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Circle Reader Service Number 166

COMPUTE

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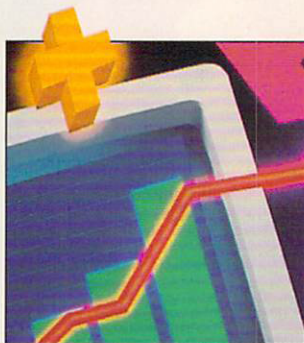
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Vengeance of Excalibur,
and more.

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Before You Upgrade To MPC, Listen To This.

BYTE

USER'S COLUMN

Sound Blaster

One of the boards we installed in the Arche 486 was Sound Blaster. With its associated software, it has quietly (no pun intended, but what the heck) become the standard sound system for advanced PCs. The Roland board has much higher sound quality for a higher price, but for anything short of professional music quality, Sound Blaster is good enough.

There are lots of other accessories you can get for Sound Blaster, including musical instrument software and a voice editor. Sound Blaster has become the standard sound board, if not for the industry, at least here at Chaos Manor. Recommended.

Jerry Pournelle

COMPUTE

SNEAK PEEKS

SOUND BLASTER PRO

In just two years, the Sound Blaster has become one of the most widely-supported PC sound cards. It's easy to see why. The Sound Blaster contains an 11-voice FM synthesizer that makes it fully compatible with the popular Ad Lib Music Card. The day it hit store shelves, the Sound Blaster could be used with hundreds of Ad Lib compatible games and educational programs. To add even more value, the original Sound Blaster included a DAC (Digital to Analog Converter) for digitized voice and sound effects, a microphone jack for voice input, a built-in game port, a built-in 4-watt amplifier, and an optional MIDI interface.

Creative Labs Update:

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

The Sound Blaster Pro includes a CD-ROM interface for either an internal or external CD-ROM player.

There's also an internal connector for CD-Audio. The MIDI interface is compatible with the original Sound Blaster's MIDI interface, but adds the MIDI time-stamp that's part of Microsoft's new multimedia standard.

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

DAVID ENGLISH

Scheduled Release: September 1991
For IBM PC and compatibles—\$299.95

CREATIVE LABS
2050 Duane Ave.
Santa Clara, CA 95054
(408) 986-1481

PC HOME JOURNAL

SOUND BLASTER DOES IT ALL

Review by Harvey Bernstein

The Sound Blaster has so many audio applications packed into one half-sized board that it almost boggles the mind. First, it has an 11-voice stereo music synthesizer that is fully compatible with the widely used AdLib sound format. Older software that only supports the AdLib board will automatically turn on the AdLib mode—no adjustment by the user is necessary. A separate channel is exclusively for reproducing digitized speech. A microphone jack on the back of the card allows you to digitize your own input voices. With a 4-watt stereo amplifier built in, you can run speakers or headphones directly from the card—no additional amplification is necessary. A standard joystick port also doubles as a MIDI interface, allowing you to connect a synthesizer or any other MIDI instrument. Combine this with an excellent library of software, and it is easy to see why the Sound Blaster has become so popular.

The Sound Blaster Pro is the Sound Blaster worth the investment? Yes, yes, a thousand times yes!!! When you hear how much the Sound Blaster increases the capabilities of your PC, you'll wonder how you ever got along without one.

PC

SOUND BLASTER PRO

By Barry Brenesal

The Marines may look for a few good men, but any PC game player will gladly settle for a single good sound card: one that plays both Sound Blaster and AdLib scores, one that doesn't fly your other boards, one that never draws attention to itself, one that delivers all the sophisticated sound effects and music bundled into the latest batch of game software.

Look no further: Sound Blaster Pro does it all, and more. At \$299.95 it's not cheap, but neither are its features.

Testing: One, Two . . .

Installing Sound Blaster Pro is a snap. The 16-bit card slips easily into place. It comes with a test disk that

Trying out Sound Blaster Pro is a treat. It's got great frequency response — that's the difference between listening to a film score on a tinny, muffled AM radio and hearing it on a stereo movie-theater speaker system. The orchestral soundtrack to Origin's Wing Commander is a good example, because it changes mood and melody to match the success of your current battle. Add Sound Blaster Pro to a good VGA screen and a responsive joystick (which you can plug into Sound Blaster Pro's joystick port), and the illusion of dogfighting aliens in a George Lucas-style film becomes 3-D, symphonic reality.

Another plus is the absence of the annoying background hiss that plagues other sound cards. In short, Creative Labs' Sound Blaster Pro is a big winner. It's quick to install, easy to use, full-featured, and compatible with Sound Blaster and AdLib files. Signal response is excellent. And don't forget about

Now you can get the number one sound card as part of our new Multimedia Upgrade Kit. Which also comes with a MIDI kit, an internal CD-ROM drive and 5 CD-ROM titles, including Microsoft® Bookshelf® and Windows™ with Multimedia Extensions. In all, \$2,000 worth of goodies for just under \$850.

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EDITORIAL LICENSE

Clifton Karnes

Last month, I talked about some of the changes taking place here at COMPUTE. The biggest change, of course, is that OMNI has moved to Greensboro. We at COMPUTE were looking forward to working closer with OMNI, and we're already seeing the first fruits of our new relationship.

As you probably know, OMNI is a top science magazine. The staff are experts at reporting scientific information, and they're crusaders for a scientific approach to measurement. In just one month, they've convinced us to adopt the metric system as our standard. So, beginning with the May 1992 issue, COMPUTE will be 100-percent metric.

What does this mean for you? Well, in some areas there will be no change, because we're using metric measures already. For example, familiar quantities such as ms (millisecond, or one-thousandth of a second), K (kilobyte, or 1024 bytes), MB (megabyte, or 1024K), and MHz (megahertz, or 1 million hertz) are metric already, so they'll stay the same.

The international organization MISERY has recently adopted improved metric equivalents for common computer measurements.

The first change you'll notice with the metric shift is the way we express the sizes of floppy disks. What used to be called 3½- and 5¼-inch disks will now be 8.89-cm and 13.335-cm, respectively. Soon the old 8.89-cm disk will be as familiar as the old-fashioned inch one.

Just as the metric system's centimeter is an improvement over the inch, the world-wide committee on metric standards, Metric International for Systems, Engineering, Relations, and Yields, or MISERY for short, has recently adopted improved metric equivalents for common computer measurements.

The first measure to fall under MISERY's ax was the popular pixel, the smallest addressable dot on a computer screen. MISERY isn't the first to propose a pixelary alternative. Recently, Microsoft started using TWIP, a device-independent measure, for screen size (nobody knows what TWIP stands for). MISERY suggests TWIT, which does stand for something: Tall and Wide but Independent of TWIPs. One TWIT is worth .76459 pixels, so an 800 x 600 display is, using that metric equivalent, 611.672 x 458.754. Much more accurate, and clearly better.

In the same spirit that gave us the TWIT, MISERY has proposed a new metric measure for money, replacing our U.S. dollar with an international currency called Monetary Organization for Original Legal Access, or MOOLA, for short. One dollar is worth 3.141592654, or pi, MOOLAs. So a software product with a price of \$39.95 will cost 125.5066265 MOOLAs.

With large computer systems, the MOOLA measurement gets really exciting. For example, a new 486 with all the trimmings sells for

\$2,999.95. That's an impressive 9,424.620881 MOOLAs. Now that's a number worthy of such a machine!

The good metric stuff doesn't end there. Software version numbers are being improved by the adoption of MISERY's Bipartisan Universal Gradient, or BUG, for short. A BUG is a simple measure. To get it, you multiply a constant—.00321—by the current version number. For example, DOS 5.0 is now DOS .01605 BUGs. With this ingenious system, most products will never get their BUGs to version 1.0.

Last, but certainly not least, we've proposed our own metric standard for numbering magazine issues. MISERY has responded favorably to this and plans to adopt it in its next MISERY version .00963 BUGs. Here's how it works.

The numbering system multiplies the year by .0001 and then multiplies that product by the number of the month. So the April 1992 issue you hold in your hands is in reality issue .7968 ((.0001 x 1992) x 4).

Going along with the new numbering system, there will be 10.3904 issues in 1992, but 10.3916 issues in 1993. We haven't given a name to this system yet. Any ideas?

That's it. Beginning in May, you'll see the drab software references in the magazine replaced with something like this: MISERY-DOS, version .98342 BUGs, 611.672 x 458.754 TWITs supported, available on 8.89- and 13.335-cm disks, for 125.5066265 MOOLAs.

