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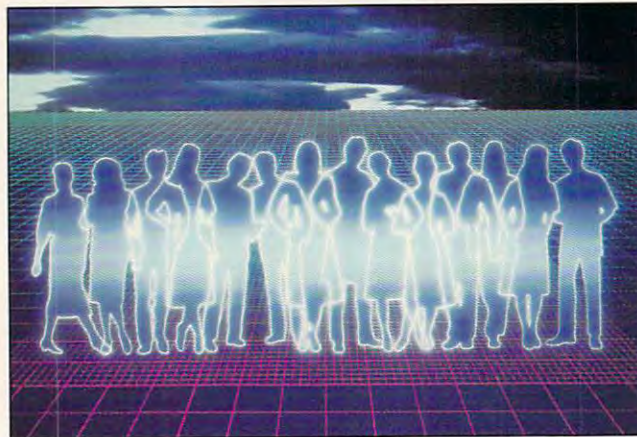
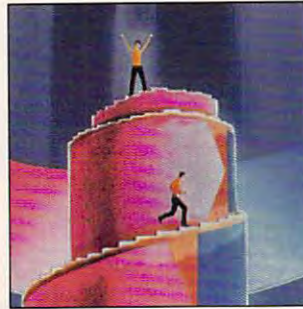
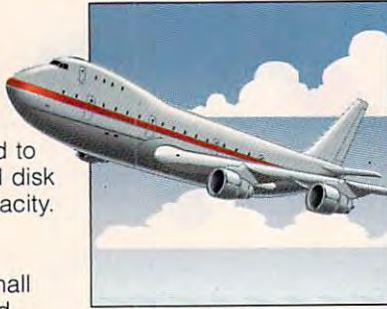
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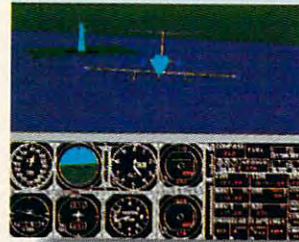
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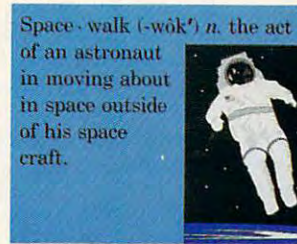
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Clifton Karnes

What is bandwidth, and where can I get some? That's the computer user's cry of the nineties. Though the term was originally coined to describe the frequency range of a communications channel, it's now used to describe the capacity of any channel to transmit information.

In the PC, there are several channels where bandwidth is an issue. The most important are those that connect the CPU to its peripherals (video, hard disk, and so on) and to networks (dial-up networks like GEnie, CompuServe, Delphi, and America Online as well as local area networks).

Unfortunately, simply increasing CPU speed won't solve the PC's bandwidth problem. Modern 33- and 50-MHz CPUs are certainly amazing speed demons that can transform raw data into useful information in a lightning flash, but the time it takes to move this

data across a network or to your screen or hard disk is still geological in comparison.

How do you increase bandwidth? There are three principal ways: You can make the channel wider, you can make it faster, or you can compress the information that travels through it.

Making the channel wider was the big innovation of the AT's 16-bit bus over the original PC's 8-bit bus. Although there have been other bus designs that offered wider channels (Micro Channel and EISA), none have really caught on, and most of us are still using the 16-bit AT bus designed ten years ago. And the fact that this bus is limited to 16 bits is not its worst problem. No matter how fast your CPU, your bus is running at 8 or 10 MHz, so information may fly out of the CPU at 33 MHz, but it nearly comes to a halt when it hits the bus.

One solution to the system bus problem is the local bus, which is hooked directly to the CPU. When a system is designed with peripherals on the local bus, they can run with a data path of 32 bits and at the CPU's speed—25, 33, or 50 MHz. Local bus promises to increase the speed of video and hard disks dramatically, and it does seem to be the solution to the PC's internal bandwidth crisis. Indeed, the local bus fights the bandwidth gremlin on two fronts because it makes the bus both wider and faster.

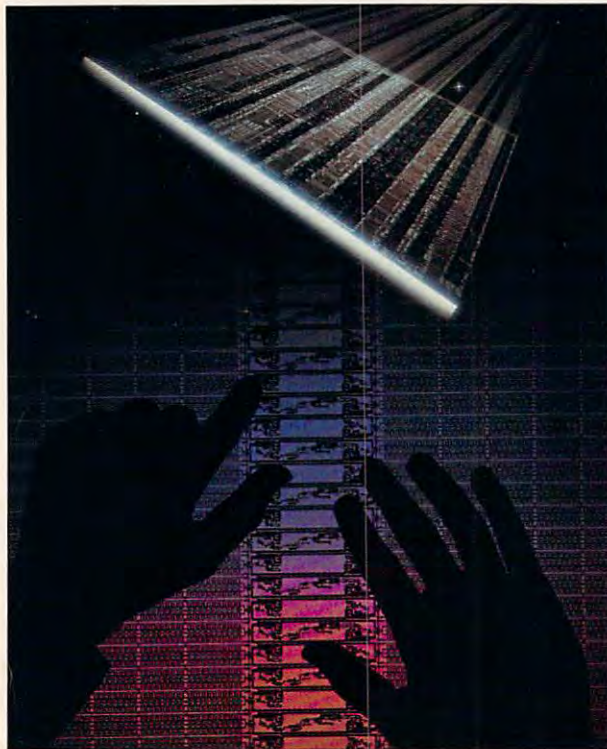
Although the local bus may be the solution for the future, what can we do now to increase bandwidth and improve our systems' performance? The best solution is compression. In telecommunications, which has had the most severe bandwidth problem of any channel, compression has been used since the

beginning. If you download or upload files from telecommunications services, you know what I'm talking about. To make transfers faster, a file or group of files is compressed before it's uploaded. Then, it's downloaded in its compressed state and decompressed so it can be used. This compression-decompression process effectively increases the bandwidth of the channel by moving more data in less time.

Although you may not have thought of it this way, your hard disk is a channel, too, just like your machine's local bus and system bus. Most of the time, however, data sits on your hard disk, so it's less dynamic than these other channels. But the size of your disk dictates the amount of data you can access via that disk, which makes it a channel. Compression can help here, too. With programs like Stacker, data is compressed and decompressed on the fly. Since the data is stored in a compressed format, the disk can hold more, hence increasing its bandwidth.

In this issue, you'll see the bandwidth problem addressed in hands-on, real-world terms in several places. First, check out Mark Minasi's "How to Fine-Tune Your Hard Disk" for ways to improve the speed, width, and capacity of that channel. The same author talks about communications bandwidth in his regular "Hardware Clinic" column. This issue's Test Lab looks at VGA systems, including accelerator cards that increase video speed—one of the PC's greatest bandwidth bottlenecks. And next issue, we'll take a look at hardware and software add-ons to help you blast through the most intractable bandwidth barrier of all—printers. □

When a system is designed with peripherals on the local bus, they can run with a data path of 32 bits and at the CPU's speed.

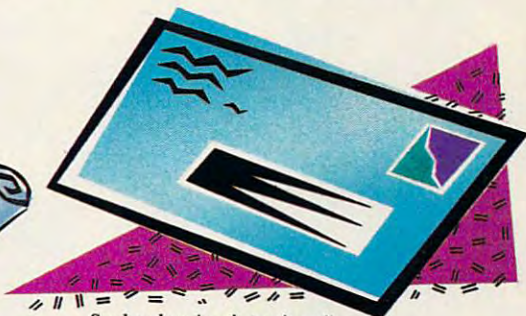


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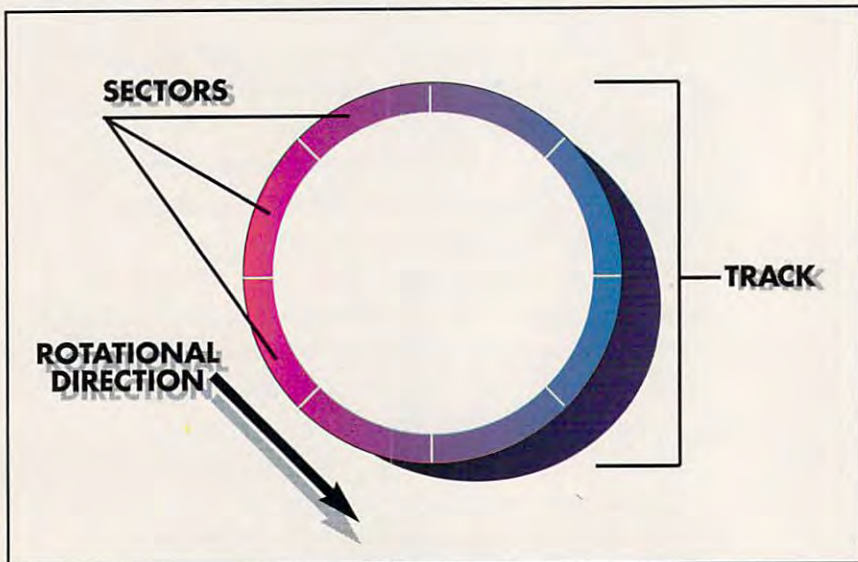
byte chunks called sectors. The disk typically locates and reads a particular sector in 10-100 milliseconds (ms); this number is the average seek time of the disk.

Ancient XT 10MB hard disks seek in around 100 ms. Newer drives typically seek in 10-20 ms. So if we say, for example, that a disk can transfer 512 bytes of data into the computer's RAM in 20 ms, how much time is required to transfer 512 bytes of data from RAM to RAM? In other words, what's the corresponding seek time for a block of data in RAM? A best-case scenario would be about 0.05 ms on a 20-MHz 386 computer, or 400 times faster. So every disk access seems painfully slow—geological, in fact—to the processor. This is where track buffers and caches come in.

Making Tracks

Look at the diagram labeled Tracks and Sectors; you'll see that sectors are grouped together into a structure called a track. The disk head floats over the track as the track spins beneath it at 3600 rpm. The disk spins whether or not the head is reading the disk's data.

The notion of a track buffer grows out of the idea that since sectors fly by the disk head while the head is waiting for the right one, we might as well read them. It's generally true that when DOS needs sector *x* on a particular track, the next sector it will need will be sector *x*+1 on that same track. So track buffer programs like Microsoft's SMARTDrive 3.0 and earlier (SMARTDrive 4.0, shipped with Windows 3.1, is a real cache)



Tracks and Sectors: Sectors are grouped together into a structure called a track.

WHAT NOT TO WORRY ABOUT: INTERLEAVES

If you've read anything about disk optimization, you've probably heard of the notion of setting the right interleave for your drive. Interleaving is the process of arranging sectors on a track in such a way that the entire track can be read quickly. PC gurus used to worry quite a bit about how to interleave a disk, largely because the period from 1983 through 1989 saw vendors selling computers with incorrectly interleaved disks. You won't need to worry about it for two reasons, however. First, today's drives are already interleaved in such a fashion that they provide data-transfer rates far in excess of what older drives could even hope for. The original XT's hard disk couldn't provide data to the system at a rate any faster than about 80K per second. Hard

disks nowadays commonly transfer data at rates of around 1200K per second and up, so there's no point in trying to improve things by tinkering with the interleave.

But the second reason to forget about interleaving is the really telling one. Today's drives tend to use a technology called IDE, or Imbedded Drive Electronics. (No, imbedded isn't spelled as you normally see it; this is the way the drive folks spell it.) IDE packs a lot of drive into a small and inexpensive package, but in doing so it cuts a few corners. One of those corners concerns reinterleaving. You can actually permanently damage some IDE drives by reinterleaving them, so don't get an interleave program off your local bulletin board and start messing with your drive.

If you really want a program that will adjust interleaves but can first determine whether or not it's safe to adjust them, get Spinrite II from Gibson Research. Spinrite has a street price of about \$70.

intercept the DOS request for a single sector and reformulate it into a request for all of the sectors on that track. When the disk hardware returns with all of the sectors on the track, the track buffer puts the copies of the disk data into an area of memory and passes to DOS the sector originally requested. Soon thereafter, DOS will probably want the next sector on that track. The track buffer, monitoring all disk activity, sees this request and shields the disk hardware from it. Then, it grabs the sector that already

has been read into its buffer area and passes the data to DOS. DOS has no idea that this has happened, only that the disk drive is suddenly fast. Obviously, track buffers work best when data is accessed in a nice, orderly, sequential fashion.

Caching Programs

There's a class of programs that are more generic in the way that they use extra RAM to increase apparent disk speed: disk cache software. Disk caches don't worry about sector and track read-aheads, although they may implement a bit of read-ahead for best performance. Instead, they focus on what, exactly, you use your disk for. If you're like most people, you use the same areas on your disk over and over. Say you get in and out of WordPerfect several times a day; that implies that your disk must reread the WP.EXE program and its attendant files every single time you start WordPerfect.

A disk cache improves on things in a manner similar to that of a track buffer by sitting quietly in memory and monitoring disk activity. As a file—say WP.EXE—is read, the disk cache makes a copy of the data that's been read from disk and puts it in the cache's memory area. Then, the next time that DOS needs WP.EXE, the disk cache program steps in, removing the need for the hardware to reread the WP.EXE file.

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It should be obvious that cache programs need a fair amount of memory in order to do any real good. Most cache programs use either expanded or extended memory. If you have RAM to burn, I'd recommend a cache of at least 512K.

If you're running Windows, don't put your cache in expanded memory; put it in extended memory. Memory-manager conflicts with Windows can cause any program that uses expanded memory to lose its data in expanded memory. If the program is a disk cache, parts of the disk may be affected, corrupting the disk's data. I found this out the hard way: Running an early memory manager with Windows caused the system to overwrite the first sector of my D drive's file allocation table. In common parlance, that means DOS no longer knew how to find the first 250 or so files on my D drive. Fortunately, I'd just finished writing a book on bringing dead hard drives back to life (*The Hard Disk Survival Guide*, published by Sybex), or those files would've been gone forever. So stick your cache in extended memory if you use Windows.

What to Cache

This leads to the next question about caches. If I allocate 1024K (1MB) of RAM to a cache (that's tiny when compared to the capacity of my hard disk), how does the cache program know what to put in the cache? Simple: It just keeps copying everything that you read into the cache until it runs out of cache space. Then it's got to make some decisions.

In order to accommodate new stuff, a cache throws out old stuff according to either LRU or LFU algorithms. With LRU (Least Recently Used), the cache throws out the oldest stuff. With LFU (Least Frequently Used), it figures how often something is used. Which is better? Truthfully, that's like asking, How many angels can dance on the head of a pin? Experts can argue the merits of one method over another, but for normal PC usage, there's no difference. I just mention LRU and LFU because you'll see references to them in the cache documentation or in marketing literature.

Three to Consider

OK, that's the techie stuff—how about some solid recommendations? First, there's SMARTDrive 4.0, the newest version of the cache that ships with Windows 3.1. In this incarnation, SMARTDrive is an EXE file that you

load in your AUTOEXEC.BAT file (previous versions of SMARTDrive are SYS files loaded in CONFIG.SYS), and it's a real cache. Not only does it allow you to change the size of the cache block, but it also caches writes (which gives it a big performance boost over previous versions), offers a raft of new configuration features, and comes free with Windows. If you opt to use the new SMARTDrive and cache writes, be sure to flush your cache before turning your machine off. To run SMARTDrive without caching writes, simply follow the SMARTDRV.EXE command with your drive letters.

Super PC-Kwik Disk Accelerator from Multisoft is my overall favorite, and it's under \$100. Unlike many other caches, it has been specifically designed to work with Windows and even includes a small Windows program that monitors what percentage of disk accesses have been satisfied from the cache. You'll typically find that 80-85 percent of your disk accesses are intercepted and handled by the cache. You can contact Multisoft at 15100 Southwest Koll Parkway, Suite L, Beaverton, Oregon 97006; (800) 274-5945.

The other cache to consider is HyperDisk, from HyperWare. When I last checked, it was a shareware product found on CompuServe, GENie, and the like.

Cheap Caches

Suppose you don't want to spend any money. (Yes, you're supposed to register—read pay—for shareware such as HyperDisk.) Assuming you've got DOS 5.0, there are three commands that will help. First is good old BUFFERS, a very simple system that, well, buffers sectors. Once upon a time, we all tried to keep our BUFFERS values to a minimum because each of them took a little over 500 bytes apiece from our precious conventional memory. But with DOS 5.0 and a 286 or higher, you just load the HIMEM.SYS device driver and specify DOS=HIGH in your CONFIG.SYS file, and all the buffers go live far away from your 640K conventional memory. Crank up your BUFFERS number as large as you like. It won't do much, but it may help some applications. On older, slower computers, this advice doesn't apply, as too many BUFFERS will slow things down.

Since version 3.3, DOS also has had a very small cache program that caches just one thing: the directory structure. FASTOPEN's only job is to prestore the information that DOS needs to traverse the subdirectory structure. You see, subdirectory information—what files are in a subdirectory, how big the files are, when they were created—is all kept in a special kind of file. Accessing a data file in a subdirectory, then, requires

ENLARGE YOUR DISK WITH STACKER

On the topic of running out of disk space, here's a quick and easy way to enlarge your disk: Stacker. This program works by compressing and decompressing files on your disk on the fly. For years, computer experts have used programs like PKZIP, LHARC, and ARC to compress computer files. Such programs can be quite effective, converting a file from, say, 100K down to 30K. That converted file cannot be used directly and must be decompressed to its original size of 100K.

The value of file compression is that you can store a lot of little-used stuff on your disk in compressed format, decompressing it as you need it. But the compression-decompression cycle takes time and is an annoying extra step.

That's where Stacker comes in. It compresses and decompresses transparently—you don't even know it's working, save that your disk accesses slow down a bit due to the compression-decompression overhead. And you can eliminate that delay by buying the Stacker disk coprocessor board.

Stacker is available from Stac at 5993 Avenida Encinas, Carlsbad, California 92008; (800) 522-7822. And, by the way, the latest versions come with a free file-unfragmenter program. The experience of my staff when installing Stacker indicates that it's best to start with a clean hard disk, install Stacker, and then reload your files rather than let the installation program install and squeeze all in one step.





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reading a bunch of files to understand the directory structure before we even get close to reading the data file. By prereading the directory structure into RAM, FASTOPEN speeds up the file-access process noticeably. A word to the wise, however: Be careful about using FASTOPEN in conjunction with disk caches, file unfragmenters, or any other disk utility. Check the disk utility's documentation before you use it with FASTOPEN.

In addition to BUFFERS and FASTOPEN, DOS also has, as already mentioned, the track buffer program SMARTDRV.SYS. If you're running SMARTDrive with Windows, be aware that the Windows and DOS installation programs are fairly dumb about the amount of memory they grant to SMARTDrive. On a 4MB system, the Windows 3.0 installation program gives 2MB to SMARTDrive—way too much, particularly since Windows desperately needs that memory.

Sort Your Directories

Reading files in subdirectories involves reading the files that are the subdirectory structure, and that brings up another problem. DOS doesn't keep files including subdirectories, in any particular order; it just puts them wherever seems good at the time the files are created. Then, when DOS needs a file or needs to find a subdirectory, it starts at the top of the directory and sequentially works down until it finds the file.

Note that word sequentially: It points out a weakness in the DOS disk structure. Say you've got 500 items in your root directory—495 files of various kinds and five subdirectories. Suppose further that the 495 files come before the five subdirectories. The result is that every time you need a file that's in one of those subdirectories, DOS must first find the subdirectory itself. To do that, it has to look through the 495 files. All of that searching takes time, and that's one reason why Microsoft wrote FASTOPEN and included it with DOS. But there's another way.

The Norton Utilities includes a program called DIRSORT, which is intended to sort your directories. There's really no point in sorting your

directories—who needs alphabetized subdirectory names? DIRSORT's value is that it allows you to throw out the alphabetizing nonsense and rearrange your directories by hand. When rearranging your directories, use two simple rules: Put the subdirectories above the files, and place the most-used subdirectories at the top.

Unfragment Your Files

Running out of disk space? Hey, who isn't? Most of us have hard disks that are packed to the gills. It's a pain to

has no choice but to scatter your file; such a file is said to be fragmented. This isn't an error, as DOS can retrieve fragmented files when needed. But it's undesirable because reading fragmented files requires that the disk head move to and fro, requiring more time than would be necessary otherwise.

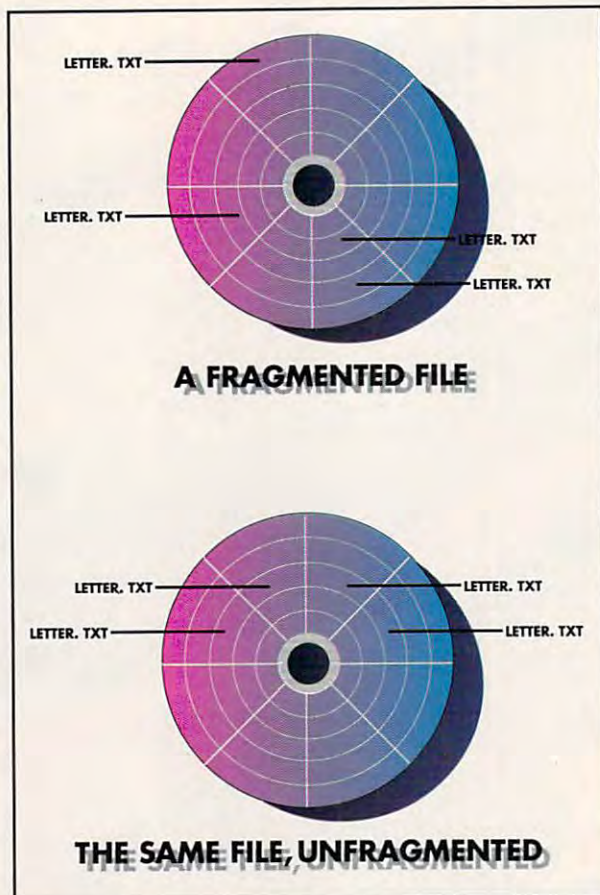
To alleviate this problem, software manufacturers have produced a slew of programs that will unfragment the data on your disk. The first was a program called Disk Optimizer, from SoftLogic Solutions. Although it's still available, the Big Three disk utility packages (Norton, Mace, and PC Tools) all now incorporate unfragmenter programs. Norton's is called Speed Disk, PC Tools has Compress, and Mace has Unfragment.

The best unfragmenter of all, however, is no longer available, as far as I know. Called FastTrax, this program first examines the dates on your files. Then, reasoning that the older files are the ones that won't be changed, it puts those files near the "bottom" of the disk space, leaving at the top a single pool of free space. As the newer files—that is, the ones most likely to change—all reside near the top, they aren't fragmented as much or as quickly when they grow. It's too bad that there doesn't seem to be a way to get in touch with the program's makers; FastTrax is a nice utility, and there's nothing on the market that works quite like it.

In any case, be sure to unfragment your disk now and then. But don't do it to

improve your disk's speed—you won't see that great an increase. You'll see the difference if you ever need to do some kind of data recovery on your disk. Think about it: If you had to use Norton or a similar program to piece a file back together, would you rather do so with the fragmented file pictured or with an unfragmented one? The unfragmented file would be much easier to reassemble.

There you have it—four ways to speed up your disk and save space. So get started: Unfragment your disk, rearrange your directories, and spend some cash on more memory so you can spend some extra memory on some cache. □



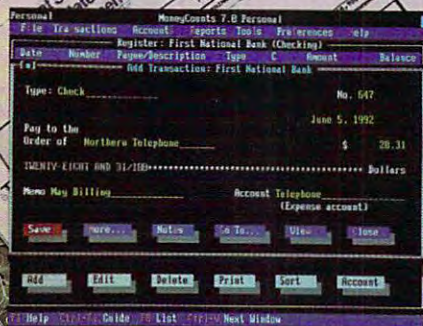
constantly have to remove one thing in order to put another on a disk. Worse yet, there's a nasty side effect: Your files get fragmented. Take a look at the accompanying figure to see what that means.

If it doesn't have enough room in one place, DOS scatters a file's data all over the disk.

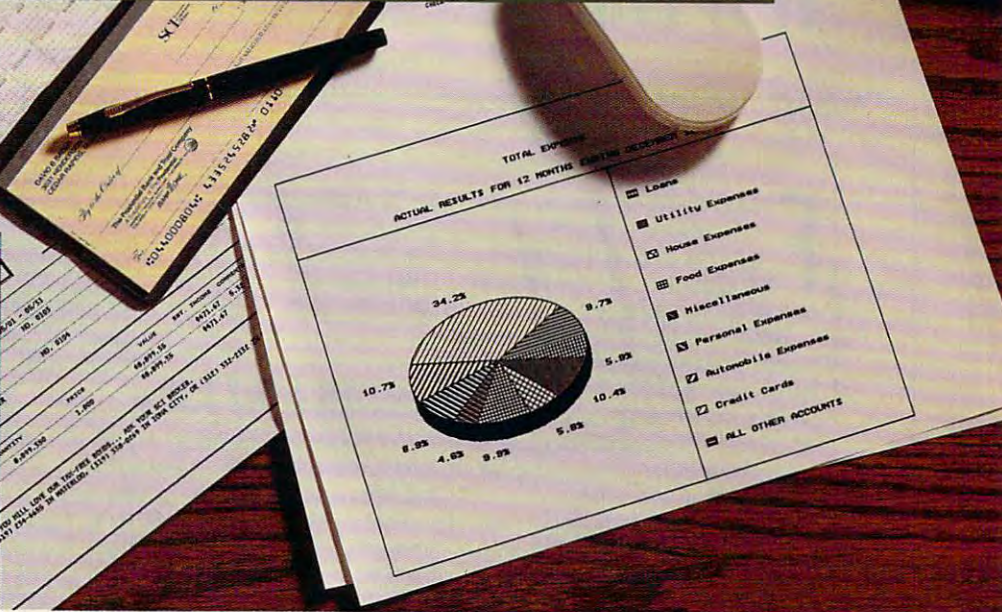
You see, when you ask DOS to put a new file on a mostly full disk, DOS would like to put the file all in one place, but it probably can't. Because the free space largely consists of empty spaces left behind by deleted files, it's not all one nice pool of unused space; rather, it's scattered all over the disk. So DOS

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Circle Reader Service Number 164

TEST LAB

Faster, sharper, and less expensive new video technology is here. This is a great time to upgrade to a new monitor and graphics adapter.

Gone are the days of boring monochrome displays and blocky, hard-to-read CGA graphics. Today's monitors and graphics adapters display hundreds of colors at once, brilliantly rendered and at surprisingly high resolutions.

Software manufacturers are taking advantage of new video technology to make their products more exciting than ever. Entertainment software is faster and more realistic, presentation software is more persuasive, and applications of all kinds are more attractive and interesting. And you can use your monitor with less eye-strain, too.

The sometimes baffling statistics from manufacturers tell only part of the story. This month's Test Lab gives you the whole picture, so to speak, running an impressive series of benchmark tests on two categories of products, Super VGA monitors and accelerator cards.

With most modern software demanding more from your video system, a Super VGA monitor will be a logical upgrade for many of you. In this Test Lab, we examine Amdek, Mitsubishi, NEC, and Sony monitors, products with a variety of features and prices.

Video accelerator cards are hot because of the pervasiveness of Microsoft Windows. With these cards, you can increase your productivity and decrease the frustration that comes with waiting for Windows screen refreshes.

Here, too, you'll see a variety of features and prices from ATI Technologies, CSS Laboratories, Glad Systems, Number Nine Computer, STB Systems, and Weitek. It's not enough to look at video technologies. You have to know what to look for. With this month's reviews, benchmark tests, and sidebars, you can do just that.

MIKE HUDNALL

WYSE TECHNOLOGY
3471 N. First St.
San Jose, CA 95134
(408) 473-1200
List price: \$599

AMDEK AM/738+

If your needs are moderate, the 14-inch Amdek AM/738+ may well be the Super VGA monitor for you.

The monitor is a multiplatform unit, which means you can use it for IBM-compatible PCs as well as the newer Macintosh II-series computers.

You'll find no controls mounted on the front of the monitor; in fact, the only adornments on the unit's face are a small Amdek logo and a green LED power indicator in the lower left corner. Look for the power switch and the brightness and contrast controls on the right side of the monitor, close to the front. Instead of having the knob-type controls usually found on monitors, the AM/738+ uses rounded "trackball" controls for the contrast and brightness adjustments, while the power switch is a flush-mounted button about the size of a nickel.

At the rear of the unit, you'll find standard slotted-knob controls for adjusting vertical size, horizontal size, and horizontal position. There are no other user-accessible controls or adjustment mechanisms.

Amdek has a very stable and highly adjustable tilt-swivel base for altering the monitor's position so that it provides optimal viewing. However, the tilt-swivel base isn't detachable on the AM/738+ as it is with most other monitors I'm familiar with.

While in general the color and resolution of the AM/738+ video are very good, I did notice moiré patterns any time a fine dot pattern was present (as with the standard Windows Program Manager screen or in Microsoft Works' toolbars and borders). "Blooming" (thin lines getting thicker at their



ends, resulting in a nonuniform and slightly defocused image at these points) was another undesirable trait the AM/738+ exhibited in some applications. This was particularly noticeable whenever groupings of fine lines appeared in the video image, such as with intricate graphics or paint files.

I also found it impossible to run Windows 3.0 with the AM/738+ in the 1024 x 768 256-color mode when using my Truevision Video with VGA Overlay board; in this mode, what I saw was an unacceptable, severely darkened image devoid of color. I didn't have a problem, however, with the 800 x 600 mode. While this 1MB board with its Tseng 4000 chip set does incorporate some non-standard timings at the higher resolutions, other monitors I've used it with don't have any problem in the 1024 x 768 mode. The AM/738+ runs in the interlaced mode at 1024 x 768 resolution, but it runs in the noninterlaced mode at 800 x 600 resolution, which is undoubtedly the reason for the incompatibility I experienced at the higher resolution with this noninterlaced board. If you intend to use a noninterlaced video adapter in 1024 x 768 resolution, be forewarned that this monitor isn't capable of noninterlaced displays at that resolution.

If you're on a budget, work predominantly in text and numerical applications rather than graphics, and don't need 1024 x 768 noninterlaced resolution, the AM/738+ is worth a closer look.

TOM BENFORD

Circle Reader Service Number 304

ATI GRAPHICS ULTRA

ATI's products have enjoyed a well-deserved reputation for high quality, high performance, and innovation since the company first started. This reputation for excellence is more deserved than ever with its current series of graphics accelerator boards, especially the ATI Graphics ULTRA board.

This half-length graphics board is chock-full of features, starting with ATI's proprietary Mach 8 coprocessor, which relieves the PC's CPU of many of the normal video tasks and routines it usually performs. This dedicated graphics coprocessor contributes to significant speed increases in Windows applications.

The Graphics ULTRA contains separate memory sections for the coprocessor and the Super VGA video. You can buy the board with either 512K or 1MB of coprocessor VRAM memory; if you buy the 512K version and decide to upgrade to 1MB later, you can handle the job with SIPP (Single In-line Pin Package) RAM modules. The separate VGA RAM section comes outfitted with 256K of dedicated VGA RAM, which can be expanded to 512K.

A 400-dpi Microsoft-compatible mouse included with the Graphics ULTRA plugs into the bus port on the card's mounting bracket. The mouse is a three-button unit with a curved shape and flush-mounted buttons; while it may be Microsoft-compatible in operation, it's no match for the Microsoft mouse when it comes to comfort, control, and overall hand-shape ergonomics. The mouse may be a purchase point worth considering for some users, however, if they need a mouse and are interested in upgrading their system's video graphics capabilities at the same time.

One of the most unique and noteworthy features of the Graphics ULTRA package is ATI's Crystal Font package. Crystal Fonts are scala-

ATI TECHNOLOGIES
3761 Victoria Park Ave.
Scarborough, ON, Canada M1W 3S2
(416) 756-0718
List price: \$599 with 512K, \$699
with 1MB

ble compact font outlines that generate font images "on the fly" at incredibly fine resolutions and ultra-fast speeds (up to 40,000 characters per second). The video display refreshes itself almost instantly, and the definition and legibility of these fonts are truly impressive. According to ATI, using the Crystal Fonts technology is like having near-300-dpi laser resolution on the video display; after using Crystal Fonts, I must agree that this is an accurate analogy.

Driver, utility, and Crystal Font software comes supplied on two 5¼-inch floppies only; no 3½-inch disks are included in the package. Installing drivers for Windows as well as AutoCAD and several other popular application packages is a simple, almost totally automatic procedure requiring the user to answer a couple of questions or accept default answers throughout the process.

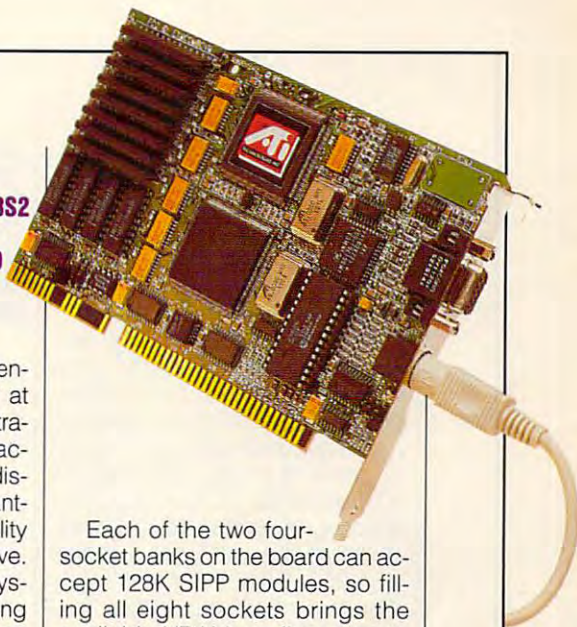
While I still preferred to use my Microsoft mouse during my review, I was very impressed with the Crystal Fonts and the overall speed of the board both in Windows applications and in DOS—the board is a screamer. Of all the boards reviewed here, the ATI Graphics ULTRA is my first choice for overall performance, features, and video fonts resolution.

