship Program. Chantelle is a rising senior at the University of Missouri in Columbia. Erin was recently graduated from the University of Texas in Austin. The entire staff wishes them the best of luck. □



INTRODOS

Tony Roberts

KEYBOARD RESHUFFLE

How would you like to have your own set of DOS function keys? Using the ANSI.SYS device driver, which extends the keyboard and screen functions of DOS, you can establish your own personal set of keyboard macros.

If ANSI.SYS, which is part of the DOS package, isn't installed on your system, add the line `DEVICE=ANSI.SYS` to your `CONFIG.SYS` startup file. (If `ANSI.SYS` is stored in a directory other than your root directory, be sure to include the complete path so DOS can locate the file.)

`ANSI.SYS` allows you to re-define keys through ANSI escape sequences. The general format for an escape sequence is the combination of the Escape character (ASCII 27), the Left Bracket character ([), one or more decimal numbers or strings separated by semicolons, and a Command character.

To create an escape sequence for key redefinition, load the word processor or text editor you use to modify your `AUTOEXEC.BAT` and `CONFIG.SYS` files. Make certain your editor can save unformatted ASCII files or text files.

These commands can't be entered directly from DOS because the commands must contain the Escape character. As you may know, pressing the Esc key in DOS clears the command line—not the effect we're trying to achieve.

Enter the lines below, substituting the Escape character for the letters `ESC` at the beginning of each line. (In many word processors, you can simply press the Esc key to generate the Escape character.)

```
ESC[0;67;"DIR A:"P
ESC[0;68;"DIR A:"13P
```

The numbers 0;67 and 0;68 are the extended character codes for the F9 and F10 keys respectively. The first of the two lines above assigns the string `DIR A:` to the F9 key. The second line adds a carriage return (ASCII 13) to the same command and assigns the string to F10.

Save the file under the name `KEYS.ANS`; then go to DOS and execute the command `TYPE KEYS.ANS` to install the new key definitions. Press the F9 and F10 keys to see how the two versions of the command behave.

Using this procedure, you can assign strings to function keys to run favorite programs with a single keystroke or to simplify data entry chores.

For example, if you're entering name and address information into a label program and you're working on a local list where nearly everyone lives in your hometown, you can save time by putting the string `HOMETOWN, STATE ZIP` on a function key.

Here in Greensboro, North Carolina, we have several ZIP codes, but they all begin with 274. I define my function keys to include `GREENSBORO, NC 274`. I simply press the assigned key, enter the last two digits of the ZIP code, and quickly move to the next record.

There are a few things to keep in mind when using ANSI key redefinitions. First, you can't redefine too many keys. The `ANSI.SYS` driver only allows about 200 characters of redefinitions.

Second, many programs re-define the function keys for their own purposes. When you use those programs, your key definitions will be suspended until you return to DOS.

Third, DOS itself uses a few of the function keys. You're free to redefine them, but you'll overwrite the DOS defaults.

DOS uses keys F1–F6 as command line editing keys.

Lastly, the keys are redefined using your environment space. Make sure you have enough allocated in your `CONFIG.SYS` file. Here's a line from a `CONFIG.SYS` file that gives the environment 512 bytes.

```
SHELL=COMMAND.COM /P/E:512
```

Redefined keys stay in force until you change them or reboot. If you develop a set of redefinitions that you use regularly, you may want to place them in your `AUTOEXEC.BAT` file, so they take effect each time you boot up.

To do this, either have your `AUTOEXEC.BAT` execute the command `TYPE keyfile`, where *keyfile* is the name of the file that stores your redefinitions, or add the `ECHO` command to each of your key redefinitions and include the redefinitions right in the `AUTOEXEC.BAT` file.

For example, `ECHO ESC[0;66;"CHKDSK";13P` reprograms the F8 key to run the `CHKDSK` program on the default disk.

If you're ready to begin setting up your own personal macros, you'll need the extended character codes for the function keys. They are 0;59–0;68 for F1–F10, 0;84–0;93 for Shift-F1–Shift-F10, 0;94–0;103 for Ctrl-F1–Ctrl-F10, and 0;104–0;113 for Alt-F1–Alt-F10.

The 0 that precedes each of these code numbers tells `ANSI.SYS` that the following value is an extended character code. If you leave off the 0, `ANSI.SYS` treats the number you supply as an ASCII value.

You could, if you wanted, re-define the lowercase *a* (ASCII 97) to be an uppercase *A* (ASCII 65) with the command `ESC[97;65P`. To return a changed key back to normal, assign it to itself as in `ESC[97;97P`. □

Create your own set of keyboard macros with a DOS program that you already have.

PROGRAMMING POWER

Tom Campbell

ASSEMBLY MEANS SPEED

This issue's program is a good example of both the benefits and the perils of programming in assembly. It's tiny, but its 100 lines would only require 10 or 12 lines in a higher-level language.

FMFD.COM is a utility that does nothing more than send a form feed to the specified printer. Some text editors and other text-processing tools (such as DOS's COPY command with LPT as the destination) don't offer the courtesy of forcing a page break when a partial page of text is printed. While it's true that you can reach over and push the form feed button on your printer, you may need to perform this operation from a batch file.

The syntax of FMFD is FMFD *port*, where *port* is an optional parallel port number from 1 to 4. If you omit the number, port 1 is assumed. Here are some examples: FMFD, FMFD 1, FMFD 3. The first two examples send a page break to LPT1. The third example sends it to LPT3. If you use a serial port for your printer, you're out of luck.

The first section of FMFD.ASM consists of equates. Like the #define in C, they serve as a single-object text-replacement facility. Assemblers make a secret first pass at your code so they can collect equates and macros (we'll get to macros shortly); then they expand them into a temporary file, which is actually the file that gets assembled. In MASM and TASM, the /L option creates a file with an LST extension exposing the inner workings of macros and equates. The line FormFeed EQU 12 means that we can later use FormFeed instead of a literal form feed character (which would corrupt the

source file) or the number 12 and that the assembler will replace it with 12 internally. You can also use the equal sign for equates.

The PrintMsg macro looks like a subroutine, but it isn't. Macros, like equates, work via text replacement, but they allow parameters and aren't restricted to a single line. So instead of *PrintMsg BadChar*, the assembler will see, on its second pass, this code:

```
mov dx, es
mov ds, dx
mov dx, offset BadChar
mov ah, 9
int 21h
```

The .Model directive, pioneered by Microsoft in MASM 5, is new to assemblers. Its purpose is to make multilanguage programming easier by automatically supplying different default values for procedure calls and data (near versus far in both cases).

No doubt Microsoft's own programmers got tired of writing similar but not identical runtime libraries for all their languages. Ironically, the Tiny model won't work with MASM 5.1, but it will work with 6.0 and QuickAssembler, the one you're more likely to own. Many of QuickAssembler's features couldn't be found in 5.1 but were debuting in 6.0. Tiny will work fine with Borland's Turbo Assembler.

The .Code directive means executable code will follow. You can alternate several .Code, .Data, and .Stack directives in each file, but few do. It's considered good form to collect each element into one location. The .Code directive stands in for the more archaic _TEXT SEGMENT WORD PUBLIC 'CODE'.

It's said that .Code is a simplified segment directive because of this, and that's absolutely true. The old way was

more flexible but is virtually never needed now, except perhaps for writing device drivers. The old segment directives are barbaric and unreadable, and you should be ashamed to use them.

ORG 100h forces execution to start at address 100 hex, or 256 decimal. All COM files do this. While Microsoft tried to prohibit the practice some years ago, even to the point of dropping COM support from every single one of its language products, popular sentiment was overwhelmingly for COM files. The EXE format lets DOS move the program anywhere it needs to (EXE files, in fact, are not completely linked until just before execution starts), but COM files are always at least 512 bytes smaller. This matters if you're using a laptop or a RAM disk. Plus, there's a vast body of source code for COM files free for the asking.

At this point, not a single line of executable code has appeared. That will change. About half of FMFD's 102 bytes are used in parsing the text of the command line, which is located at offset 81h in the PSP. The PSP, or Program Segment Prefix, is a data structure that DOS loads right before your program and which contains lots of useful values. It so happens that in a COM file the segment registers all point to the PSP, so all we have to do to point DS:SI at the command line is write the value 81h to SI.