It's true that you'll need a computer to calculate and recalculate all these metric equivalents, but if you love computers the way we think you do, you'll find the work a joy. Oh, yeah—April Fools'. □

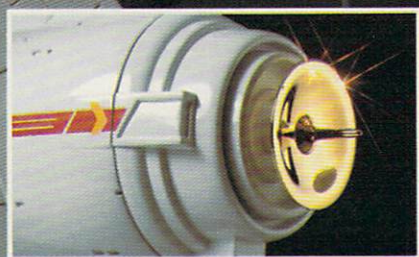




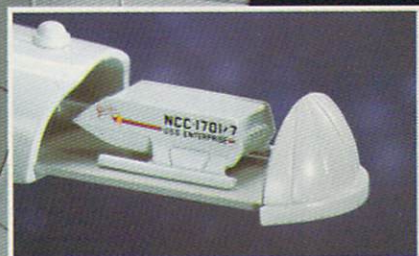
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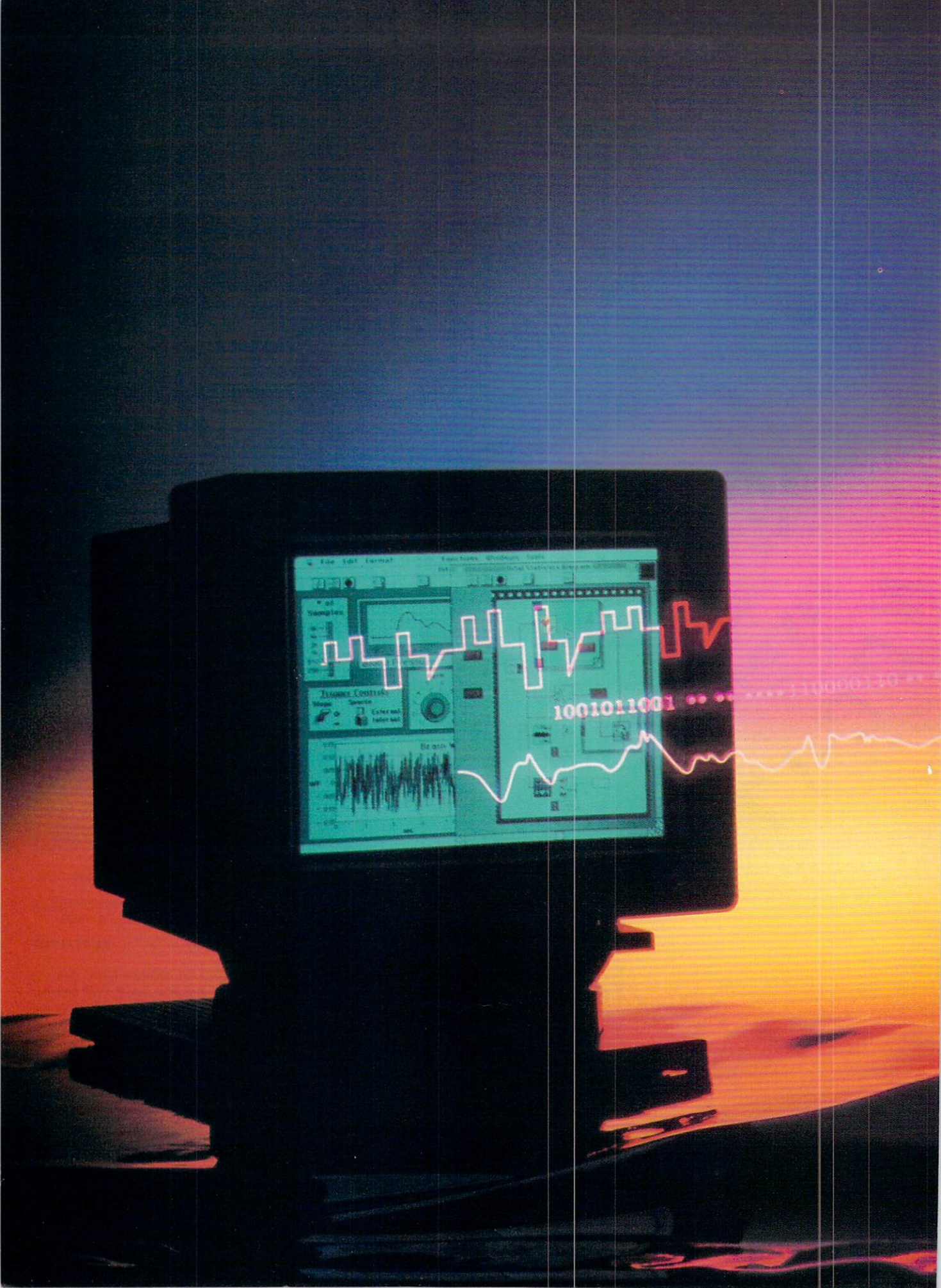
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PC JARGON MADE EASY

GENERAL TERMS

ASCII. American Standard Code for Information Interchange. ASCII is a standard for relating numbers to alphanumeric characters and symbols. Standard ASCII is a 7-bit code, which means there are 128 possible values. The first 128 symbols in the PC's character set are standard ASCII. The next 128 characters are specific to the PC and are often referred to as the extended character set.

bandwidth. Although this is technically the frequency range of a communications channel, it is often used as a relative measure of a channel's capacity to transfer information. The greater the capacity, the greater the bandwidth. For example, a 16-bit bus has greater bandwidth than an 8-bit bus.

CD-ROM. Compact Disc-Read Only Memory. CDs have been popular for several years as the medium of

choice for sound recording, and they're fast becoming an important medium for storage for computers. Although the CD's optical technology doesn't easily lend itself to erasing and rewriting, its huge capacity (about 600MB) makes it invaluable for storing large amounts of data.

command line. The DOS command line is the familiar A> prompt. When you type commands at the prompt, the command interpreter, COMMAND.COM, executes them or tells you their syntax is incorrect.

compiler. A compiler translates an entire file of source code into pure machine language. When you run a compiled program, the entire program loads into memory and executes.

CPU. Central Processing Unit. This is the computer's brain, which controls the machine's resources and manag-

BY ROBERT BIXBY, CLIFTON KARNES,
AND JOYCE SIDES

es calculations. In the PC, the CPU is a microprocessor chip from the Intel 80x86 family, which includes the 8088, 8086, 80286, 80386, and 80486. *CPU* is also used to refer to a PC's system box (the part of the machine that houses the CPU, memory, and disk drives).

DOS. Disk Operating System. Although it does much more than just manage disks, that's DOS's primary job. There are several varieties of DOS for PCs, including MS-DOS (Microsoft), PC-DOS (IBM), and DR DOS (Digital Research).

interpreter. An interpreter translates one line of source code at a time and executes it. BASIC is the most popular interpreted language, though modern BASICs can be compiled.

K. Kilobyte. A kilobyte is 1024 bytes. Early PCs came with 4K or less. The standard for 8088-based PCs is now 640K, for 80286s it's 1MB, and for 80386s it's 2MB or more. As with money, you can never have enough RAM.

MB. Megabyte. A megabyte is equal to 1,048,576 bytes, or 1,024K. Memory on large systems and storage for most hard disks are measured in megabytes.

MHz. Megahertz. A megahertz is 1,000,000 cycles per second. Megahertz is used as the measure of a microprocessor's speed. The first IBM PC ran at 4.77 MHz. The new 80386 and 80486 chips run at 33 MHz or faster.

multitasking. In modern parlance, *multitasking* means running two or more programs at the same time. On the PC, the Intel 286, 386, and 486 processors can multitask in protected mode. *Windows 3.0*, *OS/2*, *GeoWorks Ensemble*, *DESQview*, and Unix are examples of PC multitasking operating systems and operating system extensions.

RAM. Random Access Memory. Although this kind of memory can be accessed randomly, a better name would be read-write memory because you can both read from and write to any RAM memory location.

RAM disk. A RAM disk is an area of memory that functions just like a disk drive, except that it's lightning fast. To install a RAM disk on your PC, you put a command like `DEVICE=RAMDRIVE` in your `CONFIG.SYS` file.

ROM. Read Only Memory. Computer memory that can be read from but can't be changed or written to. In the PC, the BIOS (Basic Input/Output System) is ROM.

TSR. Terminate and Stay Resident. This is the name for a large class of applications that remain in your PC's memory and are called with hot keys. TSRs take advantage of two important DOS attributes. You can run a program but leave it in memory, and you can redirect system routines to your own code. The most popular early TSR was probably *Sidekick*. Recent superstar TSRs include *PC Tools Deluxe Desktop*.

MEMORY

address space. This is the amount of RAM a CPU can "see." An 8088 can address as much as 1MB, an 80286 as much as 16MB, and an 80386 as much as 4096MB of memory.

conventional memory. Conventional memory is simply the first 640K of memory. The 384K of memory between the 640K barrier and 1MB (called UMB, or upper memory) is reserved for DOS, but a portion of this memory can be accessed as expanded memory with the appropriate hardware.

EMS. Expanded Memory Specification. This is a specification developed by Lotus, Intel, and Microsoft (LIM) to break the 640K barrier by accessing up to 32MB of expanded memory. EMS maps a 64K page divided into four 16K windows in DOS's upper memory area (the 384K above 640K). Until the release of LIM version 4.0, multitasking was not available through the EMS standard.

expanded memory. Introduced in 1985 by the consortium of Lotus, Intel, and Microsoft, expanded memory is a way to expand a PC or AT beyond 1MB of memory. The memory manager (a chip set that supervises expanded memory access) is given a handle by a program to tell it where some information lies in the memory above 1MB. When the request is made, the memory manager maps that portion of memory to four 16K regions in high memory for easy program access. The system works a little like a RAM disk with a maximum capacity of 8MB (with LIM EMS 3.2) or 32MB (with LIM EMS 4.0).

extended memory. Technically, extended memory is any memory beyond the base 1MB of memory accessible by the 80286 and the 80386 operating in real mode. An AT can access memory above 1MB directly through the use of a RAM disk. DOS provides the means of creating a RAM disk with device drivers such as `VDISK.SYS` and `RAMDRIVE.SYS`. Other uses for extended memory include disk caching and expanded memory emulation. *Windows 3.0* directly accesses this memory.

HMA. High Memory Area. High memory is the first 64K of extended memory. By a quirk in the design of 80286 and 80386 processors, this memory is directly accessible in real mode.

LIM. Lotus-Intel-Microsoft. *LIM* is the acronym that stands for the developers of EMS (Expanded Memory Specification), which can allow any PC or AT operating in real mode to access up to 32MB of memory.

protected mode. Protected mode is a special multitasking feature of 80286, 80386, and higher CPUs. In this mode, your PC can run *Windows 3.0*, and it "sees" as much as 16MB of memory at a time, all of which is accessible. Protected mode also allows the 80286 and 80386 machines to access the hard disk as if it were RAM. DOS runs in real mode, not protected mode.

real mode. Real mode is the default for the 8088 and 8086 CPUs. The 80286 and 80386 CPUs are able to run as a fast 8088 chip (real mode) or as a multitasking 16-bit chip (protected mode). As an 8088-emulating chip, the 80286 and 80386 have the same memory limitations (1MB) as the 8088.