TOM BENFORD

Circle Reader Service Number 305

CSS MAXGRAPHICS/16

The three-quarter-length CSS MaxGraphics/16 graphics accelerator card is American-made and comes with either 512K or 1MB of VRAM in SIPP (Single In-line Pin Package) RAM modules.



Each of the two four-socket banks on the board can accept 128K SIPP modules, so filling all eight sockets brings the available VRAM configuration to its 1MB maximum. It's important to note that this board, as well as some of the others reviewed here, imposes some video mode restrictions when only 512K of VRAM is available on the board. With the MaxGraphics/16, the restrictions of the 512K configuration are that the board won't function in 1280 × 1024 (16-color) mode, 1280 × 960 (16-color) mode, 1024 × 768 (256-color—the 512K version supports 16 colors) mode, 800 × 600 (256-color—the 512K version supports 16 colors) mode, high-color (16-bits per pixel) mode, and two-page mode. Adding the additional 512K of VRAM eliminates these problems, so if you want to use this board in the extended or high-color mode, plan on spending more for the extra memory.

One of the first things I noticed about this board was an edge connector at the top, which made me hope that the MaxGraphics/16 might have capabilities similar to those of the #9 board for coupling to and working with an existing Super VGA card. Generally, an edge connector such as this one is put on a board for just such a purpose, but I could find no mention of this connector or its purpose anywhere in the user's manual. It was merely referred to as "feature connector" in the manual diagrams.

Although it lacks an index and

TEST LAB

information about the feature connector, the manual is otherwise adequately written. At the end of the manual, you'll find a quasi-useful glossary of terms tied to video technology (such as *bitmap*, *driver*, and *palette*).

I found the installation of the driver and utility software (on 5¼-inch disks) straightforward and uncomplicated for the most part, although not an automatic process. The finer points of configuration require a considerable amount of user interactivity. In addition to a driver for Windows, the package provides drivers for AutoCAD, Lotus 1-2-3, WordPerfect, Microsoft Word, Generic CAD, and other applications.

The board has several jumpers that may require resetting if the factory defaults cause conflicts with other devices. The manual warns of such incompatibilities, stating that they're due to certain design characteristics of IBM AT-compatible systems, which require all boards to use a certain area of memory. While I didn't experience any problem using the board on a fairly "plain vanilla" 386SX/16, the documentation warns that "you may experience problems using the MaxGraphics/16 along with other peripheral cards." This would tend to make me feel uneasy about installing this board on a system with multiple peripherals like sound cards, a hand scanner, a video capture board, a SCSI or proprietary CD-ROM controller, or other such devices. With these

CSS LABORATORIES
1641 McGaw Ave.
Irvine, CA 92714
(714) 852-8161
List price: \$325 for 512K
configuration; \$395 for 1MB
configuration

devices in your system, you'd need to be ready to resolve interrupt and other conflicts that might arise with this card.

With the CSS MaxGraphics/16, as with the other boards, you need to assess your needs, study our Test Lab results, and determine how willing and able you are to tinker with the hardware.

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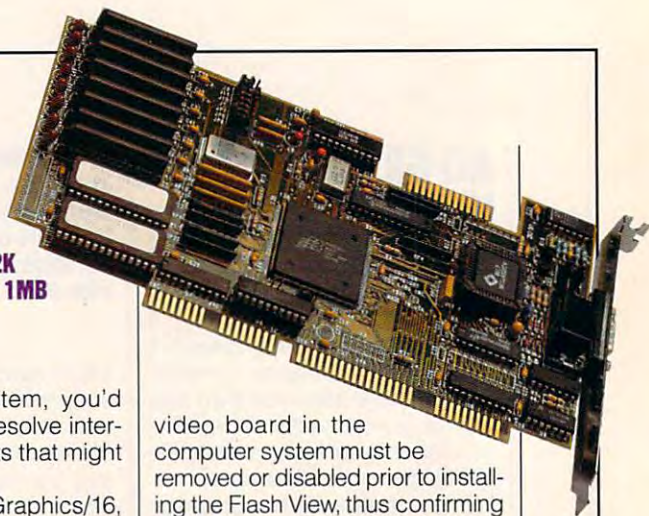
Circle Reader Service Number 306

GLAD SYSTEMS FLASH VIEW

A three-quarter-length American-made board with 1MB of video RAM already installed, the Glad Systems Flash View offers affordable Windows/GUI acceleration.

Like the CSS MaxGraphic/16, the Glad Systems Flash View has an extra-edge connector on its top side. According to the Flash View documentation, this feature connector is an "auxiliary video connector which provides support for future video applications." A bold notation in the system-requirements section of the manual advises that any other VGA or non-VGA

GLAD SYSTEMS
404 S. Abbot Ave.
Milpitas, CA 95035
(408) 456-8888
List price: \$295



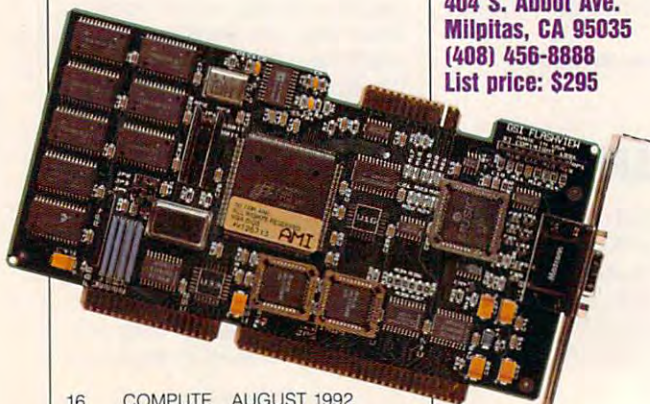
video board in the computer system must be removed or disabled prior to installing the Flash View, thus confirming that it cannot be used in concert with another video adapter. A single 15-pin D connector is located on the board's metal mounting bracket.

The software includes drivers for Windows as well as for AutoCAD, AutoShade, VersaCAD, Generic CAD, Microsoft Word 5.0, Ventura Publisher, WordPerfect 5.1, Lotus 1-2-3, Symphony, GEM 2.x/3.x, and several other applications. Setting up the drivers for Windows is simple and straightforward. But installing drivers for some of the other applications may require manually copying the required files from the driver disk into the application's subdirectory and then running the application's configuration utility to activate the newly installed drivers.

Jumpers are provided for adjusting configuration parameters to optimize the monitor and other system components and to resolve any device conflicts that might arise. To install the board, you simply insert it into any available three-quarter-length 16-bit slot and load the driver software.

The user's manual provided with the Flash View is among the best of those for all the boards covered here. It's well written, exceptionally well organized, and great in its troubleshooting advice. You'll also appreciate the plentiful technical information, component illustrations, and jumper-setting diagrams and charts.

With regard to performance, the Flash View was a pleasant surprise. Applications under Win-





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dows 3.0 typically ran two to three times faster with the Flash View card than with the review system's Oak Technology VGA board. Flash View is a no-frills board that comes in a plain package and does exactly what it claims: It significantly speeds up video processing and provides excellent image resolution without flicker even in the superextended video modes. These factors make the Glad Systems Flash View a highly attractive and affordable choice for those looking for more speed in Windows and other GUI applications.

TOM BENFORD

Circle Reader Service Number 307

**MITSUBISHI ELECTRONICS
AMERICA**
5757 Plaza Dr., P.O. Box 6007
Cypress, CA 90630-0007
(800) 843-2515
List price: \$599

MITSUBISHI DIAMOND SCAN 14

Mitsubishi's monitors have grown more attractive over the years, both in physical styling and technical advancement. The Diamond Scan 14 is a representative example of this continuing form-and-function evolution.

While the monitor makes a good viewing choice for the intermediate user, it also offers the superhigh resolutions often required by power users. The 14-inch monitor uses Mitsubishi's Diamond Scan screen-matrix technology to produce excellent color rendition and screen contrast, and it's mounted atop a removable tilt-swivel base that makes it easy to adjust the screen for the best viewing position and angle.

You'll find the power switch conveniently located at the lower right

corner of the screen and all of the viewing adjustment controls nestled comfortably under the video display. The usual complement of knobs to control horizontal size, horizontal position, vertical size, and vertical position are all located right up front for easy access.

The system I used with the Diamond Scan 14 was an i486-based PC running at 33 MHz with a 1MB Truevision Video VGA with Overlay board. The Truevision board is a high-end Super VGA card capable of the 1280 x 768 256-color mode as well as support for NTSC recordable video and overlay.

The Diamond Scan 14 had no problems running my Windows 3.0 applications with this hardware configuration in 1024 x 768 256-color mode, 800 x 600 mode, or other modes. Image clarity was very good, as was the color saturation and separation.

Moiré patterns were quite evident anytime a close grouping of vertical lines appeared on the screen, and this condition also affected the corner resolution on some images as well. The moiré patterns were particularly noticeable and visually annoying with

TIMED TESTS OF ACCELERATOR CARD PERFORMANCE

We ran this series of tests under Windows 3.0 in 640 x 480 mode. The Trident card is included by way of contrast to show how much faster our featured accelerator boards are. In these tests, the lower the numbers, the better the performance.

TEST	ATI Graphics ULTRA	CSS MaxGraphics 16	Glad Systems Flash View	Number Nine #9GXi LITE	STB WIND X	Trident 256K VGA (default)	Weitek Power for Windows
Windows Write	4.50	4.57	4.63	4.62	4.60	10.28	5.28
Works Flyer	7.69	8.03	7.13	7.81	7.80	9.18	8.18
Works Spreadsheet	3.59	3.85	3.94	4.34	3.75	5.50	4.68
Spreadsheet Pie Chart	2.53	2.75	2.78	2.69	2.72	4.06	2.97
Spreadsheet Bar Chart	2.22	2.38	2.60	2.32	2.44	2.85	2.66
Desktop Published Document	7.06	7.25	7.59	7.47	7.35	15.60	7.47
Averaged Performance Index	4.60	4.81	4.78	4.88	4.78	7.91	5.21

DISPLAYMATE TESTS OF ACCELERATOR CARD PERFORMANCE

The figures below are display-speed indexes for text and graphics; they are weighted averages of a variety of video operations. These indexes indicate how quickly images can be accessed and drawn on the display. They also indicate performance relative to the performance of three systems: an IBM PC with CGA, an IBM AT (8 MHz) with EGA, and a PS/2 Model 70 (25 MHz) with VGA. Higher numbers indicate better performance.

PERFORMANCE RELATIVE TO	ATI Graphics ULTRA	CSS MaxGraphics 16	Glad Systems Flash View	Number Nine #9GX1 LITE	STB WIND X	Trident 256K VGA (default)	Weitek Power for Windows
IBM PC with CGA							
Text	11.7	12.7	12.4	9.0	16.1	8.8	11.3
Graphics	6.0	4.5	4.1	4.8	5.2	4.1	5.7
IBM AT with EGA							
Text	4.1	3.5	3.4	2.8	4.1	2.0	3.6
Graphics	2.7	1.9	1.7	2.1	2.3	1.7	2.6
PS/2 Model 70 with VGA							
Text	2.5	2.0	1.9	1.6	2.2	0.9	2.1
Graphics	1.9	1.2	1.0	1.3	1.4	1.0	1.8

fine dot patterns, as in the borders of many Windows applications such as Microsoft Works or Word. Screen flicker, otherwise unnoticeable, made these gray-border areas "strobe," which is a major cause of eye fatigue.

The Mitsubishi monitor also showed some image persistence with fast-moving, high-contrast graphics. Simply described, when a light-colored object moved quickly across a dark background (as in moving the mouse pointer), a slight ghost image, something like a short tail on a comet, followed the object.

Quickly switching from text to graphics mode and vice versa caused a noticeable screen

bounce, especially when switching from one view to another inside an application. With DOS applications such as Microsoft Works, this screen bounce was quite pronounced when switching a spreadsheet view from the worksheet to a bar graph representation of the same information in another window. Since everything runs under graphics mode in Windows, however, screen bounce wasn't a problem there.

If you're in the market for a good-looking Super VGA monitor capable of running in the extended video modes, take a look at the Mitsubishi Diamond Scan 14.

TOM BENFORD

Circle Reader Service Number 308

NEC MULTISYNC 4FG

The MultiSync 4FG features a 15-inch "flat square" screen that is certainly one of the best computer video displays I've ever seen.

The 4FG's screen is almost flat (or at least much less curved

than those of other monitors), and the screen's corners are at right angles rather than rounded as on other monitors. Consequently, you have a viewing perspective quite different from that of traditional CRTs with their curved screens and rounded corners.

Viewed directly from the center, the screen appears to bow in slightly at both sides, but if you move your head slightly to the right or left of center, the sides then appear to be perfectly straight. I found the video display very easy to view from any angle. A built-in, nonremovable tilt-swivel base facilitates positioning the monitor at the ideal viewing angle for any user.

You'll find all controls on the 4FG front-mounted for easy access. Look for the power switch with illuminated indicator at the lower right front corner; knobs for adjusting the brightness and contrast are bottom-mounted next to it. NEC provides 11 other controls for configuring the display; these are hidden from sight behind a door on the lower left portion of the front panel. Soft-touch push-button controls allow you to adjust the image size and position; four buttons laid out like a cursor keypad are provided for these functions.



NEC TECHNOLOGIES
1255 Michael Dr.
Wood Dale, IL 61019
(708) 860-9500
List price: \$949

TEST LAB

A special degauss button instantly demagnetizes the CRT, eliminating any accumulated static electrical charges that may have collected. A three-position N-1-2 switch, located next to the degauss button, selects normal, amber, or rose-tinted screen backgrounds to aid visibility under certain lighting conditions. To compensate for some nonstandard video adapters, you can use the monitor's sync switch, which adjusts the screen's synchronization signals.

I found the overall image quality of the 4FG superb, with very little "strobing" on those troublesome fine dot patterns and absolutely no moiré patterning at all. Although there was some slight image lag (also referred to as persistence) with fast-moving graphics on high-contrast backgrounds, this was negligible and much less noticeable than on most of the other monitors reviewed in this month's Test Lab.

The MultiSync 4FG can handle all video modes and resolutions up to and including 1024 x 768 with 256 colors, interlaced or noninterlaced, which makes it compatible with just about any video adapter available. I used a Truevision Video VGA with Overlay card which has 1MB of RAM and a Tseng 4000 chip set on it during my review of the NEC, and the video from this card never looked better.

The MultiSync 4FG's excellent color and resolution, luxurious 15-inch screen, and innovative technological features make it an excellent choice for anyone who needs—or wants—outstanding video even in the Super VGA modes.

TOM BENFORD

Circle Reader Service Number 309

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.

DISPLAYMATE MONITOR EVALUATION TESTS

	Amdek AM738+	Mitsubishi Diamond Scan 14	NEC MultiSync 4FG	Sony CPD-1304S
Pass=1 Fail=0				
Screen uniformity and flicker	1	1	1	1
Freedom from background interference	1	1	1	1
Dark screen	1	1	1	1
Geometric linearity	1	1	1	1
Circular test pattern	1	1	1	1
Horizontal vs. vertical line thickness	1	1	1	1
Line brightness vs. thickness	1	1	1	1
Defocusing and blooming test	0	1	1	1
Raster visibility	1	1	1	1
Resolution	1	0	1	1
Corner resolution	1	0	1	1
Normal and reverse video resolution	1	1	1	1
Line moiré pattern	0	1	1	1
Fine line moiré pattern	1	0	1	1
Dot moiré pattern	1	0	1	1
Fine dot moiré pattern	1	1	1	1
Horizontal color registration	1	1	1	1
Vertical color registration	1	1	1	1
Horizontal color registration blink test	1	1	1	1
Vertical color registration blink test	1	1	1	1
64 intensities for primary colors	1	1	1	1
Color timing	1	1	1	1
Digital color timing	0	0	1	1
White-level shift	1	1	1	1
Black-level shift	1	1	1	1
Two-dimensional streaking	1	1	1	1
Streaking and ghosting	1	1	1	1
Persistence test	0	0	0	0
Screen regulation	0	0	0	0
Local regulation distortion	0	0	0	0
Screen snow test	0	1	1	1
Scroll flicker test	1	1	1	1
Text-graphics mode switching	0	0	1	0
TOTAL TEST SCORES	25	24	30	29



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Garry Ray, writing for PC Week, said, “Of these alternative operating environments (OS/2, DesqView and Software Carousel), Carousel may be the best choice of the day.”

Barry Simon of PC Magazine concurred with, “...I find it difficult to imagine using my computer without Carousel. This package has become an essential tool and one that I strongly recommend.”

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October 30, 1990
Software Carousel, Version 4.0



 **Software Carousel** \$89⁹⁵

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NUMBER NINE #9GXi LITE

Number Nine's #9GXi LITE is the most technically sophisticated graphics accelerator board reviewed here; it's intended for the serious power user who needs the advanced capabilities it delivers, particularly for CAD applications. With a price tag that starts at \$995 for the basic configuration, it's not for the casual or budget-conscious PC user. The review unit had a RAM option installed, adding to the price of the board.

Innovative is perhaps the best word for an overall description of the #9GXi LITE. At the heart of this half-length board is the Texas Instruments TI 34020 graphics

A NOTE ON PRICES

With computer products changing more rapidly than ever and with options more plentiful than ever, computer prices can be a tricky business.

It pays to keep the following points in mind:

Street prices can be considerably lower than list prices. Shopping around helps you find the best price.

Because computer technology evolves so rapidly, a product may have changed by the time our review sees print. Verify configuration details with manufacturers or vendors before you buy.

Because consumers are more sophisticated than ever about what they want in computer products and because manufacturers have responded with more options and configurations than ever, one computer model may be subject to dozens of variations, each with a slightly different price.

At COMPUTE, we make every effort to verify prices and differentiate between the price for a review configuration and the price for a standard configuration. It's still a good idea, however, to call the manufacturer or vendor to make sure that the configuration you want matches the price you have in mind.

NUMBER NINE COMPUTER

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(617) 674-0009

List price: \$995 for Level 20 (1MB VRAM); \$1,024 for Level 21 (1MB VRAM and 1MB DRAM)

coprocessor chip. This special graphics processing unit (GPU) is optimized for graphics functions: At 10 MIPS (Millions of Instructions Per Second), it's faster than the CPU of the IBM PC, which runs at 9 MIPS. Because the GPU frees the CPU to do its work, your system can move right along.

The graphics processor is supported by several other processors and support chips, including the TI 40 MFLOP (Math Floating Logical Operations Processor) and 128K static RAM. The board supports up to 4MB of DRAM for offscreen bitmaps and instruction memory as well as up to 2MB of high-speed VRAM. Two proprietary Number Nine ASICs (Application Specific Integrated Circuits) and flash BIOS memory contribute to the overall speed of the board and make its amazing zoom, pan, scroll, and virtual screen capabilities possible.

In addition to being a high-speed graphics coprocessor, the #9GXi LITE has its own on-board Super VGA chip, so it can be used as the sole video board in a PC. One of the features I particularly like about the #9GXi LITE is its VGA pass-through connector, which permits you to use your own favorite VGA card instead of the on-board VGA, so your current video board doesn't have to become obsolete. This feature is especially appealing to me, since my standard video board is an expensive (about \$1,000) Truevision Video VGA with Overlay.

By using the included VGA loop-through ribbon cable to connect the #9GXi LITE to my Truevi-

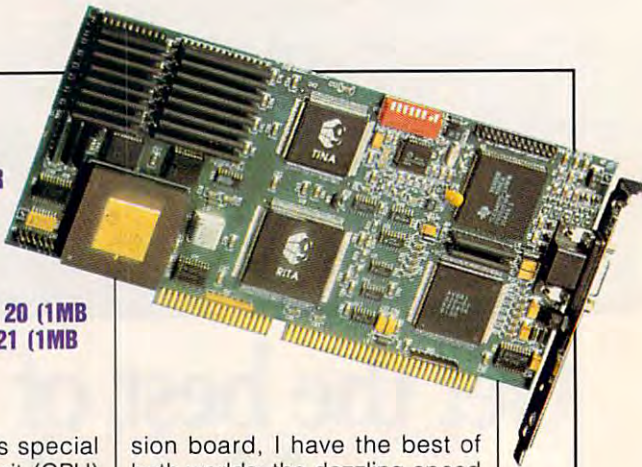
sion board, I have the best of both worlds: the dazzling speed and unparalleled image-manipulation capabilities of the #9GXi LITE and the Super VGA resolution and recordable video output of my Truevision.

The unique features of the #9GXi LITE don't stop there, however. In addition to the 15-pin D connector, a multicolored status LED is located on the mounting bracket. This LED indicates flash memory loading as well as proper operational condition of the board.

A monitor cable provided with the #9GXi LITE facilitates connecting the card to monitors with four discrete BNC jacks (a type of shielded cable connector). You also get a VGA terminator plug that works with the pass-through connector when it's used. Software comes on both 3½-inch and 5¼-inch disks. The user's manual is excellent.

Without a doubt, the video-manipulation features of the #9GXi LITE make it unique among this month's boards. For example, the board supports a superfast hardware zoom feature that increases or decreases screen magnification by two, four, or eight times; it takes but a single keystroke to activate the zoom and only 1/60 second for the screen to regenerate at the desired zoom level. Virtual screen panning and scrolling are also possible, since the board supports resolutions up to 2048 x 1024. In these resolutions, the screen becomes a movable "viewport" on a much larger picture that you can see by moving the cursor beyond the screen edge to scroll.

AutoCAD users will appreciate



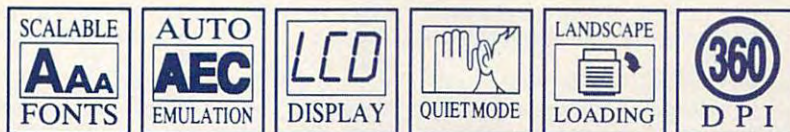
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Circle Reader Service Number 113

TESTING METHODOLOGY FOR ACCELERATOR CARDS AND MONITORS

To test our accelerator boards, we used a 16-MHz 80386SX PC equipped with 5¼-inch and 3½-inch floppy drives, a 40MB hard drive, 4MB of RAM, and a multi-frequency Super VGA monitor. We used MS-DOS 5.0 and Windows 3.0 in Enhanced mode, and, for all tests, we used 640 × 480 16-color mode. For baseline comparison purposes, we ran our video adapter test suite on an Oak Technology VGA card with 256K of on-board RAM. Following are the results of our baseline testing:

Windows Write Test:	10.28 seconds
Flyer Document Test:	9.18 seconds
Spreadsheet Preview Test:	5.50 seconds
Pie Chart Graphics Test:	4.06 seconds
Bar Chart Graphics Test:	2.85 seconds
DTP Document Test:	15.60 seconds

Averaged Performance Index for the default system board: 7.91 seconds

The Windows Write Test measures the time required to create a WYSIWYG display of a Windows Write document incorporating one dozen Bitstream FaceLift fonts of various sizes. First we loaded the document into RAM, then we switched windows, and finally we timed the creation of the WYSIWYG display. The Flyer Document Test measures the time required to create a page view (full-page print preview) of a sample flyer document with borders, numerous Bitstream FaceLift fonts in several point sizes, and some bitmapped clip art.

The Spreadsheet Preview Test measures the time required to re-create a printed-page preview display after the spreadsheet data was already loaded in worksheet format. For this test we used a very dense spreadsheet with cell data created in six-point type.

The Pie Chart Graphics Test measures the time required to create a pie chart graphical representation of the numeric information. For this test we used a corporate profit/loss balance sheet spreadsheet file.

The Bar Chart Graphics Test measures the time required to create a bar graph representation of the data in a personal assets/liabilities spreadsheet file.

The DTP Document Test measures the time required to generate a page view of a single-page document incorporating multiple typefaces, type sizes, and nine bitmapped graphics, along with rules and filled-pattern boxes.

The Averaged Performance Index is an average of the elapsed times for these six tests. This average serves as an overall performance index number for comparison purposes.

Sonera Technology's DisplayMate Video Utilities software was also used for establishing software-independent performance indexes for text and graphics with the test adapters. The DisplayMate Speed Performance Test utility is a compendium of scores of various tests which run in fully automated mode. The 35-second test suite provides performance index measurements for both text and graphics operations relative to an IBM PC (4.77 MHz)

with CGA, an IBM AT (8 MHz) with EGA, and an IBM PS/2 Model 70 (80386 at 25 MHz) with VGA. Running DisplayMate from the DOS prompt, we used this test utility to measure the video adapter's ability and speed in processing text and graphics. These tests are useful for determining the hardware's raw processing power at the base level without any application software intervention.

To test the four SVGA monitors in this month's lineup, we used a 33-MHz i486-based PC equipped with dual 5¼-inch and 3½-inch high-density drives, an 85MB hard disk, a 105MB Plus HardCard IIXL, an internal NEC CDR-83 CD-ROM drive, a Trantor 8-bit SCSI interface card, a Creative Labs Sound Blaster Pro audio card, 8MB of RAM, 64K internal caching, a Computer Eyes/RT video capture card, and a Truevision Video VGA with Overlay board. The Truevision card has 1MB of video RAM and uses the popular Tseng 4000 chip set. In addition to generating all standard and extended VGA modes, including 1024 × 768 256-color, the Truevision board is also capable of generating recordable NTSC video (television) output as well as combining computer VGA video with NTSC video input.

All monitor tests were subjective in nature and were conducted using the DisplayMate Video Obstacle Course test suite. The Video Obstacle Course is a series of 33 test patterns designed to uncover video anomalies or substandard performance. Common video irregularities, including blooming, defocusing, geometric linearity, moiré patterns, flicker, streaking, ghosting, and other conditions, are diagnosed using the test patterns displayed. A "jury" of three CPTS staff members scrutinized each monitor for each test and voted either 1, signifying the monitor passed the test, or 0, designating failure. The votes of these three testers were compiled for all of the tests, and the results were totaled. A perfect score for the Video Obstacle Course is 33; none of the monitors tested achieved a perfect score, although two (the NEC and Sony) came close to achieving perfect marks.

Additionally, we put all the monitors through the DisplayMate Video Modes Test Suite to establish their ability to display the following modes correctly:

Modes 0, 1:	40-column color text
Modes 2, 3:	80-column color text
Modes 4, 5:	320 × 200 4-color graphics
Mode 6:	640 × 200 2-color graphics
Mode 7:	80-column monochrome text
Mode 13:	320 × 200 16-color graphics
Mode 14:	640 × 200 16-color graphics
Mode 15:	640 × 350 monochrome graphics
Mode 16:	640 × 350 4- or 16-color graphics
Mode 17:	640 × 480 2-color graphics
Mode 18:	640 × 480 16-color graphics
Mode 19:	320 × 200 256-color graphics

All of the monitors tested passed these tests satisfactorily and without incident.

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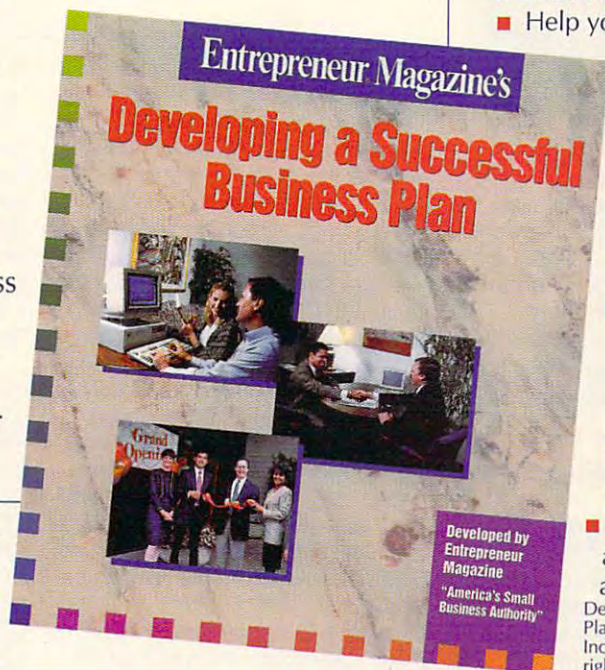
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the included Power9 software features, which present a menu of display options including pans and zooms, system fonts, definable macros, and much more.

For any power user with high-level graphic application demands, the #9GX Lite is the card of choice.

TOM BENFORD

Circle Reader Service Number 310

SONY CPD-1304S

Sony brings its Trinitron video technology, so popular with consumer televisions, to the world of PC computing with its 14-inch CPD-1304S Multiscan HG model. As with a Trinitron tube-based television, the CPD-1304S is a real treat for the eyes.

This Sony monitor is similar to the NEC Multisync 4FG, also reviewed here, in that its screen is almost flat and features squared corners rather than rounded ones. Also, as with the NEC, the sides of the video image seem to bow in slightly, but this is the result of the nonstandard screen curvature and actually improves viewing.

The removable tilt-swivel base makes adjusting the viewing angle easy, and you'll find all of the CPD-1304S's controls conveniently front-mounted.

The CPD-1304S appears very clean and uncluttered, with minimal adornments and controls to detract from its sleek look. Look for two knobs at the lower left front corner of the monitor, one for brightness and one for contrast. In the

SONY
Computer Peripheral Products
655 River Oaks Pkwy.
San Jose, CA 95134
(800) 352-7669
List price: \$1,029.95

lower right corner you'll find the power switch and illuminated indicator. These are the only controls provided on the front of the unit. The lower left side of the monitor houses the control knobs for adjusting horizontal size, horizontal shift (centering), vertical centering, and vertical size. An "auto size" switch is also located on this panel for use with PS/2 models. This switch, when set to the lock position, automatically adjusts the timing to the current VGA mode, thus locking out any manual adjustments to the picture size or position.

As with the other monitors covered here, I used a Truevision Video VGA with Overlay board in a 486 system running at 33 MHz as the test platform. The Truevision card has 1MB of video RAM on board and is capable of 1024 x 768, 256-color resolution. The CPD-1304S had no problems whatsoever in this mode, in 800 x 640 mode, or in any of the lower-resolution video modes. I found image clarity and color to be excellent throughout the various modes.

The CPD-1304S is capable of running the 1024 x 768 high-resolution video mode in either interlaced or noninterlaced mode, which makes it capable of simulating the IBM 8514a (interlaced) monitor standard as well as accommodating the numerous adapters designed to run in noninterlaced mode at this extreme resolution. Having this flexibility is a nice comfort feature, especially for PC owners who want to use the stock Windows 8514a drivers or who may be changing their video cards in the near future.

I noticed some image persistence with high-contrast, fast-moving subjects, although it was so slight as to be almost negligible.

Switching from text to graphics modes under DOS also caused some slight image bouncing, although I experienced no problems of this kind running applications under Windows.

Moirés weren't a problem with the CPD-1304S at any of the resolutions. Even tightly spaced vertical and horizontal line and dot patterns didn't produce moirés. "Strobing" occurred with some fine dot backgrounds, but it wasn't serious or pronounced enough to consider it a problem, since virtually every monitor reviewed here displayed some strobing with these patterns.

Overall, the CPD-1304S deserves very high marks. I

SOME NOTES ABOUT WINDOWS/GRAPHICS SPEEDS

While our tests show the relative improvement of changing from a standard Super VGA card to a Windows/GUI accelerator card, this is not the only way to improve the performance of Windows and other graphical applications.

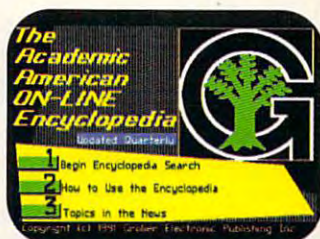
A software product, WinSpeed, claims to increase display speed performance under Windows by 200-500 percent. This product works with over 85 percent of the Super VGA cards on the market, including cards from ATI, Paradise, and Trident, as well as all cards using Tseng 4000 video controllers. WinSpeed (\$79 list) comes from Panacea (800-729-7420).

A faster CPU also significantly increases video-processing speed under Windows and other GUIs. For example, an i486-based PC with a Super VGA card will, in most cases, actually be faster than a 386 machine with a GUI accelerator. This point is worth considering if you intend to upgrade to a more powerful PC platform in the near future. If, after upgrading, you decide you still want faster performance from Windows and other graphical applications, you can always install a GUI accelerator at that time.

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would select it as my second choice, after the NEC Multisync 4FG, for extended VGA and power user graphical applications.

TOM BENFORD

Circle Reader Service Number 311

STB WIND/X

The WIND/X is a half-length Windows and GUI (Graphical User Interface) adapter card from STB. The review unit came populated with 512K of on-board video RAM (VRAM), which can be upgraded to 1MB by adding four 128K SIPP modules to the vacant sockets on the board. The accompanying installation, driver, and utility software is supplied on 5¼-inch media along with a well-written user's manual.