The LODSB instruction is a nifty little dude that does several things at once. It copies the byte pointed to by DS:SI into AL; then it increments SI to point to the next byte. (The STD instruction can be used to bump SI backward instead.) The command line is terminated by a carriage return (ASCII 13—see the equates), so we simply loop

When speed is essential, assembly language is your ticket for a ride on the lightning bolt express.

until a nonblank character or CR is encountered. Lines like this aren't all that hard to comprehend.

cmp al, CR ; Reached end yet? je @@Finished ; Yes.

The value contained in AL is compared to 13. If they're equal, control passes (via jump if equal) to the code labeled @@Finished. Note that Turbo Assembler treats any labels starting with two @ signs as local to that procedure, so you can reuse generic labels like @@TryNext or @@Exit as often as you want.

CX was set to 0 before starting and is set to 1 if a valid digit is found. If not, CX is still 0, and the default value of 1 is inserted. INT 17h, subfunction 0 writes a byte to the specified printer port whose number is written to DX. Port 1 is 0, Port 2 is 1, and so on. The instruction SUB AL, '1' normalizes the ASCII digit by subtracting the value 49 from whatever's in AL, leaving the correct binary value.

While I would normally suggest that you use DOS to open the printer as a file and write to it, using INT 17h has the welcome side effect of omitting nasty messages such as *Abort, Retry, Fail?* if the printer device isn't connected properly or is otherwise engaged. It just waits awhile and then quits. There are times when having only a hundred lines is a virtue!

Finally, instead of the usual RET instruction, the more formal technique of exiting with DOS function 21h, subfunction 4Ch is employed. A RET works in COM files but not EXE files, so I avoid it. While it would save a couple of bytes, FMFD.COM still won't occupy even the smallest possible disk sector. After all, this isn't C or Pascal. We can afford the extra two bytes. □

```
; FMFD.ASM -- Complete program to send a form feed to any printer
;
; To assemble using Turbo Assembler:
;
; TASM FMFD
; TLINK /T FMFD
;

; Equates -- these are text replacements, similar to #defines in C.
CR EQU 13 ; ASCII carriage return.
FormFeed EQU 12 ; ASCII form feed character.
LF EQU 10 ; ASCII linefeed.
Tab EQU 9 ; ASCII tab.

PrintMsg macro Message ; A macro, like an equate, is a
mov dx, es ; text-replacement facility.
mov ds, dx ; This loads the correct data
mov dx, offset Message ; segment and uses DOS function
mov ah, 9 ; 9 to print a '$'-terminated
int 21h ; message.
endm

; The Tiny model allows you to create .COM files. It's identical to
; Small model except that 1) Small requires a .Stack directive, and
; 2) Tiny employs the ORG 100h to start execution at address 256 decimal,
; not changeable as in an .EXE file.

.Model Tiny

; The .Code directive indicates that the code segment starts. It lasts
; until the next .Data or .Stack directive. The code segment is where
; executable instructions go.

.Code

; .COM files start at a fixed location--256 bytes above the PSP, which
; contains information used by many programs. The starting address of an
; .EXE file is not known until runtime. ORG sets the program counter to
; 100 hex, or 256 decimal.

ORG 100h

Begin: ; Leave this in as boilerplate.

Main proc ; A PROC is exactly analogous to
; a PROCEDURE in Pascal or BASIC.

mov si, 81h ; Start at cmd line. Add 1 to
; skip the length byte.
mov cx, 0 ; 0 until a digit is found.

GetNextChar:
; LODSB fetches the next char pointed to by DS:SI into
; AL and then increments SI.
lodsb ; Copy next char into AL.
cmp al, CR ; Reached end yet?
je @@Finished ; Yes.
cmp al, ' ' ; Blank?
je GetNextChar ; Yes. Keep parsing.
cmp al, Tab ; Blank?
je GetNextChar ; Yes.
cmp al, '1' ; Nonblank char. Is
; it in range '1'-'4'?
jl @@BadChar ; LPT4 is the farthest
cmp al, '4' ; I've ever seen.
jg @@BadChar ; Flag that a digit was found.
mov cx, 1

@@Finished:
cmp cx, 0 ; Was a digit found?
jne @@Convert ; Yes. Do nothing.
mov ax, '1' ; No. Default to LPT1.

@@Convert:
sub al, '1' ; Convert to binary and subtract 1.
cbw ; Convert AL to a word in AX.
mov dx, ax ; Copy to DX for int 17h call.
mov ah, 0 ; BIOS int 17h function 0: Write char
mov al, FormFeed ; to printer. Char is in AL.
int 17h ; Send char to printer.

@@DOSExit:
mov al, 0 ; Set ERRORLEVEL to 0.
mov ah, 4Ch ; Return to DOS using
int 21h ; the preferred function call.
endp

@@BadChar:
PrintMsg BadChar ; Load the message's offset address,
jmp short @@DOSExit ; display it to stdout, and quit.

; The .Data directive is where program text and other data values
; appear. The 'db' directive means that everything that follows will
; be written unchanged to the data segment. Messages like the one
; below can use either single or double quotes as delimiters. The values
; CR and LF were defined above, and their literal values will be written
; in as ASCII codes. Don't forget the '$' sign, because DOS function 9
; needs it to end any message it prints.

.Data
BadChar db 'Invalid character. Must be 1-4.', CR, LF, '$'
END Begin
```


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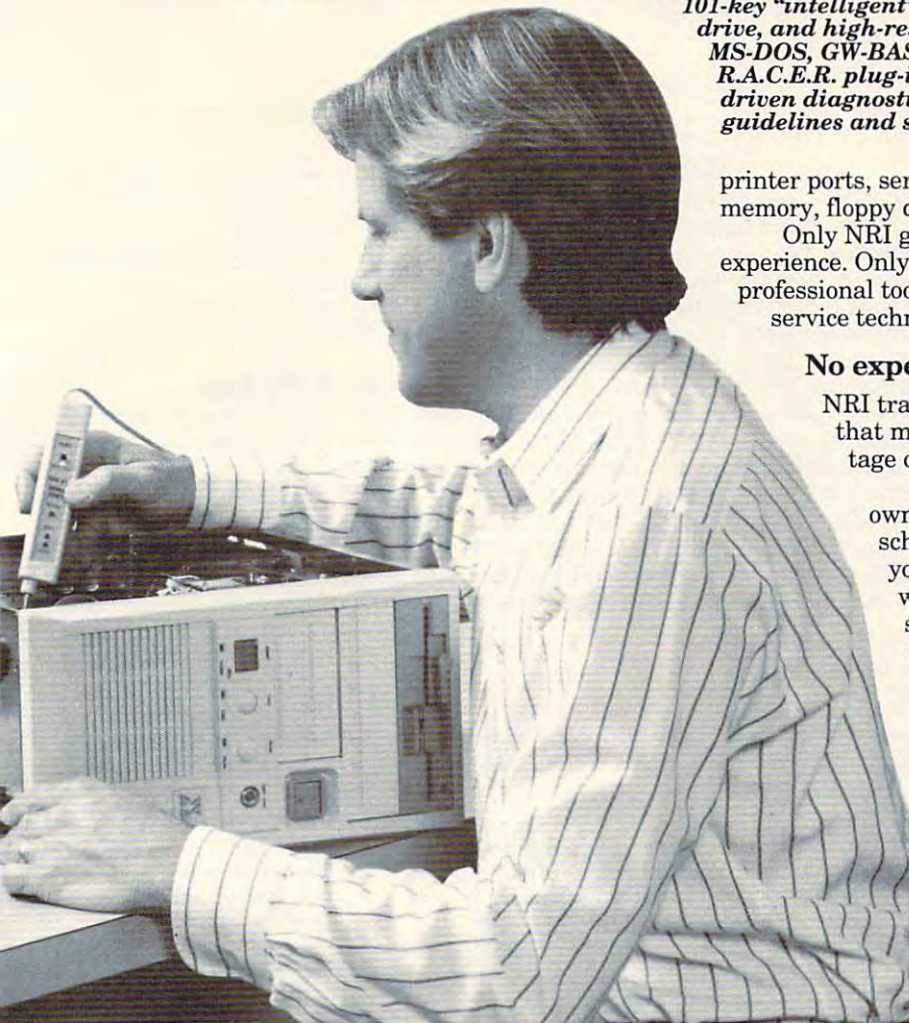


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TIPS & TOOLS

Filed Floppies

Here's a tip for those who have so many floppy disks they can't find anything fast.