UMB. Upper Memory Block. The upper memory area is located between 640K and 1MB. IBM used to call this area reserved memory. Expanded memory managers and programs such as *QEMM* and *386MAX* use this area, dividing it into blocks into which you can load TSRs and device drivers high.

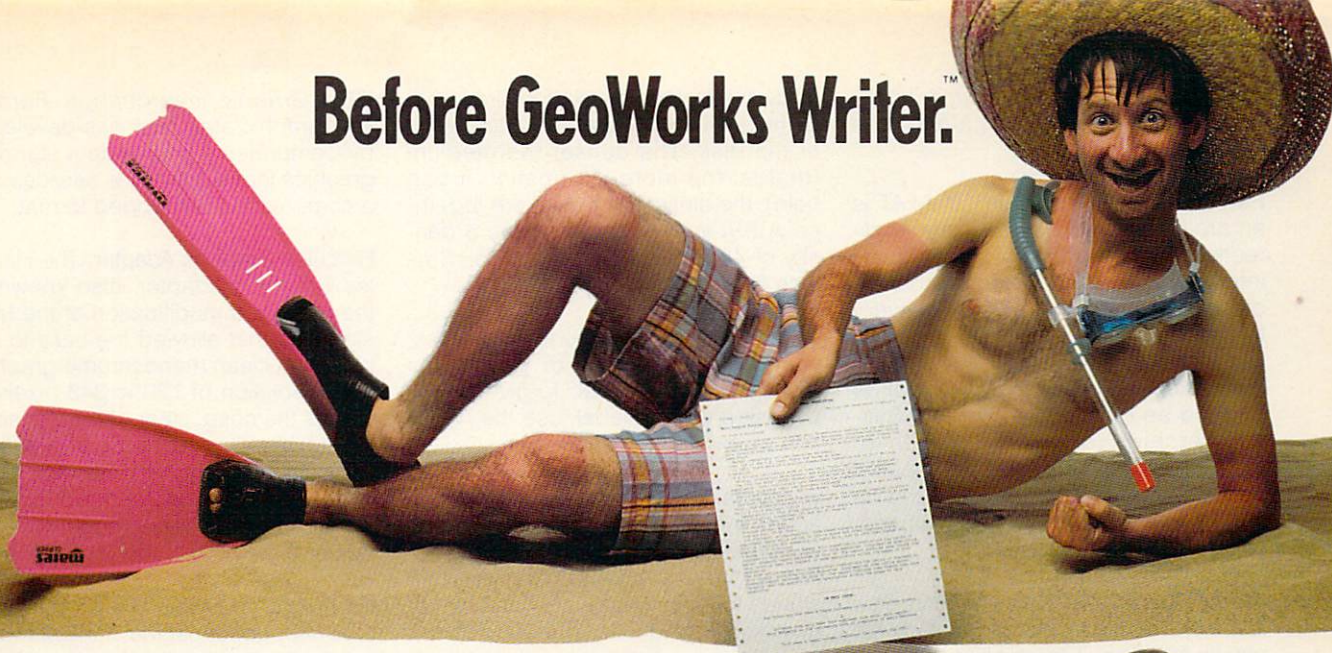
XMS. eXtended Memory Specification. XMS provides a way of managing extended memory in much the same way as EMS 4.0 provides a way to manage expanded memory. It also allows access to the HMA. To use XMS, you need to install a device driver called `HIMEM.SYS` in your `CONFIG.SYS` file.

DISKS

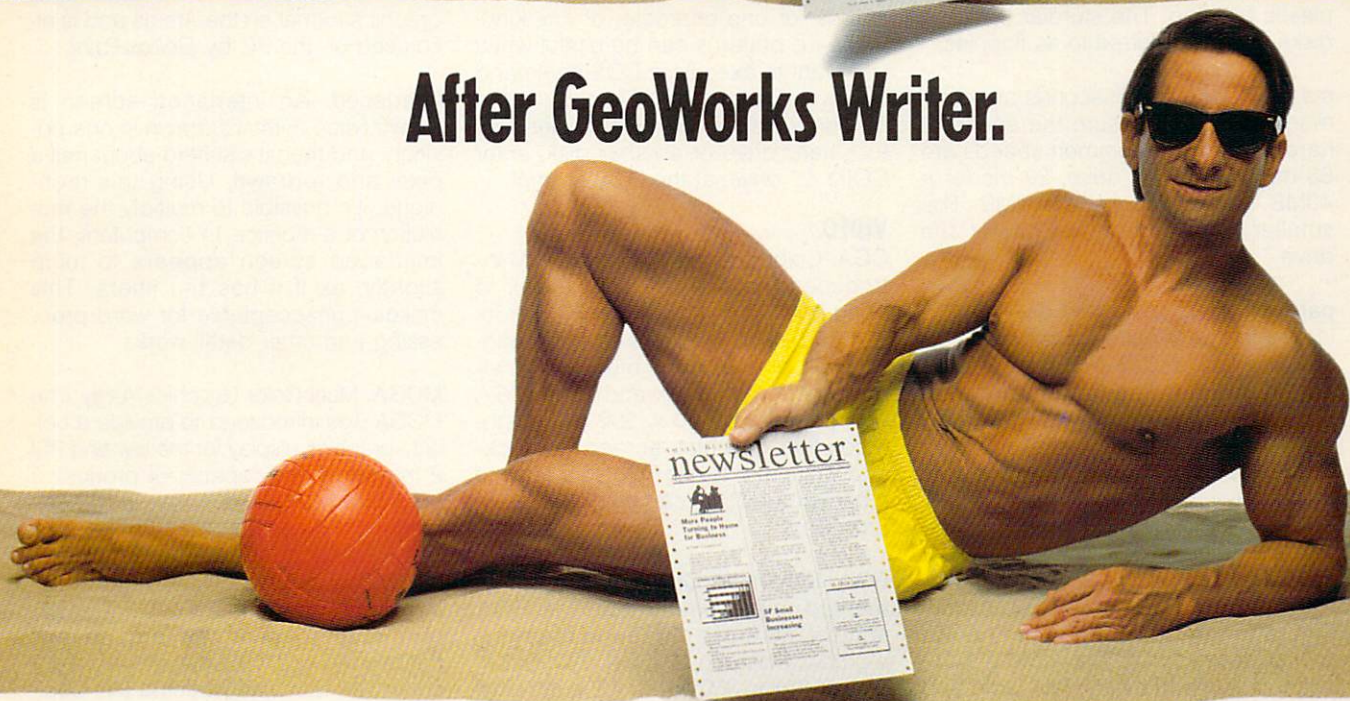
cache. A cache is a special program that uses part of your PC's RAM to store the information your disk uses most often. With a cache, when the system requests data from a disk, there's a good chance the data (or part of it) will be in the cache. Since RAM access is much, much faster than disk access, a cache can make disk-intensive applications fly.

cluster. The File Allocation Table maps groups of sectors called clusters. A cluster is the minimum amount of storage space a file can use. For this reason, each file on a disk takes up at least one cluster. On 360K flop-

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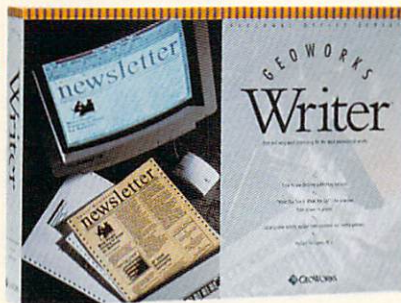
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lishing features like multi-column layouts, easy importing of graphics (it comes with clip art!)... even its own award-winning graphical environment* that makes using it as easy as clicking a mouse. And if you think it's amazing alone, just wait until you see it working with the rest of the Personal Office Series team.

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Circle Reader Service Number 155

py disks, a cluster is two sectors or 1K. On an average hard disk, a cluster is four sectors or 2K.

FAT. File Allocation Table. The FAT is an area on a DOS disk that comes directly after the boot record. It contains information on all the sectors on the disk, and it maps the location of every file on the disk.

file attributes. Each file on a disk is marked as Read Only, Hidden, System, Archive, or a combination of these. These file attributes are located with the other file information in the directory. With DOS's ATTRIB command, you can alter a file's attributes.

floppy. Floppy disks are thin, round, flexible disks housed inside a 5¹/₄-inch flat plastic housing. The sturdier 3¹/₂-inch disks are also referred to as floppies.

ms. Millisecond. Milliseconds are commonly used to measure the speed of hard disk drives. Common speeds are 65 ms for a 20MB drive, 28 ms for a 40MB, and 14 ms for a 110MB. The smaller the number, the faster the drive.

partition. Hard disks are divided logically into one or more areas called partitions. Prior to DOS 4.0, if you had a hard disk larger than 32MB, you had to partition your drive with the DOS FDISK command. After partitioning, your drive will act as if it were two or more drives. The partition table is located on track 0 directly in front of the disk's boot sector.

root directory. After a disk's File Allocation Table comes the root directory. The root directory is like the table of contents. It stores the filenames, time and date stamp of latest update, starting cluster number, file size, and file attributes.

sector. Disks are divided in concentric circles called tracks, and each track is further divided into wedges called sectors. Sectors can be identified by the side of the disk they're located on, their track number, and the sector number within the track. Although sectors can be any size, on PCs they're almost always 512K.

subdirectory. Before the introduction of DOS 2.0, all the files on the disk had to reside in the root directory. The ability to create subdirectories solved this problem and made it possible to organize a disk. The root directory is like a drawer containing folders. The folders are subdirectories, which contain other folders or individual files.

track. Tracks form concentric circles beginning with track 0 at the outer edge of the disk. The denser the medium (that is, the more information it can hold), the closer the tracks are together. A 5¹/₄-inch floppy disk has a density of 48 tracks per inch, or tpi; 3¹/₂-inch floppies weigh in at 135 tpi.

volume label. When you format a disk, you have the option of giving it a name—a volume label. To give a floppy disk a volume label, use the /V option when you format.

wildcards. Wildcards are special characters that stand for other characters. DOS uses the question mark (?) and asterisk (*) as wildcards. The asterisk stands for any number of characters of any kind, and the question mark stands for one character of any kind. Wildcard patterns can be useful when you want to execute a DOS command on several files at once. To copy all the files on a disk or in a current directory to a hard drive or another disk, enter COPY *.* drive: at the DOS prompt.