The straightforward hardware installation consists principally of replacing the current video card with the WIND/X unit and installing the software. There are no switch settings to contend with on the board, although several jumpers are provided to change the default configurations if you find it necessary to resolve special hardware conflicts that may occur on some systems or with other peripheral devices. I didn't encounter any problems with the default settings on the review unit, but the excellent diagrams and explanations in the manual would've been invaluable in correcting them had they occurred.

The WIND/X card has a built-in bus mouse port on its mounting bracket, which also holds the 15-pin D connector for attaching the monitor cable. A Logitech MouseMan three-button bus mouse and Logitech mouse driver software are packed with the WIND/X card. The bus mouse port can be disabled by pin-cap position of jumper J8; I opted to disable the port in order to use my Microsoft mouse (connected via COM 1) for review purposes. (This also eliminated the need to change all my software configurations to tell them to look for the

STB SYSTEMS
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(214) 234-8750

List price: \$339 for HC version;
\$399 for Ultra version with port
and Logitech MouseMan

mouse at the bus port instead of the serial port.)

The WIND/X board is a fast and capable performer, delivering excellent resolution and significant graphics speed improvement for Windows applications, although text-based applications didn't reflect the accelerated speeds as much. I didn't experience any performance improvements that even remotely approached STB's claim of speeds "up to 20 times faster than Super VGA for Windows 3.0 functions." It should be noted, however, that the WIND/X board was indeed faster than some of the more expensive boards reviewed here.

Like the other Windows and GUI accelerators covered here, the WIND/X is capable of supporting 640 × 480, 800 × 600, and 1024 × 768 resolutions without flicker. The WIND/X board also supports the high-color option of 65,536 colors at 640 × 480 resolution with the insertion of a special DAC (Digital-to-Analog Converter) chip into the socket on the board. The upgrade chip, sold separately, allows for a 16-bit or CEG (Continuous Edge Graphics) extended-range color palette.

You get an abundance of drivers, including those for Windows, AutoCAD, Microsoft Word, WordPerfect, Lotus 1-2-3, CADVANCE 3.50, Generic CAD 1.1, and other applications. Installing the drivers is an automated process for Windows and some of the applications, while others require you to manually copy the desired video display drivers into the appropriate application's subdirectory. Although they arrived too late to be part of testing and evaluation, new optimized drivers for

Windows 3.0 and 3.1 are available for this card.

The STB WIND/X makes a good choice for many users desiring faster performance for Windows or other graphics-intensive applications.

TOM BENFORD

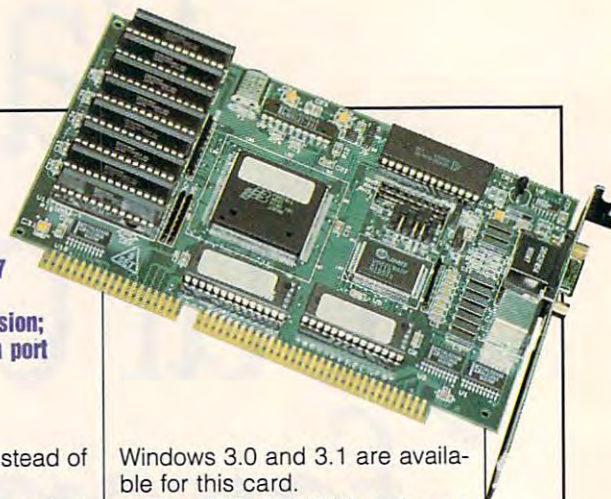
Circle Reader Service Number 312

WEITEK POWER FOR WINDOWS

Weitek is probably best known for its line of math coprocessor chips that speed up numeric calculations by several orders of magnitude. But Weitek is also a leading developer and manufacturer of graphics coprocessors, and the Weitek Power for Windows graphics board is its latest offering.

The half-slot board contains Weitek's single-chip graphics controller, the W5086, which effectively off-loads the PC's CPU operations dealing with certain graphics operations. It does this by incorporating the Microsoft Windows Graphic Device Interface (GDI), Bit-Block Transfer (BitBLT), and LineDraw functions in hardware (rather than system RAM) to increase performance.

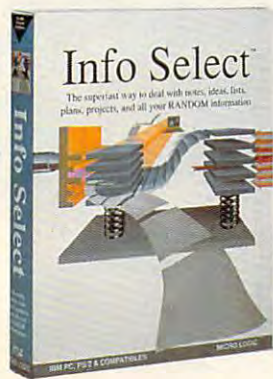
The board by itself can significantly speed up all Windows and AutoDesk applications (AutoCAD, AutoShade, and others), and it comes supplied with an assortment of drivers for Windows 3.0, ADI (AutoDesk), and other popular applications such as WordPerfect 5.0 and 5.1, Microsoft Word 5.0 and 5.5, Lotus 1-2-3, and Ventura Publisher (GEM version). Although they did not arrive in time for testing and review, new drivers for Windows



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TEST LAB

3.0 and 3.1 are now available.

The Power for Windows card comes equipped with 512K of video RAM, and it's a fully functional and completely compatible VGA board. While video cards with 1MB of RAM are quite common, the Weitek board actually outperforms Super VGA cards with double the RAM, thanks to its dedicated W5086 User Interface Controller chip, even with DOS applications. Under Windows, the card typically runs applications from two to four times faster.

Installing the board consists of removing or disabling the present video card and replacing it with Power for Windows, connecting the monitor, and loading the supplied drivers. A single 15-pin D connector is provided on the board's mounting bracket.

The Weitek package includes driver software on both 3½-inch and 5¼-inch media. An automated installation program makes

WEITEK
1060 E. Arques Ave.
Sunnyvale, CA 94086
(408) 738-8400
List price: \$299

copying the required drivers and support files to the appropriate Windows directories a foolproof process, and a driver-removal program (for uninstalling the drivers) is also included. Along with the software, you get an excellent 58-page user's manual with all of the information that you'll need to get optimal performance for all Windows applications with this high-performance graphics board.

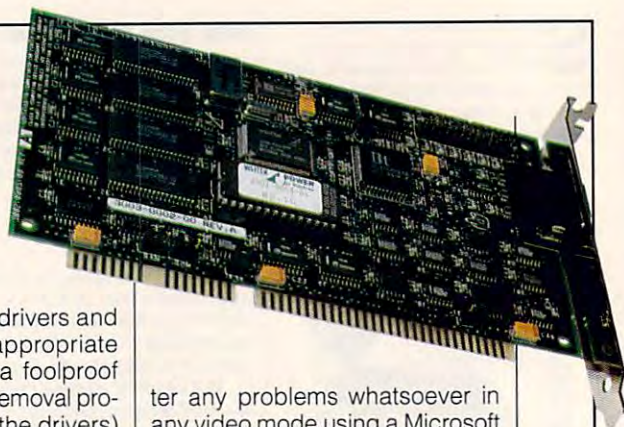
Although the disk-based README file warns of the possibility of mouse incompatibilities that may exist with some mice in the super-extended video modes (800 × 600 and 1024 × 768) because of nonstandardized mouse driver implementations, I didn't encoun-

ter any problems whatsoever in any video mode using a Microsoft serial mouse.

The Weitek board was a joy to use, producing crisp, flicker-free displays in 640 × 480, 800 × 600, and 1024 × 768 video modes, with excellent color and image resolution even when using a relatively inexpensive multi-frequency analog monitor. The product also lived up to Weitek's claims by producing a speed increase of more than 200 percent in the applications I used it with.

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Circle Reader Service Number 313



GLOSSARY

CGA. The IBM Color Graphics Adapter. One of the first video adapter standards to support color monitors, it displays as many as 16 colors (at 160 × 200 resolution); however, 4-color implementation is more common. These colors include black, dark gray, light gray, and white.

color depth. The maximum number of colors that a video board can display simultaneously. For example, a VGA card can display as many as 256 colors at a time.

driver. A series of instructions that the computer follows to reformat data for transfer to and from a particular device or expansion board. The specific requirements differ from one kind of device to another and from one application package to another.

EGA. Enhanced Graphics Adapter. The graphics standard that replaced CGA (Color Graphics Adapter) in the 1980s as the predominant color standard. With EGA, resolution is pushed up to 640 × 350 pixels, and 64 colors are available. EGA had a

rather short life as the major video standard, as VGA soon replaced it.

interlaced display. A monitor that refreshes every other scan line on every other pass of the screen, thus requiring two scans to completely refresh the screen. Interlaced displays characteristically show more flicker and "strobing" as a result of the extra passes. Contrast with **noninterlaced display**.

moiré. Shimmering waves of display distortion.

multisync display. Also known as variable frequency display (VFD). A monitor that is capable of displaying a wide range of resolutions because of its ability to scan at various horizontal and vertical frequencies.

noninterlaced display. A monitor that refreshes the entire screen (every scan line) on every pass of the screen. This feature greatly reduces flicker, "strobing," and user eyestrain. Noninterlaced displays are highly preferable to interlaced displays.

palette. The total number of colors that your computer's video board can take advantage of. Typically, a video board can display only a portion of its palette at one time. See also **color depth**.

resolution. The number of dots, or pixels, on the screen. The more pixels there are on the screen, the sharper the image. VGA can display 640 pixels horizontally by 480 pixels vertically. SVGA is capable of even higher resolution.

Super VGA. Also known as Extended VGA. The video standard that goes beyond the maximum resolution of standard VGA (640 × 480). Such modes as 800 × 600, 1024 × 768, and the new 1280 × 1024 are all in SVGA range.

VGA. Video Graphics Array, the video standard developed by IBM that supersedes EGA, pushing resolutions to 640 × 480.

—DAVID ENGLISH
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ABOUT DISPLAYMATE

Sonera Technologies' DisplayMate was a valuable testing tool in this month's Test Lab. As you can tell from the grids on monitor and accelerator card testing, DisplayMate allowed us to compile detailed information. For those of you in search of this kind of detailed information on video performance, here's a rundown of the product.

DisplayMate is a set of utilities, tests, and performance benchmarks for checking the overall video performance of PC systems. Some of the tests are especially useful for rating the speed performance of video adapter cards in both text and graphics modes, while other tests are primarily intended for evaluating the image clarity, integrity, and resolution on video monitors.

The DisplayMate software is supplied on both 5¼- and 3½-inch disks and is accompanied by an outstanding 370-page user's manual.

Though truly industrial-strength in its capabilities, DisplayMate is also very easy to use, thanks to excellent function layout and strong online help. The program is so easy to use, in fact, that the manual is really more of a technical reference guide and primer on video technology in general than a user's manual. And, while it's a huge repository of information on the tests and utilities which comprise the software, many users will probably want to skip the pedantic material in the manual and get right into using the program.

Installation is an almost completely automated procedure which requires you to answer a few question prompts to establish which hard drive you wish to install to, whether the default subdirectory is satisfactory, whether you'd like a path statement added to your AUTOEXEC.BAT file, and whether you'd like a DisplayMate video test pattern automatically displayed for 20 seconds when the system is booted. Once you've answered these queries, the installation is complete, and you're ready to start using DisplayMate.

Two levels of tests are available: nontechnical and technical. The differ-

ence between the two levels is the amount of user intervention required. For example, the nontechnical performance test set is a fully automatic operation that conducts several hundred tests over a 35-second time period, compiles the data, and displays a comparative reference index of your system's overall performance for text and graphics. Your system's performance is compared to the performance of

The performance tests are particularly useful in evaluating the performance of different video cards, while the video obstacle course and different mode tests are especially useful for diagnosing monitor problems and gauging display quality. Though the performance tests produce objective performance data on the video hardware's speed performance, the monitor tests require the subjective evaluation of the user's own eyes.

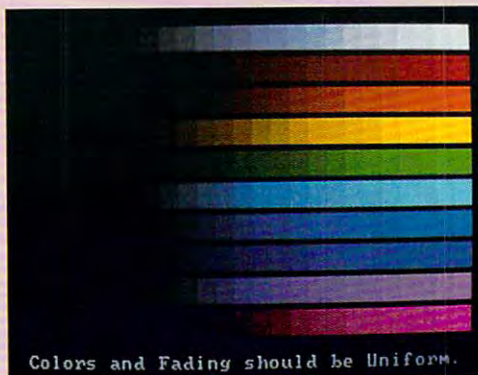
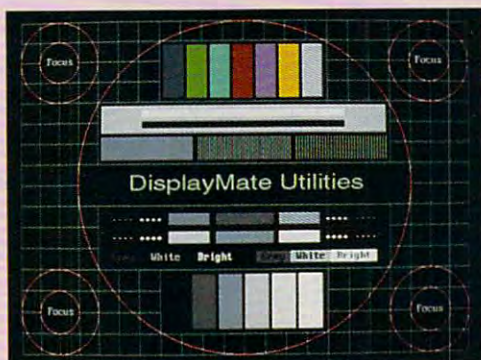
The monitor tests are composed of scores of different test patterns at different resolutions to check the monitor's convergence, resolution, focus, edge clarity, ghosting/image lag, video refresh rates, and more. Different patterns are used to test for moirés, flickering, line bowing, reverse video, and other color/intensity/clarity attributes. The excellent online messages explain what each test does and how to interpret the results. If you prefer, the extended help screens can be toggled off with the F10 key once you become familiar with the program.

If you're shopping for a new video card, a Windows accelerator card, or a monitor, you'll be in a much better position to make an educated purchase if you use DisplayMate for your comparisons. Since the program is contained on a single floppy disk, it's easy to take along to your dealer for checking out your potential purchase. And if you're shopping for a laptop or notebook PC, DisplayMate is outstanding for testing and evaluating LCD and gas plasma displays as well.

DisplayMate is also excellent for diagnosing potential monitor problems that may become progressively worse with age. It can be invaluable for directing a service technician to correct a particular problem as well. In other words, DisplayMate is an indispensable video evaluation and diagnostic tool that can do it all. To order DisplayMate (\$149), contact Sonera Technologies in Rumson, New Jersey, at (800) 932-6323 or (908) 747-6886.

TOM BENFORD

Circle Reader Service Number 314



three standard IBM platforms: an IBM PC, an 8-MHz IBM PC AT, and a PS/2 Model 70 (80386) running at 25 MHz. On the other hand, the technical performance tests require that you specify the desired video mode and other data. The detailed test results require four full screens to display, but unless there's a specific measurement you're looking for and you have very sophisticated technical knowledge, these tests will be more than you need. The nontechnical section provides plenty of meaningful information to compare with the three IBM configurations.

NEWS & NOTES

Jill Champion

Not Your Father's Oldsmobile

Highway travel of the future, or at least how some envision it, is getting a test run in Orlando, Florida, this year. Last March, the American Automobile Association, General Motors, the Federal Highway Administration, the Florida Department of Transportation, and the city of Orlando launched TravTek, a project involving the nation's most advanced intelligent vehicle/highway system (IVHS), on a one-year experimental basis.

IVHSs, also called smart car/smart highway systems, apply

Smart cars take the worry out of driving, find the best route, and alert you to hazards on the road ahead.



electronics, computer, and communications technology both in cars and on highways to guide motorists via sight and sound and, simultaneously, to inform area traffic managers of travel conditions. Drivers then receive up-to-the-minute information from the area's traffic management center.

The TravTek project in Orlando involves 100 Oldsmobile Toronados equipped with built-in microcomputers. Fingertip controls are located on the steering column and dashboard. When the driver selects a destination, TravTek calculates the fastest route, providing both visual and audio driving instructions. A mon-

itor built into the car's dashboard displays a map along with the driver's current location. The screen shows the fastest route to the destination chosen, turn-by-turn driving instructions, and realtime information on traffic jams, accidents, detours, weather, and road conditions.

TravTek Toronados communicate with "smart highway" apparatus, highway video cameras, traffic sensors, emergency vehicles, construction reports, and other TravTek cars, while magnetic compasses, satellite communications, and wheel sensors operate in tandem to pinpoint the car's location on the map display.

AAA members interested in participating in TravTek while in the Orlando area may contact their travel agents for information on renting a TravTek Toronado through the Avis rental car agency.

Have CD-ROM, Will Travel

Speaking of modern transportation, you can journey through ten of the globe's most interesting cities without ever leaving home. All you need is a CD-ROM-equipped PC and InterOptica's Great Cities of the World, Volume 2, to get moving through Berlin, Buenos Aires, Chicago, Jerusalem, Johannesburg, Rome, San Francisco, Seoul, Singapore, or Toronto.

Over two hours of audio, 300 photographs, 300 maps, music, narration, examples of spoken languages, and text equivalent to ten travel guidebooks make up this multimedia package.

For more information, contact InterOptica Publishing, 300 Montgomery Street, San Francisco, California 94104; (415) 788-8788.

Number Crunching Made Easy

Professors, engineers, and others who use complicated math-

ematical equations take note: TK Solver 2.0 is an equation processor that does for equations what a word processor does for writing. The program taps the number-crunching power of virtually any major brand of PC running nearly any software.

Once your variables, rules, tables, and plots are organized into sheets, the Presentation View feature allows you to use any number and combination of sheets to create a presentation-quality interface. Release 2.0 is an update of TK Solver Plus 1.1. Suggested retail price is \$595. Upgrades for prior versions are available at a lower cost. For more information, contact Universal Technical Systems, 1220 Rock Street, Rockford, Illinois 61101; (800) 435-7887.

Interactive TV

Pretty soon your TV will be watching you. Interactive TV, two-way communication between the television set and viewer, recently crept from the Sacramento area into the San Francisco Bay area of California. Eventually, it will find its way into TV viewing areas all over the country.

Interactive Network (IN) is a two-way television entertainment system that allows TV viewers to play along with game shows, live sports events, and dramas, and to participate in polls and voice their opinions during live news shows and talk shows. The IN system uses a simple wireless, hand-held control unit that receives FM radio signals transmitted from the company's headquarters, where the information is produced and simulcast with local television signals.

IN's programs include major sporting events (NBA basketball and major-league football and baseball), game shows ("Wheel of Fortune"

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Every month, from now until November, you'll have the chance to win fabulous prizes by playing the Compute SearchStakes. You'll also have the chance to win the SearchStakes Grand Prize by submitting the solution to any two monthly SearchStakes, plus the solution to the Grand Prize SearchStakes, to be featured in our upcoming December issue.

IT'S FUN TO PLAY

Each of the six picture disks displayed below is a portion of a photo or illustration taken from an ad in this issue. To

solve the August SearchStakes, locate the ads from which these disks were taken and note the page number for each. If the ad has no page number, simply count that page or cover as zero. Then add up all six page numbers. That is the solution to this month's SearchStakes.

IT'S EASY TO ENTER

Once you find the solution, you may enter the August SearchStakes automatically on a touch-tone phone by calling 1-900-454-8681 by 9/30/92. The cost for the call is \$1.50 for the first minute, \$1.00 for each additional minute. Average call is estimated to be 2-3 minutes. Callers must be 18 or older. You may also enter by mailing your answer on a 3" x 5" piece of paper, along with your name, address, and phone number, to: "August Compute SearchStakes," 324 West Wendover Avenue, Suite 200, Greensboro, N.C. 27408 by 9/30/92. No purchase necessary. For more information on how you may win this month's prize, valued at more than \$1,500, turn to page 40.

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and "Jeopardy!"), drama (CBS's "Murder, She Wrote"), and documentary and news programs ("60 Minutes" and "NBC Nightly News").

The Mountain View, California, company that developed the system says the patented technology is capable of eventually reaching every home in the United States. If you happen to be a couch potato in the Sacramento or San Francisco Bay area, however, price is something to consider: The control unit costs \$199, in addition to a \$15-per-month subscriber fee, which allows you to interact with whatever's offered. To compete

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against *other* subscribers costs an additional 50 cents per game for freestanding games, \$1 per game for game shows, and \$2 per game for sporting events. An extra \$30 per month buys unlimited competitive play.

If you would like more information, contact Interactive Network, 1991 Landings Drive, Mountain View, California 94043; (415) 960-1000.

Video Blaster

You're probably already familiar with Sound Blaster, the sound system for PCs from Creative Labs. Now the same company brings you Video Blaster for displaying, editing, and frame-capturing full-motion video on standard PC

monitors. Competitively priced at \$495, Video Blaster lets you combine full-motion video from NTSC or PAL with computer-generated graphics and animations. The resulting images are captured in freeze frame; saved in one of a variety of formats, including bitmap, Targa, M-motion, TIF, and encapsulated PostScript; manipulated by adding titles or changing colors; and exported to other applications.

For more information, contact Creative Labs, 1901 McCarthy Boulevard, Milpitas, California 95035; (408) 428-6600.

Future Naders of America

Fed up with the feds? Then take a closer look at Personal Advocate, a new program from Parsons Technology for the consumer advocate in you. The software is designed to help you cut through red tape to get action, receive information, and express your views. Designed in conjunction with a team of attorneys, Personal Advocate generates nearly 40 of the most commonly written letters to creditors, corporations, elected officials, consumer organizations, and government agencies. A free-form letter lets you create personalized documents.

Personal Advocate also provides an expandable address book of approximately 2500 consumer contacts: names, addresses, and telephone numbers of major corporations, Better Business Bureaus, offices of attorneys general, consumer groups; and numerous other organizations. A small built-in word processor lets you record details each time you make a contact. By tagging notes to address book entries, you can chronicle the date of a conversation, what the outcome was, and future actions still required.

Suggested retail price is

\$69. For more information, contact Parsons Technology, One Parsons Drive, P.O. Box 100, Hiawatha, Iowa 52233-0100; (319) 395-9626.

What Price Speed?

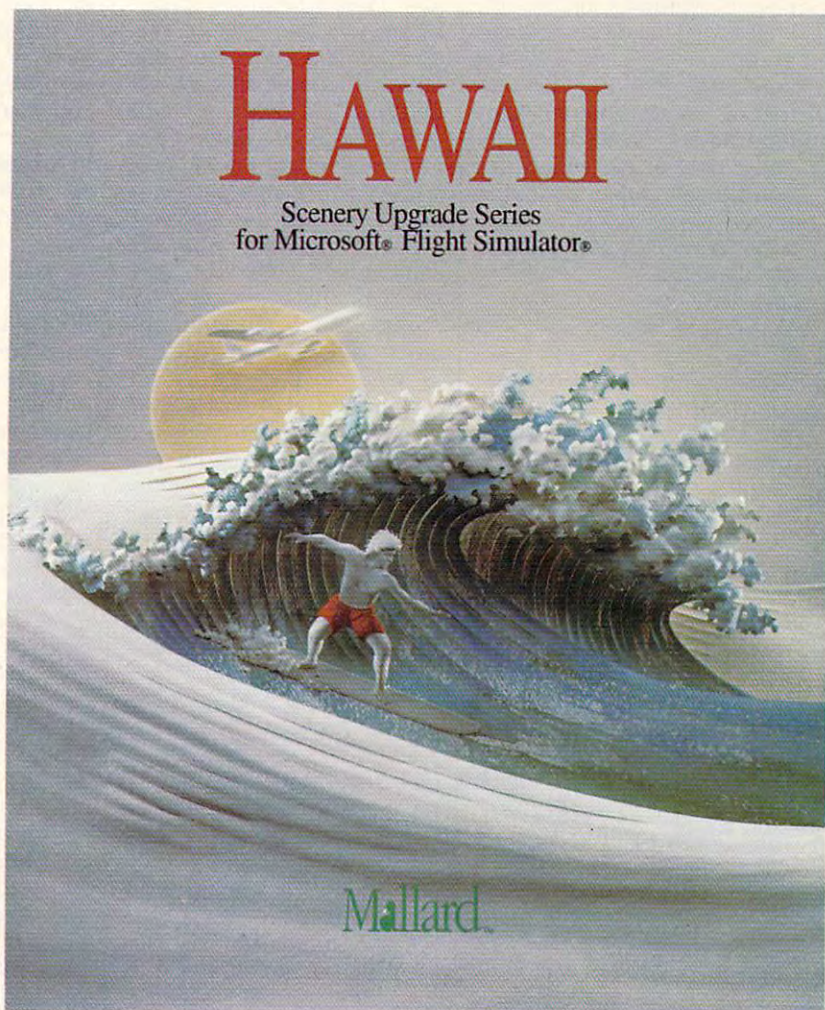
You can get fast for less, if you're looking for 50-MHz performance. Intel's speed demon chip, the Intel486 DX2 microprocessor, makes lower-priced systems perform like 50-MHz machines. Intel's "speed-doubler" technology allows the internal frequency of the processor to operate at double that of the rest of the system, combining the high performance of the advanced 50-MHz Intel486 DX CPU with the cost-effective 25-MHz system design.

The DX2 comprises an integrated central processing unit, a floating-point unit, and a complete on-chip cache, all of which execute at a rate twice that of the CPU bus due to the speed-doubler technology. CPU performance increases significantly without requiring a new generation of supporting components. If you're in the market for a new computer, look for competitively priced systems based on the Intel486 DX2. They're popping up all over the place.

For more information contact Intel at (800) 548-4725 or write for the Intel Literature Packet #JB-47, P.O. Box 7641, Mount Prospect, Illinois 60056-7641.

Companies with items of interest suitable for "News & Notes" should send information along with a color slide or color transparency to News & Notes, Attn: Jill Champion, COMPUTE, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. Although space is limited, all items will be considered for publication. □

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The Right Pitch

I am still a novice and am planning to upgrade soon to VGA. I called a local discount dealer regarding buying a 28-dpi standard VGA monitor. He told me I would have a hard time finding a 28-dpi, yet I see plenty of big mail-order companies with reasonably priced 28-dpi monitors. Does a standard VGA get 16 colors or 260 colors?

JOHN R. MAHONEY
LINCOLN PARK, NJ

Actually, the measurement for a monitor screen is dot pitch, not dots per inch (dpi). You would use dpi to express how many distinct dots a printer can lay side by side. You'll also see dpi applied to mouse resolution, though we prefer the emerging term Mickeys to indicate the distance the mouse pointer moves on the screen and points per inch (ppi) to indicate the minimum motion of the mouse that can be detected by the software. Dot pitch (dp) refers to the diagonal distance between dots of the same color on a monitor screen.

We don't know why your dealer is having a hard time finding a 28-dp monitor. It's not hard. Go with a mail-order company you already know about and skip your dealer. And stick to your guns—28 dp is definitely the way to go, especially if you do a lot of text work.

As you probably know, the color image on your screen is made up of individual pixels, or dots, and each of these dots is made up of three smaller colored dots (one each of red, green, and blue). In most monitors these pixels are laid out diagonally so that the individual pixels don't form vertical stacks.

Imagine trying to cover the bottom of a rectangular box with Ping-Pong balls. If you

line them up horizontally and vertically in a Cartesian pattern, there'll be large spaces where you can see the bottom of the box between them. If you allow the Ping-Pong balls to take their natural positions, they'll come to rest in a sort of honeycomb pattern. You'll see far less of the bottom of the box and pack more balls into the same space if you align them this way. That's why dot pitch measures the diagonal distance rather than the vertical or horizontal distance.

Standard VGA provides 16 colors at 640 × 480 resolution and 256 colors at 320 × 200 resolution. Anything higher than that is called Super VGA, and there are untold numbers of Super VGA standards and resolutions. There was some hope that IBM's XGA or 8514A standard would replace Super VGA and result in a new standard, but that hope was in vain.

Life Sentence

I want to write a program to generate random sentences from small lists of words. It should pull a verb from a verb list, a noun from a noun list, and so on, and then link them into a sentence. Could you talk about the RANDOMIZE command?

J. P. MYERS
DOWNEY, CA

RANDOMIZE is used to prepare the computer to generate random numbers. Keying this command to the timer causes whatever value is currently in the hardware clock to be the seed value. If you don't use RANDOMIZE before generating random numbers, you'll generate the same list of random numbers each time the program runs. The numbers are really random, but they're generated by a formula. If you use the

same seed value to start the process, the numbers will always be the same sequence.

RND is then used in a formula. RND will give you a random value between 0 and 1. You multiply this by the range you want and then add to it the lowest value you want. For example, if you want random integers between 5 and 20, you would use this formula: $INT(RND * 15 + 5)$.

The following program goes a step further. Defining a function (DEF FN) in the second line allows you to use fna anywhere in the program where you want a random integer between 0 and 10. This saves space and typing.

The first value in the parenthesis in the string array word\$() is the part of speech (0 = adjective, 1 = noun [person], 2 = verb, 3 = adverb, 4 = preposition, 5 = noun [thing]). To keep the sentence simple, one of each part of speech is used, the nouns are always singular, and the verb is always intransitive and past tense.

You can easily make this sentence-generating program as complex as you desire. Increasing its vocabulary would be the simplest improvement. Note that the way it's currently designed, there have to be equal numbers of each part of speech, but this was done to keep the program short. There's no reason why you couldn't have different numbers of nouns and verbs, for example. Just create separate loops to load the different parts of speech into their respective arrays.

```
RANDOMIZE TIMER
DIM word$(5, 10):DEF fna =
  INT(RND * 11)
FOR i = 0 TO 5
  FOR j = 0 TO 10
  READ wordfromlist$
  word$(i, j) = wordfromlist$ + ' '
  NEXT
```

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For the solution(s), complete rules, and detailed description of prizes including prize values, send a self-addressed stamped envelope to *Compute SearchStakes Solutions*, Dept. RRS, 1965 Broadway, N.Y., N.Y. 10023-5965 by 12/31/92; no return postage required for residents of VT and WA. Solutions and prize information will be provided through the issue date in which the request is received.

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FEEDBACK

NEXT

FOR i = 0 TO 10

PRINT 'The ' + word\$(0, fna) +
word\$(1, fna) + word\$(2, fna) +
word\$(3, fna) + word\$(4, fna) +
'the ' + word\$(5, fna)

NEXT

END

DATA red,blue,tall,fat,smart,
worried,hungry,persistent,
wet,elegant,happy

DATA man,child,tenor,accountant,
plumber,dog,gorilla,machinist,
florist>window washer,fry cook

DATA ate,sang,worked,hid,
paraded,read,flew,ran,
harvested,welded,talked

DATA loudly,quietly,proudly,
unceasingly,frantically,
methodically,intently,
poignantly,sloppily,hesitantly,
pointlessly

DATA in,under,over,around,out
of,inside,with,beside,far
from,through,along with

DATA airplane,house,car,diner,
college dormitory,machine
shop,school,roof,cellar,
attic,barn

Capturing the Image

I have a computer card designed to display images captured from video recorders. I have several image-capturing programs for capturing PCX and TIF images, such as PC Partner from DAK, but none of them can capture images in VGA mode. I contacted DAK, but PC Partner is several years old, and the technician told me it won't capture images at VGA resolution. Are you aware of any other capturing software that can capture images at VGA resolution?

Another question I have concerns hardware and software for my internal fax/modem. Each time I load the fax software, I get problems such as neither the mouse nor the fax working properly. I've written the manufacturer, but it's been three weeks, and I've not heard from the company. Can internal fax/modems work with other fax software, or are they restricted to their own software?

LEO FRENCH
MODESTO, CA

HiJaak (Inset Systems, 71 Commerce Drive, Brookfield, Connecticut 06804; 203-740-2400) can capture a maximum resolution of 1024 x 768 pixels in 256 colors. Collage Plus (Inner Media, 60 Plain Road, Hollis, New Hampshire 03049; 603-465-3216) can capture up to 800 x 600 pixels in 16 colors in DOS.

The maximum resolution and number of colors for a Windows capture

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with Collage Plus is a little more complicated. If you're running in 386-enhanced 386 mode, it can capture whatever is on the screen, regardless of the resolution or number of colors. In real or standard mode, you'll need to have about 1MB of free RAM above whatever programs you're running to capture a 1024 x 768 256-color screen.

None of these programs should have any trouble saving to disk whatever is captured by your card.

Your fax problem is probably due to a serial-port conflict between your mouse and your fax card. If you have at least two serial ports, try moving your mouse to the other serial port. (This will require rerunning your mouse setup in DOS and Windows.)

If that doesn't work or if you have only one serial port, you'll have to dig through your fax/modem manuals to figure out how to set your DIP switches and jumpers so the devices aren't trying to use the same IRQ. Remember that serial port 1 is interrupt 4 and serial port 2 is interrupt 3. Technically, you can have two additional serial ports, but serial port 3 must use interrupt 4 and serial port 4 must use interrupt 3. There's probably a reason for this other than to mystify and confuse people.

Regarding your question about fax software, there's hope but only if your fax supports a common file format. Many older fax machines don't—they employ their own file formats and thus force you to use their software. Many, however, can create PCX or TIF files, so any fax software that reads these files should work. Also, give the manufacturer a call (or fax your question in, if there's a fax number in the manual). Most manufacturers are responsive to telephone contact.

The Doctor Is In

We'd like to update our item Getting Better on Dr. Schueler's Home Medical Advisor that ran in the June 1992 issue's "News & Notes." According to Pixel Perfect, the program's publisher, the referral database mentioned in the article has been discontinued and, due to popular demand, is being replaced with a health and diet section in the database. Second, although the story highlights some of the new version's features, there are several others the company thinks our readers might like to know about. The program now has full print capability, first-letter-sensitive menus for fast referencing, a newly formed specialty review board consisting of 40 Board Certified Medical Specialists, and continuing updates for registered users at cost. A major new version of Schueler's Home Medical Advisor is also in the works.

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ZEOS 486-33 Pricing

A number of COMPUTE readers have called ZEOS hoping to purchase the 486 system featured in the April Test Lab section of the magazine for the price listed, only to be told that the system isn't available for that price. The \$1,795 list price that appeared in our product box was supplied by ZEOS, but it isn't the price for the review configuration. Also, the review refers to a hard drive that's no longer available from ZEOS. We at COMPUTE regret the confusion and offer the following explanation.