Begin by labeling all of your disks and putting numbers on them. Be sure to put the disks in a box in order, where you can easily see the numbers. Then, create a text file with a text editor or word processor in ASCII mode. Make a chart with the disk number, filename, description, and other useful information. Make sure that you don't use any capital letters (or if

Closer Paths

When programs are in your path, it's easy to run them from any directory on your hard drive. But if your path is fairly long and each included directory has a lot of files, you might have a long wait for DOS to find the program. For programs that you run often, there's a way to cut to a small fraction the time it takes DOS to find programs.

Run a text editor and load in your AUTOEXEC.BAT file. Find the PATH statement and notice the order in which the

It took 16 times longer than the first test. My computer is a 386DX that runs at 25MHz. Slower computers compound the delay.

RICHARD C. LEINECKER
REIDSVILLE, NC

Batch File Keys

If you ever write a batch file and try to create even a simple menu, you'll be stuck, since you can't get a keypress from the user and then jump to the appropriate section in the batch file. Here's a way to create a COM file that will wait for a keypress and return it to your batch file as an ERRORLEVEL. The code that is returned is the ASCII code for the key that is pressed.

Make sure that the DOS program called DEBUG is in your path. Enter the following. The computer's prompts are in italic; you type the characters in plain text.

```
C>DEBUG GETKEY.COM
File not found
-E 100 2A E4 CD 16 B4 4C
  CD 21
-RCX
CX 0000
:8
-W
writing 0008 bytes
-Q
```

This creates a program file called GETKEY.COM.

The following program returns all alpha characters in capitalized form.

```
C>DEBUG ALLCAPS.COM
File not found
-E 100 2A E4 CD 16 3C 61
  72 06 3C 7A 77
  02 24 DF B4
-E 110 CD 21
-RCX
CX 0000
:8
-W
writing 0011 bytes
-Q
```

Keep track of floppies, speed up DOS, capture keypresses in batch files, conserve your handles, and operate QuickBASIC rodent-free.

#	Name	Description	Type
1	pkzip.exe	archiving utility	program
2	chapter 1.doc	the first chapter of my book	text document
3	cheeta.gif	gif picture of a cheetah	gif picture

you do, make sure that you enter the search string exactly as it appears in the text file). I've written a sample that I named LIST.TXT.

Next, create a batch file as follows (I call it F.BAT, but you can call it anything you want). Make sure the batch file and the DOS FIND program are both in your path or in the current directory. The F.BAT file will only have one line and look like this.

FIND "%1" LIST.TXT

You can name your text file anything you want. Just make sure you change the string LIST.TXT to match whatever your filename will be.

To find a program, type *F chapter1.doc*, and you'll see the line on which the entry appears. It makes finding floppies easy, and you don't have to run a database program to do it. As long as the batch file and FIND are in the path, you can do a search from any directory.

ROY RAZON
MEITAR, ISRAEL

specified directories appear. DOS will search them in that order to find files that you type from the command line. Directories that contain programs that are used often should be first. That way, DOS will find them right away instead of searching most of the other directories first.

How much time can you save? I wrote a COM program that was three bytes long to reduce the loading time. I then disabled my cache program so I could accurately time disk operations. Next, a batch file was created that ran the small program 50 times (making sure ECHO was off so that screen I/O wasn't a factor, either.)

For the first test I placed the small program in my DOS directory, made the DOS directory the first one in my PATH statement, and rebooted. The batch file ran in about four seconds. I then made the DOS directory the very last entry in my PATH statement and rebooted. The elapsed time for the batch file execution was one minute and four seconds.

Here's a sample batch file that uses the GETKEY.COM program.

```
ECHO OFF
:BEGIN
CLS
ECHO 1.Run QuickBASIC
ECHO 2.Run XyWrite
ECHO 3.Run Windows
ECHO 4.Quit Batch File
:GETTHEKEY
GETKEY
IF ERRORLEVEL 52 GOTO END
IF ERRORLEVEL 51 GOTO
  WINDOWS
IF ERRORLEVEL 50 GOTO
  XYWRITE
IF ERRORLEVEL 49 GOTO
  BASIC
GOTO GETTHEKEY
:BASIC
QB45
GOTO BEGIN
:XYWRITE
EDITOR
GOTO BEGIN
:WINDOWS
WIN
GOTO BEGIN
:END
CLS
```

RICHARD C. LEINECKER
REIDSVILLE, NC

WordPerfect PAGING

In many programs, pressing PageUp or PageDown will move to the previous or next screen of data. In *WordPerfect* pressing those keys will literally move you to the previous or next page. This is especially frustrating when you want to go to the latter part of a page but don't want to scroll through the page line by line. I have found that pressing - or + on the numeric keypad with NumLock off will allow you to move through data screen by screen with the - key moving you to the previous screen and the + key moving you to the next screen.

JIMMY QUACH
PACIFICA, CA

More Efficient Paths

The search path I use is rather long, and it eats up a lot of environment space. Here's the PATH statement.

```
PATH=C:\BATCH;C:\UTILITY;
C:\DOS;C:\NORTON;
C:\WORDSTAR;C:\DBASE;
C:\GRAMMATIK;C:\
```

I save a considerable number of bytes by using the DOS SUBST command in my AUTOEXEC.BAT file. Here's what I've done.

```
\DOS\SUBST F: C:\BATCH
\DOS\SUBST G: C:\UTILITY
\DOS\SUBST H: C:\DOS
\DOS\SUBST I: C:\NORTON
\DOS\SUBST J: C:\WORDSTAR
\DOS\SUBST K: C:\DBASE
\DOS\SUBST L: C:\GRAMMATIK
```

Next, I define my path. D: is my secondary partition and I define E: as a virtual disk.

Add a line to your CONFIG.SYS file like this:

```
LASTDRIVE=x
```

where x is the last valid virtual drive to be recognized by DOS (in my case, L:).

ROBERT R. DWELLEY
ROCHESTER, NY

Tips for Tips

The PC Hot Tip in the January 1991 issue of *COMPUTE* to swap the contents of two files can be improved upon. Here's the example from the January issue.

```
ECHO OFF
CTTY NUL
COPY %1 TEMP.DOC
COPY %2 %1
COPY TEMP.DOC %1
DEL TEMP.DOC
CTTY CON
```

For some reason DOS uses two file handles to perform a CTTY NUL, yet it only frees

one for a CTTY CON. If the batch file above is run very many times, you could wind up with a Too Many Files Open error. Here's my solution to this rather vexing problem.

```
ECHO OFF
COPY %1 TMP.DOC>NUL
COPY %2 %1>NUL
COPY TEMP.DOC %1>NUL
DEL TEMP.DOC
```

BRIAN WREN
SEATTLE, WA

Mouseless QuickBASIC

Help screens. In *QuickBASIC* I discovered by accident that pressing the first letter of any hypertext link jumps the cursor to that topic. If several topics share a first letter, the cursor will cycle among them until you press Enter. And when looking at a QuickHelp or Details screen, Q and D toggle between those links.

Zoom. You can zoom any window using Ctrl-F10, which I often find more comfortable than clicking the zoom icon.

Opening files. Make short shrift of the Open dialog with Tab and the space bar. Press Tab to move to the file list and press the space bar to select a file. The space bar often works where Enter does in the *QuickBASIC* and *Windows* environments, especially for clicking push buttons.

TOM CAMPBELL
IRVINE, CA

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HARDWARE CLINIC

Mark Minasi

TAKING A HARD DRIVE THROUGH ALPHABET SOUP

Growing out of your 40-mega-byte hard drive? You're in good company—plenty of us are looking to upgrade. Up above 80MB, however, there's more to worry about than how big it is.

Computer sellers refer to ESDI, SCSI, and IDE drive types. Some experts even debate the merits, fighting tooth and nail about which is better—ESDI versus SCSI. Here's what all the fuss is about and how to choose the hard drive that's right for you.