VIDEO

CGA. Color Graphics Adapter. IBM introduced the CGA card as a way to bring color graphics to the PC. For its 320 × 200 pixel graphics screen, it added pink and powder blue to the already perfected black-and-white. CGA also provides a 640 × 200 pixel high-resolution graphics screen in black-and-white and text in 16 colors against a background that can be displayed in 8 colors.

EGA. Enhanced Graphics Adapter. A marked improvement over the CGA adapter, EGA can display 16 colors on a graphics screen of 320 × 200, 640 × 200, or 640 × 350 pixels. Although originally released in a configuration that only provided 16 colors on a 320 × 200 pixel screen, this limitation was overcome in response to consumer demands.

8514/A. The 8514/A graphics card, introduced in 1987 with the PS/2 line of computers, provides an interlaced screen with a resolution of 1024 × 768 pixels. At this resolution, it provides 256 colors. Currently, it is only one of many ultra VGA designs trying to establish themselves as standards. Since the 8514/A hardware is expensive and very few programs make use of it, most users have been content with the various flavors of Super VGA.

EPS. Encapsulated PostScript. This object-oriented graphics format contains all the code necessary to print a graphics file on a PostScript printing device.

GIF. Graphic Interchange Format. This graphic standard was developed by CompuServe to provide a standard graphics format for online services. It is a compressed bitmapped format.

Hercules Graphics Adapter. The Hercules Graphics Adapter, also known as the HGA, is a modification of the MDA standard that allowed the card to display very clean monochrome graphics at a resolution of 720 × 348 pixels as well as the crisp, clear character set of the MDA. This adapter dates from 1982. Interestingly, the Hercules Graphic Adapter was developed by Van Suwannukul so that he could write his doctoral thesis with the Thai alphabet.

IFF. Interchangeable File Format. IFF is a bitmapped format that's the standard graphics format on the Amiga and is also used on the PC by *DeluxePaint*.

interlaced. An interlaced screen is drawn twice. First it's drawn in one position, and then it's shifted about half a pixel and redrawn. Using this technique, it's possible to multiply the resolution of a monitor. In computers, the interlaced screen appears to jump slightly, as if it has the jitters. This makes it unacceptable for word processing and other detail work.

MCGA. Multi-Color Graphics Array. The MCGA was introduced to provide a colorful graphics display for the low-end PS/2 machines. It's capable of producing graphics of 320 × 200 pixels in 256 colors from a palette of 262,144 colors.

MDA. Monochrome Display Adapter. Introduced with the PC in 1981, this display adapter could only display text, though the text it displayed was very clear. The reasoning behind this decision was that the PC was aimed at business users and business persons were not interested in displaying graphics. It failed to revolutionize computer graphics and was quickly supplanted by the Hercules Graphics Adapter as the monochrome adapter of choice. If it had been capable of displaying graphics, it would have displayed 720 × 350 pixels.

PCX. This is a standard bitmapped graphics format for the PC, developed by Z-Soft. Most PC paint programs support PCX, as do almost all bitmapped graphics applications. According to Z-Soft, PCX doesn't stand for anything, though Picture Exchange seems an obvious origin.

pixel. Picture element. A pixel is the smallest dot of color your video card

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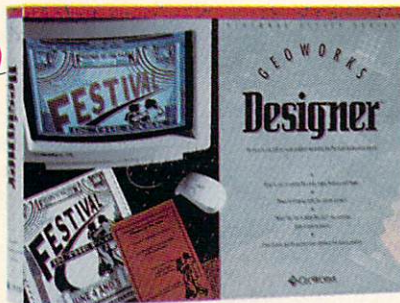
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can manage. Screens are defined by their dimensions in pixels.

resolution. *Resolution* refers to the number of pixels available to reproduce an image on the screen. The higher the resolution, the more pixels there are available. Curves produced in a low resolution like 320 x 200 have a stairstep appearance. They are obviously formed of short straight lines. A curve on a high-resolution screen will appear much smoother. *Resolution* is also used to describe printer dot density. Most laser printers can reproduce 300 dpi (dots per inch), making very smooth curves with only a few jaggies. A 300-dpi laser printer provides 90,000 dots per square inch. A 400-dpi laser printer can provide 160,000 dots per square inch, providing still higher resolution and smoother curves.

Super VGA. Super Video Graphics Array. This was an enhancement of the standard VGA that allowed an 800 x 600 pixel screen displaying 16 colors

from a palette of 256. But barely was the standard set before manufacturers began to depart from it. Now virtually any board with capabilities beyond VGA might be called Super VGA.

TIFF. Tagged Interchangeable File Format. This bitmapped graphics standard is rapidly becoming the graphics equivalent of ASCII. Nearly all high-end graphics programs can export and import TIFF files.

VGA. Video Graphics Array. This advanced graphics adapter was introduced by IBM with its PS/2 line of personal computers. It's compatible with CGA, EGA, and MCGA. The adapter provides a wide assortment of display options, some of which are undocumented. Its highest resolution is 640 x 480 pixels, with 16 colors from a palette of 262,144.

PRINTERS

dot-matrix. A dot-matrix printer is one that produces printouts by driving tiny

hammers (called pins) against an inked cloth ribbon, leaving little dots on the paper beneath, from which graphics or text is formed on the page.

dpi. Dots Per Inch. This term is used to express the resolution of a printout from a laser printer. Most laser printers are able to print 300 dpi, though enhancements are driving high-end laser printers up against the lower limits of typesetting machines (1200 dpi). DPI is also used to describe the sensitivity of a mouse to movement. See also ppi.

DTP. DeskTop Publishing. *Desktop publishing* is a term coined by Paul Brainerd at Aldus to describe the ability of an individual to create a typeset page at his or her desk, thus marrying the jobs of editor, typesetter, layout artist, and printer. With so many responsibilities, the desktop publisher must have multiple skills because amateur efforts in any of these areas stand out even to the untrained eye.

font. Technically, a font is an individual typeface in a particular style and of a particular size. An example of a font is Times-Roman 12-point bold oblique. In computer and desktop publishing parlance, Times-Roman is often called a font. Owing to the magic of scalable outline fonts, an individual character can be changed almost infinitely in size from about 4 points to something in the hundreds of points, allowing variations of tenths or hundredths of points in between. Italic (or oblique) type, boldface, underscore, and several other variations are called typestyles. Purists are disdainful of these corruptions of the ancient language of typesetters.

ink-jet. Ink-jet printers spray an image on paper in tiny droplets of water-soluble ink. Though they are billed as producing printouts indistinguishable from those of laser printers, the tendency for the ink-jet nozzles to become clogged often results in telltale horizontal white lines through the image. Another drawback of ink-jet printers is the fact that the ink is susceptible to damage from moisture.

laser. *Laser* is an acronym standing for Light Amplification through Stimulated Emissions of Radiation. It's a very dense, concentrated light beam capable of crossing great distances with little degradation of power. Lasers are at the heart of much of the most exciting computer technology, and they may soon drive computers themselves. They are the power behind bar code readers that have affected our daily lives from the checkout counter at su-

PC SLANG

bells and whistles. Features, often of limited value, that are indiscriminately added to a program.

bogus. Something that's false or doesn't work correctly. A false person is a bogon.

brain-damaged. Programs that behave rudely or strangely are brain-damaged.

bug. Something that causes a program to crash or hang. The first bug was a real bug—a moth—that caused an early model computer to act strangely.

bum. To enhance code by making it smaller. This is unfortunately a lost art.

crash and burn. To fail or hang in a spectacular way.

feature. Often used sarcastically to refer to bugs in a program that can't be fixed. For example, "Oh, yeah, that screen of garbage is a feature."

flaky. Said of programs and people. If they're erratic, they're flaky.

flame. To talk endlessly, and usually boringly, about something.

foo. From *foobar*, which is a corruption of *fubar*, a World War II acronym for Fouled Up Beyond All Recognition, or a slight variation thereof. *Foo* and *Bar* are traditional programming variable names.

fry. Synonym for *crash and burn*.

glitch. A bug.

grok. To understand in a deep way. From Heinlein's book *Stranger in a Strange Land*.

hacker. The word comes from the Tech Model Railroad Club at MIT in the 1950s. A neat addition to a railroad was a hack. The term moved to computer jargon, where a neat programming feat was a hack. A hacker creates hacks. *Hacker* is used incorrectly by the popular press to mean people who break into computer systems via telephone.

jock. This term used to signify someone who employed brute-force methods to solve programming problems. Today, a jock is an expert programmer.

kludge. Pronounced "klooji," this is a software or hardware patch that works but is conceptually (and sometimes physically) ugly.

nerd. Synonyms are *weenie*, *techno-weenie*, and *dweeb*. Computer jocks are often called nerds by noncomputer people. This is a mistake. Because of the popular misconception, however, power users often jokingly refer to themselves as nerds. Real nerds never know they are nerds, but you can usually spot them by their pocket protectors.

tweak. A small improvement that enhances a program.