A footnote at the beginning of Test Lab explains the difficulty of coming up with a list price for a "standard" system: "Prices for this computer system and the others vary according to the configuration/options chosen. Contact the manufacturer for further information." Because consumers are more sophisticated than ever, companies like ZEOS offer a menu approach to pricing. Even when a manufacturer offers a "standard" system, there are usually a number of options. The price ZEOS supplied us is for the base configuration, which includes, for example, a monochrome monitor rather than an SVGA monitor.

In the future, we will make every attempt to indicate whether the price is for the base configuration or for the re-

view configuration. However, our advice still stands: You should call the company in question for current pricing on the configuration of your choice. Computer technology is changing more rapidly than ever, and occasionally, despite all our efforts, a system configuration will change between the time we receive a system and the time the issue hits the stands. Also, prices for components like hard drives and microprocessors can change according to market demands.

Finally, remember that street prices (for products not sold directly by the manufacturer) are frequently well below list prices. For current pricing, it pays to consult our advertisements and make some calls.

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. □

POINT & CLICK

Clifton Karnes

FIVE ALIVE

There are five Windows utilities that I couldn't live without. I use three of these constantly, so they're all but invisible to me. I use one of the others just a few times a week, and the last one I only use a few times a year. Buy they're all essential to my productivity and well-being.

The first of these must-haves is Stacker AT/16 (Stac Electronics, 5993 Avenida Encinas, Carlsbad, California 92008; 800-522-7822; \$249.00). Stacker AT/16 is a

size for any font I have. And it gives me real WYSIWYG on-screen display for these fonts. Version 2.0 of this outstanding program uses 32-bit access in 386-enhanced mode, and it's fast. A type manager is essential if you do anything beyond the simplest document formatting. It's true that Windows 3.1 comes with its own font manager, TrueType, but ATM is for PostScript fonts, and I, like many others, already have a large investment in PostScript. Also, PostScript is what service bureaus use. ATM has turned my inexpensive HP LaserJet into a printer that offers most of the benefits of a PostScript printer.

The last of the three all-but-invisible products I use is Software Workshop's Icon Paks (Software Workshop, 75 South Mountain Way,

Orem, Utah 84058; 800-762-9550; Icon Pak I, \$39.95; Icon Pak II, \$99.95; both, \$135.95). These two packages contain beautiful, handcrafted icons for almost every imaginable application. They're naturals for DOS apps, and with an editor that can edit icons inside EXEs and DLLs (such as the same company's Icon Creator), you can actually replace a Windows application's original icon with one that you like better from an Icon Pak. Most of the DOS apps on my desktop are represented with Software Workshop icons. If you get in the mood to redecorate your desktop, these two icon collections are the place to start.

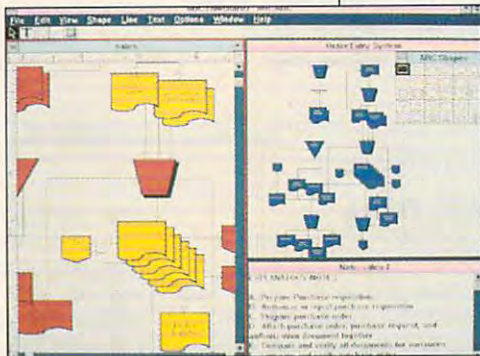
The essential utility that I only use a few times a week is WinFax Pro (Delrina, 6830 Via del Oro, Suite 240, San Jose,

California 95119; 800-268-6082; 119.00). This program is a special Windows printer driver that, combined with a supported fax modem, lets you send a fax by simply printing from any Windows app. It's a snap to use, and since the faxes don't have to be scanned before they're sent, the output is the highest quality you can get with a fax.

WinFax Pro also receives faxes (with boards that support this option), and it offers scads of neat features including a phone book, scheduled calling, send and receive logs, and page preview. The latest version of the program supports a very large number of fax modems. If you've used DOS fax programs, you'll be amazed at just how easy it really can be. I don't fax from my PC every day, but when I do, I use WinFax Pro.

The last utility I can't live without is one that I don't use very often, but when I need it, it's a superb performer. I'm talking about ABC FlowCharter (Micrografx, 1303 Arapaho, Richardson, Texas 75081; 800-733-3729; \$295.00). This program makes it a snap to design all kinds of flow charts, organizational charts, and so on. It supports all your fonts (it works perfectly with ATM), and it has automatic drop shadows, intelligent connections between flow-charting objects, page preview, and lots of other functions that make designing charts quick and easy. You can even fax your flowcharts directly from ABC FlowCharter with WinFax Pro. And the results are stunning. You can use conventional drawing programs to create a flow chart, but it can be a frustrating experience. Don't try it. Get ABC FlowCharter and have some fun. Your charts will get some respect, and they'll look so good that people might even read them. □

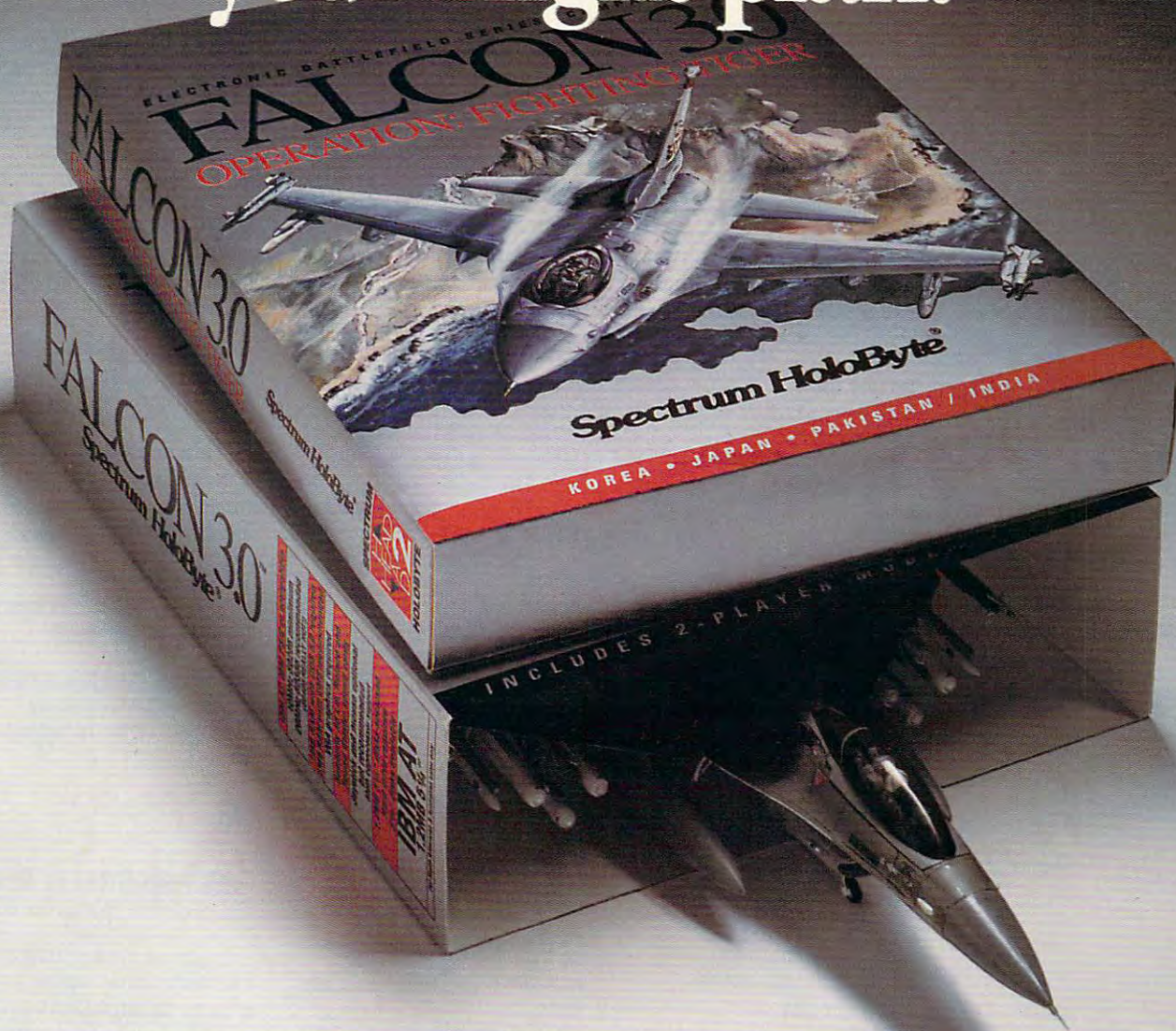
With ABC Flowcharter, your charts will get some respect, and they'll look so good that people might even read them.



16-bit coprocessor card and software driver that uses on-the-fly compression and decompression to effectively double the size of your hard disk. It's turned my 110MB disk into a 220MB jumbo and made it easy for me to live with the mega sizes of most Windows programs. And with the 16-bit coprocessor version of the product, there's no performance degradation. Stacker is completely transparent, and it works with all my Norton and PC Tools disk utilities. Stacker's something of a miracle.

Next on my list is ATM, the Adobe Type Manager (Adobe Systems, 1585 Charleston Road, P.O. Box 7900, Mountain View, California 94039; 415-961-4400; \$99.00). As the name suggests, ATM is a type manager. It uses PostScript fonts and prints in any point

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TIPS & TOOLS

Edited by Richard C. Leinecker

Easy Viewing

Now you can display several files consecutively using two batch files. The main batch file is called SEE.BAT. To use it, type SEE and the files you want to view (you can use wildcards in your file list). The SEE.BAT file calls a second batch file named SEE_TYPE.BAT to type the file.

```
@ECHO OFF
IF (%1) == () GOTO ERROR
:BEGIN
FOR %%F IN (%1) DO CALL
SEE_TYPE%%F
ECHO"
SHIFT
IF (%1) == () GOTO END
GOTO BEGIN
:ERROR
ECHO Usage: SEE <file>
ECHO"
ECHO You can specify as many
files as you want and use
wildcards, too.
:END
```

The second part of the system is SEE_TYPE.BAT.

```
@ECHO OFF
ECHO %1 > TEMP.$$$
ECHO >> TEMP.$$$
TYPE %1 >> TEMP.$$$
TYPE TEMP.$$$ | MORE
DEL TEMP.$$$
ECHO"
PAUSE
```

The character before the MORE command in line 5 is the vertical bar.

GIAMPAOLO LADOMATO
SCOTTSDALE, AZ

Conserving Disk Space

If you don't mind a short wait while running some programs, you can save as much as 50 percent of your drive space with a batch file, PKZIP, and PKUNZIP.

Every time you run a program using this method, there'll be a delay. The amount of delay depends upon the size of the program

and its support files. For example, 3MB will usually decompress in about ten seconds.

First, make sure you have a copy of PKZIP and PKUNZIP in your path. Then, create a directory called ARCHIVES. Next, use PKZIP to compress each directory into a single file, copy the ZIP files to the ARCHIVES directory, and delete the contents of the directories of the files you just compressed. You should also remove the directories.

Here is an example batch file. The routines :SQ, :XY, and :TP decompress and run Space Quest IV, XyWrite, and TurboPaint, respectively.

```
@ECHO OFF
IF (%1) == () GOTO ERROR
IF "%1" == "SQ" GOTO SQ
IF "%1" == "sq" GOTO SQ
IF "%1" == "XY" GOTO XY
IF "%1" == "xy" GOTO XY
IF "%1" == "TP" GOTO TP
IF "%1" == "tp" GOTO TP
GOTO NOTFOUND
:SQ
CD \
MD SIERRA
CD SIERRA
MD SQ4
CD SQ4
PKUNZIP C:\ARCHIVES\SQA.ZIP
SQ4
CD \SIERRA\SQ4
ECHO Y | DEL *.*
REM The character before DEL is
the vertical bar.
CD ..
RD SQ4
ECHO Y | DEL *.*
REM The character before DEL is
the vertical bar.
CD ..
RD SIERRA
GOTO END
:XY
CD \
MD XY
CD XY
PKUNZIP C:\ARCHIVES\XYA.ZIP
EDITOR
CD \XY
DEL C:\ARCHIVES\XYA.ZIP
PKZIP C:\ARCHIVES\XYA.ZIP *.*
```

```
ECHO Y | DEL *.*
CD ..
RD XY
GOTO END
:TP
CD \
MD TPAINT
CD TPAINT
PKUNZIP C:\ARCHIVES\TPA.ZIP
TPAINT
CD \TPAINT
DEL C:\ARCHIVES\TPA.ZIP
PKZIP C:\ARCHIVES\TPA.ZIP *.*
ECHO Y | DEL *.*
CD ..
RD TPAINT
GOTO END
:NOTFOUND
ECHO Incorrect specification.
GOTO :VALIDARG
:ERROR
ECHO Usage: USEPACK <compressed archive name>
:VALIDARGS
ECHO Type SQ for Space Quest IV.
ECHO Type XY for XyWrite.
ECHO Type TP for TurboPaint.
:END
```

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LAKEWOOD, CA

Copy from Drive to Drive

Copying files from one floppy disk to another is easy enough, unless you're using the same drive. When I need to copy several files from one 3½-inch disk to another, it takes several steps. I copy the files from the source disk into the temporary directory. Then, I swap disks and copy the files to the destination drive.

You can avoid this hassle by using DOS's DRIVER.SYS. Here's how you load it in your CONFIG.SYS file for the four floppy disk types.

Low-density 5¼-inch drives:

```
DEVICE=C:\DOS\DRIVER
.SYS /d:0 /f:0 /h:2 /s:9 /t:40
```

High-density 5¼-inch drives:

```
DEVICE=C:\DOS\DRIVER
.SYS /d:0 /f:1 /h:2 /s:15 /t:80
```

Read consecutive files with a single command, and use your precious hard disk space more efficiently.



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A★C★E★S OF THE PACIFIC



YCGA Color Macintosh

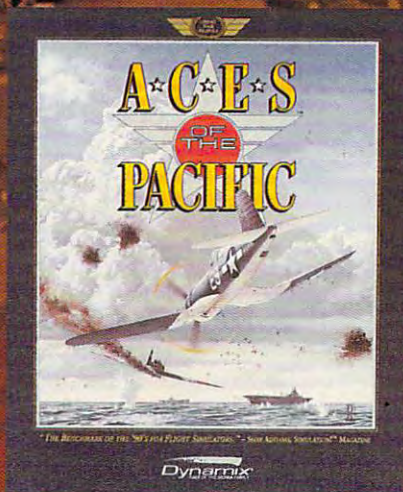


YCGA Color Macintosh

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Computer Gaming World.



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Circle Reader Service Number 224

TIPS & TOOLS

Copy files from disk to disk on a single drive, and access 256-color PCX graphics files from BASIC.

Low-density 3½-inch drives:

```
DEVICE=C:\DOS\DRIVER
.SYS /d:0 /f:2 /h:2 /s:9 /t:80
```

High-density 3½-inch drives:

```
DEVICE=C:\DOS\DRIVER
.SYS /d:0 /f:7 /h:2 /s:18 /t:80
```

The /d:0 switch specifies the device number. For drive A it's /d:0; for drive B it's /d:1. DRIVER.SYS uses the next empty logical drive it finds for DRIVER.SYS. If I load it for drive A on my system, drive D becomes the logical equivalent of drive A. The first time I call for a directory of drive D, DOS gives me the prompt *Insert diskette for drive D: and press any key when ready.* DOS uses my first drive as drive D until I access A. When that happens, I will see the prompt *Insert diskette for drive A: and press any key when ready.*

If I add another DRIVER.SYS in my CONFIG.SYS file for the second drive, it becomes drive E. Don't worry if you've already got a drive D; the system will keep looking until it finds a logical drive that's available. DOS defaults to five available drives: A-E. If you plan to use a disk drive beyond drive E, you'll have to add a line to your CONFIG.SYS file (before you load DRIVER.SYS) that tells DOS the last drive you'll be using. If, for instance, drive H is the last drive you need, you'll have to add the line LAST-DRIVE=H.

Now you can use the COPY command without the need for a temporary directory on your hard drive. If I wanted to copy all EXE files from one disk to another, I would type COPY A:*.EXE D:*.EXE. I'd be prompted for the appropriate times to swap disks.

MIKE CHATEL
WALLACEBURG, ON

BASIC PCX Files

This program loads a PCX file in BASIC. It works only for 320 × 200 256-color MCGA pictures. You'll have to make changes for other picture types and video modes.

The major points of the PCX file format are the 128-byte header, the picture data, a single byte indicating that a palette follows (in MCGA and Super VGA), and a 768-byte palette.

The picture data uses a simple encoding system called run length encoding. There are two signals you get when decoding a PCX file: single bytes and repeating bytes.

If the highest two bits of a byte are set, then the lowest six bits contain the number of repetitions of a repeat sequence. The next byte in the file is the data that's put into screen memory multiple times. Otherwise, each byte is a single bit of data that goes directly into screen memory.

After the picture data, MCGA or Super VGA has a single byte followed by 768 bytes of palette data.

You should be aware that PCX pictures can contain images that are smaller or larger than the visual screen. For these you'll have to examine the 128-byte header and adjust the code.

I'm opening a file called TEST.PCX. Change this to match your filename.

```
REM PT will count the
pokes into screen memory until
we get to 64000.
PT = 0
a$ = SPACE$(128)
DEF SEG = &HA000
REM Open the file TEST.PCX.
OPEN "TEST.PCX" FOR
BINARY AS #1
REM Get the header (128 bytes).
GET #1, , a$
REM Set a$ to a length of 1 so we
can read one byte at a time.
a$ = " "
```

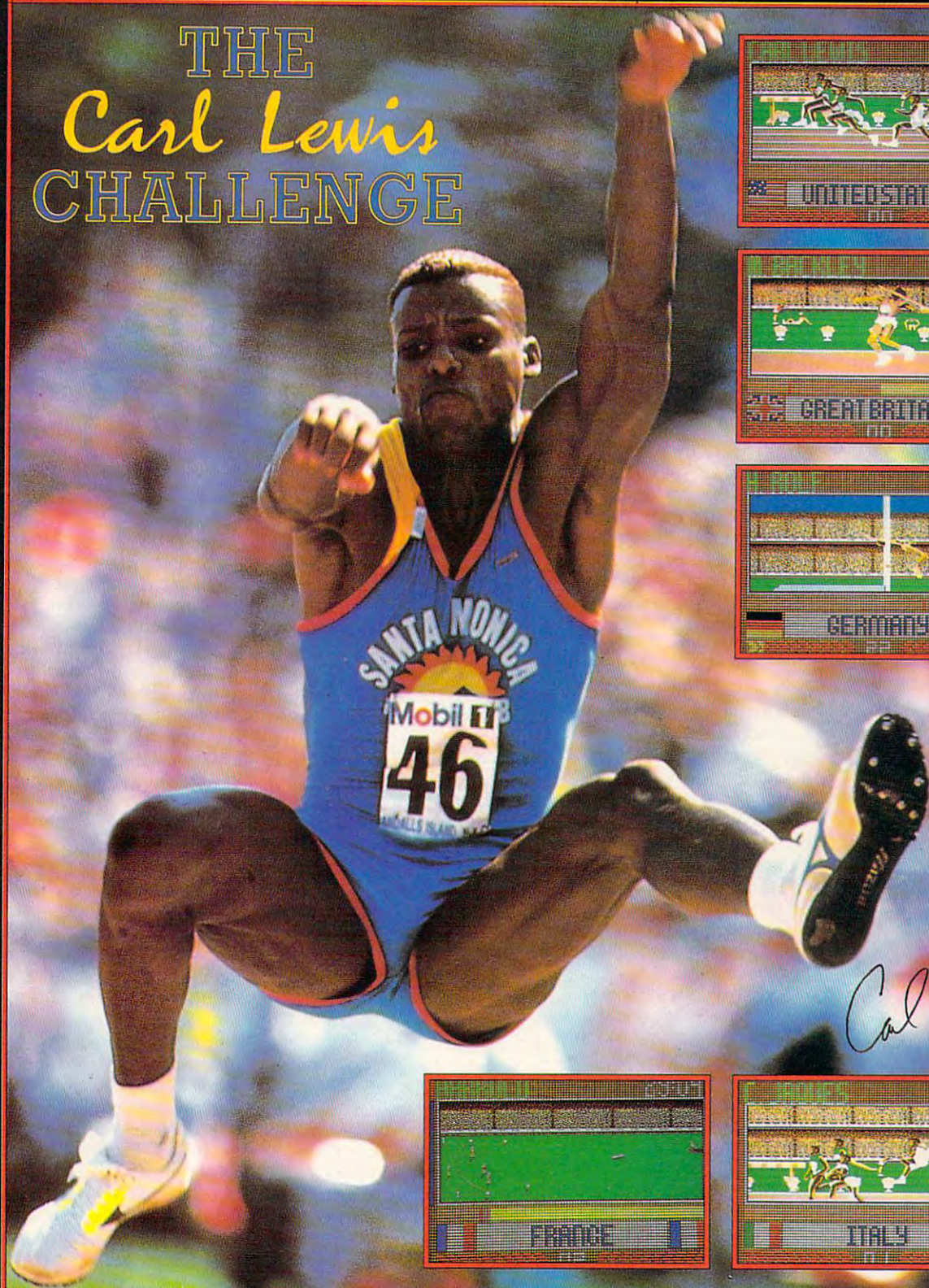
```
REM Set MCGA mode.
```

```
SCREEN 13
WHILE PT < 64000
GET #1, , a$
CT% = ASC(a$)
IF (CT% AND 192) <>
192 THEN
POKE PT, CT%
PT = PT + 1
ELSE
CT% = (CT% AND 63)
REM Get the byte to repeat.
GET #1, , a$
DAT% = ASC(a$)
WHILE CT% AND (PT < 64000)
CT% = CT% - 1
REM Poke data into memory.
POKE PT, DAT%
PT = PT + 1
WEND
END IF
WEND
REM Get the byte that tells us a
palette follows. It should
be 192.
GET #1, , a$
REM Tell the hardware to start
with palette register 0.
OUT &H3C8, 0
REM Read and set 768 palette
registers.
FOR I% = 1 TO 768
GET #1, , a$
OUT &H3C9, ASC(a$)
NEXT I%
CLOSE #1
a$ = ""
WHILE a$ = "": a$
= INKEY$: WEND
SCREEN 0
WIDTH 80
```

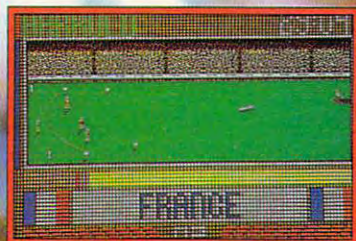
RICHARD C. LEINECKER
MIAMI, FL

If you have an interesting tip that you think would help other PC users, send it along with your name, address, and Social Security number to COMPUTE's Tips & Tools, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. For each tip we publish, we'll pay you \$25-\$50 and send you a COMPUTE's PC clock radio while supplies last. □

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COMPUTE/NET

Troy Tucker

GROWING BY LEAPS AND BOUNDS

Electronic publishing is fast becoming a commonplace in our high-tech world of computers. Many popular publications, such as COMPUTE, have turned to this emerging medium to broaden their coverage.

Progress has been relatively slow in past years because the technology wasn't in place and because people simply didn't think of modems as necessary computer peripherals. But things have changed. Now, with high-speed data communications and advanced computer hardware, anyone can quickly connect to thousands of popular publications and databases. Where will this new technology take us? We've already heard metaphors like "global village" and "electronic mall." As the online world expands, it will bring everyone closer. I think we've only scratched the surface.

Video telephony and multimedia technology could easily become parts of online services. Imagine interactive videogames featuring high-resolution graphics and digitized sounds being transmitted via modem or perhaps a slick chat line that allows you to view the person on the other end—in realtime! These ideas aren't as farfetched as they sound. Video telephones are already in place in Europe. Interactive online videogames are also in operation. Both, though in early stages of development, could mark the beginning of things to come. Who knows what to expect from online services in the future? You can bet that whatever comes along, COMPUTE will be in the thick of it.

This month on COMPUTE/

NET we're featuring a large variety of programs in our software library. You'll find everything from games to virus checkers. Here's what to look for in the New Uploads library: Directory Master, Quick Type, Skullduggery, MathMagic, Fastbuffer, Flu Shot, PC-KWIK, and Cshow. All of these programs have been pretested. Some of the programs are shareware, so I ask that you please honor the hardworking developers by paying the registration fees.

To find these programs, log on to GENIE or America Online. Use the menus or type the keyword *COMPUTE* to get to the COMPUTE/NET area. Once in COMPUTE/NET, enter the software library (it's called Files from COMPUTE on America Online). From there, enter the New Uploads area. If you have trouble finding the programs, please drop me a line, and I'll be glad to help you.

For all you power users, we have a healthy collection of programs that will add muscle to your computing. First up is Directory Master. This full-featured DOS shell allows you to customize an interface that includes 30 programmable keys. You can access commands such as COPY, MOVE, and DELETE with a single keystroke or program hot keys to perform multiple operations.

Next, if you're tired of waiting for slow key repeats, then we have just the remedy. Fastbuffer speeds up key-repeat rates and saves your monitor from burnout with a screen blanker. This memory-resident program comes complete with source code. While you're at it, you may want to speed up your hard drive, too. PC-KWIK is a transparent program that turbocharges file access by keeping frequently used files in memory, which results in fewer delays.

If you're in the market for educational programs, look no further. Quick Type is a valuable tool for those who are all thumbs when it comes to typing. Unique graphics entertain you while you improve your typing skills. Varying levels provide a challenge for all typists. Are you a little rusty on your math? Try MathMagic. This program tests your mathematical abilities with four educational games: MathCatch, MathRun, MathLander, and MathShoot. They'll hone your skills in addition, subtraction, multiplication, and division.

Looking for a new way to view all our popular online graphics files? Cshow is just the ticket. This high-quality GIF viewer will show pictures in Hercules, CGA, EGA, and VGA graphic modes. Cshow automatically adjusts to use the graphics card that you have installed. I use this program all the time—it's great!

Looking for mystery and adventure? Skullduggery is a game of intrigue that provides hours of brain-teasing entertainment. Look for clues in various text-based maps and diagrams, and then solve the puzzles that reveal the secret of Skullduggery.

Last but not least, we have a superb virus-checker program for you. Ward off computer viruses and the anxiety they cause with Flu Shot. It checks hard drives for uninvited code. Just add a line to your AUTOEXEC.BAT file, and you're protected. Suspected viruses are reported not only at boot-up but also while the program is running.

If you have any questions or comments about COMPUTE/NET, you can write to me here at COMPUTE in Greensboro or send E-mail to me on GENIE, address TROYGT, or on America Online, screen name TROY GT (that's with a zero). See you online! □

As technology improves, so do the benefits of online services. You may be amazed at what the future holds for this up-close and personal area of computing.

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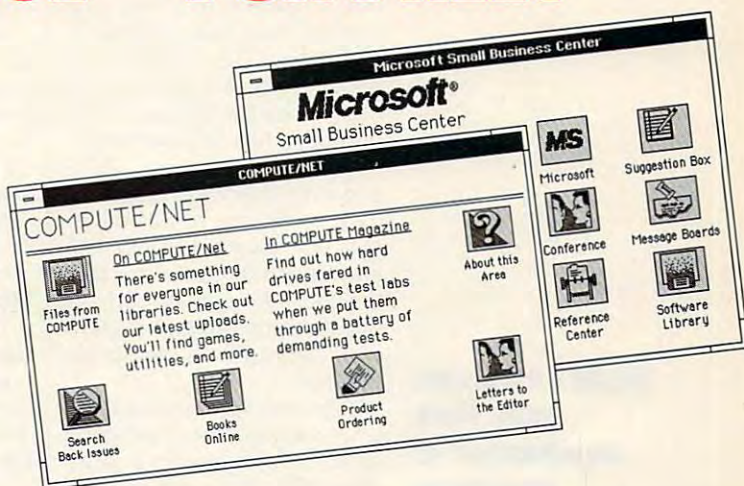
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INTRODOS

Tony Roberts

ORGANIZE YOUR DISK WITH FDISK

DOS's FDISK is the utility that's used to examine and change hard disk partition information. FDISK doesn't get the kind of everyday use that commands like DIR and TYPE get, but it has its purposes.

In earlier versions, DOS was able to access only hard disk partitions of 32 megabytes or less in size. DOS 4.01 and DOS 5.0 have eliminated that barrier, permitting hundreds of megabytes of hard disk storage in a single partition.

Although this appears to be an advantage, there are good reasons for breaking a large hard disk into smaller segments. You may want to isolate game files from business files, or Bob's files from Mary's. If you have a large hard disk that needs partitioning—or a partitioned hard disk that you'd like reorganized—FDISK is the tool to use.

First, be warned that FDISK is a powerful utility. It's designed to give you a clean slate—to wipe out everything on your hard disk. Before you undertake any FDISK experimentation, make sure you have a full and verified backup of all your hard disk's data.

Also, make sure you have plenty of time. Repartitioning a hard disk requires backing up the data, repartitioning, formatting the new partitions, and then restoring all the data.

FDISK is careful, though, about not destroying information without demanding your confirmation. You can run FDISK and display partition information, for example, without being concerned about wiping out your disk.

Let's say that you want to partition your hard disk into three logical drives—C:, D:, and E:. Make your backups and create

a boot-up disk that includes the operating system files as well as FORMAT, FDISK, CHKDSK, and whatever programs you'll need to restore your backups. Then run FDISK.

Let's assume that we have a 100-megabyte disk that needs to be partitioned into these areas: 50 megabytes for C:, 25 megabytes for D:, and 25 megabytes for E:. Start by selecting the Delete option to remove the current partitions. This will render the data on your hard disk useless, so double-check those backups.

Once all the partitions are deleted, choose the option to create a primary DOS partition. This is the partition that will contain your DOS startup files—your boot drive. When you're asked whether this partition should be made the maximum possible size, answer no. Select a 50-megabyte partition. The partition you've just created will be known as drive C:, the name given to the primary partition on the first hard disk in any system.

Follow the FDISK menu selections to create an extended DOS partition. FDISK will suggest using all of the remaining space for the extended partition, and you should agree. Even though you're going to create two more logical drives, you're permitted to create only one extended DOS partition per drive.

Once the extended DOS partition is created, you can choose the option to create logical drives. You can have as many as 23 logical drives, but all the logical drives you create will exist within the one extended DOS partition. Specify sizes for the logical drives, and FDISK will assign a drive letter in sequence to each logical drive you create.

Once the disk is partitioned, there's one final step to take. You must use option 2 from the main FDISK menu—

Set Active Partition—to make your primary DOS partition active. This is crucial; without it, you won't be able to boot from the hard disk.

When all the changes are made, exit FDISK, restart the system from the startup floppy, and reformat each of your new drives. Use the FORMAT command with the system switch (FORMAT C:/S) to copy the system files to the C: drive and to make it bootable. Then format the other drives normally.

After formatting, restore your programs and data files from the backups, and you're in business. If you add a second hard drive to your system, be prepared for some confusion with logical drive names on your first hard disk's extended DOS partition.

As I mentioned earlier, the primary DOS partition on the first hard disk is always designated with the C: label. Similarly, a primary DOS partition on a second hard disk is always designated with the D: label. If your first hard disk originally included logical drives D: and E:, those designators will be changed to E: and F: when the D: designator is assigned to the primary DOS partition on the second drive.

This change in drive designators will cause you to rework any batch files, scripts, or program startup icons that refer to the original names.

You can avoid this problem of logical drive name switching by not creating a primary DOS partition on the second hard disk. Just create an extended DOS partition and fill it up with as many logical drives as you want. These new storage areas will be given names that follow the names of the logical drives on the first hard disk.

It isn't easy to repartition a hard drive. It's worth doing if the resulting setup will make it easier for you to do your work or protect your data. □

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HARDWARE CLINIC

Mark Minasi

HOW MODEMS WORK, PART 3

For the last two months, we've looked at some of the things we need to know in order to get the fastest, most reliable file transfers out of our existing modems. This month, I want to wrap up the topic of improved protocols, talk about setting modems and software to handle varying error climates, and look at modems that are inexpensive and fast.

We saw last month that a checksum is calculated for every block of data sent via XMODEM. The receiver uses that checksum to ensure that the data in the block was transmitted without damage from phone noise. The checksum's a good tool, but there are some cases where line noise could change two bits in a 128-byte message but the noise wouldn't be detected by the checksum procedure on the receiver side. While such a thing is unlikely, it's still too likely for my taste. The checksum is only 99 percent effective—that is, it only detects line noise in 99 percent of the cases where it occurs. Most modern protocols don't use checksum but instead employ a more complex mathematical function called a cyclical redundancy check (CRC), which is 99.9926 percent effective.

It would often be nice to use a wildcard character when transferring data. Unfortunately, with XMODEM you have to specify each file, one by one. YMODEM Batch and ZMODEM are among the newer protocols that offer batch transfer. I particularly like ZMODEM; it lets me specify a list of files and then asks if it should hang up after the transfer. I then walk away for a while, return, and find that ZMODEM has transferred all of the files for me.