First things first: ESDI, SCSI, and IDE are all drive interfaces. No, wait—don't turn the page yet! Give me a minute. To understand what a drive interface is, consider this: You've got a hard drive, and it's attached (inside your computer, of course) to a circuit board called a hard disk controller.

How do they talk to each other? The hard drive and controller must agree on a language—how fast they should communicate with each other, what kind of commands they can pass back and forth, what level of voltage they should use to send information, and other odds and ends. Together, that's what defines the drive interface.

Old Reliable

Currently, you've probably got a drive and controller whose interface is the most common and basic one, called ST506. Having a nice reliable standard like ST506 has served the industry well for the past few years. Because all the hardware vendors understand ST506, you can buy a hard disk from vendor X, connect it to a hard disk con-

troller from vendor Y, and be 99-percent sure they'll work together the first time.

The ST506 interface is good because it's standard, but it's bad because it has limitations that are beginning to chafe. ST506 both limits the disk's data transfer speed and requires too much of the CPU's attention, rendering it less suitable for multitasking environments such as *Windows*.

ST506's maximum data transfer rate of 750,000 bytes per second (750 KBps) must have seemed plenty of room to its designers in the late 1970s.

Even now, most XT's read data from their disks at a maximum speed of 167 KBps, and most AT clones clock in at 250 KBps to 510 KBps. But there are drives available today that could zap out data at 2500 KBps, if their interfaces could handle it.

I know you're thinking, "Only power users need that kind of speed—I don't, not for the things I do." Well, consider this—your computer becomes hundreds of times slower every time it reads or writes to the hard disk. Even the slowest XT has to wait around for its hard disk.

A 16-MHz 386SX's microprocessor could, in theory, benefit from a hard disk that transfers data at a speed of up to 8000 KBps. You'd see an immediate benefit from a faster hard disk interface even if you're already running flat-out at 510 KBps; essentially, it would balance your system's power better.

Adding Some ESDI Smarts

ESDI (Enhanced Small Device Interface) was designed basically as an improved ST506. It's designed to handle a maximum transfer rate of 3000 KBps. It does this partly by moving some of the elec-

tronics from the controller to the drive; it costs a bit more but makes for greater speeds than are possible with an ST506.

The other big difference between ST506 and ESDI is in the basic intelligence in the interface. Under ST506, the microprocessor can't tell the hard disk controller to go to location X on the hard disk and start reading the data that's there.

Instead, the CPU must do most of the work, telling the drive (through the controller) exactly how to move the disk's read head to the location of the data: "Move the disk head a little more . . . now just a little more . . . now just a bit more . . ."

With ESDI, on the other hand, the CPU just says, "Go to location X and read the data there," and then the CPU waits for the controller to do it. It's the difference between being able to tell someone "Go to the living room" and having to say "Take one step forward, then another, and another, and another, then turn left, then . . ." You see ESDI on larger (300MB+) drives.

IDE: A Poor Man's ESDI

It's reasonable to ask, "Why didn't they put some of these nifty ESDI features on ST506 in the first place and save us a lot of trouble?" Mainly because those ESDI features would have cost an arm and a leg back in the late 1970s. But nowadays they're much more affordable. That's why most drive vendors are now offering a low-cost alternative to ST506 drives called IDE—Imbedded Drive Electronics (or Intelligent Drive Electronics, depending on whom you ask).

Like ESDI, IDE puts most of the controller electronics on the drive itself. The data

You've decided to buy a new hard drive. Which kind should you choose—ESDI, SCSI, or IDE?

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is then pumped directly to the CPU at up to 1000 KBps—not as good as ESDI, but better than ST506.

Putting the controller and drive physically together makes IDEs easier to build, which is why IDEs are faster, cheaper, physically smaller, less power-hungry, and more reliable than corresponding ST506s.

There is, of course, one hitch. Many data recovery techniques that are available on ST506 systems can't be used on IDEs. In the words of the chief engineer of a major drive maker, IDEs are disposable. They're great drives, but if anything goes wrong, you throw them—and your data—away. I avoid them at the moment and would recommend that you do the same, but IDE manufacturers claim that they're working on models that are more fixable. When that happens, IDE will hound ST506 out of existence in short order.

SCSI Raises the Ante

While some designers were seeking greater speed (the main goal, recall, of ESDI), others were looking ahead to more sophisticated operating systems. They sought to design an interface that could serve more than just hard disks. This new interface could be used for tape drives, floppies, and optical drives of various kinds, to name but a few.

So computer manufacturers have developed another peripheral interface called Small Computer Systems Interface (which is abbreviated SCSI and pronounced *scuzzy*—an unfortunate acronym, if there ever was one).

Why have SCSI in addition to ESDI? It's simple: SCSI doesn't do what ESDI does. SCSI is a bus manager, not a drive manager. It lets you put up to eight different drives—optical, floppy, whatever—on a single SCSI host

adapter (you don't call them controllers, for reasons that will be clear later in this article).

That assumes, of course, that all of these drives are equipped with a SCSI interface, and it also assumes that SCSI is a solid standard. It actually isn't yet, so in reality your SCSI floppy, hard disk, and tape drives probably couldn't run off the same SCSI host adapter. Things are getting better, however, so in a year or two this scenario will be more likely to come true.

Suppose, then, that you wanted to back up your hard disk to tape and you had both a hard disk and tape that ran off the same SCSI interface. Under the normal ST506, IDE, or ESDI arrangement, the microprocessor would have to do a fair amount of work. It would have to issue commands to first read the data from the



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hard disk, then copy it to the tape drive, read some more, and so on.

A Different Story

With a SCSI interface, however, the story's different. The CPU just says, "SCSI bus, get data X, Y, and Z from the hard disk, and copy that data over to the tape drive. Let me know when you're done."

And in the meantime, the CPU can be busy paying attention to something else, like running another program in some multitasking environment.

Under normal DOS, of course, the microprocessor will just twiddle its

thumbs until the SCSI bus reports success, since DOS is a single-tasking, do-only-one-thing-at-a-time operating system.

The way that the SCSI interface can support so many kinds of storage devices lies in its manner of addressing these devices.

As far as it's concerned, your hard disk isn't a hard disk—it's just a storage peripheral with storage areas called sectors numbered from 0 to some large value. The same is true for floppies, tapes, or optical devices.

Which leads to an interesting question. The hard disk doesn't see itself as

a mere collection of sectors—it uses a more complex addressing terminology. So who does the translation from SCSI sector addresses to physical hard disk addresses?

The answer is that every SCSI drive has a controller built right onto it, kind of like IDE. That controller talks both to the drive in whatever language the drive prefers and then to the SCSI adapter in SCSI language.

So here's the punch line: SCSI drives are really drive-and-controller combinations, and those drive-and-controller combinations can use any interface—IDE, ST506, or ESDI, although ESDI is the only one I've seen used. ESDI is used most often because of the raw speed that it offers.

No Guarantees

You can see now that SCSI, in and of itself, is no guarantee of a fast drive, although most drives chosen for SCSI are, in fact, fairly quick. SCSI really has nothing to do with speed, but rather with multitasking.

Remember that ESDI is basically just a souped-up version of ST506. Drive management is handled mainly by the CPU, and that's not a problem for single-user systems.

But what about a local area network server that must manage six or seven ESDI drives and multiple requests from different workstations for data on those drives? Because that's a lot of work for the CPU, it could benefit from distributed intelligence. SCSI provides that distributed intelligence.

In fact, the SCSI host adapter is a CPU all in itself. All the PC's microprocessor would have to do in the six-drive scenario is just to issue six data requests rapid-fire to the SCSI host adapter and then sit back and wait for the data to come in. (Actually, it wouldn't sit back and wait—a good multitasking system would do something else while waiting for the responses to come in.)

In general, you can count on an ST506 interface to transfer data at the rate of 250K–750K per second (using MFM or RLL encoding), an IDE interface to transfer data at the rate of 1MB per second (using ARLL encoding), an ESDI interface to transfer data at the rate of 1MB–3MB per second (using RLL encoding), and a SCSI interface to transfer data at the rate of 1MB–3MB per second (using RLL encoding).