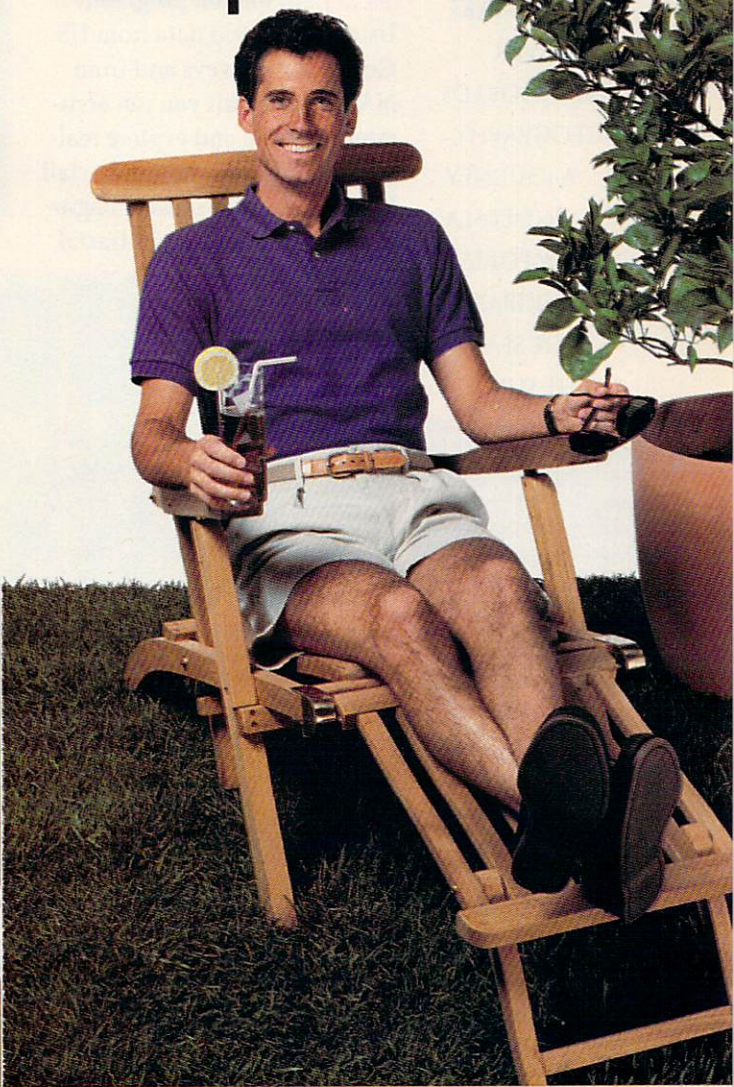
vaporware. Software that is publicized but which never appears.

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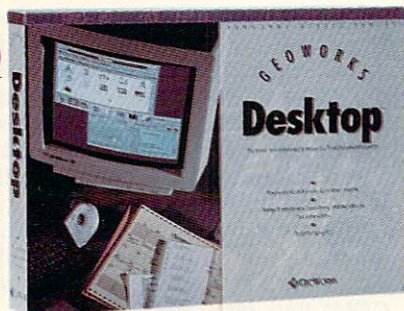
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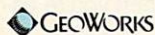
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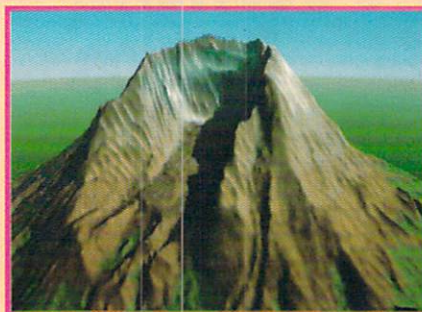
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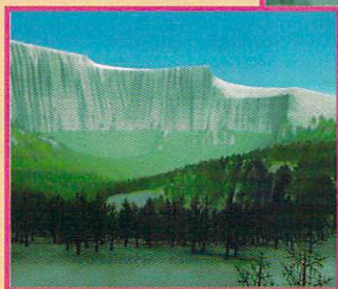
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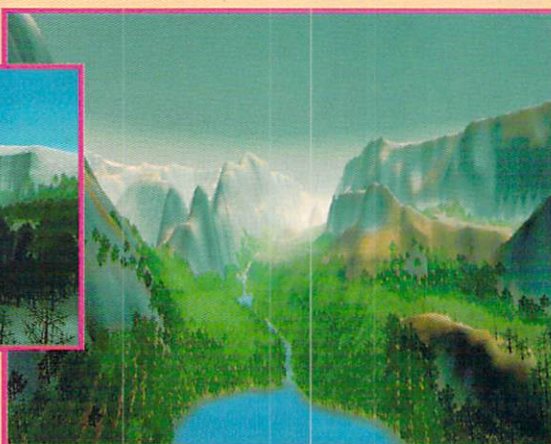
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Right: Valles Marineris, Mars
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permarkets to the recordkeeping technology at hospitals. Lasers have even been put to use in optical mice, laser printers, and hand scanners for importing graphic images. Laser printers use the laser beam to charge a light-sensitive coating on a drum in a manner similar to that of a photocopier. The drum is then exposed to charged toner particles that cling to the drum. Paper with an even greater electrical charge is moved past the drum, and the particles leap from the drum to the paper, which is then heated to a temperature high enough to melt and bond the toner particles to the paper.

PostScript. PostScript is an interpreted computer language from Adobe Systems specially designed to make up pages, and thus it's known as a page-description language. When a page is created with PostScript, it's sent to the printer, not as a series of byte values to describe individual points on the page (which is how most graphics information is sent to printers), but as definitions of lines to be drawn, fonts to be used, and text to be printed in the specified fonts. These instructions are then interpreted by the printer and, through the hardware of a laser printer or typesetter, turned into a printed page.

ppi. Points Per Inch. Dissatisfied with the standard means of expressing a mouse's sensitivity to movement in terms of dots per inch (dpi), Microsoft invented points per inch. It means exactly the same thing: the number of discrete positions that the optical sensors inside the mouse can count through a mouse movement of an inch.

typeface. Technically, a typeface describes the appearance of a set of characters regardless of their size. Times-Roman 12-point and Times-Roman 14-point are different fonts in the same typeface. In computer and desktop publishing parlance, *typeface* and *font* are often used to refer to the same thing. The two most popular typefaces are Times Roman and Helvetica.

typestyle. *Typestyle* is a new expression created by desktop publishers to further describe the appearance of a font. Italic, boldface, shadow, outline, underline, super- and subscript, grayed, strikeout, and plain are the standard typestyles.

COMMUNICATIONS AND PERIPHERALS

AUX. Auxiliary. AUX is another way in DOS to refer to communications port 1 or COM1.

baud. Baud is a measure of the speed at which bits of information are sent or received over communications lines such as those used with a modem. Although the two don't mean the same thing, *baud* and *bits per second (bps)* are used interchangeably.

BBS. Bulletin Board System. A BBS offers a convenient way to communicate with fellow computer enthusiasts and acquire copies of programs, picture files, and so on via a modem. The programs available on BBSs are usually shareware, which means you can try a program before you buy it.

COM. Communications. This is a DOS device name used in connection with serial ports and is usually reserved for communications with a modem. There are, however, serial printers, for example, that must be connected to the computer through a serial port. To connect a serial printer to the computer, the MODE command is used to tell the system where to find the printer. With DOS 3.3 or higher, four communications devices may be specified on one system, COM1 through COM4.

CON. Console. CON refers to the keyboard and monitor. When you're using

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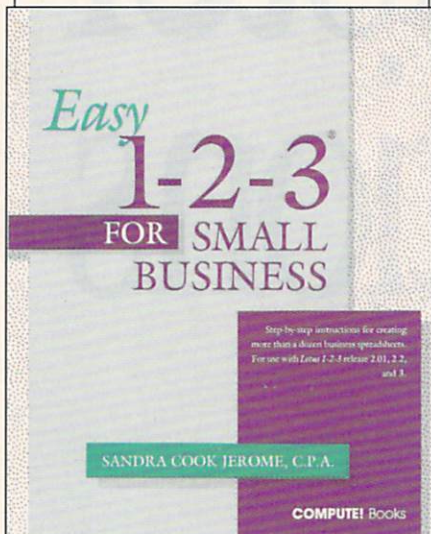
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CON for input, it refers to the keyboard. For example, COPY CON > MYFILE.TXT copies everything you type at the keyboard up until a Ctrl-Z and writes it to the file MYFILE.TXT. When used as output, CON refers to the screen. If you want to view the file you just created, you could view it with COPY MYFILE.TXT CON.

device. Any peripheral connected to a PC such as a mouse, printer, print buffers/spoolers, expanded memory boards, and so on can be called a device. You usually tell your PC's system about devices by installing device drivers in your CONFIG.SYS file.

device driver. Device drivers are essentially special TSRs that handle the input and output between peripherals such as printers or mice and the CPU of a computer. The standard device drivers include drivers for the keyboard, serial and parallel ports, and disk drives. You can install device drivers in your CONFIG.SYS file with lines that begin DEVICE=.

game port. Game ports are for joysticks, and joysticks are most beneficial when used with arcade games. The game port may allow the use of one or more joysticks. Some cards come equipped with a game port. Most game ports are the 15-pin variety.

LPT. Line PrinTer. This DOS device name specifies which port is used to connect a parallel printer to the computer. As many as three line printers can be installed on one system: LPT1, LPT2, and LPT3.

modem. MOdulator-DEModulator. A modem converts digital data to signals that can be transferred over audio transmission lines, most commonly phone lines. There are two types of modems, internal and external. An external modem must be connected to a serial port. An internal modem is a serial port and a modem combined.

mouse. A mouse is an input device that supplements the keyboard and was first used as a pointer in CAD, paint programs, and other graphics applications. The mouse's power and flexibility soon warranted its use in other environments such as database, spreadsheet, telecommunications, and desktop publishing. Most mice can be programmed for use with nonmouse applications.

NUL. Null. This is a DOS device used to hide output that usually appears on the screen. It can also be used with the CTTY command to hide all stan-

dard screen output during the execution of a batch file.

parallel port. Parallel ports allow your computer to connect to devices such as printers that use parallel interfacing. Usually, parallel ports send information from the computer to an attached device but don't receive information. A system with one parallel port recognizes the port as LPT1. Information is processed over eight wires, and each signal arrives at the printer at the same time (that is, in parallel).