Even more amazing, if ZMODEM detects that one of the files was only partially transferred, perhaps because I was disconnected in midtransfer during my last transfer session, ZMODEM will actually pick up where it previously left off! Late at night, when phone charges are at their lowest, I can queue up several megabytes for transfer and go off to bed without worrying about staying connected all night. Along the same lines, XMODEM requires that you specify twice the name of the file you want to transfer—once for the sender and once for the receiver. YMODEM and later protocols transfer not only the file but also the filename. All you need to do is to tell your communications software to receive the file, and it gets the filename from the sending BBS.

Squeezing the Last Bit

There are many data-compression techniques in use these days; the most popular are the ones used by the PKZIP, ARC, PAK, and LHARC programs. If you've ever pulled a file off a computer bulletin board system (BBS), it probably had a ZIP, ARC, PAK, or LZH extension, requiring that you have the appropriate decompressing program.

The idea with file-compression programs is simple: The more time required to do a file transfer, the more the transfer costs, whether from CompuServe charges, long distance charges, or whatever. File-compression programs can often compress files to one-tenth of their original size, so a 1MB file would compress to a 100K file.

That's why many of today's modems include the ability to compress and uncompress data on the fly. With such a system, you'd never have to bother with the whole compress-

ion and decompression process; you'd just leave bloated, uncompressed files on your BBS and let the modems handle the compression. You'll recall from last month that two terms stand out in the error-correction area: *MNP*, for Microcom Networking Protocol, and *V.42*, an international standard. Both standards have been augmented to include data compression in addition to error correction. *MNP's* Level 5 includes data compression, as does *V.42 bis*. These days, many modems come with these features.

If you download images from bulletin boards, you've probably heard of GIF (Graphic Interchange Format). GIF files don't benefit from modem compression, because GIF files are already compressed.

Since ZIP, ARC, PAK, LZH, and GIF files are in formats that don't lend themselves to further compression with normal compression techniques, it should be obvious that modems with built-in compression capabilities are of very little value to most of us. Not only are they of little value, but they're often downright undesirable, since modems with built-in compression can waste time trying to compress uncompressible data, slowing down file transfers. Given that ZIPs and GIFs are what most of us are downloading, look for a modem with the ability to turn off compression.

Communications Coprocessor

An inexpensive chip that can increase the speed of your file transfers has been around for years. Called the 16550, it's a member of the class of chips called UARTs (Universal Asynchronous Receiver/Transmitters). A UART is the heart of any serial port. If you're curious, pop the top on your PC and pull out the

How data compression, faster protocols, and the 16550 UART chip can affect your online communications



A legendary year in the history of naval conflict has returned.

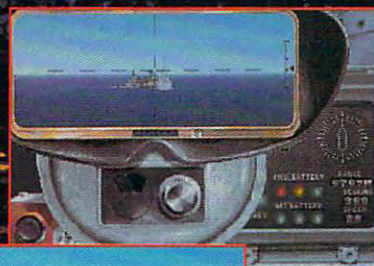
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Given the choice, let the modem do the error checking.

board that has your serial port on it. (Some computers may have the serial-port electronics right on the computer's motherboard.) You'll probably see a large 40-pin chip on the board. Look for the numbers 8250, 16450, or 16550. They may be wrapped up in some other characters, such as INS8250AP or the like.

The 8250 was the original UART used in PCs and XT's. It was fine for communications up to 2400 bps, but it couldn't keep up with faster computers and communications. So the 16450 was developed, and it's fairly prominent on the serial ports of computers in the 286 and higher class. A complete internal redesign makes it up to ten times faster than the 8250 for some applications. Part of that speed comes from a one-byte buffer that makes life easier for multitasking systems. Multitaskers like buffers because serial devices need nearly constant attention or data gets lost. Buffers hold the data for a few extra milliseconds, making the process of juggling tasks a bit simpler. OS/2, in fact, insists on 16450 UARTs, and serial ports with 8250s aren't recognized at all. Fortunately, the 8250 and 16450 are pin compatible, so I've been able to convert a number of old parallel/serial cards to OS/2 compatibility by just swapping a single chip. The task is further simplified by the happy fact that many UARTs are socketed, removing the need for soldering.

OS/2 works well with the 16450 because it has to deal only with well-behaved programs that were designed to be multitasked. Unfortunately, DOS multitaskers such as DESQview and Windows don't have that luxury. It can take so much time to swap

multiple DOS applications that background communications can be a real pain under most DOS multitaskers; in fact, I use background file transfers as one of my basic tests of DOS multitaskers. There's where the 16550 comes in. The next member of the UART family, it includes a 16-byte buffer that turns out to be just perfect for communicating with DOS multitaskers. It even smooths out file transfers at 9600+ bps for slower PCs. And, best of all, it's pin compatible with its older siblings, the 8250 and the 16450, so you can upgrade easily if your current UART is socketed. And you'll need just one more thing: a program to turn on the 16550. Some applications do that automatically, but just to be sure, you can grab a program called 16550 off CompuServe.

But all isn't good news here. You'd think that a multitasking platform such as Windows would benefit from the 16550 and would use it if present. To the contrary, Windows will likely lock up if your 16550 buffers are enabled. The Windows COMM.DRV and virtual driver *combuff must be rewritten in order to use the 16550; Microsoft says it will take care of this "in a future release of Windows."

Tips for Maximum Transfers

Assuming you have a fast computer and 9600-bps or faster modem, how do you squeeze the maximum file-transfer rate out of your system? First and foremost, choose a protocol that allows large block sizes, as that will net the greatest transfer rate. Make sure only one part of the system handles error checking: either the modem or the protocol. That means either diving into your modem manual to find the code to

turn error checking off or leaving the modem alone and finding and using a protocol that won't try to do error checking. The preferred protocol here from my experience is YMODEM-G. The G is the important part; regular old YMODEM does error checking. Given the choice, let the modem do the error checking. It's faster, more robust in the case of noisy lines, and more thorough in its discovery of transmission errors. The main problem is finding a host that supports YMODEM-G.

Install a 16550 if you can, or think about replacing your current parallel/serial board with one that sports the newer chips. You won't see a difference with a 16550 unless you're multitasking, transferring data at 9600+ bps, or both.

And whenever possible, use COM2 rather than COM1. Why? You'll get a slightly better response from COM2 because it's driven off interrupt 3 (so is COM4, so you could alternatively use COM4), whereas COM1 and COM3 are driven by interrupt 4. The interrupts in the PC are prioritized, meaning the items with the lower interrupts get higher priority. Assuming your PC is monitoring both COM1 and COM2—if, for example, you had a serial mouse on one COM port and a modem on the other—you'd do better to put the mouse on COM1 and the modem on COM2.

If you're using Windows, that's the preferred arrangement anyway, since Windows deals best with communications ports when it sees them in order. It sees the mouse first, so put that on COM1. Then it sees the modem on COM2 whenever you get around to starting up the communications application. And remember to turn off compression in most cases. □

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PROGRAMMING POWER

Tom Campbell

DEVELOPMENT ENVIRONMENTS FOR WINDOWS

This month we'll walk through a couple of significant Borland products, Borland C++ & Application Frameworks 3.0 and ObjectVision 2.0. Each will probably have a column of its own in the future, as each has a wildly divergent means of creating applications.

Because there's so much to cover, this column won't have any code this month. Check out COMPUTE/NET anyway because I've uploaded the source code to a number of utilities I use constantly.

Borland pulverized its competition when it entered the C++ market last year, simultaneously legitimizing what was—hard as it is to believe now—an uncertain future for that language. The company's flagship product is now Borland C++ & Application Frameworks 3.0, a gigantic development system for both DOS and Windows. It includes the latest version of Turbo Debugger, Turbo Assembler, Turbo Profiler, a C compiler, a C++ compiler, integrated environments for both DOS and Windows (finally), the Turbo Vision (for DOS) and ObjectWindows (for Windows) development libraries, the Whitewater Resource Toolkit, a Windows help compiler, a C++ container class library, support for C++ version 2.1 including some proposed extensions (notably templates), a ton of utilities, and the best example programs in the business.

It's become my preferred development environment for both C and C++, but it's not without problems. The integrated Windows environment is actually Turbo C++ for Windows, which also sells as a \$149.95 product on its own; more on it

in a moment. You still don't get a Windows-style debugger; Turbo Debugger runs under Windows, true, but in character mode. While it's a vast improvement over Microsoft's CodeView, which is no fun to use in Windows unless you have two monitors, it's no fun to snap in and out of graphics mode each time you step over a function call.

Debugging Windows apps is hard enough as it is. Turbo C++ for Windows, which is the first C++ integrated editor/compiler that runs under Windows, is a wonderful development environment. It has everything you'd expect in a Windows-based editor and the increasingly trendy toolbar for quick selection of common actions, but my favorite part is the ObjectBrowser. It's a visual representation of your program's function calls in a tree format, the programmer's equivalent of an outliner. My version of Turbo C++ is much buggier than a first release should be; I hope a .01 release fixes some of the bugs. Plan on saving your files *all* the time.

If you're on a budget, either Turbo C++ for Windows or Turbo C++ 2.0 for DOS is a great buy. Another recent Borland release is ObjectVision 2.0, a Windows database builder that straddles an uncomfortable line between being an end-user tool and a development environment—but it straddles it well. Nowhere does Borland have a quotable sentence or two describing just what ObjectVision *is*, so I'll try to do it.

ObjectVision is a visual design tool that lets you create Windows data-entry forms and the databases behind them with little or no programming. A form isn't limited to one database or even one format. Unbeknownst to you, a single form window can simultaneously be updating dBASE, Paradox, Btrieve, and

ASCII databases while you enter data. OV lets you create stand-alone Windows databases, and you're allowed to distribute all the support files required to create turnkey systems for redistribution.

Whew! While that paragraph may not be pretty, it does the job. OV looks somewhat like a drawing program or forms-design program, but what you draw is the "live" data-entry form itself. Borland tends to view this as a front end to other databases, but I have nothing but praise for its use on a single-user system.

You can create complex data-validation procedures and filters without any programming at all, and a *novel* (if you haven't used such Macintosh products as Double Helix) visual "decision tree" lets you program using 1-2-3- or Quattro Pro-style @functions as a rudimentary, foolproof programming language. As a programmer, I found it a less-than-perfect environment; as a user, I must confess it's easy to learn and very fast to program in. A poorly documented but effective DLL interface allows plenty of access to OV's innards and a seamless way of extending its already considerable abilities. An obvious idea would be a DLL that lets you modify the access to dBASE memo fields, which are limited to 4096 characters through OV's editor. OV doesn't pretend to create reports or offer debugging facilities, but what it does, it does magnificently.

Should you buy it? At \$100 (street price), if you need to create Windows data-entry forms of simple-to-medium complexity, it can't be beat. I imagine forward-thinking MIS departments are going wild about ObjectVision because it allows a naive user to update many, disparate databases from what appears and behaves like any other data-entry form. □

You can create complex data-validation procedures and filters without any programming at all.

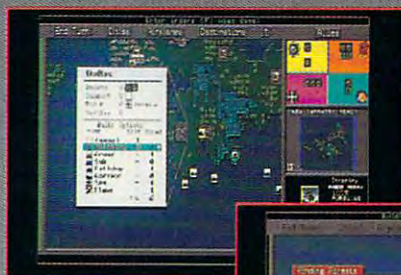
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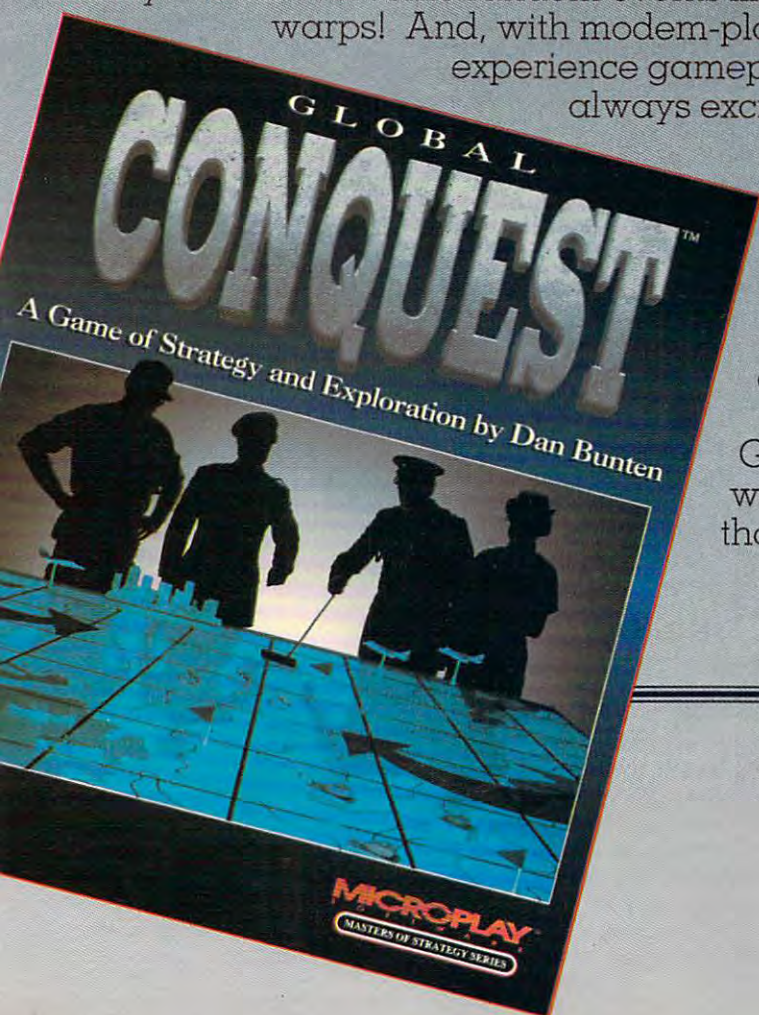
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Steve Draper

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QFILER 3.2A

QFILER is designed to make the management of your hard

disk files much easier. Two different, sorted directories are displayed side by side, allowing you to select both individual files and groups of files for QFILER to act on. You can easily copy and delete files, find a file on any drive, rename files and directories, move files from one directory to another, run other programs from within QFILER, display files in sorted order, define a file mask to display only certain files, back up files, and much more.

Most of the features in this impressive list can be performed from the DOS command prompt. However, with QFILER's dual directory display, tasks become much easier than with DOS, and more intuitive. You don't have to worry about the confusing syntax of DOS commands or about not being sure of what each command will do. You can see exactly what you're doing as it happens.

For the advanced DOS user, QFILER offers a number of file-management tools, allowing you to set or clear file attributes, change the file time and date stamps of files, rename disk volume labels, use file-compression utilities, and locate duplicate files. You may never want to use DOS again.

QFILER runs on any IBM PC or compatible with 256K RAM and any monitor. The registration price is \$20.

TOURNAMENT GOLF 1.5

Tournament Golf is an excellent simulation of one of the world's most popular sports. The game is very easy to learn, with only a few keys used to control all of the options, yet it's challenging enough to keep you involved for months. This game surpasses many of the commercial golf games in quality, ease of use, and playability.

The action takes place on the Augusta International course, the site of the Masters golf tournament. The course is beautifully rendered with 3-D graphics, and the motions of the player's swing and the ball's flight are smoothly and realistically animated.

Up to four players can play at a time, or you can practice your golfing skills solo. Either way, you'll see why the tournament that is played on this course is called the Masters. There are numerous obstacles to overcome. Trees line the fairways, sand surrounds many of the greens, and water hazards are abundant and strategically placed. These obstacles combine to make every shot a challenge.

When you're ready to play, the program gives you an overhead view of the hole that you're currently on. Use this view to plan your strategy for the hole. When you're done, hit the space bar, and you're ready to tee off. Select the club you want to use and get ready to start swinging. Use the space bar to control the swing Power Meter. The Power Meter determines how hard you hit the shot and also how accurate the shot will be. Be careful when you make contact with the ball; it's easy to put a slice or hook in your shot—just like in the real thing.

Another great feature of Tournament Golf is the computer's realistic scorecard, which frees you from having to keep track of bogies and birdies. You can relax and concentrate on the game itself, instead of worrying about hanging on to the little pencil.

To run this program, you'll need an IBM PC or compatible, a monitor with EGA or better, and a hard disk or a high-density floppy drive. The registration price for Tournament Golf is \$9.50. □

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IT TAKES MORE THAN TALENT,
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DETERMINATION TO SUCCEED.

THE TAPROOTS OF SUCCESS

BY ROSALIND RESNICK

When it comes to running a business from home, there's no sure-fire recipe for success. Although computerization is virtually essential to compete, it takes a lot more than a trusty PC to start a successful business. Toss in raw ambition, add hard work, stir in a pinch of market savvy, and in the end you could still be stuck with a money-losing flop. That's because no amount of ambition, hard work, and market savvy can guarantee that your biggest customer won't go belly up, your competitors won't slash their prices, or somebody else won't come along with a better mousetrap.

Even so, these unavoidable business problems aren't always the things that sink a new company. More often than not, small businesses fail not because they lack good products but because their owners lose sight of the fundamentals: cash flow, marketing, collections, and long-term planning. Interestingly, not only shortsighted businesses run into trouble. Successful com-

panies have the same kinds of problems. The difference is that successful businesses tend to spot these problems early on and correct them long before they get too big to handle.

Of course, it's entirely possible to sidestep many of these pitfalls if you know what to expect beforehand. To that end, we've interviewed three successful home-based entrepreneurs. We asked them to talk about some of the mistakes they made along the way—and how they managed to turn lemons into lemonade. Essentially, what we've asked them is this: If you had it to do all over again, what do you wish you had known before you took the plunge and started your own business?

How to market my services. Robert McElwain, 51, once a stockbroker with some of the nation's leading brokerage firms, dropped out of the corporate rat race in 1984 to launch North American Capital Management in Shawnee Mission, Kansas. Though Shawnee Mission is a long way from Wall Street,

the Kansas money manager and his stock-picking prowess have rated favorable mentions in *Money*, *Wealth*, and other national magazines. McElwain now manages more than \$12 million for clients nationwide and says his company's annual billings are comfortably "in the six figures."

When McElwain first went out on his own, he very nearly became a victim of his own success. "In the beginning, we were very fortunate because we were featured in *Money*, *U.S. News & World Report*, *Wealth*, even the local newspaper," the money manager recalls. "The effect was that I got spoiled, and I forgot that you're supposed to market your services. It was not until a year or so ago that we realized we needed to get back to the basics and start doing some marketing."

McElwain's solution: an information-packed newsletter targeted at affluent individuals and pension managers nationwide. Thanks to McElwain's renewed emphasis on marketing, he's seen his business grow from \$10 mil-



Getting on the customer's wavelength was key to Turkel Advertising's success.

lion in assets under management—the commonly used benchmark for the money-management field—to over \$12 million since he launched the newsletter in November.

How to speak my customers' language. Bruce Turkel, 34, quit a good job at a Miami advertising agency to freelance from home eight years ago. Today, Turkel is president of Turkel Advertising, which employs 14 staffers and racked up \$8.6 million in billings last year, thanks to clients like American Express and Turbana, one of the world's largest fruit companies. Turkel says that his billings are up 42 percent over last year and that his company now ranks 32nd out of approximately 260 Miami-area ad agencies.

When Turkel quit his job as an art director to start his own agency, he often found himself trying to explain to his business-owner clients the creative concepts behind his ads. It wasn't long before he realized that he was wasting his breath. "Advertising is not what they know," Turkel says. "They know about widgets. Now, I speak to what my clients want to know: that we're going to boost their image and expand their business. How we do it doesn't matter to them."

With a bit of chagrin, Turkel notes that, while his ad agency has snared a number of prestigious industry awards, many of his clients remain unimpressed. "One client said to me, 'I just want you to win me green awards,'" Turkel recalls. "As long as you win me green awards, I don't care what you do."

How to diversify my customer base. Donna Partow, 30, owner of Syntax Services in Barrington, New Jersey, is a marketing consultant and freelance copywriter. Partow, who had previously worked at a bank, opened her home business shortly before her daughter, Leah, was born three years ago. Working from home allows Partow to spend the day with her child without sacrificing her career. Last year, she raked in \$22,000 in revenues—not bad for 20 hours a week of work.

Partow says it's easy to get hooked on a single client, especially when you're just starting out. But, while that regular income stream can be a lifeline, it can also become a dangerous addiction that saps the strength of a growing company. Partow recalls, "One client wanted me to call on clients, do business development, all kinds of things. I began spending most of my time developing his business, not mine. One day, I actually heard myself referring to him as my boss. That's when I knew the relationship was over."

Partow's solution: informing the client that she wouldn't be available to work more than five to ten hours a week for him. "It's better to have multiple clients rather than just one big one," Partow says now. "I think that's a mistake a lot of people make. You get one client and just lean on him. That's not wise."

How to get my customers to pay me. Early on, Turkel, who started his business at the tender age of 25, also

learned some costly lessons about handling receivables. "I believed that if you do the work, you get paid," Turkel recalls. "It was what my dad called 'the confidence of ignorance.'" At the beginning of his second year in business, Turkel got a rude awakening: A client that had always paid on time before stuck the fledgling agency with \$40,000 in unpaid bills. Though Turkel took the client to court and won, he wasn't able to collect his judgment. That left Turkel on the hook to pay all the outside vendors he had hired to help him with the job.

Now, Turkel says, his agency estimates every job up front and sets a "comfort level" for unpaid receivables beyond which the agency will call a halt to its work. With one client, that level may be as low as \$2,000; with another, \$10,000 or higher. "It has nothing to do with trust; it has to do with business," Turkel says. "It's a lot better to do it this way than to do the work and have the client not pay us."

But Turkel admits he still occasionally gets burned. Recently, a client filed for bankruptcy protection—owing Turkel's company \$20,000.

How to manage my cash flow. In the burst of excitement that comes with finally going out on their own, many home business newcomers forget that they probably won't see any money from their labors for at least 30 to 60 days. That's how long customers typically take to pay their outside vendors (often longer in these recessionary times). A good strategy is to moonlight, as Turkel did, before quitting your job to go out on your own or, at least, to sock away enough cash to get you through a couple of lean months.

Advises Partow: "Don't quit your day job until you have thoroughly researched your business, analyzed your market, and completed a detailed business plan. I quit my job, opened up shop, bought a computer, and said, 'Now what?' As a result, I had to wait months before seeing any cash flow." Also, she adds, "Don't bank on showing a profit the first year."

How to find my niche. Some of the more fortunate home-based entrepreneurs have a skill or a customer base that they can take with them from their old office jobs. McElwain, for example, had spent years as a stockbroker, and Turkel had three years' experience at various ad agencies. But for people without those ready-made connections, finding a niche can be much more difficult.

Partow was an English major who had honed her writing skills by writing booklets, brochures, and articles while an investment banking rep at Mellon Bank. But when she launched her mar-

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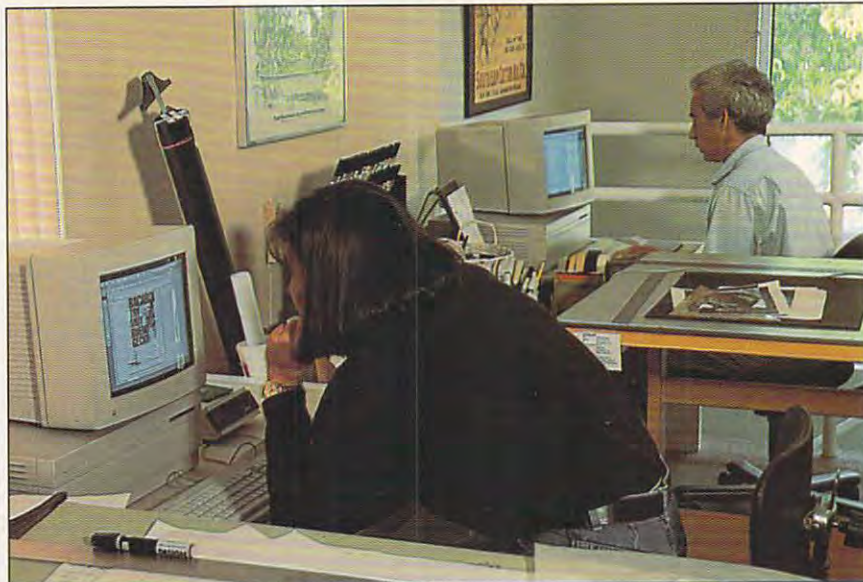
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keting and copywriting firm, she realized she needed to be more of a specialist to get where she wanted to go. While she hasn't reached her goal yet, she's gaining a reputation as a home business expert by teaching a class at a local university, writing books on the subject, and contributing to a newsletter for people who work from home. Her book on starting a home business, *Homemade Business: A Woman's Step-by-Step Guide to Earning Money at Home*, is now available; ordering information can be found in the product box accompanying this article.

"You need to find your niche and stay focused," Partow says. "Clients are willing to pay you more if you're a specialist."

When to reach out for help. Running a home-based business doesn't necessarily mean going it alone. Though the work force of the typical home business consists of a self-employed individual or couple, farming work out to independent contractors with different but complementary skills isn't unusual.

McElwain, the money manager, is unusual in that he has four part-time employees, including his wife, who all work in his home office. One is a freelance computer programmer; another customizes software for Harvard



Technology is leverage in a small business, letting a few workers do the work of many.

Graphics. McElwain's wife works at the company two days a week to handle the bookkeeping. Fortunately for McElwain, his office is large enough to accommodate a staff that size. It measures 1400 square feet, has its own entrance, and houses five desks and three computers.

"The employees can come in in

blue jeans and fix themselves a cup of tea or have a Coke," McElwain says. "It's very informal and relaxed."

How to leverage my business through technology. These days, it's hard to imagine a home business that doesn't have a personal computer. Add on a printer, modem, fax machine, and some basic desktop publishing software, and your fledgling business has most of the tools it takes to compete with the pros. Nevertheless, how much technology to buy, which technologies you need, and how to get them to do what you want them to can still be a struggle.

"I wish I'd known more about computers before I started my business," says Partow, who still has the same IBM XT clone she started out with. "I think the people at WordPerfect know me by name."

Keeping up with technological change can also be a challenge for more sophisticated users like McElwain, who runs his business on an old IBM PC and two newer 286 AT clones. "Each time I've bought a computer, I've bought it based on what I thought I needed at the time, but each time the software packages have been upgraded to operate at far greater speeds. Now, I'm planning to get a 486 machine with a math coprocessor to help me crunch the numbers."

How to delegate responsibility. Once you get your home business up and running, you may find that it literally spills across your living room and out the door. Unlike McElwain, who employs people at his home, most home business owners who hire employees eventually break down and lease office space. But while hired workers can help expand your business by multiply-

YOU'RE NOT ALONE

If you're thinking of starting a home business (or have done so already), it's reassuring to know you're not alone.

LINK Resources, a New York-based research and consulting firm, estimates that close to 12 million self-employed people work from home these days. Part of the phenomenon can be attributed to advances in personal computers, modems, and fax machines that let people create their own offices outside the corporate whirl. In 1991, nearly half of all homemaker households owned a personal computer, compared to fewer than 25 percent five years ago.

Here are some of the findings of LINK's latest (1991) homemaker survey:

- Of the 122.9 million Americans in the adult work force, some 38.4 million (31 percent) work from home at least some of the time, and that number is expected to grow at a 12.7-percent annual clip. Roughly one-third of the United States' 94.4 million households have at least one person earning a living—or trying to—at home.
- There are 11.8 million people running full-time businesses from home, up 5.4 percent from 1990.
- People juggling multiple jobs by working part-time, or moonlighting, from a home office number 10.5 million. This segment, composed primarily of baby boomers looking for extra income, grew by 12 percent from 9.4 million in 1990.
- The telecommuting population has

reached 5.5 million people. These workers are company employees who work at home part- or full-time during normal business hours. This figure is up 38 percent from 1990. Roughly 900,000 telecommuters now log 35 or more hours a week at home, thanks to corporate belt-tightening and shifting management attitudes.

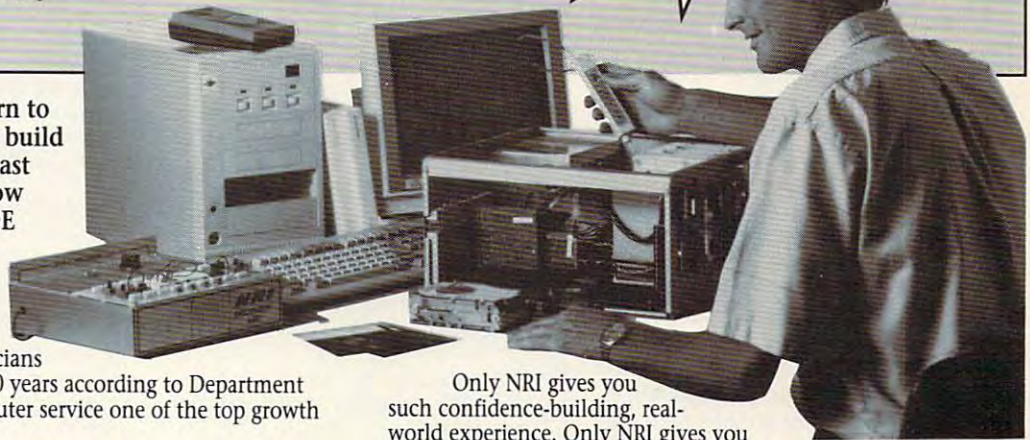
- People routinely bringing work home from the office to do after hours number 10.6 million. Actually, LINK estimates that closer to 29 million employees bring work home at least some of the time but don't meet the "homeworker" definition.
- By 1995, 50 million or more Americans may do some or all of their work at home, LINK predicts.

How does LINK know all of this? LINK collects data by conducting its National Work-at-Home Survey each year, polling a randomly selected group of 2500 households nationwide. To qualify for "homeworker" status according to the criteria in LINK's survey, households must indicate that one or more adults age 18 or older either "perform income-producing or job-related work at home, part- or full-time," and/or "use one or more of the following for business purposes at home: personal computer, modem, fax, multiple phone lines."

For more information, contact LINK Resources at 79 Fifth Avenue, New York, New York 10003, or call (212) 627-1500.

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NEW!
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computer, 40 meg
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Jobs for computer service technicians will almost double in the next 10 years according to Department of Labor statistics, making computer service one of the top growth fields in the nation.

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Only NRI gives you hands-on training with the finest example of state-of-the-art technology: the powerful new West Coast 386sx/20 MHz computer. As you assemble this fully IBM PC/AT-compatible machine, you actually see for yourself how each section of your computer works.

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Your hands-on training continues as you install a powerful 40 meg IDE hard drive—today's most-wanted computer peripheral—now included in your course to dramatically increase your computer's data storage capacity while giving you lightning-quick data access.

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ing the amount of work you can take on, they can also pose new problems as the individualist entrepreneur is forced to become a team player again, this time as the boss.

"When I started hiring creative people, I would give them the concept of a job, and they would give me back the copy," Turkel says. "I learned that it doesn't have to be done the way I would do it. It just has to be done well."

One of Turkel's main challenges, he says, has been keeping his employees motivated. "I think I spend more of my time getting my people excited than anything else," he says. "People love to work if they're doing something they believe in."

How much I'd enjoy having my own business. Though the prospect of cutting the corporate umbilical cord and starting your own business may seem scary at first, it's amazing how many home business people say they wish they'd gathered the courage to strike out on their own long before. McElwain, for one, says he wishes he'd taken the plunge ten years ago. Partow, too, says she wishes she'd started her home business sooner.