So what's my advice on which kind of drive you should buy today? If you're buying a large drive for personal use, go with an ESDI drive. For a LAN server or a machine that may become a LAN server, buy SCSI for a slightly more efficient drive. □

Denny Atkin

REACH OUT AND PLAY WITH SOMEONE

You sigh with frustration. "Honey, Stephanie is still tying up the phone. Won't she ever tell her friends good-bye and come down and visit the rest of the family?"

"You're right. She should hang up and come down here and watch *Married with Children* with the rest of us. It's important that she spend time doing wholesome, family things like this," your wife responds. "Stephanie Ann! Get off the phone and get down here right now!"

"But moth-er!" she cries. "Only a few more minutes! Dave and I have three orcs cornered, and we're only two dungeon levels away from finding the Great Ark!"

"She's playing *Dungeon Monger* again with that boy from North Dakota. Why can't she just talk to her local friends like I did when I was a teenager?"

That's right, folks. A new excuse for your teenagers to tie up the phone—online games. The biggest inconvenience might not be the important business calls you miss, but the fact that while *they're* tying up the phone line and the computer, *you* can't get online and play the games yourself!

Online gaming has really taken off in the past couple of years. In the early eighties, online gamers on networks such as CompuServe and the Source could play versions of the original mainframe games, including such venerable titles as *Colossal Cave Adventure* and *Star Trek*. While these games were fun, they were generally single-player games, and the only real advantage in playing them online, rather than playing a version on

your personal computer, was that the games were larger in scope than the common 64K machines could handle.

As personal computers became more powerful and the IBM PC replaced CP/M computers and C64s as the de facto BBS platform, online games grew in sophistication. Instead of calling up a national network to play *Adventure* all by yourself, you could just dial your local BBS and challenge a number of other players to games like *TradeWars*, a multiplayer space game. Most of these boards still only supported one user at a time, so players would have to take turns making their moves. Still, it was much nicer to have a human opponent.

The late 1980s saw an online gaming renaissance. The biggest networks, CompuServe and GEnie, began to expand their online gaming areas. As the old single-player adventure games dropped in popularity, the networks began to implement multiplayer games that took advantage of the unique features of online services. You could log on and explore dungeons or destroy space armadas with people from around the country. And unlike most of the BBS games, you could interact with several different players at the same time.

The games became more sophisticated. The text-based games grew—GEnie's *Gemstone III* adventure game is larger in scope and more complex than any of the disk-based text adventures. Perhaps the biggest groundbreaker was *Air Warrior*, a multiplayer World War II air combat game. No longer were online games trapped in the realm of text-based interfaces.

Even when you're not online, *Air Warrior* is a superb flight simulator, with speedy polygon graphics and a real-

istic flight model. But when you log on, the real fun begins. You're suddenly a WWII pilot fighting for one of three countries, in your choice of aircraft. There may be up to 50 other players from around the country sharing the sky with you—or trying to knock you out of it. The newest version adds both European and Pacific theaters of operation, as well as WWI and Korean-era aircraft. *Air Warrior* is a far cry from the early BASIC games that used to be popular on BBS systems.

The newest entry into the online gaming fraternity is the Sierra Network (TSN). At the moment it's a fairly limited service, offering games such as backgammon, cribbage, checkers, and bridge. But this flat-rate service, currently available in California, plans to expand to offer more sophisticated games in the coming SierraLand and adult-oriented LarryLand extensions. New games should come online as the service moves to national availability.

Interestingly, TSN is a combination of the mainframe and BBS gaming techniques. When you call TSN, you're actually calling the host computer closest to your geographic area. If you want to play a game with someone across the country, you can, as TSN computers are networked using the same Tymnet network used by major online services. Your local TSN computer simply hooks up with your friend's local node, and you can still play across the country without incurring long-distance charges. TSN is still in its infancy, but it may portend what we can expect from online gaming in the future.

What are your favorite online games? Drop me an E-mail note at 75500,3602 on CIS, DENNYA on BIX and GEnie, or DENNY on Plink. □

The late 1980s saw an online gaming renaissance. Since then, games have become multiplayer, graphical, and more personal, even on the big networks.

HOME OFFICE

COMPUTE CHOICE. To get your PC housekeeping chores under control, no other toolkit does the job like this longtime favorite.

Tony Roberts

PC TOOLS 7.0

A few versions back, *PC Tools* was a compact set of utilities—an easy-to-handle tool belt of programs to make computing smoother. Today it would take a pickup truck to hold everything that's packed into robust *PC Tools 7.0*.

If you've been computing for any length of time, you've no doubt assembled a collection of programs that do many of the things *PC Tools* does. If you're in the market for any one utility—say a backup program, a disk cache, a DOS shell, hard disk diagnostics, a disk optimizer, or a virus detector—you can get that and a whole lot more in *PC Tools*. While an impressive collection of utilities, *PC Tools 7.0* falls a bit short of perfection. There are some apparent incompatibilities between elements of this software and some memory managers, some versions of DOS, some hardware, and some other software. Part of this problem, though, stems from the fact that much of this software must be or can be run memory resident, and memory-resident software causes conflicts by its very nature. Some users will have difficulty installing and using *PC Tools*. With so many TSRs running loose, there's a good probability of conflict. It will take experimentation and monitoring to set up a *PC Tools* system that's stable and safe.

The difficulty starts during the *PC Tools* installation process. Although it's possible to install individual elements of *PC Tools*, the tendency to want to install it all—all 7.2 megabytes of it—to see what everything does will override most users' intentions to save hard drive space.



This can be like letting a baby organize your button box. Suddenly, your carefully tuned system is choking on a plethora of new TSRs; you're fiddling with command line switches and kicking the dog as crash follows lockup and you don't know what to blame. You can't learn how to run 15 or 20 programs at once, so when you install *PC Tools*, proceed methodically.

PC Tools comes packed with seven books of documentation, each dedicated to a different facet of the software. Despite this segregation, finding information is sometimes difficult because some programs are covered in more than one manual and the indices are not cross-referenced.

The hypertext-style, online help files provide excellent guidance while you're learning the programs, but since the help files occupy 1.2MB, they didn't last long on my overcrowded hard disk.

PC Tools' installation and configuration programs help set things up for you, and they will take care of rewriting your CONFIG.SYS and AUTOEXEC.

BAT files if you like. This is fine with plain vanilla setup files, but *PC Tools* unraveled my AUTOEXEC.BAT, which includes several questions and ERRORLEVEL tests regarding the software I want to load. Still, I put these inconveniences out of mind once I got a handle on what this most recent version of *PC Tools* offers. *PC Tools 7.0* provides a backup program, an undelete utility, and a program launcher that are bona fide *Windows* applications. The *Windows* backup can run in the background and can be scheduled to perform unattended backups at a specified time, if you have a tape drive. The rest of the package, including *PC Shell*, can be run under *Windows* as DOS applications.

Central Point Backup—a solid disk-backup utility that is also sold as a stand-alone program—is aging nicely. This incarnation comes with a DOS version and a *Windows* version that are compatible. You can make a backup in *Windows* and restore it in DOS. Configuration options

are myriad. You can save named setup files so it's easy to do a full backup one day, an incremental backup another day, and a backup of only *PageMaker* documents on a third day.

Like *Central Point Backup*, *Commute* is also offered as a stand-alone program and is just as welcome in this bundle of utilities. A remote computing utility, *Commute* permits connection of two systems across a network, via modem, or by direct link. With this software you can control your computer at work from your laptop or home computer; you can transfer files and run applications from afar.