PRN. Printer. This is another DOS device name used to refer to the printer connection. PRN can usually be used interchangeably with LPT.

RS-232. In 1969, the EIA (Electronic Industries Association) established a standard of communications between computers known as RS-232. Under this standard, an interface can have up to 25 wires connecting two devices. Most of the pins or wires have been assigned a function by the EIA standard. RS-232 is a serial standard, which means data bits are sent one after another. Devices that are connected with an RS-232 cable include external modems, mice, and serial printers.

serial port. A serial port lets you connect devices that communicate via a serial interface. Printers using an RS-232 cable are one example. Other serial devices include modems, mice, and optical character readers. Unlike parallel ports, serial ports normally send and receive information. One signal at a time is sent through the serial port, and the information is reassembled on the receiving end. □

WHERE TO FIND MORE JARGON

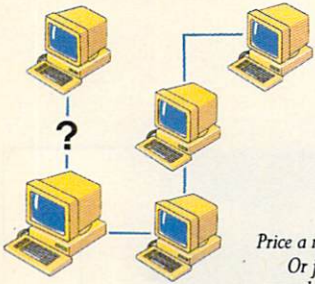
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Computer Dictionary
JoAnne Woodcock and others
Microsoft Press
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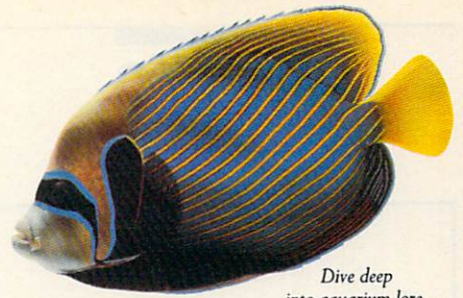
Computer Glossary
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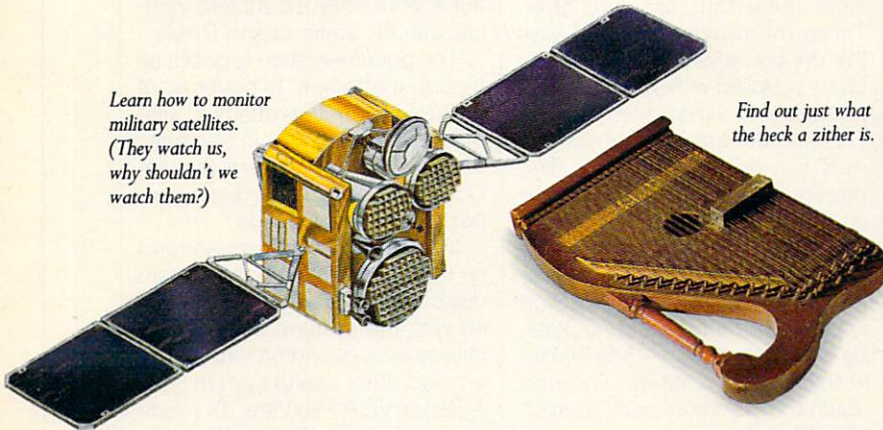
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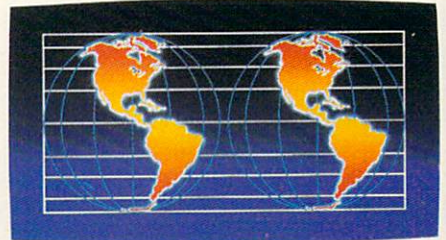


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TEST LAB

It seems like only yesterday that computer mavens were oohing and aahing over the wonders of the IBM PC and computerizing their bookkeeping as easy as 1-2-3. Now we have more power, speed, and applications on the desktop than we could've imagined, and the original IBM PC crawls compared to today's speed demons. (Remember waiting for the old 4.77-MHz IBM PCs to boot?)

Now the question isn't really whether you can afford a power desktop computer; it's how much power you need and how you want it configured.

This month's Test Lab looks at 11 desktop computers—some of them 386SX systems running at 20 MHz, the rest 486DX machines humming along at 33 MHz. Why these two groups? Because 20-MHz 386SXs and 33-MHz 486DXs are, respectively, the new entry-level and state-of-the-art systems.

While everyone would prefer to buy the bigger, faster, more powerful systems, your pocketbook and needs will dictate the choice of a desktop. This month's Test Lab gives you reviews, benchmarks, and other relevant information to help you understand the technology and make an informed decision.

ALR POWERFLEX 20SX

It's a fact of life: Advances in new computer technology go hand in hand with obsolescence of the old. How do you combat computer obsolescence? ALR has taken a unique approach by creating a modular PC, and the ALR PowerFlex 20SX is a good example of this modular approach.

With a footprint of only 14¾ inches wide by 16½ inches deep by 6¼ inches high, the PowerFlex 20SX offers lots of expansion room in this baby-AT case. A single 3½-inch high-den-

ADVANCED LOGIC RESEARCH
9401 Jeronimo
Irvine, CA 92718
(714) 581-6770
List Price: From \$1,195*
Warranty: one year, parts and labor

sity floppy drive is mounted vertically at the right side of the machine next to two vacant half-height bays which can be used for additional drives. An 82MB thin-line IDE hard drive is also mounted vertically, next to the power supply at the rear of the chassis; it's hidden from view when the system cover is in place.

The system includes five 16-bit expansion slots and one 8-bit slot, but since the VGA video card occupies one of the 16-bit slots, only four are available. Three megabytes of RAM was the configuration the review unit came supplied with, and this is expandable to a maximum of 5MB. The memory arrangement on the ALR PowerFlex is unique: The base memory of the motherboard is 1MB, which is composed of eight 256K × 4 DRAM chips. The additional 2MB of RAM comes in the form of 1MB SIMMs installed in two of the four SIMM sockets. By adding two more 1MB SIMMs in the vacant sockets, you can reach the maximum configuration of 5MB.

The intermixing of DRAMs and SIMMs is certainly an unconventional method of configuring RAM, but there is an explanation for it. The PowerFlex motherboard is, in reality, a 286 motherboard, which accounts for the DRAM memory configuration. When the CPU is upgraded to a 386 in the computer's modular architecture, the SIMM sockets provide a convenient, economical, and space-saving means of adding additional RAM to the base 1MB.

Upgrading this 286-based system involves using a slot called the 386/i486 Feature Connector. The various configurations possi-



ble through CPU module upgrades are the SX PowerFlex (386SX/16MHz), the PowerFlex 20SX (the model reviewed here), the PowerFlex 20CSX (the 20SX with an additional 32K static cache RAM), and the PowerFlex 486ASX (a 486ASX/20MHz module with 8K static cache RAM).

The documentation is good, although it attempts to cover all of the various configurations available for the PowerFlex in one main document. An Auxiliary System Configuration Guide covers your particular configuration.

MS-DOS 5.0 comes preloaded on the hard drive, and the system disks and manuals are also packed with the system, as well as a utilities disk providing video drivers and other useful system files. A Super VGA FlexView 2X monitor, which came as part of the ensemble, provided comfortable viewing with good color saturation and image resolution.

While this modular approach may make good sense from an economic and manufacturing point of view, the PowerFlex 20SX's performance was considerably less than spectacular.

TOM BENFORD

Circle Reader Service Number 301

*Prices for this computer system and the others vary according to the configuration/options chosen. Contact the manufacturer for further information. Street prices are generally lower than the list price.



COMPAQ 386S/20N

The COMPAQ 386s/20N is a tiny desktop computer that packs a lot of power.

Like many computers on the market today, the COMPAQ has an all-in-one motherboard; the disk controller and other cards that would otherwise take up slots and add to the demands on the power supply are built into the motherboard of this COMPAQ. Consequently, COMPAQ can pack more computer components into a small area, and you can save on desk space. This model has one serial port, one parallel port, and one VGA video port. If you find that your CAD programs or large spreadsheets begin running a little slow, this computer supports an 80387 math coprocessor, which should help speed things up a little bit.

The 386s/20N comes with 2MB of RAM and can take up to 8MB using SIMMs (Single In-line Memory Modules); just about any novice should be able to expand the memory.

The case is very small—probably the smallest case I've ever seen for a desktop model. With only two expansion slots and one of them used by the modem shipped with this computer, you're left with only one open slot. These 16-bit slots should be able to handle just about any

COMPAQ
20555 F.M. 149
Houston, TX 77070
(713) 370-0670
List Price: \$2,348 configured as reviewed
Warranty: one year

card, but the system is clearly intended for someone with limited expansion needs. The 386s/20N comes with two drive bays, one housing a high-density 3½-inch drive and the other housing a 60MB IDE drive. There are no extra drive bays. Although small, the power supply appears to offer all that this machine needs.

The video control adapter is capable of providing 256 colors in 640 × 480 mode, which is pretty much standard these days. COMPAQ includes a TSR program, *ADAPT*, that allows you to change a variety of video attributes from contrast to cursor size, all with the touch of a couple of keys.

The COMPAQ Video Graphics Color (VGC) monitor that came with this review system offers graphics resolution of up to 640 × 480 pixels and is capable of displaying up to 256 colors. It also

offers a VGA-compatible text resolution of 720 × 400 pixels. On the front you'll find conveniently located controls, one for contrast and the other for brightness. While this review system came with a VGA monitor, I recommend a Super VGA monitor to take full advantage of the video controller's capabilities.

The basic 2400-baud modem that comes with this computer seems to be compatible with most communications software. I checked the computer with *Procomm* and *Aladdin*, for example, and the modem worked fine.

The keyboard feels heavy-duty; the keypress is somewhere between a soft touch and a click. With a complement of 101 keys, this standard keyboard should meet the needs of most users.