"Now I can work where I want and when I want," she says. "That's about as good as life gets." □

RESOURCE BOX

Thinking of starting your own home business? Here are some helpful resources to speed you on your way:

Working from Home: Everything You Need to Know About Living and Working Under the Same Roof

Paul and Sarah Edwards
\$14.95

ISBN 0-87477-582-5

Jeremy P. Tarcher
5858 Wilshire Blvd., Ste. 200
Los Angeles, CA 90036

The Self-Employed Woman: How to Start Your Own Business and Gain Control of Your Life

Jeannette R. Scollard
\$7.95

ISBN 0-671-68407-8

Simon & Schuster Trade Books
A Division of Simon & Schuster
1230 Avenue of the Americas
New York, NY 10020

Homemade Business: A Woman's Step-by-Step Guide to Earning Money at Home

Donna Partow

\$11.00

ISBN 1-56179-043-5

Syntax Services
P.O. Box 82
Barrington, NJ 08007

How to Run Your Own Home Business

Edited

\$7.95

ISBN 0-8442-6666-3

VGM Career Horizons

A Division of NTC Publishing Group

4255 W. Touhy Ave.

Lincolnwood, IL 60646

The New Small Business Survival Guide: Winning at Business in the '90s

Bob Coleman

\$10.95

ISBN 0-393-30750-6

W. W. Norton & Co.

500 Fifth Ave.

New York, NY 10110

The Working from Home Forum

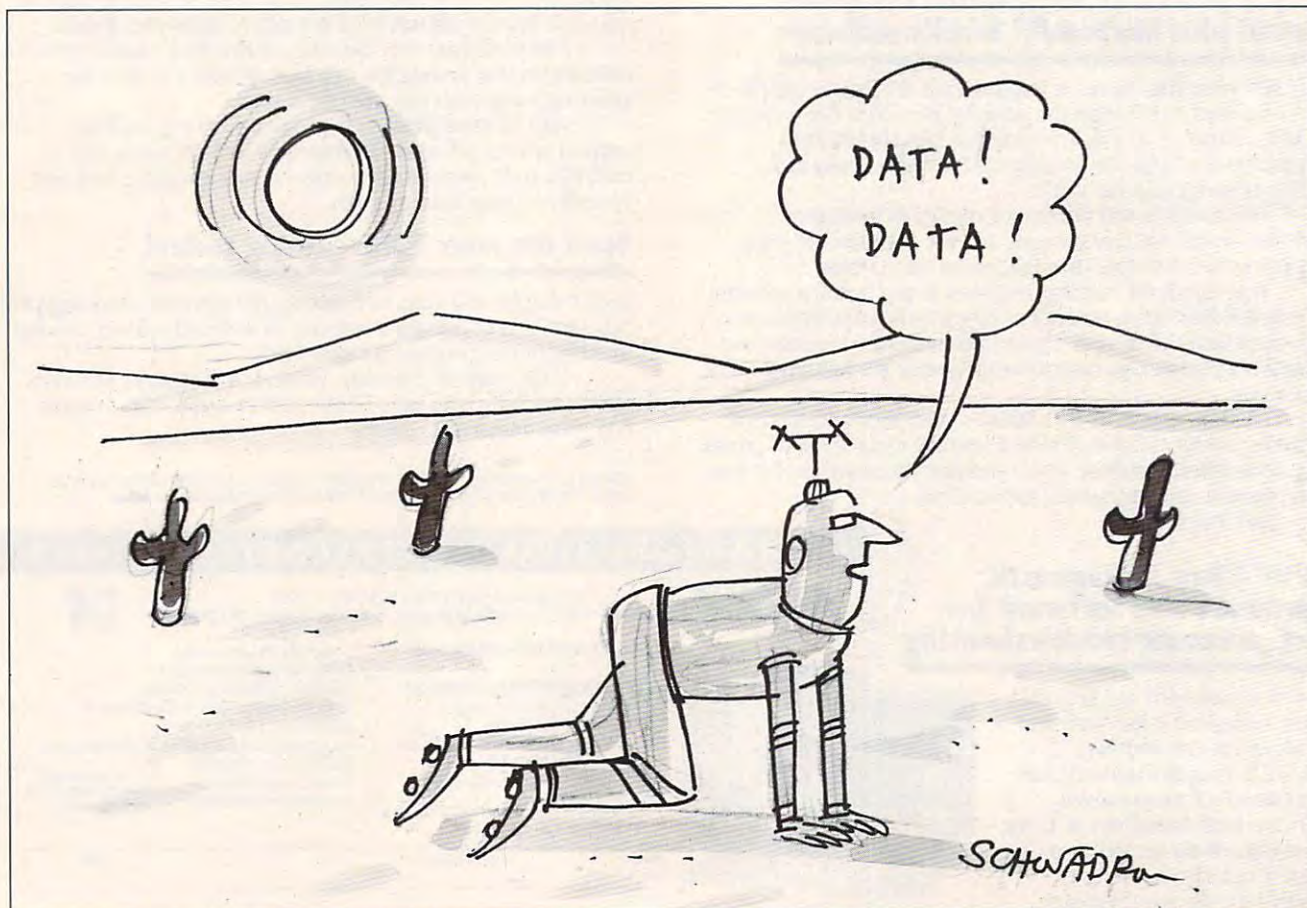
Available on CompuServe

P.O. Box 20212

Columbus, OH 43220

(800) 848-8990

Provides a place for online networking among home office entrepreneurs. Also contains information about home office management tips, resources, laws, tax benefits, and marketing approaches. Paul and Sarah Edwards (coauthors of the book *Working from Home* listed above) are sysops. The Working from Home Forum is not surcharged, though CompuServe itself charges an access fee.

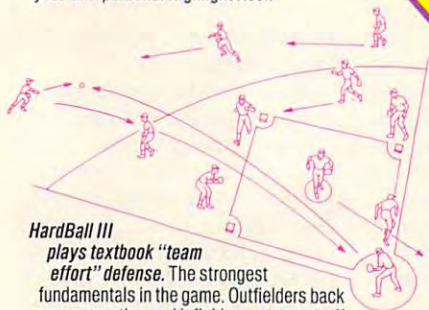




▲ *HardBall III* takes a full cut at major league realism. A power line-up that includes printable stats, standings and box scores; the ability to import data from *HardBall II*,[™] *Earl Weaver II*[™] and *Tony LaRussa*[™]; plus a Team & Player Editor that allows you to alter everything from team logos to a player's ability.



▲ *HardBall III* zooms in on the bang-bang plays. Five camera angles cover the entire ballpark. Watch instant replays and save the best for your own personal Highlight Reel.



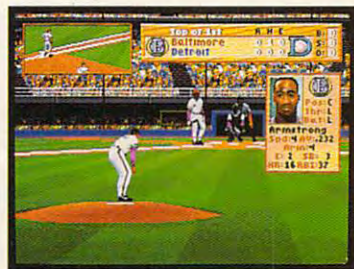
HardBall III plays textbook "team effort" defense. The strongest fundamentals in the game. Outfielders back up one another and infielders act as cut-off men, coming out to take the throw.



▲ *HardBall III* has the best play-by-play man in the business. Network broadcast great Al Michaels joins the *HardBall III* Team up in the booth, with a digitized description of all the action.

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PRESENTING THE ALL-NEW HARDBALL III[™]



▲ *HardBall III* leads off with digitized players and 256 color VGA graphics. Nobody beats this double play combo. Visuals as eye opening as a line drive up the middle. Animation as smooth as a Gold Glove shortstop. From fresh mowed grass to ivy covered walls, details that capture The Show.



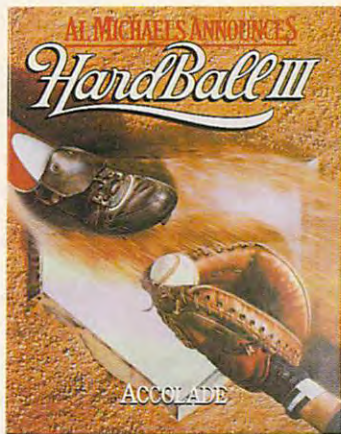
HardBall III tests each hitter's power with eight real ballparks. Famous fields from both major leagues. Your catcher may have just enough pop to put it out of Chicago's "friendly confines," but can he go deep in Toronto?



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To order, visit your favorite software retailer or call 1-800-245-7744.



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Play-by-play announcing requires 2MB of RAM. Actual game screens from IBM PC VGA version of the game. Other versions may vary. HardBall III, HardBall II and HardBall are trademarks of Accolade, Inc. Earl Weaver II is a trademark of Electronic Arts. Tony LaRussa is a trademark of Strategic Simulations, Inc. All other product and corporate names are trademarks and registered trademarks of their respective owners. © 1992 Accolade, Inc. All rights reserved.

Circle Reader Service Number 232

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PRODUCTIVITY CHOICE

Say goodbye to clutter and confusing notes: This PIM will organize your home office and streamline your business.

Peter Scisco

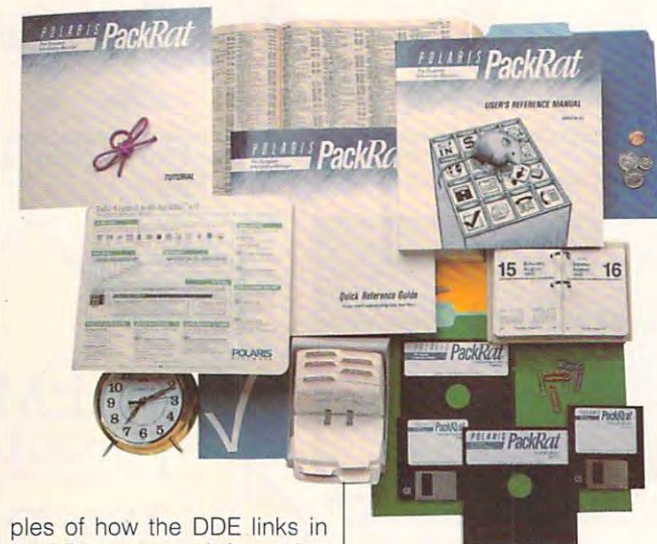
PACKRAT 4.0

PackRat 4.0 from Polaris Software stores, organizes, and provides easy access to every detail of your office. While several personal information managers (PIMs) fly the Windows banner, PackRat 4.0 ranks as the premier implementation of this application group. No other PIM quite matches its scope or capabilities, yet it doesn't ask you to sacrifice a lifetime in learning. The program's overall integration, intuitive functionality, and well-developed links to other Windows applications make it a natural leader.

Comprising 15 separate activities, called facilities, PackRat can be configured to be as simple or as complex as you want. This eases the way for first-time users, while offering the expandability that a growing business requires.

For users who fear such an armada of applications, one of PackRat's best features is its ability to display only those facilities that you want or use regularly. Customize the interface to streamline it and keep the screen simplified. This is especially important in the beginning, for too many options at the start may intimidate you too much to allow you to make the most of PackRat's many features.

The facility to which most users will immediately gravitate is Phone Book, an excellent database for telephone numbers, addresses, and contact names. PackRat even accesses your fax software—so you don't have to keep a separate directory of fax numbers. Windows word processors can use macros to gain access to addresses stored in Phone Book. These are simple exam-



ples of how the DDE links in PackRat manage information across all of your applications.

Phone Book's companion is Phone Log, which tracks calls you make or receive. You'll find such a log invaluable if you must track phone costs from a home business or bill a client for phone calls related to a particular project.

PackRat's To Do and Agenda facilities are comparable to similar features in most other PIMs. Each keeps track of appointments and projects, supports repetitive and custom scheduling, and displays scheduling conflicts.

Besides these fairly straightforward facilities, PackRat offers more exotic but still useful options. For example, the Financial module lets you track expenses and account balances for any number of accounts. While not a replacement for a dedicated financial package, the Financial module can be designed to perform most of your accounting functions.

Index Card is a free-form card file for storing miscellaneous information. Use Index Card to store information for proposals, for brainstorming ideas, or for lists. Think of it

as an electronic equivalent of Post-it Notes.

Track the history of documents created in other Windows applications and launch documents with their associated applications with Disk File. You can also launch DOS files with accompanying applications, provided you've defined the document extension and its accompanying application in your WIN.INI file.

PackRat's Resource Management facility is designed for people who monitor the use of company equipment or bill clients for the use of special resources. You may define each resource item (conference room, computer, and so on) and its billing amount. As you attach a particular resource to a project, the billed amount is automatically calculated for the accrued time of the project.

PackRat attachments are particularly significant, for they govern the way information can be retrieved and linked. A Phone Book item linked to a project gives you a means of tracking who has been contacted for

each stage of a project. Any facility item can be linked to any other.

Project Management tracks projects and the tasks associated with them. Tasks can show dependencies, and prospective completion dates can be calculated and refined as the project proceeds. Like the Financial facility, Project Manager isn't meant for large projects better served by dedicated applications. But for small projects requiring the completion of smaller tasks, this manager performs nicely.

PackRat's Time Management module tracks the elapsed time spent on user-defined projects, tasks, clients—anything to which you want to assign a timed task. This facility can double as a time/billing module, as each Time item can be assigned a resource rate, which is then multiplied by the elapsed time for billing purposes. It's a very workable and elegant solution for home office workers or small businesses that want to track the amount of billable time spent on particular tasks.

An Alert facility allows you to schedule reminders for any task, call, or appointment. A pop-up window will occur in any other Windows application once an Alert has been activated. If you're using a DOS application in a windowed environment, the program will automatically be minimized, and you'll drop to the PackRat Alert screen.

A Global facility allows instant access to a variety of informational tidbits stored throughout PackRat. This can be very helpful when you're trying to pull together all of the information for a particular task. You can also use

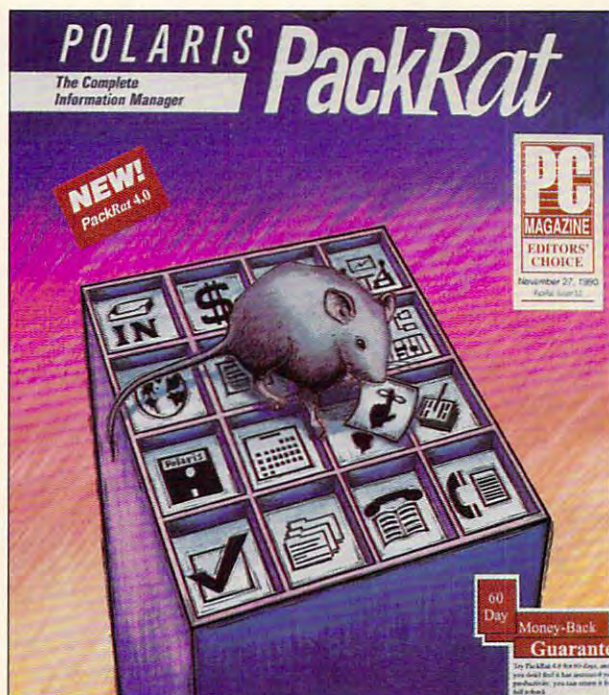
Scratch Pad to assimilate information from different databases as you work toward the next stage in a project.

Essentially, all of these separate facilities act as modules for a simplified, intuitive database. As such, PackRat provides ample opportunity for you to define each entry you make in a way that allows you to search and retrieve that information easily.

For example, in a simple module like Phone Book, you can enter all the basic information: name, address, title, position, company, business phone, and so on. In addition, you can fill four User Key fields to refine your entry. If you needed a report on all of your suppliers located in the Northeast, you'd type *supplier* in one of the User Key fields and *northeast* in another. Then, before traveling to the Northeast, you'd search using those criteria and the Boolean search routines that PackRat provides. The intuitive and powerful search routines are a major part of PackRat's power.

As another indication of its powerful database activities, PackRat can issue a variety of reports based on parameters defined in a similar way to the search parameters. It includes several standard reports and provides tools for defining and designing your own. You can save your reports as a Print Catalog that you can call up later—so you have to define the report only once.

Is PackRat the perfect personal information manager? Almost. There's still room for improvement, especially in the program's manuals. A more thorough examination of each of the intricate and varied functions is needed. Certainly, instructions for report-



ing functions, printing, and the Resource and Project Management modules all need to be more detailed.

A second caveat is the power you really need for this incredibly disk-intensive application. I've been using the program for several months on a machine with 4MB of memory, but I feel the distinct need to double that amount of RAM to accommodate this program, the Windows environment, and Ami Pro 2.0.

Still, you'll have to look pretty hard to find a program that does so many things so well. PackRat is billed as a "complete information manager," and it lives up to this claim in grand style. If your work requires you to balance several projects, think creatively, and stay in contact, PackRat 4.0 might be as perfect as it gets in this world. □

IBM PC and compatibles (80286 or faster); 1MB RAM; EGA, VGA, or Hercules; Windows 3.0 or higher (running in standard or enhanced mode)—\$395; network version (three users)—\$695; each additional node—\$175

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PERSONAL PRODUCTIVITY

Daniel Janal

FAX FROM ANYWHERE

"What's your fax number?" seems to be the catch phrase of the 1990s among business people. If you have a computer, you don't need to buy a fax machine to jump on the fax bandwagon. All you need is a modem, a phone line, and software—and perhaps an account with an online service like MCI or CompuServe.

Like a fax machine, most computer alternatives can

- Send any ASCII, graphics, or binary file
- Keep a directory of people you send faxes to
- Provide a transcript of faxes you have sent
- Broadcast faxes to groups of people in your directory, so you don't have to retype all the information
- Redial the number if the recipient's machine is busy

However, these alternatives do have drawbacks. Software and online solutions won't receive faxes. Hardware solu-

tions will eat a lot of disk space and could monopolize your computer. In all cases, if you want to transmit hard-copy, such as newspaper articles and contracts, you'll have to buy a scanner.

Here is a look at several popular alternatives to help you join the fax vanguard

Online services, like MCI and CompuServe, will send your ASCII document to any fax machine. You establish an account with the service, sign on, upload the files, and provide the recipient's fax number. The service will send the file to the fax machine.

CompuServe Information Services (CIS) charges a \$7.95 monthly connect charge, for which you receive a nine-hour credit for basic services (including faxes). After the nine-hour credit is exhausted, CompuServe charges \$0.75 for the first 1000 characters faxed and \$0.25 for each additional 1000 characters. Joining the service costs \$39.95 (free memberships are available with several modem and software packages). CompuServe can send ASCII files only and can't broadcast faxes.

With MCI, you pay only the cost of sending the message inside the U.S. There's no annual fee or startup charge. And with MCI you can broadcast faxes.

On the GoFAX from Ibis Software is a software alternative. You send the files to a service bureau, as you do with MCI and CIS, which in turn transmits the files to the recipient. But unlike MCI and CIS, On the GoFAX will transmit virtually any file format, including pictures and spreadsheets.

Mastering the software takes about ten minutes. You need only seven keystrokes to navigate through the system. The phone call is free, but your credit card will be billed \$2 for each page.

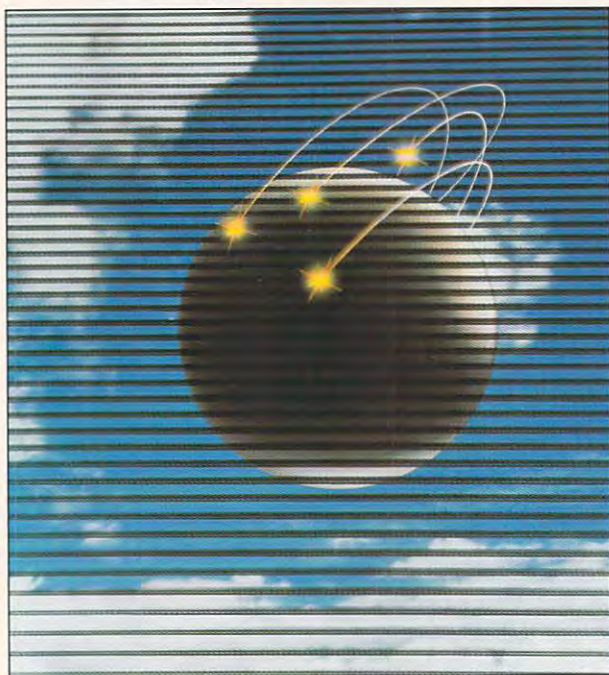
On the GoFAX saves you time on file conversions. Imagine having to spend several minutes converting a file and then hearing the busy signal when you finally reach the recipient's line. You'll have to do it all over again later—with no guarantee that the line will be free then. A system that doesn't require file conversion has a major advantage over hardware systems, which tie up your machine while converting text and graphics files.

If you want to receive faxes as well as send them, you must have a fax card and software. Consider the Frecom Fax96 from Fremont Communications, which allows you to send and receive faxes directly through its combination of fax/modem and software. One caveat: Most fax/modems are not regular modems. Unless you see a statement on the box that the modem will function as both a fax/modem and a standard modem, it won't let you sign on to your favorite online service to send E-mail. The Frecom Fax96 has both modem and fax/modem, thus freeing a slot on your machine.

The hardware alternative is less expensive than a fax machine. The Frecom Fax96 costs about \$150, discounted from \$250. Another advantage is that you will receive the file into your computer, so you can print the fax onto plain paper instead of flimsy fax paper offered by fax machines.

Each system offers advantages and disadvantages, so determine what your needs are. If you send only ASCII files, MCI does the job at the lowest price. If you send many graphics files, then the On the GoFAX software might be the way to go. If you need to send and receive, the hardware option is most viable. In any case, if you can't afford a stand-alone fax machine, let your computer do the dialing. □

If you have a PC, you have most of your faxing needs covered. Send and receive faxes without a fax machine, thanks to modems, special software, and online services.



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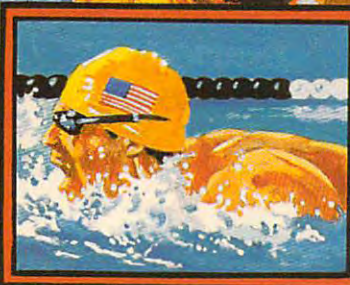
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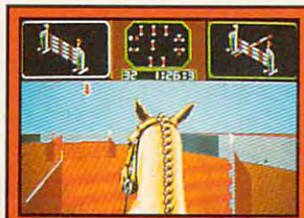


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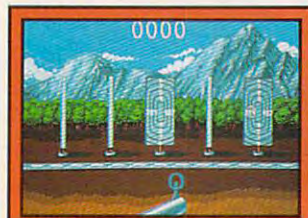
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RUN, JUMP, SWIM, KICK

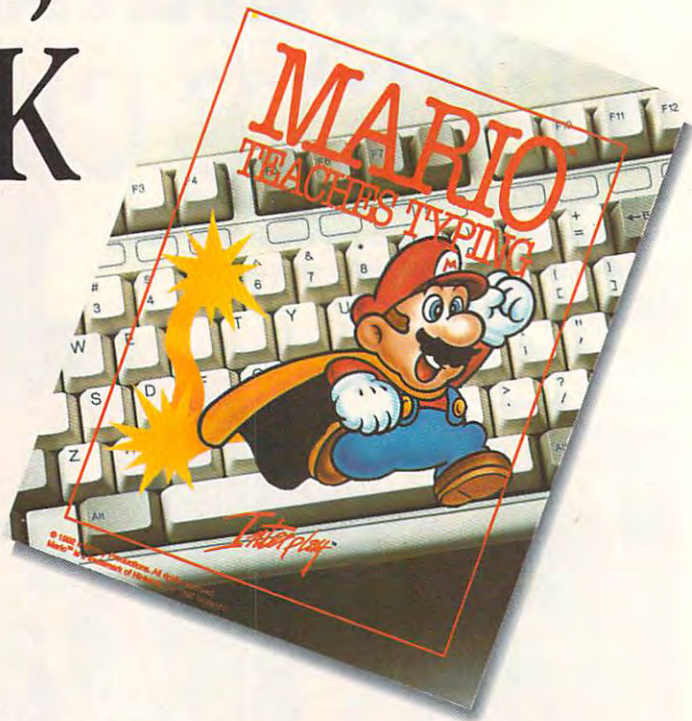
NOW YOU'RE LEARNING HOW TO TYPE!

Mario's not just the world's king of adventure—he's your personal typing teacher!

All the great Mario characters and scenes that you've come to know are here. Start by choosing your own identity—Mario, Luigi or The Princess. Then go at your own pace through each adventurous level:

Level 1— Hit the blocks, kick the turtles, and jump as high as you can while graphic hand visuals help you learn to find all of the letters on the keyboard without looking.

Level 2— Plunge underwater to escape the chasing fish while you learn to easily type full words.



Level 3— Head for the castle—but watch for falling blocks and treacherous quicksand—as you quickly become skilled at typing complete sentences and paragraphs.



- Convenient on-screen and picture-oriented icons

- Individually charts and records progress for entire family

- Follows progress from beginning through advanced levels

- Straight typing tutor option to eliminate game elements

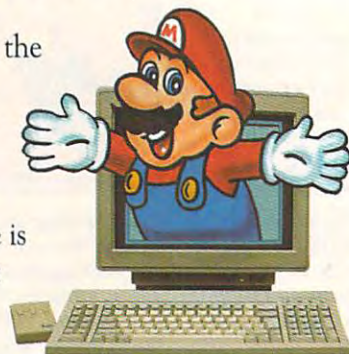
- Full 256 color VGA graphics

- Sound effects throughout, including famous Mario music



And when you reach the end, Mario says congratulations by printing out his special completion certificate—just for you!

Learning how to type is boring ...not! At least not with Mario and the gang.



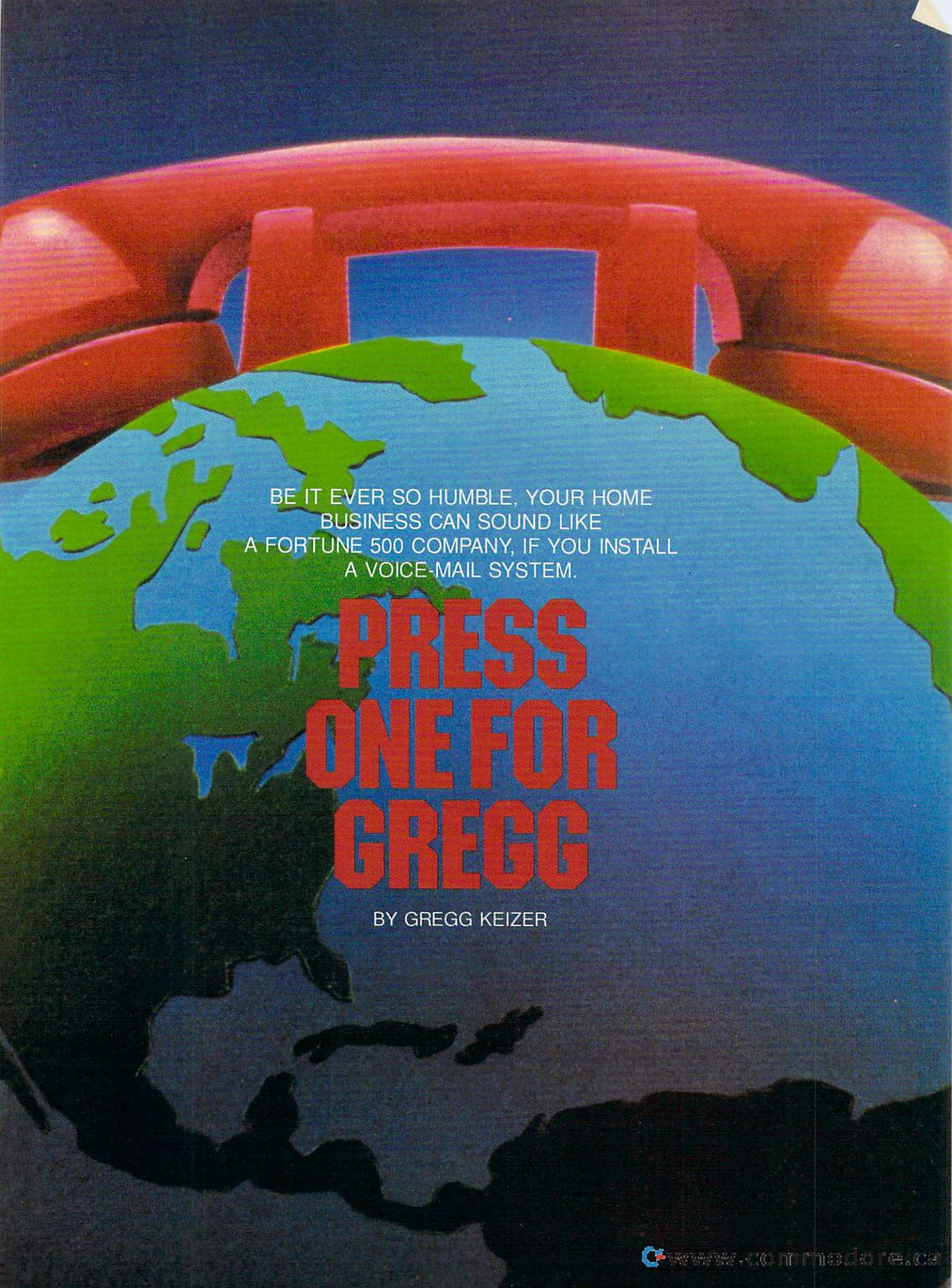
To order *Mario Teaches Typing*™, call 1-800-969-4263, or see your local retailer. Available on MS-DOS and compatibles for \$39.95. Coming soon on Macintosh.

Interplay™

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MS-DOS Screens Pictured.

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PRESS ONE FOR GREGG

BY GREGG KEIZER

"Hello. Welcome to Wordcraft's automated voice-mail system. If you know the extension of the party you wish to reach, enter that number now on your touch-tone telephone. If you would like to leave a message for the Editorial Services Group, press 1. For Research, press 2. For Marketing and Public Relations, press 3. Press 4 if you'd like to send a fax. If you wish to speak with an attendant, press 0 now. If you have a rotary-dial phone, stay on the line, and an attendant will pick up shortly. Thank you, and have a nice day."

Callers to large companies—particularly in the world of electronics—hear messages like that all the time. Byzantine in their layers, obscure in their operation, voice-mail systems have captured the imagination of corporate America and the attention of cost-cutters. It's hard not to run into such automated phone services.

Now you can have your own voice mail, making incoming callers think your operation is huge, though it may be only you and your computer. By adding voice mail with its around-the-clock efficiency, your business can benefit from multitudes of options and appear to be as large as any downtown corporation.

All you need is a PC with an empty slot in the expansion bus.

The Silicon Receptionist

No question about it—voice mail can be impersonal. And it can be frustrating to navigate, if it's improperly designed. But if you keep voice mail courteous and succinct, it can actually draw *in* business, not turn off potential customers. Its potential payoffs for the small business or home office can be dramatic.

Answering machines, the low-tech solution to catching calls, may spout a message, record incoming calls, and even mark calls with the time and date, but they're limited. An answering machine can play only one outgoing message at any given time; it can't organize incoming calls; and if you don't work alone, its replay isn't private. A voice-mail system, however, lets you compose multiple messages, direct calls to specific mailboxlike destinations, and route calls to other extensions; it can even serve as an automated telemarketer.

While your answering machine has a single personality, a voice-mail system is a veritable Proteus, ready to take on any number of personae. If, for instance, part of your home office time is spent providing desktop publishing services and another part is spent in organizing motivational seminars, a PC-based voice-mail system can assume

a different personality for each business activity you engage in.

Hello, This Is the Home Office

Most voice-mail systems try to do two things: replace an answering machine with a feature-packed digital substitute and distribute voice messages within a company.

It's unlikely that you'll need the latter within a home office. Even in a small business, such voice memos may be overkill. Concentrate, then, on the answering machine-like qualities of a voice-mail board.

You have to factor other considerations into the voice-mail equation, too. Some boards require a dedicated computer as a robotic receptionist while others work in the background on your primary PC. If you have only one system in the office, your decision is simple. But if you've recently upgraded to a more powerful PC and have an older model gathering dust, you can opt for a dedicated voice-mail system. What better way to put that lazy computer to work?

Does your home office rely on more than one phone line? Because the most affordable voice-mail boards are single-line devices, you'll have to limit incoming calls to one number if you want things to work.

And though you can set up a voice-mail system to transfer fax calls, don't expect it to automatically route faxes directly to the machine. You may have to eschew automatic fax reception if you don't have a separate telephone line committed to the fax. This might be preferable anyway, since people tend to become confused when you list the same number for telephone and fax.

Can I Take a Message?

Among the voice-mail systems that make sense for the home office, three stand out: Natural MicroSystems' Watson, Talking Technology's BigMouth, and The Complete PC's The Complete Answering Machine. Ranging in price from \$249 to \$399, these three single-line voice-mail cards snap into your PC and turn it into a telephone assistant without peer.

Watson, the least expensive voice-mail board, works in the background, a boon to single-PC offices. Based on a card-file system, Watson's software not only plays outgoing messages and records incoming messages but also offers a phone book for autodialing, a dictation file for recording voice memos, and an appointment calendar.

You can set up as many as 750 mailboxes for people calling in, each with its own ID code and message. You give potential callers the codes you've

assigned, they call and enter their codes, and they're immediately transferred to their mailboxes. Incoming calls are recorded to your PC's hard drive (Watson can store about an hour of messages in 10MB) and then displayed in chronological order when you later retrieve them. If you want, Watson will even switch the outgoing message based on the current time according to the PC's internal clock.

Watson's card-style interface makes it easy to set up and use as either a single-mailbox answering machine or a multibox voice-retrieval system.

BigMouth may cost a bit more than Watson, but it provides far more voice-mail flexibility. It easily handles the basics—setting up a single-user answering system with several personal mailboxes is a snap—but the card really struts its stuff when you begin exploring its more advanced features. Want to create an automated telemarketer? Simple. You can configure BigMouth to ask your callers questions and then record their answers, a godsend if you want the computer to take orders for the products you sell. Want to set up an outbound calling system to contact your clients periodically and send them a personalized spiel about your new services? You can do that with BigMouth, too.

BigMouth's biggest home office problem is that it demands the full attention of a PC. You can't run voice mail *and* work with the computer at the same time. That effectively adds the price of a PC to the cost of setting up voice mail.

The Complete Answering Machine may, as its name implies, be only a replacement for your telephone's answering machine, but its ease of use—especially to people calling in for messages—marks it as an ideal home office add-on. Like Watson, The Complete Answering Machine (CAM) operates behind the scenes, letting you keep to one PC. In fact, CAM can set a limit on the amount of hard drive space it uses for messages so that you won't return from a trip and find a packed drive with no room for other applications.

Out of the box, CAM works as a single-mailbox answering system, complete with a prerecorded greeting and voice prompts. You can, of course, add more mailboxes—up to 999—as you grow into the system.

One of CAM's most impressive features is its voice prompting, which greets mailbox owners and steps them through such things as remote message retrieval and recording. It sure beats memorizing commands. Something else to note is CAM's connection to The Complete Fax, a fax board sold by the same company. As-

sign The Complete Fax its own mailbox, and callers can send faxes through CAM to the board, so you get double use from a single phone line.

Voice-Mail Etiquette

Whatever voice-mail system you choose, you'll want to make it friendly. One of the most important attributes of voice mail—its professional distance—is also its principal weakness. Here are some ways to avoid making your answering system into voice-mail hell for your callers.