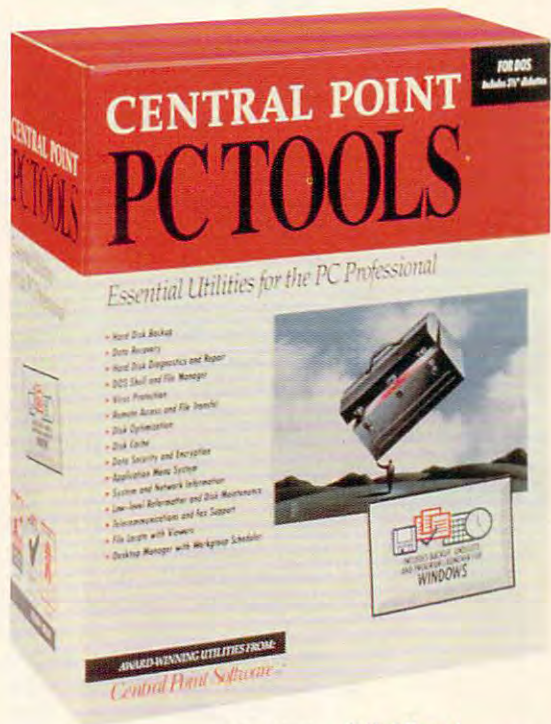
Don't dread the day your PC contracts a virus any longer. *VDefend*, *PC Tools'* memory-resident virus detection utility, scans for hundreds of known viruses. However, running *VDefend* slows performance noticeably, and *VDefend* can only detect, not eradicate, viruses. *Central Point Anti-Virus* (sold separately) takes care of that chore. *PC Tools'* *DiskFix* and *Backup* programs scan for viruses while they work, so you'll have some measure of protection even if you ignore *VDefend*.

Enhancements made to the *DiskFix* utility include interleave tuning and low-level reformatting for those hard drive controllers that will permit it. During repair, you're allowed to save crucial disk information to a floppy so you can undo the repair if you want. *Unformat* will help recover an accidentally formatted disk. *Compress*, the defragmenter and disk organizer, has some useful new options for compression technique and file sorting.

PC Tools 7.0's FileFix pro-

gram adds the ability to repair damaged *dBASE*, *Lotus*, or *Symphony* files. *Undelete* allows recovery of files that have been accidentally erased. This program works similarly to DOS 5.0's *Undelete* command. In fact, Central Point Software licensed versions of its *Mirror* and *Undelete* utilities to Microsoft for use in DOS 5.0. An added feature of the *PC Tools* version, however, is *Delete Sentry*. *Delete Sentry* works by moving deleted files to a hidden subdirectory on your disk rather than actually erasing them. The system then can be set to purge erased files after a specified number of days. All of the memory-resident parts of the *PC Tools* package can be loaded into high memory, if available on your system, leaving acres of conventional memory available for application programs. In addition, much of the software in this package has been made compatible with Netware networks.

PC Tools 7.0 also includes a new *Windows*-like graphical interface for all its components. A new Application Menu System lets you run *PC Tools* utilities and other DOS applications from a configurable cascading menu. *PC Shell*, a DOS-based file management system, now permits viewing of files in more than 35 different formats. *Desktop Manager* offers a suite of functions including appointment scheduling, telecommunications and fax board support, notepad, outliner, autodialer, *dBASE*-compatible database, calculators, and macro editor. The many options offered by *PC Tools* mean flexibility for you. If you like working from a shell, you can use *PC Shell*



as your base and launch programs from there. On the other hand, if the command line suits you, you can execute any program from the DOS prompt. Although few will use every program in this package, I can't imagine anyone who couldn't find almost daily use for some of this software.

While I encountered no major problems with *PC Tools*, I did manage to lock the system up several times. I found that the Find Duplicates portion of the *Find File* program hung up every time under DR DOS 5.0, but it works fine under MS-DOS.

You could buy several products to handle the chores *PC Tools* handles, or you could just buy *PC Tools*. No other package bundles so much in one box. Despite the minor problems mentioned here, *PC Tools* never comes up short in the usefulness department. □

IBM PC and compatibles, 640K RAM, hard disk (Windows applications require Microsoft Windows 3.0 and 2MB RAM); supports mouse, Netware 2.15 and above, and Netware 386—\$179

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WORKPLACE

Daniel Janal

YOU CAN GO HOME AGAIN

How would you like to escape the perilous drive to work and still not miss the excitement and intrigue of office politics? Why not convince your boss to let you do some work at home? After all, the commute is about 30 seconds, and you get to see your kids grow up.

These days, over 5 million workers telecommute, according to Link Resources, a New York-based think tank. Not to be confused with the self-employed, telecommuters make arrangements with their employers to divide work time between office and home. Arrangements can vary from working mostly at the office to working mostly at home—or somewhere in between.

Telecommuters can be as much as 20 percent more productive than full-time office workers, according to a study conducted by the state of California, which has its own telecommuting policies. Brad Schepp, who has documented the phenomenon in his book, *The Telecommuter's Handbook* (Pharos Books, \$9.95), says telecommuting can not only enhance the quality of your life, it can also benefit your employer.

Large corporations such as Pacific Bell, Ap-

ple Computer, AT&T, and JC Penney offer telecommuting as an option for certain employees. Their efforts have paved the way for other companies to formalize policies. "Everything in the program is clearly spelled out," Schepp says, "who can telecommute, how they stay in touch with coworkers and supervisors, and how the company applies workmen's compensation laws."

Such companies aren't the norm, however. Some 90 percent of companies that offer telecommuting do so informally. Mid-level managers don't want to involve top management and the inherent red tape that follows. Telecommuting goes against the grain. MBA programs don't condone it, and employers are only beginning to understand the unique problems of two-income households. You might have to shop around to find a company that's interested in having employees telecommute. That type of company will make it worthwhile.

Other issues that make companies reluctant to offer telecommuting are providing workmen's compensation for accidents at home, managing numerous off-site employees, and determining the best candidates to work at home.

The best telecommuters tend to be those employees who have good working relationships with their supervisors, have been with the company for a long time, can work independently, are good communicators, and are proven performers. And some positions are better suited than others to telecommuting. Computer programmers, writers, translators, sales reps, stockbrokers, and attorneys, to name a few, fall into that category.

Schepp says the best telecommuters are "information specialists" in jobs that involve three basic stages: research,

execution, and presentation. For instance, an architect meets with a client to discuss house plans, goes home to sketch out the blueprints, and then meets with the client again for a presentation.

Schepp says that it's in the second stage, when the work is produced, that telecommuting can be most effective. "That's where you need solitude. You need space and peace to do the best possible job," he says.

Because interaction is limited, the person must become adept at communicating with coworkers and supervisors and work harder to stay in touch via fax, E-mail, and the phone. "You've got to do what you can to ward off feelings of isolation," Schepp says.

Successful telecommuting programs aren't made in heaven, however; they're written on paper, with the guidelines spelled out and paths and tasks clearly defined. Schepp advises companies to hire specialists to set up programs for telecommuting. "They can help you avoid the mistakes other companies have made," he says, "and they can hold your hand through the entire process."

That workstyle isn't for everyone, however. Some 20 percent of telecommuters eventually return to the office for various reasons, often because of an inability to concentrate.

If telecommuting sounds like your answer, Schepp advises you to start slowly. "You'll find it's a learning process. You may find you aren't as productive at first—you have to get used to distractions or not having a support staff or a copy machine. You have to get used to other ways of communicating with people. And you show up at the office fairly often."

Showing up is fine—as long as you can go home. □

Look homeward, boss. That's where you may find your best employees.