If your computer needs are modest and you feel more comfortable buying from a well-known manufacturer with a reputation for quality, this COMPAQ could be an excellent choice. And if you're interested in a workstation for your company network, the 386s/20N is, again, an excellent candidate.

PEER PLAUT

Circle Reader Service Number 302

386/486 TEST METHODOLOGY

To test this month's systems, the lab used COMPUTE's own benchmark program.

Our database test times how long it takes to sort a 1000-record database. The word processor test uses a 40-page text document and times how long it takes to search and replace text that occurs 691 times throughout the document.

The spreadsheet test times the elapsed time for calculating an amortization table that yields the interest and principal amounts on a monthly basis over a 1500-month term using an eight-digit (two decimal places) principal and a four-digit (two decimal places) interest rate.

The graphics test times the load of a complex color graphic incorporating thousands of gradient dithered

color "washes" within outlined forms. Since the gradients must be calculated on the fly, this test is particularly indicative of the system's floating-point calculation capabilities. The *Windows* tests time how long it takes to load a *Windows* application and a *Windows*-based paint application graphic from within *Windows*.

To guarantee accuracy and fairness to all systems tested, we ran each test three times, totally shutting down and rebooting each system in between each test pass to ensure that any on-board caching would not affect the results. We averaged the results of the three test passes and used the averaged figures for our reports.

—TOM BENFORD, PRESIDENT
 COMPUTER PRODUCT TESTING SERVICES

TEST LAB

CUMULUS GLC 486DX/33

I'm partial to products manufactured right here in the good old U.S.A.—provided they measure up to their foreign-manufactured counterparts in quality and price. I'm delighted to report that the Cumulus GLC 486DX/33 not only measured up to but even surpassed my somewhat jaded expectations!

Upon unpacking the box containing the CPU, I found a small American flag and a certificate which bore the signatures of the Cumulus personnel responsible for assembling, testing, performing quality assurance checks, and packing the system. The signed certificate proclaimed that the GLC was "proudly designed, built, and tested in the U.S.A." So we were off to a good start, and the deeper I dug into the box, the better it got.

The GLC's low-profile CPU cabinet (less than 4½ inches tall) looks small but offers a surprising amount of expansion space thanks to excellent integration of the system board and essential I/O components. Four 16-bit expansion slots (two full-length and two ¾-length) accommodate your peripheral boards. How

CUMULUS COMPUTER
23500 Mercantile Rd.
Cleveland, OH 44122
(216) 464-2211

List Price: \$4,350 configured as reviewed (including the following options: 256K cache—\$400, 5¼-inch floppy drive—\$100, .28 color VGA monitor—\$425)
Warranty: one year, limited

does Cumulus do it? A vertical backplane connector accepts expansion boards on both the left and the right sides of the backplane—two rows of slots—a most efficient and well-engineered arrangement that maximizes all available space within the cabinet.

MS-DOS 5.0 and *Windows 3.0* are both supplied with the system, along with a Logitech two-button serial mouse. To handle input and output chores, the GLC comes equipped with a single parallel port and dual serial ports in addition to a 512K VGA video card. An excellent 101-key keyboard with a light but firm touch comes as standard equipment with the Cumulus GLC 486DX/33. The keyboard features audible key click; 12 function keys; and illuminated Num, Caps, and



Scroll lock indicators.

Both 5¼-inch 1.2MB and 3½-inch 1.44MB floppy drives are built into the unit, with an 84MB IDE hard drive handling the mass-storage requirements. No additional bays are available to accept additional drives, although a secondary 3½-inch hard drive could conceivably be mounted within the cabinet.

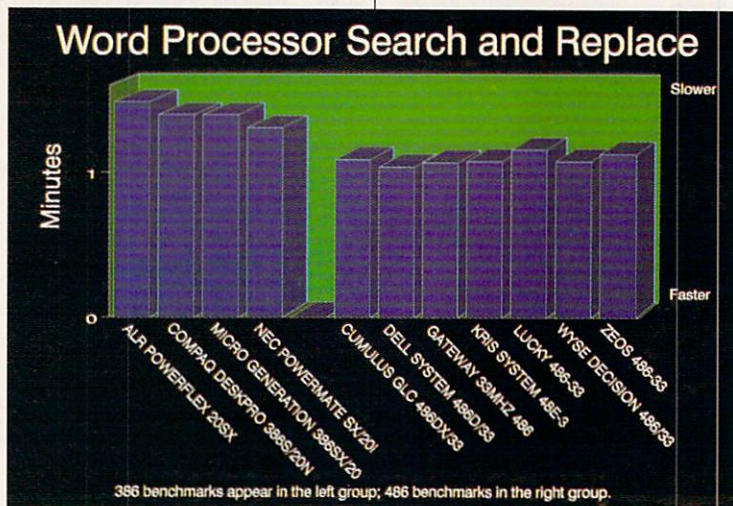
The performance of the GLC is truly excellent, as evidenced by a Norton computing index rating of 72. The Intel 80486DX CPU is responsible for this blazing speed, and the chip's integrated math coprocessor handles even the most demanding number-crunching or CAD applications without a whimper. With 4MB of RAM, the GLC is armed and ready to do battle with the best of them.

An optional VGA monitor with .28-mm dot pitch was supplied with the system, and it was a pleasure to use. Colors were rich and vibrant, the screen's resolution was tight, and there was no color bleed—eye fatigue is not a problem with the Cumulus monitor.

I found everything about the Cumulus GLC to be excellent; the quality and care show through in every detail. The manuals supplied with the computer exemplify this in their organization and thoroughness. If you're thinking of moving up to a 486 machine, the Cumulus GLC is definitely worth your serious consideration.

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TEST LAB



DELL SYSTEM 486D/33

Dell has a sterling reputation for producing high-performance, high-quality, dependable personal computers, and the Dell 486D/33 is a prime example of why Dell has this reputation.

The 486D/33 uses a baby-AT case, measuring 6 inches tall by 16 inches deep by 16 inches wide. The excellent design and layout of the machine still provide plenty of room for expansion in this small-footprint case, however. Dell uses the 3½-inch drive as A and the 5¼-inch drive as B, which is not the usual drive arrangement. A quick (14-ms average seek time) 82MB IDE hard drive is mounted internally in the Dell adjacent to the power supply.

The review unit came equipped with DOS 5.0 already installed on the hard drive; the Microsoft manual and a rich assortment of excellent documentation also came packed with the system unit. Rather than packing the floppy disks containing DOS 5.0 with the system, however, Dell included a utility called *Dell Diskette Librarian* on the hard drive. It facilitates making the three 3½-inch 720K backup disks for the DOS system and utility files.

The standard configuration is

DELL COMPUTER
9505 Arboretum Blvd.
Austin, TX 78759-7299
(800) 289-3355
(512) 338-4400
List Price: \$4,187.95 configured as reviewed
Warranty: one year, parts and labor; 30 days, money back; one year of free on-site service

4MB of RAM, expandable to 64MB via four SIMM sockets on the motherboard. Dell offers real innovation in memory expansion, since only four SIMM sockets are provided but 1MB, 4MB, or 16MB SIMMs can be used in any combination to provide configurations of 4, 5, 6, 8, 9, 10, 12, 16, 17, 18, 20, 24, 32, 33, 34, 36, 40, 48, or 64 megabytes.

The heart of the Dell 486D/33 is the Intel i486DX CPU, which zips along at 33 megahertz and tallies a Norton computing index rating of 71.2. The i486 has its own internal math coprocessor, which really speeds up number-crunching and other math-intensive applications like CAD. Dell doesn't provide a socket for a Weitek 4167

math processor, but since this chip is usually used only to speed up intensive floating-point calculations, it won't be missed by the vast majority of users.

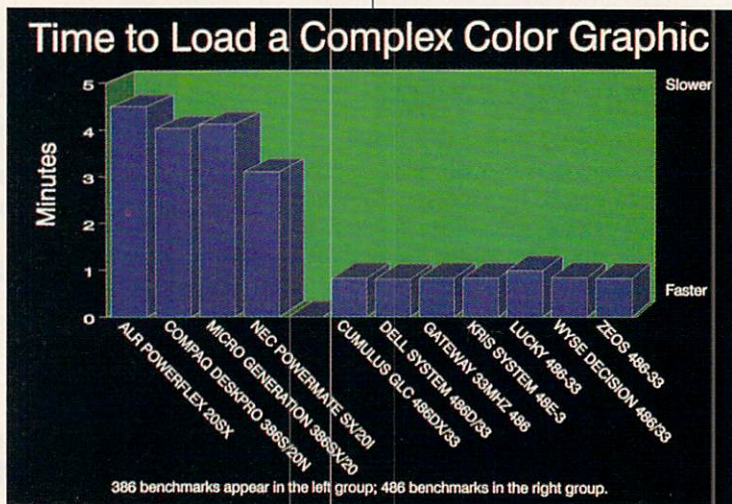
A Dell 14-inch UltraScan Super VGA monitor came with the PC, and its crisp, well-defined images and colors make it one of the nicest VGA monitors supplied for review here.

Dell offers probably the best and most complete documentation I've encountered with any PC system. Exceptionally well-written and thorough, it also provides an index that gets you to the exact section you need in a minimum amount of time. In addition to the main User's Guide, the other supplied documents include a Diagnostics and Troubleshooting Guide, a Getting Started booklet, a booklet on the hard disk, and booklets entitled Documentation Update, Dell-Installed Software User's Guide, and Software Support Utilities. While these documents provide invaluable technical information, they are accessible and unintimidating—written in language that even a novice user will find understandable.

Quality, clarity, and support make the Dell 486D/33 a real contender. I give it my highest rating.