- Personalize messages whenever possible. Although voice-mail boards generally come equipped with pre-recorded messages, personalize them whenever you can. It adds your personality to an inherently impersonal technology.
- Keep menu choices to a minimum. You'll lose callers (and prospective clients) if they have to listen to long lists of possible choices. Pare the possibilities to the minimum.
- Don't hide behind voice mail. Callers should still be able to get through to you, either by pressing a button on their touch-tone phones or by briefly waiting. If you're out, make sure that your own mailbox is ready to take messages.
- Return calls. There's nothing more infuriating to a caller or potential customer than an unreturned call.
- Keep your messages up-to-date. It's rude to make people listen to out-of-date messages. If you're pushing a seasonal sale in an informational mailbox, change or delete the message as soon as the sale's over.

Avoid Voice-Mail Pitfalls

Moving to voice mail is a big change, almost like hiring a new employee. And like any foray into the unknown, using voice mail presents its share of risks. Here are some ideas that will make voice mail simpler and more practical.

- Get a big hard drive. Digitizing incoming and outgoing messages takes a lot of disk space. If your PC has a hard drive with less than 60MB, voice mail will cramp your regular work.
- Don't try too much too soon. Set up a simple voice-mail system at first—a standard greeting and perhaps a couple of personalized mailboxes. As you become familiar with the voice-mail system, gradually expand its capabilities.
- Try out any changes. Whenever you change the voice-mail prompts or the paths that lead to new mailboxes, try them out yourself. See if there

are any dead ends and ensure that all calls will be captured.

- Erase old messages. Although voice mail makes it easy to store the messages you've received, those messages will quickly eat hard drive space. If you want to keep old messages, get a tape recorder. Cassette storage is much less expensive than hard disk storage.
- Consider a dedicated voice-mail machine if calls pour in. The typical home office may be able to get by with The Complete Answering Machine or Watson running in the background, but set aside a PC for voice mail if the call volume starts affecting your ability to get work done on the computer. Frequent background voice-mail activity will slow down your PC and your work.

Putting It to Work

As with every technological advance, the users of voice mail have shown themselves to be more creative than the developers, putting it to work in unexpected ways. For example, voice mail eliminates telephone tag if properly used. When you contact someone, you can leave much more than your name and number. Many software companies accept beta test results via voice mail. Contracts have been negotiated this way, too, with representatives from both sides leaving messages on each other's voice mail to indicate unacceptable language and to make changes.

Writing in COMPUTE, Daniel Janal quotes Terry Kalil, public relations manager of Great Plains Software, observing that voice mail can be an important adjunct to communications. When it comes to adoption of technology and the changes it causes in the corporate structure, "a lot depends on corporate culture. The company must be flexible and informal." Kalil's supervisor even conducted her performance review through voice mail. "It was not uncomfortable because our communication skills have adapted. It feels like we are talking face to face."

As it grows ever harder to catch a person at the right time and place to talk on the telephone, voice mail can take up the slack. It allows the parties to think things through before replying, more like the process of actual letter writing, but conducted over telephone lines, and with the added value of your being able to hear the speaker's inflection, which can be as important as the words themselves.

Hold On

Which voice-mail system is the best one for you and your home office?

For single-PC home offices that receive relatively few calls, The Complete Answering Machine is the best choice. It works in the background, sets up simply, and has advanced options to cover everything but telemarketing tasks. It may carry the highest list price, but you can buy it by mail for roughly the same price as the others—\$235-\$245.

Once the number of calls climbs, though, you're going to hate The Complete Answering Machine. It steals RAM (about 80K is needed for the memory-resident answering module) and drive time as it answers calls and processes messages. You'll want a dedicated system on a separate PC.

If that's the case, then BigMouth is your voice-mail maven. Any of these three programs can work as a dedicated voice-mail system, of course, but BigMouth's extraordinary flexibility guarantees that you can accomplish any voice-mail task. It's especially attractive if you want an inbound or outbound automated telemarketer to take and (if you're really audacious) make calls.

No matter what voice-mail system you decide to add, you'll boost the image of your home office in the world outside. No one will ever suspect that you're running the next highflying multinational corporation from the back corner of the downstairs bedroom. □

VOICE-MAIL PRODUCTS

Here are the products you need to set up your first voice-mail system.

The Complete Answering Machine—\$399

The Complete PC
1983 Concourse Dr.
San Jose, CA 95131
(800) 229-1753
(408) 434-0145

IBM PC or compatible, 512K RAM, hard disk, analog touch-tone phone, full-length expansion slot

Watson—\$249
Natural MicroSystems
8 Erie Dr.

Natick, MA 01760
(800) 533-6120
(508) 650-1300

IBM PC or compatible, 256K RAM, 20MB or larger hard drive, full-length expansion slot

BigMouth—\$295
Talking Technology
1125 Atlantic Ave., Ste. 101
Alameda, CA 94501
(800) 934-4884
(510) 522-3800

IBM PC or compatible, 256K RAM, 1.5MB hard disk space, full-length expansion slot

ART WORKS

Robert Bixby

PUBLISHING PROJECTS

I've run across many interesting publishing projects, and I thought August would be a good time to talk about a couple of them. Many of the ideas I'll be talking about in this and future columns are appropriate for use in schools. Others would be fun for families looking for computer activities.

The first is the compiled book. As nearly as I can determine, this idea was invented by Richard Kostelanetz. Belinda Subraman, whose Vergin' Press publishes *Gypsy* magazine, has updated the form in two compilation issues of that magazine. The technique is to contact a number of writers and artists and request from each of them 300 copies of a page with literary work or artwork printed on both sides. (A class could do with a much smaller number—perhaps 50–100 copies.)

Many simply sent in 300 copies of a page of poetry run through a mimeograph, a copy machine, or an offset

press. But some, such as Joan Payne Kincaid and I, took the time to paint each of the 300 copies individually, which makes each book something midway between a unique artwork and a mass-produced item. Since the artists were left to choose their own work, some of it is very risqué, verging on the objectionable. Subraman collated the work as it came in; created a cover, table of contents, and copyright page; perfect-bound the booklets; and sold them as publications of her press. "When I flip through the compilation issues, it's like visiting a museum of modern art," Subraman says. "All different colors and textures. There's a feeling of excitement." In fact, she's thinking of putting together another issue. If you'd like more information about past compilations or if you'd like to be considered for publication in a future compilation, send a stamped, self-addressed envelope and a sample of your work to Vergin' Press, 10708 Gay Brewer, El Paso, Texas 79935.

Another unique publishing venture is the Alternative Press, run by Ken Mikolowski, who is currently teaching at the University of Michigan. Mikolowski purchased an old-fashioned letterpress in the late 1960s. He uses it to create beautifully designed broadsides (poems suitable for framing), bookmarks, and postcards. By purchasing dingbats and typefaces from other presses that are moving from letterpress to electronic and other printing media, he has been able to assemble an impressive array of obsolete typographic elements, including the buffalo that serves as the press's colophon. Anne Mikolowski, Ken's wife, is a graphic artist. She often designs beautiful wood engravings and linoleum blocks for

use in the press (one of her current projects outside of the press is a graphic for an Absolut vodka advertisement).

A few times a year, Ken Mikolowski sends 500 postcard blanks (with the "business side"—the side for the stamp and address—preprinted on his letterpress) to poets like Robert Creeley and Faye Kicknosway and to graphic artists like Archie Rand and Brenda Goodman. The writers and artists prepare something for the back of each individual postcard—a poem, an idea, an essay, a pen-and-ink sketch—and return the postcards to the Alternative Press. Twice a year, subscribers receive mailings which include these unique artworks in addition to the current run of other Alternative Press offerings (the rate is \$15 per year). You never know what you're going to get, but you can bet it will be absolutely unique and astounding.

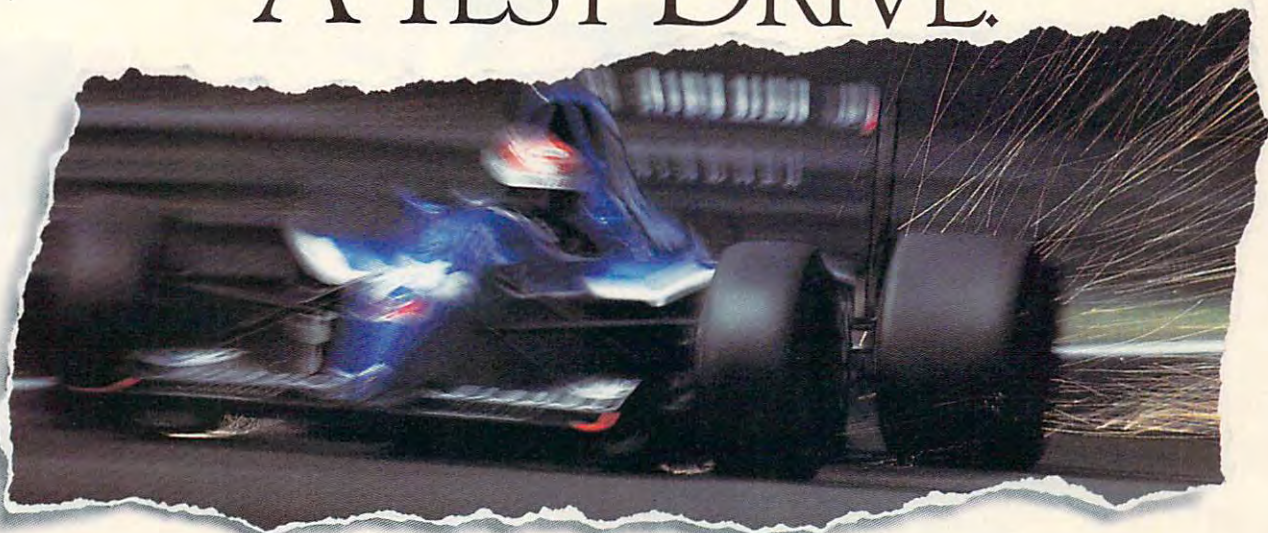
Art in use seems to be the guiding principle of the Alternative Press. Mikolowski says that sometimes these postcards are mailed by subscribers to friends or to the originating artist and then returned to him for archival purposes, completing a cycle of creativity. If you'd like more information about this, write to the Alternative Press, 1207 Henry, Ann Arbor, Michigan 48104.

Following this model, a teacher might have each student in a class of 25 make 25 greetings. The teacher could then collate the cards and give each student a folder that contains work from all of the other members of the class. It would be easy to incorporate the electronic aspect into the project by designing (or having the group design) different kinds of cards on the computer, printing them out, and then distributing them for painting. □

Ken and Anne Mikolowski with their low-tech letterpress.



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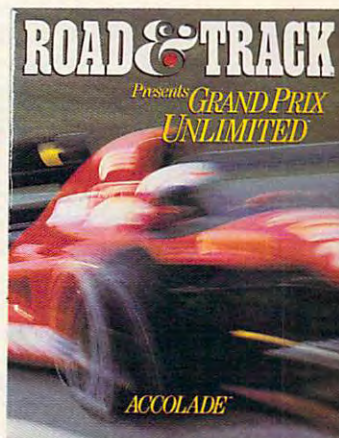
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DISCOVERY CHOICE

Create cartoons—complete with sound—that surpass Saturday morning favorites with this beginning animator's package.

Steven Anzovin

DISNEY ANIMATION STUDIO

"An unending voyage of discovery in the realms of color, sound, and motion." That's what Walt Disney called the art of animation. This vision of animation as an adventure led Disney to make some of the greatest animated classics of all time.

Now you can use your PC to learn the master's techniques—without the tedium. Disney Animation Studio, from Walt Disney Computer Software, uses a tightly knit group of four modules—Pencil Test, Exposure Sheet, Ink & Paint, and a supervisor program called DAS—to re-create the traditional process of cel animation used in all Disney cartoons.

The Pencil Test module includes drawing tools for creating black-and-white outline drawings of your characters. But instead of drawing on pieces of paper, you work on a succession of screens, called cels (after the pieces of clear celluloid that animators paint on in traditional animation). A click of the mouse button allows you to move back and forth between cels and play your pencil test at any time.

One of the best parts of Pencil Test is the Onionskinning feature. With Onionskinning turned on, you can see the faint outlines of previous cels behind the current cel as though you were looking through tracing paper at other drawings beneath. This is incredibly helpful in aligning your drawings from cel to cel so your characters move smoothly and believably.



Another useful Pencil Test feature is Cleanup. At Disney's Mouse Factory, this task was assigned to apprentice animators, who tediously cleaned up pencil tests by tracing over them to eliminate unnecessary lines. In Disney Animation Studio, however, removing extra pixels can be achieved with a single mouse click.

Disney Animation Studio's Exposure Sheet, accessible from the Pencil Test, works rather like an animation spreadsheet. Each cel in the animation is given a line in the Exposure Sheet, showing the cel number, assigned sounds, timing, and other information. You can rearrange cels of an animation in the Exposure Sheet by cutting, pasting, or deleting their lines, which is much easier than cutting and pasting cels in Pencil Test.

The Exposure Sheet is also where you can add sound to your cartoon. Disney Animation Studio supports Sound Blaster, Sound Source, and Tandy sound. With one of these, you can attach digitized or synthesized sounds to any

cel or block of cels using the Exposure Sheet to synchronize sound and motion.

Syncing simple sound effects isn't too difficult, but drawing a character so that it actually appears to be speaking takes a lot of practice. The excellent manuals give some helpful hints for drawing mouth movements and matching them to the phonetic elements of your character's speech. However, because you can hear sound only when playing back your animation in the included Flick player utility program, not in Disney Animation Studio, adjusting sounds requires jumping back and forth between the two programs.

Disney Animation Studio's Ink & Paint module is where you add color to your pencil test and put it over a background. The program's extensive palette and area fill tools make it easy to define new colors and apply them, without having to worry about accurate mixing or painting over the outlines. Every cel can have its own palette of colors, though in most cases you'll use one palette throughout.

Backgrounds can be created right in Ink & Paint, or they can be imported from other paint programs and inserted behind your characters by using the Frisket feature. This masks the colors in your characters so they won't be affected by the background or any thing done to it. If the colors in an imported background don't match the ones in your animation, the colors can be quickly remapped.

Once you've assembled all the elements, you're ready to play your cartoon. Animations run entirely from memory, so they play fast—up to 30 frames per second. Playback is smooth, without the flicker in large moving objects seen in some other animation programs. However, the length of an animation is determined by the amount of expanded memory in your system. Even with 640K standard RAM and 1MB expanded memory in my 386, there still wasn't enough memory to play the color Donald Duck sample cartoon that comes with the program. You'll want at least 3MB of expanded memory to do substantial color animations.

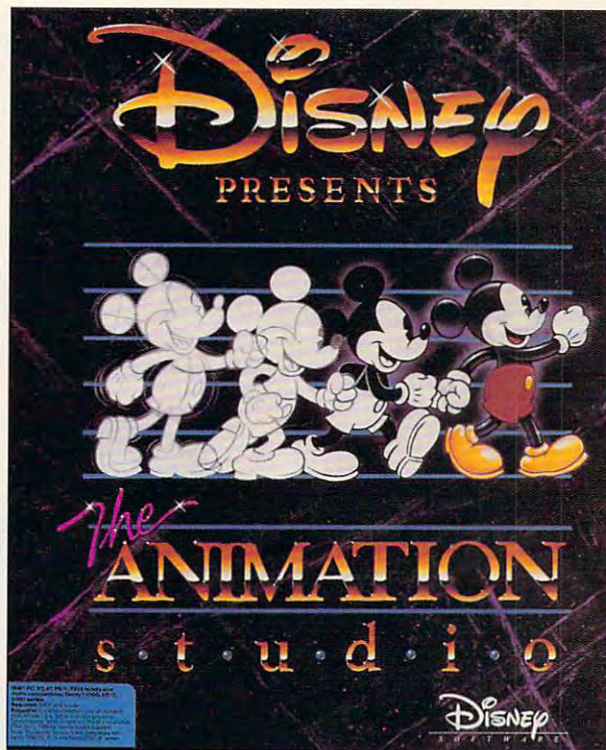
Disney Animation Studio is well thought out and a pleasure to use. But that doesn't mean it's the perfect animation environment for everybody. Because it adheres so closely to the traditional process of film animation, it doesn't take advantage of all the possibilities of computer animation. Even though it manages cels, mixes colors, and allows easy cutting and pasting of images, you still have to do a lot of repetitive manual labor, just as Disney's animators did (and do). In Ink & Paint, for example, you have to color every part of every

character in every frame by hand—a real chore for long, complex animations.

Experienced computer animators will chafe at the program's other limitations, too. I know I was disappointed when I discovered that there's no way to move characters automatically along paths or turn them smoothly into other shapes. I also wish that the program provided a storyboarding feature or a more powerful scripting utility for playing completed animations in sequence, complete with wipes, dissolves, and other transitions. These capabilities, which can be found in other animation and presentation programs, make it easier to create more professional-looking 'toons.

Even if you accept that the traditional film-animation process makes sense for computer animation, Disney Animation Studio doesn't give you everything you need to make your own *Bambi*. There's no way to do camera moves—the zooms, pans, trucks, and scrolling backgrounds that give film animations the feeling of taking place in a real three-dimensional world. Nor can you achieve multiplane effects in which layers of animation appear to be taking place at various distances from the audience. Part of the problem, of course, is that few home PCs have the power and speed to perform such calculation-intensive effects at typical animation speeds.

But a lot of these criticisms are beside the point for this program's main audience, beginning animators. With that in mind, I asked my ten-year-old son, Raf, an animation enthusiast, to evaluate the pro-



gram. He quickly taught himself to use the software and informed me that Disney Animation Studio passed muster. He especially liked the Onion-skinning effect and the fact that he could work in VGA resolution (640 x 480), which some other animation programs don't support. The other day he spent three happy hours in front of the screen, animating his own creations and planning future cartoon epics.

Disney Animation Studio may not make everyone an ace cartoonist; you still have to know how to draw and be willing to work hard. But it's definitely the best way to learn at home the techniques of character animation that have brought the world so much enjoyment since Steamboat Willie first whistled a tune. □

Circle Reader Service Number 301

IBM PC and compatibles; 640K RAM (2MB or more expanded memory recommended); CGA, EGA, MCGA, VGA, or Tandy; hard disk with at least 3MB free; mouse or other pointing device; supports Sound Source, Sound Blaster, and Tandy Digital sound boards—\$129.95

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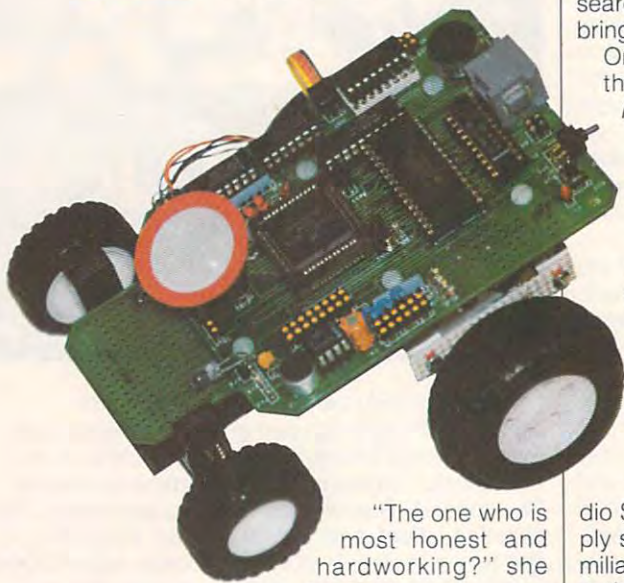
Steven Anzovin

THE RUG WARRIOR

In Czech playwright Karel Capek's 1922 satire *R.U.R.* (the work in which Capek coined the term *robot* and invented many of the other ideas about robots that we take for granted today), a young, idealistic woman visits a company that builds human-like artificial workers.

"What sort of worker do you think is the best from a practical point of view?" a company executive asks her.

This build-it-yourself robot has a brain and the ability to find its way around.



"The one who is most honest and hardworking?" she guesses.

"No," says the executive, "the one that is cheapest. Young Rossum [the robots' inventor] rejected everything that makes man more expensive. In fact, he rejected man and made the Robot. Mechanically they are more perfect than we are, they have an enormously developed intelligence, but they have no souls." But later it turns out that the robots do have souls, and in anger over being exploited they rise up and destroy their masters.

The fear of vengeful robots has been around since well be-

fore the Terminator movies or even Mary Shelley's *Frankenstein*. In Jewish folklore, an artificial man called a golem protected the Jews of sixteenth-century Prague, but he had to be destroyed when he could no longer be controlled.

For all our anxiety about robots, in the real world they aren't at all like us, nor are they ready to rebel against their creators. Given the current level of robot research, that future, if it ever comes, is comfortably far away. But if you're a handy hardware hacker, you can do mobile robot research at home—and possibly bring that future a step closer.

One source to check out is the book *Mobile Robots: Inspiration to Implementation* by Anita Flynn and Joseph Jones (Jones & Bartlett Publishers, 1 Exeter Plaza, Boston, Massachusetts 02116; 800-832-0034; \$29.95; slated for a fall 1992 release). It contains complete instructions for creating an autonomous mobile robot from parts costing about \$200, all of which can be purchased at your local Radio Shack and electrical supply store. For readers less familiar with a soldering iron, the authors plan to offer both a kit and a fully assembled 'bot. The little beast, called the Rug Warrior, will zip around obstructions, tag after you as you move around the room, and come when you call.

I talked with coauthor Joseph Jones, who works at Artificial Creatures, a division of Intelligent Systems Robotics (238 Broadway, Cambridge, Massachusetts 02139; 617-876-2999). He described some of the issues involved in making robots truly autonomous and mobile. Interestingly, the problems aren't so much mechanical as conceptual.

Most autonomous mobile robots work by comparing the current environment as perceived by the robot's sensors with a software-based "world model" contained in its controlling computer. The more complete and detailed the rules contained in the world model are, the more autonomy the robot can achieve, but checking every movement against the rules requires lots of processing power and slows the robot down. It's as if you had to think about the global consequences of every step whenever you walked around the house. Jones, however, is working with a different model of robot autonomy called subsumptive behavior, which was developed at Rod Brooks's Mobot Lab at MIT. Mobile robots using subsumptive behavior don't follow a world model at all; instead, each sensor directly triggers a behavior.

Jones believes that building such reflex behaviors into robots is the way to create responsive mobile 'bots capable of practical tasks. What's the one innovation that Jones thinks will bring us into the Robotic Age? "There are plenty of problems to work on," he chuckles, "but I've got a little kid, and a robot that could clean up under the kitchen table would make a big difference."

Another useful resource is *The Robot Builder's Bonanza* by Gordon McComb (TAB Books, 13311 Monterey Avenue, Blue Ridge Summit, Pennsylvania 17294; 717-794-2191; \$14.95). This book includes tips on choosing motors, building power supplies, constructing metal and plastic bodies, and designing locomotion and arm systems.

Bear in mind that one day our mechanical creations might refuse to clean up after us and head out the door to join others of their kind. Let's hope they think well of us. □

Andrew Visscher's and Bruce Williams Zaccagnino's ...

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MULTIMEDIA PC

David English

TRIPPING THE LIGHT FANTASTIC

Where's the best place to learn what's hot and what's not in multimedia? The seventh annual CD-ROM conference (now called The International Conference & Exposition on Multimedia and CD-ROM). Over the past seven years, many of the major CD-ROM announcements have been made at this event. It's also a great place to tap into emerging technologies, such as realtime video compression, home delivery of

Sony unveiled a portable CD-ROM XA player at The International Conference & Exposition on Multimedia and CD-ROM.



multimedia using fiberoptic cables, and commercial applications for virtual reality.

Even though MPC is clearly the fastest-growing CD-ROM format, the conference provided equal time to the alphabet soup of competing platforms, including Mac CD-ROM, CD-ROM XA, CD-I, CDTV, Photo CD, and UNIX CD-ROM. The wide scope of today's multimedia was reflected by the eclectic mix of attendees. They included traditional information publishers, such as Compton's, Grolier, and World Book; traditional hardware manufacturers, such as Altec Lansing, Panasonic, and Sony; and tra-

ditional computer-based consumer companies, such as Brøderbund, Access, and Creative Labs. The products reflected a similar divergence, including everything from a new \$199 parallel-port audio card (the Audioport from Media Vision) to \$50,000 video-editing systems.

Which were the most interesting new multimedia products? In addition to the Audioport, Media Vision announced its new 16-bit multimedia sound card, the Pro Audio-Spectrum 16 (Media Vision, 47221 Fremont Boulevard, Fremont, California 94538; 800-348-7116; \$349). This card has true 16-bit audio for CD-quality sound. The Pro Audio-Spectrum 16 also uses the new Yamaha OPL-3 chip for high-quality synthesized sounds and has full compatibility with the Ad Lib, Sound Blaster, Windows 3.1, and MPC sound standards.

Grolier announced its New Grolier Multimedia Encyclopedia (Grolier Electronic Publishing, Sherman Turnpike, Danbury, Connecticut 06816; 203-797-3500; \$395). It contains all 21 volumes of the Academic American Encyclopedia, plus high-quality maps, color photographs, illustrations, sounds, video, and animation—all on a single CD-ROM.

The marooned-on-a-desert-isle-and-can-choose-only-one-CD-ROM award would have to go to Library of the Future Series Second Edition (World Library, 12914 Haster Street, Garden Grove, California 92640; 714-748-7198; \$399). It's a first-rate selection of 500 great works of literature, religion, science, and government. A close second for the same award would be the upcoming Oxford English Dictionary (Second Edition) on Compact Disc (Oxford University Press, 200 Madison Avenue, New York, New York 10016; 212-679-7300; \$895). With over

2,400,000 illustrative quotations and a powerful search engine, it's the perfect gift for any PC-savvy word lover.

Speaking of massive amounts of information in compact form, Sony displayed a prototype of its new portable CD-ROM XA player. Somewhat larger than the diminutive Discman (this one's seven inches wide, two inches high, and six inches deep), it plays standard XA discs that have been altered to accommodate the smaller screen (320 x 200 pixels).

Interested in creating your own CD-ROMs? You can with Philips's new CDD 521 Compact Disc Recorder (Philips Consumer Electronics Company, One Philips Drive, Knoxville, Tennessee 37914; 800-722-6224; \$5,995). Not only can it record standard CD-ROMs, but it can also write in XA, Photo CD, CD-I, and CD-audio formats. If \$6,000 sounds like a lot, consider that this model sells for one-third the price of previous units. At this rate, you'll be able to afford your own CD-ROM recorder in just two or three years.

IBM was also making a strong pitch for the high-end multimedia buyer. The company has turned its Ultimedia computer into yet another CD-ROM platform. In effect, it's a higher-level MPC, with a minimum IBM 386 SLC processor, 4MB of RAM, CD-ROM XA drive, 2.88MB 3½ floppy, XGA graphics, and 16-bit audio card. According to IBM, it can also run your MPC titles. As you can imagine, this is no home computer. Expect to pay \$4,500–\$10,000. On the other hand, once you've seen multimedia CD-ROMs designed specifically for this platform (including such eye-popping titles as Columbus: Encounter, Discovery, and Beyond), you can see why the future of multimedia will include a generous helping of wonder and excitement. □

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ENTERTAINMENT CHOICE

Anything goes in this latest version of the famous falling blocks game.

David Sears

SUPER TETRIS

Tetris has captivated audiences of all ages ever since its arrival in this country in 1988 (it was designed in Russia). How appropriate that Super Tetris incorporates the Russian Circus as a theme—like the circus, it's fun for children of all ages. Though Super Tetris differs in presentation from Tetris only in its backgrounds and bouncy music, these differences will stun first-time players. Lions, clowns, and elephants—mainstays of the circus—enliven the screen. For you Super VGA owners, the 256-color paintings alone justify purchasing the game.

Maybe you don't have Super VGA yet, and maybe you intend never to upgrade. Forget the sound card, too, while you're at it; Super Tetris doesn't need all the frills Spectrum HoloByte generously offers. It's the quality of the gameplay that makes a game great, not the graphics and soundtrack.

Like so many other incredulous Tetris veterans, you may wonder what could've changed. After all, haven't there been more than a few Tetris sequels already? Blocks fall, you rotate them, you build lines, the machine beeps, and eventually blocks fall too fast for you to drop them into just the right slots. Play begins again, right?

Besides the innumerable public domain clones, Tetris was officially reincarnated three times. First came Welltris, a truly perplexing twist on the fill-the-grid theme. Not only do players have to contend with the usual falling-block formations, but

they have to look down a three-dimensional well—four walls and a bottom, too—while they do it. This version probably finds its most avid fans among the mathematically minded, though any Tetris pro can do well enough for a while.

Faces showed up next. Instead of fitting blocks, players mix and match strips containing the eyes, noses, mouths, and so on of various historical figures. Many players thought that this went too far from the original design and reverted to playing the earlier versions.

Then WordTris debuted, and wordmongers had a field day. Blocks were falling again, but this time they contained letters. Building words instead of horizontal lines proves not only educational but surprisingly addictive. With the game's built-in 60,000-word dictionary, players can score points with all sorts of accidental spellings.

The designers might have stopped there, and everyone could've been happy playing a favorite variation. After all, Tetris had expanded in three diverse areas: strategy, visual effects, and words. Like Tetris addicts, though, the design-

ers couldn't stop. In an ingenious feat of redesigning, Spectrum HoloByte has delivered a sequel that does justice to its auspicious title.

What's different about Super Tetris? The playfield runs deeper, divided in half by a "water line." Each level begins with a pit of scattered blocks, none of which make complete lines. To clear this rubble away and move to the next level, you must find open spots for the descending blocks and neatly stack them above the water line. Piece by piece, you work your way through the debris; every time you complete a line, the rubble scrolls up to meet you. A small display window to the left of the actual Super Tetris action slowly reveals a pattern in the debris; when you complete this picture, you move on to the next challenge.

Granted, all the rubble might seem to pose a bit of trouble. In the original Tetris, a big pile of disconnected blocks means trouble and often a quick end to the game. Don't worry, though; Super Tetris is much more forgiving. For



every line you complete, you're rewarded with a bomb cluster. The more lines you clear at a time, the more bombs you earn—and you'll certainly make use of them, blowing away obtrusive blocks or activating special squares.

The special squares can greatly affect play. One square fills all the empty spaces between itself and the water line with blocks; another removes all the blocks above itself. Yet another square annihilates all the blocks within a 3 x 3 area. Blowing up a square with a bomb icon in it turns the next falling piece into a cluster of bombs shaped like that piece. Detonating still other squares can add blocks to the total number allotted to you per game; Super Tetris imposes a preset block limit. In most games, you'll need to earn a few extra blocks to clear away all the rubble, so go for those special squares.

Bombs and treasures make a tremendous difference in the psychology of the game. Instead of being the hapless victim of poorly placed shapes, you can act on your frustration and remove those bothersome pieces. In the original Tetris, a mistake can remain a mistake for a long while; in Super Tetris, it's just part of the gameplay.

Ask Tetris players about strategy. You'll receive ready answers, perhaps something like "I try to fit pieces in the middle last" or "I tend to stack pieces on the left and right." They've rationalized long ago why the longest pieces should remain vertical and why the perfect squares belong on the left. In Super Tetris, however, anything goes. Special blocks seem random-

ly scattered throughout the rubble, and the bombs make powerful equalizers. The save-game feature works wonders for timid players, allowing room for some freewheeling gameplay. You can return to the same level again and again, to the same situation, just as you saved it.

As mentioned earlier, Super Tetris has a competitive mode—you use your bombs and falling pieces to prevent your opponent from completing lines. There's also a cooperative option, which allows players to work together. Each of these two-player modes expands the width of the pit to increase block maneuverability.

In the head-to-head competition, you race against one another to clear away rubble. This two-person mode requires two copies of Super Tetris and a null modem cable or Novell local area network to function. Simpler single-player game variants include 5-, 10-, and 15-minute timed games.

As super as Super Tetris is, however, you'll often wonder just when that vital long, skinny piece might turn up. Super Tetris can display an almost malicious streak in withholding necessary pieces, and you might see eight red squares before you encounter the long purple one you so desperately require.

Also, Windows users must consider whether they want the Windows or the DOS version. Super Tetris for Windows makes excellent use of a 640 x 480 256-color display; the DOS-based display, though still quite attractive, drops the resolution to 320 x 200. Moreover, because of the problematic nature of Windows' relationship to sound

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cards, the Windows version of Super Tetris supports only Sound Blaster. And while the Windows version does multitask properly, it doesn't offer a head-to-head play option. The differences between the two versions balance out, forcing you to choose between two equally superb variants. Some players will no doubt gladly purchase both versions and alternate play between them.

No computer gamer can live by Tetris alone, not even Super Tetris. But given Super Tetris's unadulterated appeal to all age groups, both sexes, and yes, even computer-phobes and computer haters, no one who sees it will want to live without it. □

IBM PC and compatibles; 640K RAM (2MB for Windows version); VGA, EGA, VGA, Tandy 16-color, or Hercules (VGA or Super VGA for Windows version); supports Ad Lib, Sound Blaster, Tandy 1000, or Roland sound (Windows version supports only Sound Blaster); joystick and mouse optional (Microsoft-compatible mouse required for Windows version)—\$49.95

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GAMEPLAY

Orson Scott Card

ATTRACTIVE NUISANCES

Last month I talked about the Windows games from Symantec (Symantec Game Pack) and Microsoft (Windows Entertainment Pack Two and Windows Entertainment Pack Three). All the games are fun, and some are wonderful.

But these games can also be a problem. First, they're all quick. Some of them take no more than five minutes to play to the end. Memory Blocks, Tripeaks, and WordZap, for in-

column. In their quiet, pleasant little way, they're like time vampires, sucking away years of my life.