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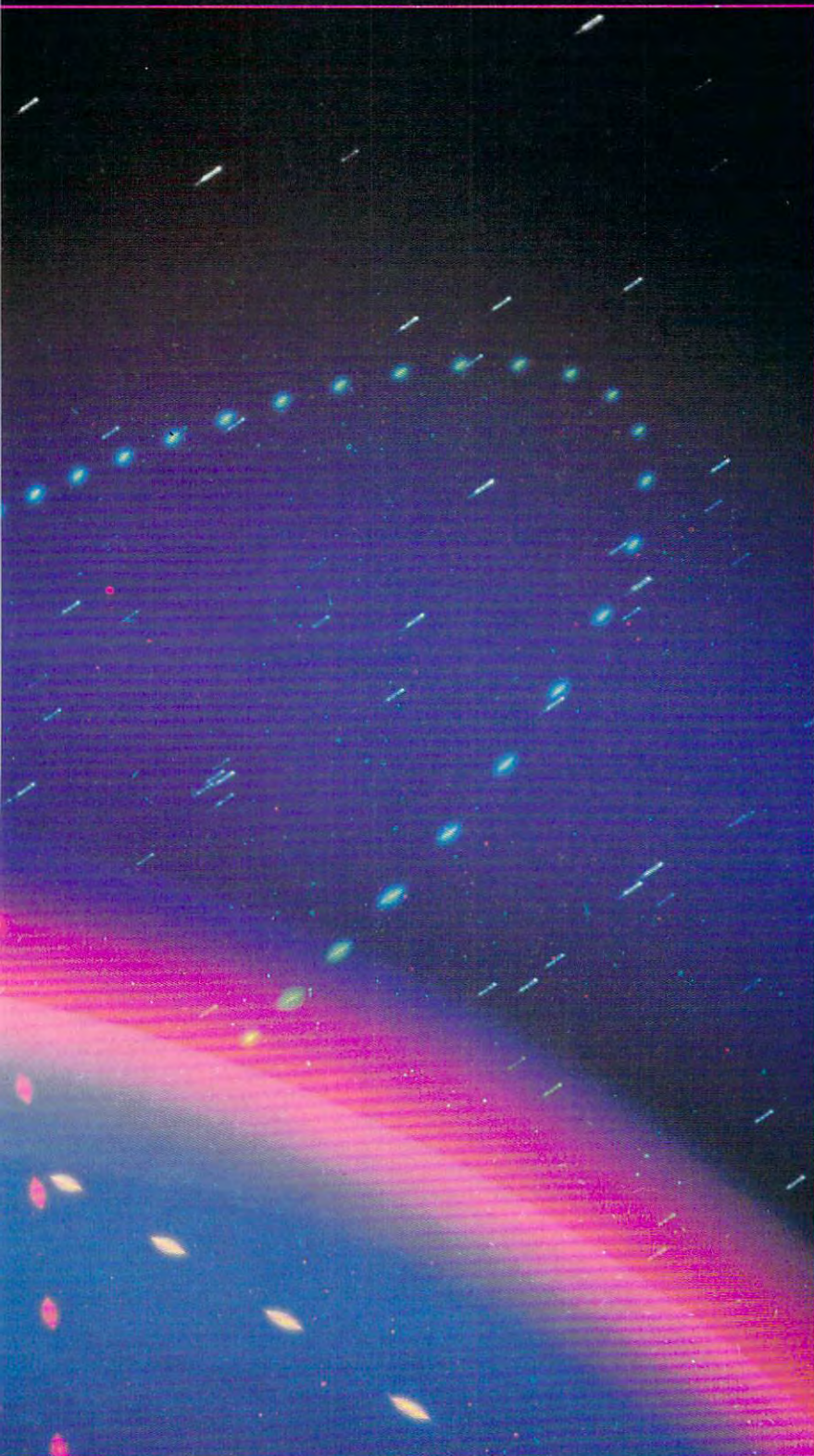
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MORE AND MORE
EMPLOYEES
ARE WORKING FROM THEIR
HOME OFFICES.
HOW CAN YOU GET INTO
TELECOMMUTING?
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REMOTE POSSIBILITIES

BY ROSALIND RESNICK

Ask most people to describe their dream job, and they'll start talking about great pay, top benefits, flexible hours, a short commute, and loads of quality time to spend with the family.

Mention the word *telecommuting*, though, and you'll get a blank stare.

Telecommuting—commonly defined as working from the home or a remote location via personal computer, phone, fax, and modem—has been around for years, but it's only now beginning to catch on in a big way. Link Resources, a New York research firm, estimates that nearly 4 million U.S. employees telecommute on at least a part-time basis with more than half a million telecommuting full-time. Just five years ago, there were fewer than 100,000 telecommuters nationwide.

Who Needs It?

"Telecommuting is like a lot of other new ideas," says Gil Gordon, a Monmouth Junction, New Jersey, consultant and publisher of "The Telecommuting Review," a newsletter for employers. "I always like to remind the skeptics that when the Xerox machine first came out, people said, 'Why do you need that? We have carbon paper.' Telecommuting is one of those rare things that works out well for both employee and employer."

In other words, what's good for the worker has suddenly become good for corporate America. With the recession forcing companies to pinch every penny, more and more managers recognize that there are sizable bottom-line benefits to letting employees work from home. Not only are telecommuters happier and more productive, studies show, but having fewer workers at the

office or production plant means reduced expenses and overhead. Telecommuting also lets employers attract and retain topnotch employees who live far from the office, suffer from a disability, or need to stay home to care for a young child or an elderly relative.

Companies and government agencies that offer telecommuting include IBM, American Express, J.C. Penney, General Electric, Los Angeles County, and the Washington State Energy Office. Apple Computer, whose San Francisco Bay area employees face an arduous commute choked with traffic and pollution, has started giving workers a \$1 credit in the company store every time they work from home.

Productivity and Price

Many bosses say they've been pleasantly surprised by how well their companies' telecommuting programs have worked out. National studies show that productivity can jump by as much as 20 percent when employees are allowed to work from home.

"I was apprehensive at first," says Marti Nurse, director of appeals and state hearings for the Los Angeles County Department of Public Services, who counts 35 telecommuters among the 103 staffers she supervises. "But as our caseloads have gone up, the people who are telecommuting are doing more work, and they're doing it better."

For Los Angeles County, which boasts one of the nation's largest telecommuting programs, employer altruism is a matter of dollars and cents. According to Nancy Apeles, the program's assistant manager, clerks who work from home for the county assessor's office work 64 percent faster than their counterparts in the office and save the county \$30,000 a month. Of the 80,000 people who work for the county, more than 1200 now are telecommuters, up from 78 when the program was launched three years ago. "It's a win-win situation," says Apeles.

Who's Who

Who are America's telecommuters? Many are mothers with young children. Computer programmers tend to gravitate to telecommuting, while other tele-

commuters are technical writers, telephone operators, and data-entry clerks.

Los Angeles County, which numbers more than 1,200 telecommuters among its 80,000 employees, boasts 200 different telecommuting job classifications ranging from clerks and social workers to auditors and department heads.

Jim Mitchell, 50, chief of contract monitoring for the Los Angeles County Health Department and a self-described modem junkie, set up an electronic bulletin board for his 14 telecommuting em-

ployees to swap messages. He himself works from home 4½ days a week.

didn't pay enough to justify what she was spending on day care. Thanks to IBM's Work-at-Home pilot program, Kilmain spent six months as a telecommuter, tapping away at her PS/2 Model 70 while Caitlin napped.

"I got a lot done at home while she was sleeping," Kilman says. "People couldn't walk into my office and say, 'Hey, what did you do last night?'"

"Being a parent myself, I knew the importance of the mother's being present," says Ed Denson, Kilmain's boss. "It was good for the company, too. Lisa was able to accomplish more in her 20 hours at home than she would have in the office."

Though Kilmain is now back at the office, she says she's planning to have more children and hoping to repeat her telecommuting experience.

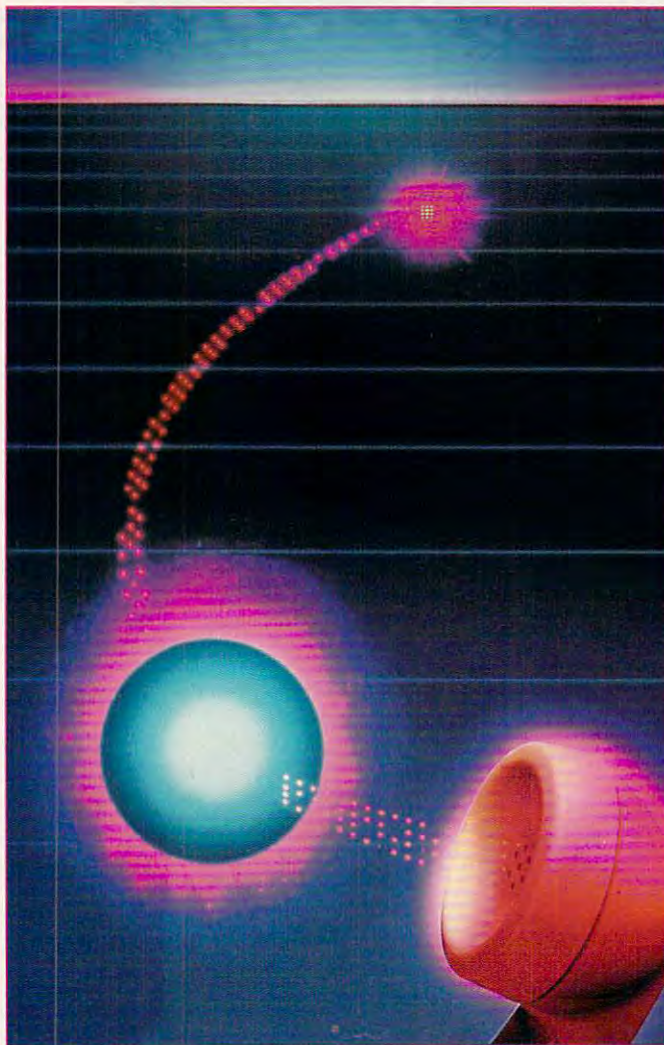
Chris Stroud, vice president of Financial Data Planning (FDP), a Miami software company, tells a similar story about Laura Falco, 28. Falco, a programmer who also fields phone calls from customers, cares for two young children at home while telecommuting 35 hours a week. Though FDP has no formal telecommuting program, the company has allowed Falco to work from home for the last 2½ years because she's a talented self-starter. FDP also picks up the tab for a second phone line.