I've come up with a name for games of this genre that reflects their true character. I call them *nuisance games*. They're the Windows equivalent of a dish of M & M's. You never take more than a couple, but before you know it, they're gone. And it was you who ate every one of them.

Nuisance games, yes, but remember that in law there's a principle called attractive nuisance. This is the concept in

It's Risk, from Virgin Games (licensed from Parker Brothers). Much better than the DOS version, which only shows you a small part of the globe at any one time, the Windows version always shows a full view of the world map. You can decide whether your computer opponents are good, fair, or passive; or you can, with easy adjustments, play with a mix of human and computer opponents. Yet the Windows version faithfully reproduces everything good about the board game.

I never realized, in all my years of Risk playing in my adolescence, how much of the game was taken up with the sheer mechanics of counting out armies and moving them from place to place around the board. Games would last hours. But this computer implementation is so smooth that you waste no time at all on housekeeping. It's all strategy and battle. It's the Platonic ideal of Risk.

You can wipe out a computer opponent without worrying about making an enemy. So, for the first time, I get to play the game the way it was designed to be played.

Risk is so much fun and so fast that I forgive little infelicities, such as the way that every now and then the game decides that you're a computer player, too, and plays all your turns for you or the way that the white numbers sometimes blend in with the white borders so that you can have 18 armies in England but it looks like you have only 1.

Do I recommend Risk? Sure. Just the way that I recommend that you climb over the fence and swim in your neighbor's pool at 2:00 a.m., alone and in the dark.

It's not my fault if it steals hours from your life. I'm not the one who programmed such an attractive nuisance. □

Risk promises the world—and provides it on a single screen in the Windows version.



stance, can be played out in less than three minutes every time. Now, that should be a recommendation, especially if you tend to play these games at work. But it doesn't always end up that way. Because they take only a few minutes, it's easy to talk yourself into playing just once more.

Second, because they're Windows games, they aren't hiding in some dark corner of DOS where you can forget they're there long enough to get some useful work done. Instead, they're waiting a couple of mouse clicks away every time you come back to your desktop.

And there I am, three hours later, switching from FreeCell to Tetravex, from Tetris to Stones. Endlessly. Unproductively. Heck, I've played these games instead of writing this

your pool is an attractive nuisance.

Someday, I'm going to bring suit against Microsoft and Symantec, demanding that they pay me for all the hours of writing time they stole from me with their attractive nuisances. I'll demand that they reimburse me for the novels I didn't write, the columns that were late, and my ill health because of sleep I missed. And I know I'll win. All I'll have to do is get the judge to let me provide the jury members with computers loaded with these games, and after they've had time to get hooked (20 minutes tops), they'll award me millions.

Having said that, let me now tell you about my favorite Windows game, knowing full well that I'm leading my fellow compulsives to self-destruction.

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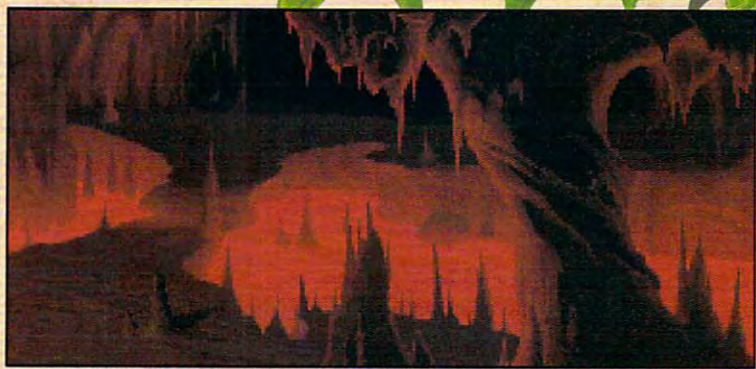
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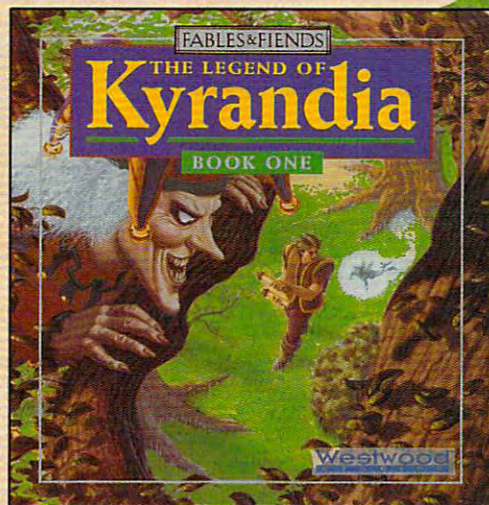
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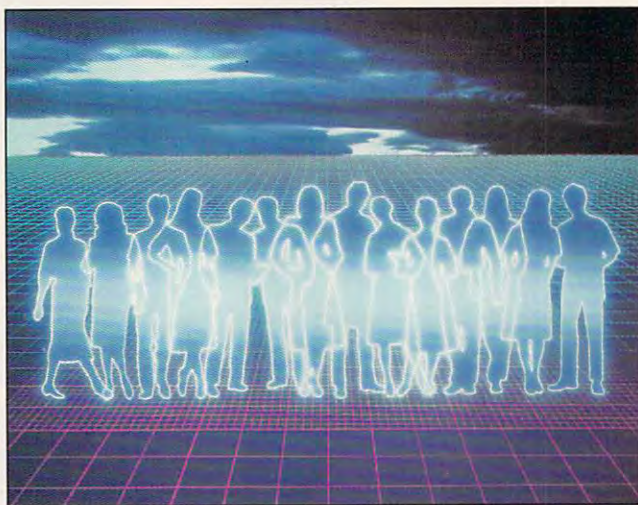
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THE ELECTRONIC MEET MARKET

BY ROSALIND RESNICK

For many of us, the idea of meeting new people can be a daunting prospect. Whether you're out on a date in hopes of putting the single life behind you or at a trade show trying to lasso new customers, in-person salesmanship can be difficult for all but the most thick-skinned. Despite their much-vaunted reputation as social animals, most human beings would just as soon run, not walk, from any situation that involves someone other than the familiar circle of family, friends, and coworkers. Often, we'd rather sit home and mope than risk an all-too-personal rejection.

That's where online networking comes in. A cross between old-fashioned letter writing and high-tech electronic communication, online networking lets you work a room without actually being there. By logging on to an online service or bulletin board, you can use your computer and modem to send E-mail to that intriguing person across the way, carry on uninhibited chats about the most intimate of topics, and log off if the situation gets too hot for you to handle. Not only is mo-



dem-to-modem communication a boon for the painfully shy, but it's also a great way to find a job, start a business, get free advice, and hobnob with like-minded people you'd never meet at the neighborhood block party. And, of course, there's no need to dress up, make small talk, or pass out business cards.

Though online networking has been widely touted as a powerful home business tool, it's also gaining popularity with people looking for romantic and sexual liaisons—in the age of AIDS

and other sexually transmitted diseases, perhaps the riskiest of all interpersonal encounters. By logging on to one of hundreds of bulletin boards, anyone with a PC and a modem can hook up with an interesting stranger without ever leaving the comfort and safety of home. And if you do decide to make your fantasies a reality, you can always arrange to chat by phone or meet in person. In fact, dozens of online dalliances have already led to matrimony.

These days, romance is popping up all over the on-

line world—on America Online, with its racy realtime Romance Connection, on DELPHI, GENie, and Prodigy, the somewhat stuffier IBM-Sears venture, which has started to run personal ads in its classifieds. Then there's CompuServe's CB Simulator, another realtime chat channel that boasts the famous story of the couple that met online and eventually married—with the bride, groom, and minister typing their parts of the ceremony into the communal PC.

For those desiring less serious relationships, there are plenty of bulletin boards that offer electronic meeting places for people looking to explore their fantasies—and perhaps set up a rendezvous later on. *Penthouse*, a sister publication of COMPUTE's, has launched an online service called Petline that lets you chat with Penthouse Pets and special guests from around the world, swap erotic E-mail with the service's other members, and download photos for private enjoyment. (Call 212-254-3838 to download the software necessary to gain access to Petline. Remember that you must be

WHATEVER YOU NEED, WISH, OR DESIRE

18 or older to use Petline.)

Max K., 42, who's single and works as a consultant on the West Coast, says he logs on to America Online to find partners willing to share their fantasies over the phone. Though Max says he has been in a monogamous relationship with the same woman for the last four years, he typically logs on to the service four or five times a week to find the fantasy partners that give his life spice. He says his girlfriend knows all about his online adventures and sometimes joins in herself.

"I'm living in sin in a [monogamous] relationship," Max explains. "I've always been into fantasy, and this is the ultimate in safe sex."

Not all online relationships are as risqué as Max's, of course. Many are downright conventional—people exchange messages, meet in person, and decide to form an ongoing relationship—maybe even marry. That's pretty much what happened to Kathie Fields and Kevin Morley, two novice online networkers who met on Prodigy. Kevin, 31, a never-married electrician in Spring, Texas, ran a classi-

fied ad in September 1991 that went like this: "White male, age 30, 6 foot 1, 210 pounds, looking for a female with a sense of humor for companionship and possibly more? I like to read, watch movies, computers and many, many other things. I can't tap-dance or tightrope-walk, and skydiving is against my religion. What? (Signed) Texas No Can't Dance."

The ad soon piqued the interest of Kathie, 36, a long-haul trucker and divorced mother of one, and the rest is history. They tied the knot on New Year's Day. "It started with this friendly chit-chat," Kevin recalls. "We would go online and type letters back and forth." Says Kathie: "Then the letters got more intense. We found out that there was a lot we had in common."

But online networking isn't limited to people looking for love. It's a medium that unites people of all ages, occupations, interests, lifestyles, and parts of the world. In the realm of business, CompuServe's Working from Home Forum lets home office professionals swap notes on everything

from marketing tips to health insurance. GENie's Computer Press Association RoundTable features a bulletin board where editors can post help-wanted notices and writers can download business leads. America Online posts job listings on its Teacher's Information Network and lets entrepreneurs get help from the Service Corps of Retired Executives at the Microsoft Small Business Center.

Jeff Freeman, 25, of Front Porch Computers in Chatsworth, Georgia, says his fledgling business never could've taken off the way it has without the help of online networking and advertising. Started as a home business in May 1991, Front Porch expects to rake in gross revenues of more than \$500,000 this year and sell its homemade IBM clones to customers as far away as Europe and South America. Freeman, who says he has met a number of prospects through CompuServe's Working from Home Forum, spends less than \$200 a month on an ad in the CompuServe classifieds and reaches as many as 800,000 people world-

wide. No one would complain about that kind of return on an investment.

Take away his online connections, Freeman says, and his booming business would be "nowhere." Chatsworth, population 5000, is 100 miles north of Atlanta, he explains, and his computer store is the first and only one the town has ever had—and is ever likely to have. "With a store in a town like this, you may sell one computer at a time, but on CompuServe you may meet somebody who wants to buy multiple computers for his business. Our store is a small thing here, but with CompuServe I can reach the world."

Online networking is also becoming increasingly popular with people who suffer from chronic illnesses and other disabilities—people who, in some cases, can't leave their homes or hospital beds to find the support and companionship they desperately need. For this purpose, CompuServe offers a wide variety of support groups and resource centers, such as the Diabetes and Hypoglycemia Forum, the Cancer Forum, and the

Living with AIDS Section of the Human Sexuality Forum.

"The typical reaction of new diabetics is basically one of horror and fear and uncertainty," says David Groves, 46, a longtime diabetic and former bank executive in Bedford, Texas, who manages the Diabetes and Hypoglycemia Forum. "Our typical reaction is to be comforting. What we tell people is that no matter what they've heard about diabetes, they can take care of it, and we'll help teach them how."

Groves's forum appears to be attracting a wide following. More than 5000 people have visited the forum so far

from places as far afield as France, New Zealand, Japan, and Belgium. Groves estimates that 30 percent of the new members are people who've recently been diagnosed with diabetes.

The Kid Connection

But online networking—with the exception of Petline and other X-rated services—isn't just for adults. Prodigy, for example, has the Club (for Kids), which lets the under-18 crowd swap notes about everything from the hottest rock groups to their feelings about the snooty cliques who rule the school. The good news for parents: Prodigy

charges a flat monthly fee, so the kids can talk as long as they like without busting the family bank account.

In the Club forum not long ago, a couple of junior high school kids became involved in a discussion about dissection, a hot topic in these days of animal-rights activism. "I oppose the dissection of animals," declared a member named Julie. "There is no reason to dissect many animals when the whole class could watch one on a video and possibly learn even more. It is understandable for medical students to dissect, but I really don't believe it's necessary to have seventh graders

DON'T GET BURNED

Online is the hottest new way to meet people. Friendships, business relationships, and even matrimony can result. But that's not all that can happen. Unscrupulous and unbalanced people sometimes work the online world, looking for vulnerable people to use and abuse. Don't be afraid of the online world, but treat it as you'd treat the personals in a big city newspaper: A certain amount of caution will pay off.

What kinds of troubles can you expect online? Any service that provides for instant communication and E-mail also provides a channel for harassing communication that can be more trouble than fun. If your name and telephone number are known to many people online, then it won't be difficult for an abusive person to get that information—after all, you can't count on a casual acquaintance to protect your interests and privacy as carefully as you do.

One day, knocking around on a BBS service, I asked people whether they had been harassed online. Virtually all the people I contacted said either that they had been harassed or that they knew someone who had. Usually, the harassment takes the classic form of sexual harassment everywhere—men pursuing women beyond the point that women want to be pursued. But there are plenty of female harassers, too.

How can you protect yourself?

1. Never, never reveal your password. Not even to a friend or to a spouse or to a loved one. It not only allows someone to use your account without your knowledge—perhaps racking up hundreds of dollars in charges before you can detect the abuse—but also allows another person to speak as if he or she were you, making it look to other members of the service as if you are being abusive or inappropriate.

2. If you're using a service that lets you hide behind a handle (a fictitious name), select one in keeping with the kind of interaction you want to have. If *sexy* or *foxy* is part of the name, you're going to get a fairly predictable stream of messages whenever you log on. If you don't want that kind of message, change your handle to something more sedate. I have it on good authority that any handle that sounds feminine invites abuse. And if you're in the habit of sending lewd messages to anyone with a

feminine handle, remember that there are plenty of men online masquerading as women and vice versa.

3. Try not to get too involved with someone you haven't gotten to know. Some people online tell too much about themselves too soon. One man said, "I couldn't believe how much some of these women were willing to reveal about themselves—their names, addresses, telephone numbers. I tell them that they shouldn't give out that information the first time they talk to someone. It's just plain dangerous." But also remember that the barrage of information might not be truthful. Just as you can't tell the sex of a person sending a message, it's difficult to check on whether a person is actually married and only pretending to be divorced, separated, or single.

4. Watch for red flags. If a person tells you one day that she is a florist and another day that she is a veterinarian, that person is probably lying to you and has probably told you other lies, too. If information about a person doesn't add up, perhaps it's time to look for other interests online. When you stop responding to people and they continue to send you messages, that's another danger sign. Don't be surprised if the messages you receive become increasingly abusive. If that happens, consider changing your handle or going to another online service.

5. Don't forget that the sysop is your best friend. If you find yourself in an abusive relationship, let the sysop or someone in authority know. An abusive person is often a compulsive person. It's likely that abusing you is part of a pattern of abuse and the abusive person might already be on probation for this behavior. The sysop will probably want to know that it's going on and should take measures to stop it.

6. If you're getting information from someone that's just too good to be true, check the person out with people you trust. Abusive people get reputations quickly in the small world online. One person I heard about used a macro to send salacious messages to anyone online with a feminine handle. He made people so uncomfortable that they discussed his behavior among themselves and demanded his ouster.

7. If you're even mildly famous—an au-

thor, an actor, or an entertainer—you might run into fans online. If your handle is too transparent, you'll invite abuse. "People think they own you," one woman said. "Like you're their private celebrity." It's no secret that most of the computer and science-fiction publishing business is online, from freelancers to publishers. Other celebrities like William F. Buckley and Timothy Leary are also avid users of online services. Romance and other genre writers are also discovering online services. As computers become more widespread, television and movie stars are appearing on the services. If you're famous, protect yourself with a well-chosen handle and a vague air of mystery. Don't let anyone pin you down. If you're a fan, remember that celebrities are just people like yourself and that unless you have something specific to impart, perhaps it's best not to send messages at all.

8. You can avoid getting a reputation as a harasser by never saying anything online that you wouldn't want said to you, or to your mom. And never say anything that you can't take full responsibility for. Remember that an E-mail message can be printed, copied, and sent to your boss or your spouse or the sysop. If the message is abusive, slanderous, or sexually inappropriate, it could be embarrassing later (and there might even be serious consequences—freedom of speech doesn't extend to threats). If you stop getting replies to your E-mail, stop sending it. Don't forget that other people have lives, too. There may be very good reasons why you haven't heard from people. Let them go. You serve no purpose by becoming hostile or abusive.

9. Treat all messages in good humor. Remember the adage "A soft answer turneth away wrath." Just because someone has been beastly to you, that doesn't mean you have to respond in kind. And there's always the possibility that you misinterpreted what the person was saying—that it was a joke or a simple miscommunication.

10. If you find someone who interests you and you want to meet that person, plan to meet in a neutral location where there are plenty of people around—a restaurant or mall, for example. Meeting at your residence is an enormous gamble.

—ROBERT BIXBY

Guy Spy™

and the Crystals of Armageddon

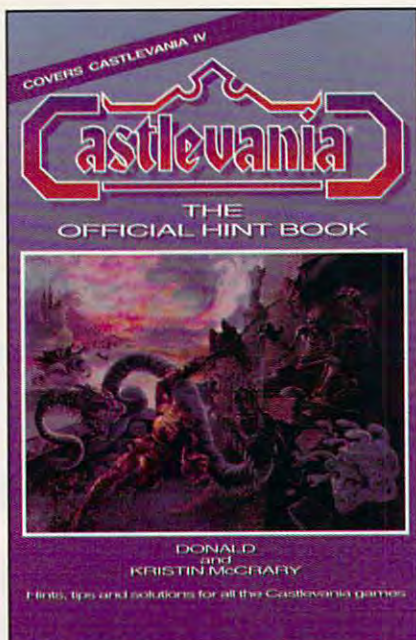
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pair off and go at innocent frogs and worms. What important lesson does that teach?"

Richelle, another member, disagreed and didn't hesitate to say so. "What is so wrong with dissecting?!!" she asked. "It is the best way to observe and learn the complexity of a multicellular organism."

Like any other form of human interaction, of course, online networking is

not without its risks. One is the chance that, just as in offline relationships, the online pal you give your phone number or address to can harass you with late-night phone calls or visits and generally make your life miserable. There's also this danger: When you chat online, it's harder to tell if the people you're talking to are really who they say they are. Larry Zinn, 39, a rock-'n'-roll tour manager who lives in New York City, says

GETTING TOGETHER

People who meet and get to know each other online like to get together in person. For example, the Trivia Club on America Online often holds parties so people in various parts of the country can meet, at least regionally. A general grouping like this is a perfect setting to meet a person you might hesitate to meet individually.

Be prepared to meet people who don't match your impressions. The fact that you can't see a person's face when you interact online means that all you have to go on is your imagination. Don't be disappointed. Getting to know a person face to face is a completely different experience—after all, that's the purpose of the meeting.

Checking with the party animals on a couple of online services only turned up two online party horror stories. One involved a person who was "a stuffed shirt and a workaholic," and the other involved an obsessive character who later harassed people on the telephone and in person. But the online crew is generally stable, highly intelligent, and fun loving. Regardless of other specialized interests, they like conversation and wordplay.

Share pictures. If you have a snapshot of yourself, scan it in, convert it to GIF, and upload it to the people who will be coming. Get a commitment from the others to upload snapshots as well, so everyone will recognize each other on sight. Locating a specific person in a public place might otherwise be difficult.

Be honest, at least with people you're going to become involved with. In the online world, it's so easy to mask your identity that people do it almost without thinking. When you meet people face to face, you won't be able to lie about your height, your weight, your age, or your IQ, though you might be able to prevaricate about at least a couple of these online.

Meet in a neutral place. Since you probably can't know in advance all of the preferences of the people attending, avoid bars or places that might offend the sensibilities of one of the members unless you have cleared it in advance with everyone who's expected to attend.

A restaurant with a conference or banquet room would be a perfect meeting place except for one thing: You also want to make it easy for people *not* to join the group. A person who walks into a banquet room has to all intents and purposes committed himself to joining the group. That fact alone might be enough to make him turn around and walk out of the restaurant.

You want to make it possible for people to see the group as they approach. Therefore, it would be an even better idea to meet in some open, public place before adjourning to the restaurant at an appointed time. That way, latecomers will be able to locate the group, and more hesitant people will have the opportunity to approach or walk by, whichever they wish. Therefore, a mall or a large hotel lobby is a good initial meeting place.

Arrange your meeting via E-mail. By not making a general announcement, you maintain control over the guest list. Remember that there are very few really private areas online and a general announcement might attract people who aren't members of the group and people that you don't want to attend for whatever reason.

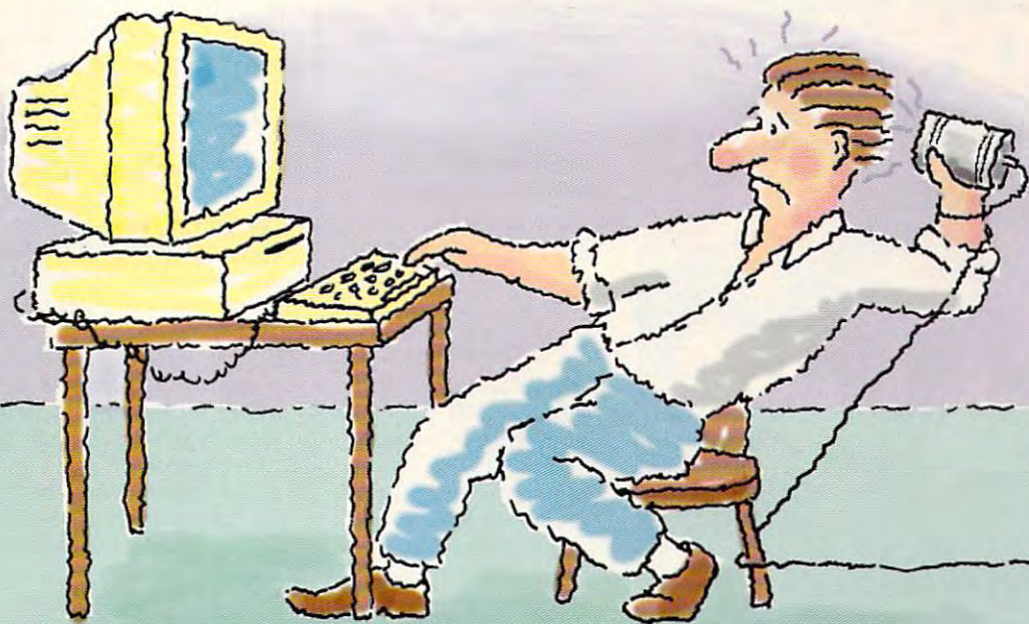
Another approach would be to have a group grow from a small circle of friends. Limit the initial meeting to four people, or perhaps four couples. Then, as a group, put together a larger guest list. By first including people that you know well, and then people that *they* know well, you reduce the anxiety of the new people.

Most groups coalesce around a specific activity—online gaming, trivia, sports, politics, religion—and these activities dictate the focus of the group. But many groups of people have no central interest. Writers, for example, are a particularly centrifugal group—independent, opinionated, and often egotistical—and any gathering not devoted to a single purpose might turn into a nightmare. Therefore, if there is no focus, you should give more thought to an agenda.

You might consider inviting yourself to one of the parties being arranged at any given time. If you're interested in seeing how it's done, check out La Pub or use the keyword *QUE* on America Online to see the get-togethers being arranged and the conversation among the party-conscious. On DELPHI, create a custom forum to announce a party. GENIE doesn't have any specific area for announcing or finding out about parties online, but you can discuss anything you like in a chat area. In CompuServe, parties are usually arranged within forums in conjunction with trade shows and events of special interest to forum members. For example, within the Macintosh forum (MAUG), the Club forum is used for arranging get-togethers and accommodations at Mac shows and often contains "official" party lists.

—ROBERT BIXBY

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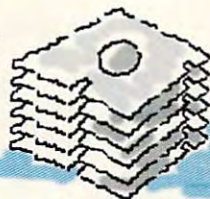


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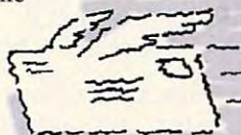
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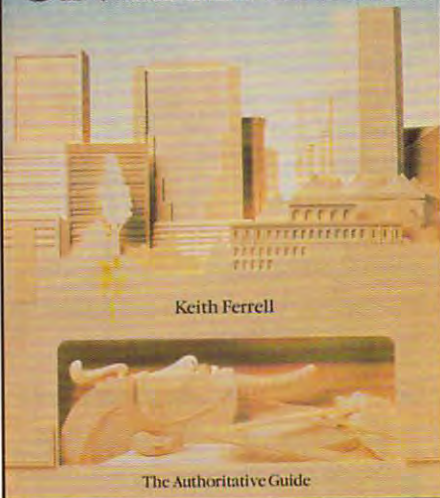
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he once fell hard for a woman he met on America Online only to discover—the day before he'd planned to fly to Florida to visit her—that she was married. Though he was upset at the time, he says he's gotten over it and has since gone out with someone else he met through the service. "The online thing can be extremely addictive if you're not careful," he says, explaining that his biggest problem so far with online networking has been trying to keep a lid on his monthly online charges. Currently, he spends several hundred dollars a month in access fees.

The Online Thing

As computers and modems continue to proliferate, it's possible that one day online networking will become as common as business lunches and cocktail parties. Face-to-face business conferences will be replaced by forums and round tables. In the future, "What's your sign" may well give way to "What's your log-on?"

For now, online networking offers a unique opportunity to reach out to a universe of computer-literate strangers and find a friend, a lover, a customer, or even a fellow student with some strong feelings about dissecting frogs. Whatever your need, wish, or desire, from business relationships to human relationships, there's probably someone in front of a computer somewhere waiting to share it with you. □

Linking Up

America Online
8619 Westwood Center Dr., Ste. 200
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(703) 448-8700

CompuServe
P.O. Box 20212
Columbus, OH 43220
(800) 848-8990

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Cambridge, MA 02138
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Rockville, MD 20850
(800) 638-9636

Petline
1965 Broadway
New York, NY 10023-5965
(212) 254-3838 (Modem)

Prodigy
445 Hamilton Ave.
White Plains, NY 10601
(800) 284-5933

64/128 VIEW

Define your computing goals.
Then see if your computer—dinosaur
or not—can get the job done.

Tom Netsel

Take time to flip through the pages that surround Gazette in this issue, and you'll see a section comparing the latest Super VGA monitors and accelerator cards.

If you're impressed by the sweeping changes in monitors, try keeping abreast of the latest features packed into computers themselves. One COMPUTE editor is planning to buy a PC for use at home, but just as he decides on a system, something newer and faster pops over the silicon horizon. Prices are dropping, but buying a new system is still a major investment. Like any consumer, this editor would hate to decide on a computer, fork over the cash, and then find a new improved model hitting the streets a few days later.

The PC market is volatile. What's new and hot today soon becomes yesterday's technology. As Bill Ihlenfeldt said recently in the *The Wall Street Journal*, "I bought the latest computer; it came completely loaded. It was guaranteed for 90 days, but in 30 days it was outmoded."

I spotted something similar the other day as I browsed through some user group newsletters. I came across an article written by Bjo Ashwill in "The Computer Group" of Eugene, Oregon. Ashwill, in a vein similar to his *Journal* colleague's, made a tongue-in-cheek gibe about the way today's technology changes so rapidly. He mentioned his old laptop computer. People called his six-pound laptop a dinosaur, a mere 8086 with a 20-meg hard drive, poking along at a pedestri-

an 8 MHz. "You couldn't prove it by me," Ashwill said. "I'm still starry-eyed about my Commodore 64."

Ashwill knows how easy it is to get carried away by new toys and the latest megaspeed gizmo. SVGA monitors may appeal to many enthusiasts, but many 64 owners still don't own monitors. They hook their computers to TV sets.

No matter how unglamorous the 64 may seem when compared to today's electronic speedsters, the little 8-bitter still gets the job done. That point was illustrated nicely by Max P. Feld, who's one of the Miami Individuals with Commodore Equipment (M.I.C.E.). He wrote in "M.I.C.E. News" about a member who was having trouble with her securities program. It wouldn't produce the financial data she needed. Group members recommended that she define her goals and then look for a way to accomplish them. Instead of trying to coax pertinent data from a fancy but temperamental program, they suggested she use a simple spreadsheet to accomplish the task.

Feld sees a lesson in this for all of us. "What do we expect to get out of our computers?" he asks. "Just why do we use the 64 or 128?" Once we ask ourselves these questions and define our computing goals, we should take another look at our 64s and 128s. They may not be today's pride of Silicon Valley, but can they still handle our needs? If so, it might come as a surprise to discover that our 64s and 128s are not the dinosaurs some folks say they are. □

GAZETTE

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So it's a dinosaur! Your 64 still works, doesn't it?
By Tom Netsel.

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Questions and comments from our readers.

BURIED TREASURE **G-6**

It may take a little digging to find them, but some public domain programs can be real gems.
By Henning Vahlenkamp.

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To be a hot programmer, learn how your 64 works.
By Randy Thompson.

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Build this simple device to control appliances.
By Larry Cotton.

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Here's the latest Commodore news from the U.K.
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Questions and answers about machine language monitors, memory limitations, and printouts of program listings

Monitor or MLX?

What is the difference between a machine language monitor and MLX, the Gazette utility program that we use for entering machine language programs? I have noticed that with a monitor we must enter eight codes, but in MLX we must enter nine codes.

MAURIZIO GEREVASI
QUITO, ECUADOR

A machine language monitor is a versatile program for entering and editing raw computer code. Its main feature is an assembler for writing programs in assembly language.

LDA # $\$41$;load the accumulator register with the value 65 ($\$41$)

JSR $\$FFD2$;jump to the subroutine for printing the accumulator value

For example, the code above is a simple two-line assembly program for printing the letter A. (The text following the semicolons consists of remarks and isn't part of the code.)

The assembler takes these mnemonic instructions and turns them into machine code, a set of numbers that tells the processor what to do. LDA # $\$41$ is converted to the numbers 169 and 65 ($\$A9$ and $\$41$) and JSR $\$FFD2$ becomes 32, 210, and 255 ($\$20$, $\$D2$, and $\$FF$). In addition to letting you write assembly language programs, a machine language monitor can move blocks of code, search for a specific string of values in memory, and display the assembly language equivalent of machine language.

It also does one more thing. It can perform a hex dump. A hex dump displays the hexadecimal values in memory and allows you to alter them. In a sense, the MLX program works in the same

manner as a hex dump. The difference is that MLX works with specific program data, while the monitor hex dump deals with data in a direct and raw form. Like the 40-column machine language monitor, the 40-column MLX displays eight bytes at a time, too. The ninth byte is a checksum, helping to ensure that the real program data in the other eight bytes was correctly entered. If you use the hex dump capability of a machine language monitor to enter MLX program listings from Gazette, just ignore the ninth (final) character in each row.

Out of Memory

For the past few years I have been using a program called Free-Form Filer (June 1987). It has worked without a flaw since I first typed it in until now. When I try to add another file, I get a message that states I am low on memory. Checking the disk directory, I notice that I have 11 blocks of another program, 152 blocks of the Free-Form Filer program, and 501 blocks of free space. How can I change the program in order to use the remaining blocks on the disk?

G.P. WINDAU
FOSTORIA, OH

It's true that you have 152 blocks of memory remaining on the disk, but you have exhausted your computer's memory. Free-Form Filer grows itself each time you add a record, and you must load the entire program each time you use it. After five years, you have added enough material to fill the 64's memory.

If you notice your opening screen when you first turn on your 64, it says you have 38911 BASIC bytes of free memory. Now load your version of Free-Form Filer, but do not run it. Once the program

has loaded, enter the following to determine how much RAM you have remaining.

FRE(0) - (FRE(0)-0) * 65536

You should see that you have less than 2K of free memory. You can add a few more files, but you've just about pushed the 64 to its memory limit with all the records that you've added over time. You might consider either breaking up your file into smaller sections or deleting records that you no longer need.

Remember, you must use a separate copy of Free-Form Filer for each database you create, and you can use only one copy of the program on a disk. I hope you saved a master copy that contains no data. You can then use it to create working copies on any number of disks.

BASIC Printouts

I wish to point out a serious oversight which occurred in the December 1991 "Feedback." The published tip for skipping folds in fanfold paper will not work with MPS801, MPS803, and 1525 printers. These printers do not support paging. Six years ago, Gazette offered a solution for skipping folds in computer paper that works with these printers. Check out List Pager, December 1985. I use this utility with my MPS803, and it works great.

RANDY CLEMMONS
SAN DIEGO, CA

Thanks for the reminder, Randy. Readers who don't have access to that back issue may want to try a similar utility that's found in this issue. It's a type-in program called Formatted List. It's also available on this month's Gazette Disk, which can be ordered for \$9.95 plus \$2.00 shipping and handling.