"After my daughter was three months old, I didn't want to go back to work," Falco says. "I wanted to take care of her. The company said it was willing to try [letting me telecommute] for three months. Now, it's been two-and-a-half years."

Some of her colleagues are even a little envious. "There have been other people who have pointed to Laura and said, 'She's doing it. Why can't we?'" Stroud says. "But Laura's job is very suited to working from home, and she's an extremely productive person."

Out of Sight

As Falco's story shows, telecommuting is still a privilege, not a right, even at the companies that do allow it. The reason: Many managers worry that home-based employees will be tempted to sleep late, watch television, raid the



More typical of the telecommuting population are people like Lisa Kilmain, 28, a senior associate programmer at IBM in Irving, Texas. Kilmain wasn't ready to go back to the office full-time when her daughter, Caitlin, was born two years ago. But part-time work

employees to swap messages. He himself works from home 4½ days a week. "I do my real thinking at home," says Mitchell, who still comes to the office for a weekly staff meeting. "I think that companies that do not offer this option are going to find themselves behind the curve when it comes to recruiting."

More typical of the telecommuting population are people like Lisa Kilmain, 28, a senior associate programmer at IBM in Irving, Texas. Kilmain wasn't ready to go back to the office full-time when her daughter, Caitlin, was born two years ago. But part-time work

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refrigerator, or take their kids to the park rather than do their jobs.

Likewise, many employees fear that, once out of sight, they'll be out of mind—passed over for raises and promotions.

If you're willing to take that risk and you want to persuade your employer to let you telecommute, the experts suggest you try the following approaches:

- Put yourself in your boss's shoes. Show your boss that telecommuting can save the company money by shrinking overhead. Point out that employees who work from home are often more productive and can keep working in spite of minor illnesses and family emergencies. Explain that telecommuting helps boost morale and keep good workers.

- Show initiative. Prove that you've got what it takes to work from home—self-discipline, organization, and the ability to handle tasks and meet deadlines without direct supervision. Demonstrate these qualities at the on-site job you have now.

- Start small. If your boss won't let you telecommute full-time, ask to try telecommuting one day a month. Once your employer feels comfortable with the idea, you can start lobbying for one day a week, two days, or more.

- Work hard. Even if your boss gives you the green light to telecommute, that doesn't mean you can't be hauled back

to the office if your performance falls short. Telecommuters are expected to meet the same productivity standards as staffers who work in the office.

- Be flexible. If your boss wants you to report to the office once a week for a staff meeting, don't fight it.

Trends and Anomies

Telecommuting experts believe that working from home is an emerging trend in the workplace of the 1990s, not just a flash in the pan. With advances in computer and telecommunication technology, people can perform more and more jobs from home.

"It's not just women with kids sitting behind the keyboard," says Gordon, the telecommuting guru. "Many more men are becoming interested in it, too."

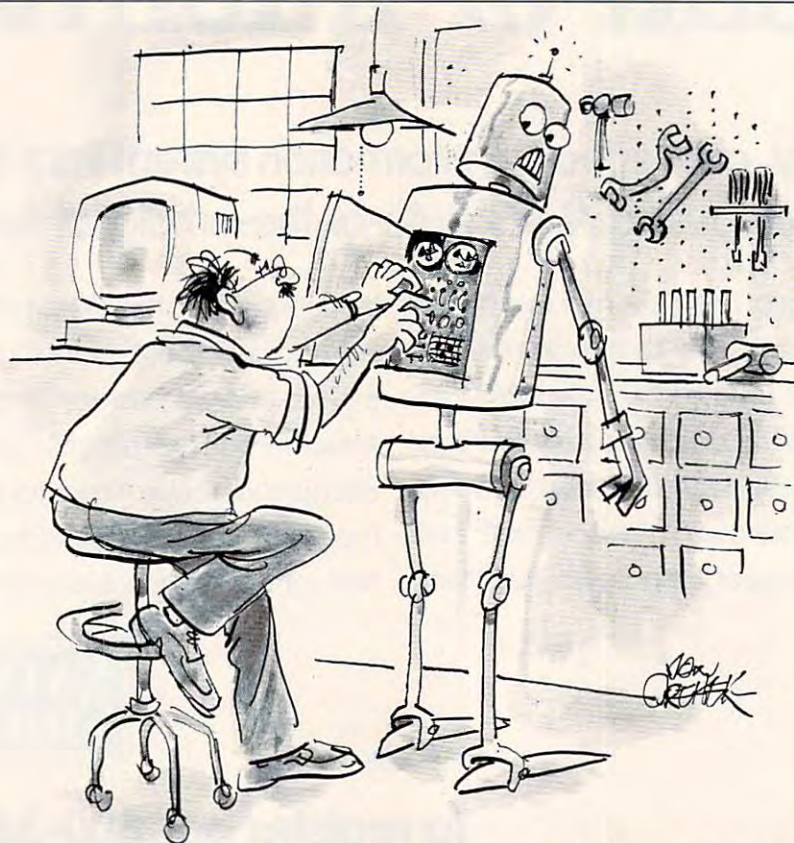
But not even telecommuting's staunchest backers envision a future littered with empty office buildings and urban ghost towns. The reason? A basic human need to talk, meet, and gossip with fellow workers face to face. Gordon predicts that no more than 5 to 10 percent of the nation's work force will telecommute at any one time.

"Telecommuting is not about working at home," Gordon says. "It's about decentralizing the workplace. For the right people and the right reasons, it has tremendous value." □

BOOKS ON TELECOMMUTING

There are several publications on telecommuting, including *Telecommuting: How to Make It Work for You and Your Company*, by Gil Gordon and Marcia Kelly (ISBN 013902339-9, Prentice-Hall). To order a copy, contact Gordon at 10 Donner Court, Monmouth Junction, New Jersey 08852; (908) 329-2266. The price is \$15.95 for U.S. orders and \$25.95 for foreign orders. Price includes shipping. Gordon also edits "The Telecommuting Review," a monthly newsletter geared toward employers. A subscription costs \$157.00 per year. The address and telephone number are the same.

Other books include *The One-Minute Commuter* by Lis Fleming (ISBN 1-877887-14-5; Acacia Books, 1309 Redwood Lane, Davis, California 95616; 916-753-1519; \$9.95 plus \$2.00 postage and handling; California residents should add \$0.75 sales tax), *The Telecommuter's Handbook* by Brad Schepp (ISBN 0-88687-571-4; Pharos Books, World Almanac Education, 1278 West 9th Street, Cleveland, Ohio 44113; 800-521-6600; \$9.95 plus \$1.50 postage and handling), and *Working from Home: Everything You Need to Know About Living and Working Under the Same Roof* by Paul and Sarah Edwards (ISBN 0-87477-582-5; Jeremy P. Tharcher, 5858 Wilshire Boulevard, Suite 200, Los Angeles, California 90036; 213-935-9980; \$14.95).



"Rewind the IPL tape, check the board position and see if the amber light blinks."