TOM BENFORD

Circle Reader Service Number 304

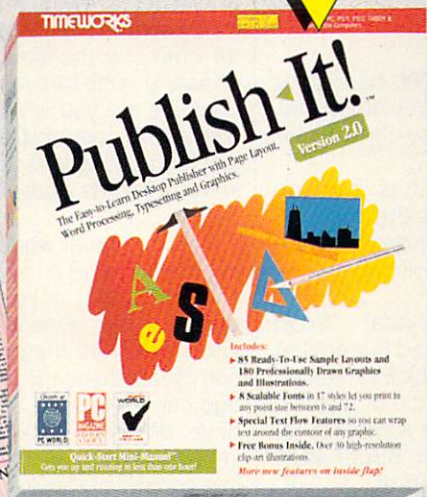


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GATEWAY 33MHZ 486

With a 200MB hard drive, 8MB of RAM, and a Super VGA monitor, the Gateway 33MHz 486 is a powerhouse. Better still, it offers you plenty of room to grow.

The review unit from Gateway came with a Micronics motherboard and a Phoenix BIOS. I've never run into any compatibility problems with Micronics motherboards, and the five available 16-bit expansion slots (out of seven) should be more than adequate for the expansion needs of most users. Although floating-point math calculation capabilities are built right into the 486 processor, there's a slot available for a Weitek math coprocessor if your number-crunching needs are truly enormous and you decide to get one later. Most users will never need that option.

Looking for lots of memory? You can expand the computer's standard 8MB of RAM up to 32MB on the system board—even more with a 32-bit memory expansion slot.

The huge case on the Gateway 486 reminds me of the old full-size cases of yesteryear. Three of its bays are exposed, allowing for two floppy drives and one other drive requiring front access. This Gateway sports a

200MB Piranha 4200 hard drive manufactured by Western Digital. Though a little noisy, this drive is plenty fast.

The keyboard has function keys both across the top and down the left-hand side of the keyboard, and it offers other programmable functions.

Gateway's Crystal Scan 1024NI noninterlaced Super VGA monitor provides quick screen refreshes with very little or no flicker, and this monitor compares favorably with other Super VGA monitors I've looked at.

The video card that comes with the Gateway 486 is a SpeedStar with a Tseng Labs video controller. The one meg of RAM on

the video card allows you to throw 256 colors at one time up on the screen with no problems in Super VGA mode.

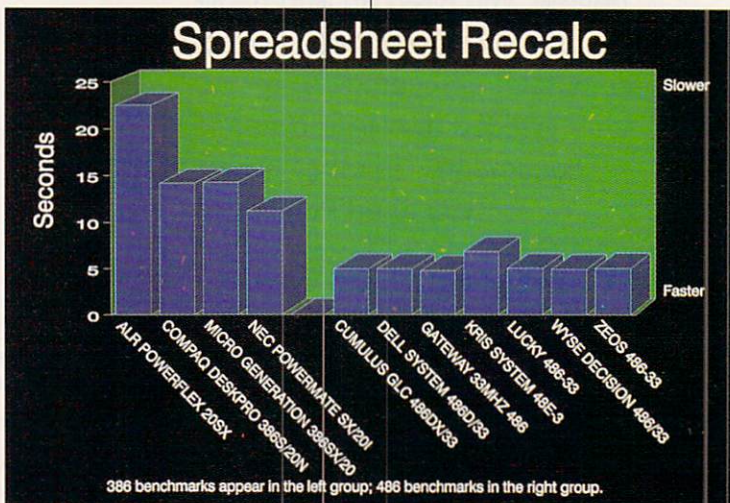
One thing many people seem to overlook when they buy computers is serviceability. With this computer, if any one component goes, you can easily replace the part yourself, or your local service center can replace the part for you.

The Gateway 486 comes with Microsoft Windows 3.0 and MS-DOS 5.0—enough to get you up and running. While that's not as much software as other packages offer, by the time you purchase a 486-based machine, chances are you're experienced with computers and either have just the applications you need or know precisely what you'd like to buy.

This computer would make an excellent choice as a network file server. Another good use would be as a stand-alone in a CAD environment. With the power of the 486 Micronics board and the storage capacity of the 200MB hard drive, drawings should come up in no time. With all it has to offer, this computer should please any power-hungry user looking for a high-performance system.

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TEST LAB

KRIS SYSTEM 48E-3

If you like powerful PCs with plenty of room for adding drives and peripheral cards, then you're bound to love the KRIS SYSTEM 48E-3 provided for this review.

This KRIS system gives you EISA (Extended Industry Standard Architecture) rather than ISA (Industry Standard Architecture). The full 32-bit EISA bus can accommodate standard 8-bit and 16-bit peripheral cards as well as dedicated 32-bit EISA cards. EISA is the hardware platform of tomorrow that is fast becoming a favorite today, since it offers much faster bus-processing speeds and expansion significantly beyond what is possible with ISA motherboards.

The motherboard occupies about two-thirds of the large tower case, largely because of the dozens of discrete components (mostly chips) used for various computing functions. In this respect, the KRIS board differs significantly from many VLSI (Very

KRIS TECHNOLOGIES
260 E. Grand Ave.
S. San Francisco, CA 94080
(800) 282-5747

List Price: \$5,039

Warranty: two years, parts; 18 months, labor/service; on-site service optionally available from Dow Jones

Large Scale Integration) motherboards offered in other 486s (and 386s, for that matter) today.

KRIS builds its computer to customer specifications, which explains why standard documentation manuals are not supplied with the unit. Instead, a system-board manual is supplied, along with another dedicated manual for the VGA video board and separate data sheets for other component assemblies (disk drives, I/O cards, and so forth).

MS-DOS 5.0 came already installed on the 150MB full-height drive in the KRIS tower case. I



was quite surprised to see a full-height drive on a machine like this, since I fully expected to see a half-height (or even a thin-line) IDE drive. Unfortunately, this drive slowed down the overall performance of the system considerably; while its average seek time was 15.42 milliseconds, its data transfer rate was only 490.4 kilobytes per second. The Norton computing index for the KRIS pegged it at a very respectable 70.5, but the slow speed of the

RAM CACHES EXPLAINED

The RAM cache is an extremely useful feature in today's 386- and 486-based PCs that, unfortunately, is frequently misunderstood.

A cache is a section of memory separate from the main system memory. It works by intercepting repetitive tasks and data and holding them for immediate access when needed. As your computer processes information, going to the cache is much faster than going to the disk. So in addition to reducing the amount of hard drive access required to fetch this data, the cache greatly increases a system's overall information-processing speed.

Many vendors offer external caches on their higher-end 386 models, and cache sizes typically range from 32K up to 256K. Separate memory chips (usually DRAMs) are required for populating the cache sockets, and the cost per kilobyte of RAM with these can be rather expensive compared to the cost of SIMMs (Single In-Line Memory modules).

The 486 systems have a giant head start over 386 systems, since there's a built-in 8K RAM cache integrated right into the i486 CPU itself and almost every 486 system provides sockets for additional external caching as well. While the 8K cache doesn't sound tremendous, in reality the i486's built-in 8K cache has the same power and capacity as a 32K external cache. The reason is that Intel's i486 chip uses four-way set-associative architecture.

Here's how the chip architecture works. Typical 32K external caches are usually two-way set-associative, which means that they do comparative data associations (comparing the data stored in RAM with that currently being requested by the user or program at that instant) using bidirectional processes, as opposed to the i486's quad-process method. In practical terms this means that the i486 can find and use RAM-cached data faster and more efficiently—on a consistent basis—than external

caches, which are often hit-or-miss.

The cache size you need depends on such factors as how much money you can spend on the system and additional DRAM chips to expand the cache, what types of applications you normally use, and how much of your computing involves accessing the same information over and over. Generally, 32K is a practical size for most users, since the vast majority (about 90 percent) of the data in use at any given time will remain in the cache until summoned by the user or program.

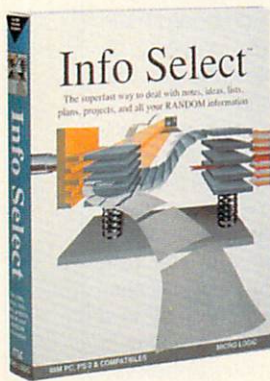
Performance increases over a 32K cache with larger caches (64K, 128K, or 256K) are generally imperceptible except when you're using the most demanding applications. Even then, you'll have to carefully consider whether the slight performance gains offered by larger caches will offset the extra expense involved in purchasing additional RAM chips.

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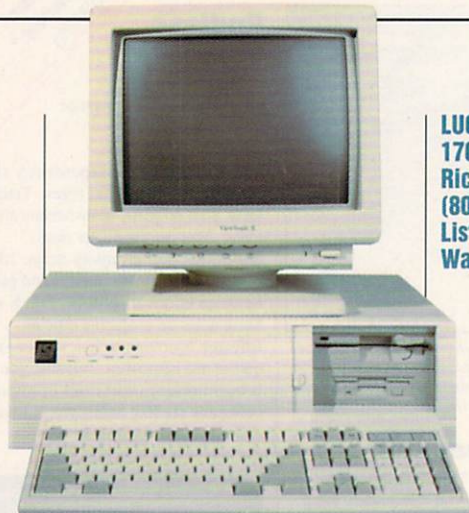


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drive resulted in a somewhat lack-luster Norton overall performance index of only 48.6.

With a machine this fast, you sometimes need to slow down to run certain applications. An illuminated LED panel on the front of the KRIS system shows whether you're running at the normal 33 MHz or the slower 25 MHz.

A 1MB VGA video card in the review machine was connected to a 14-inch Super VGA monitor. I found the display bright and easy to view for extended periods; the colors were rich and vibrant, and the screen's resolution was quite good.

A single parallel port and dual serial ports are provided for the I/O functions, and again the KRIS Tower surprised me. I expected to find 9-pin serial ports (the usual configuration used on 286 and higher machines), but instead I found the older 25-pin D connectors for the serial ports. This necessitated using a 25-pin to 9-pin adapter to connect my trusty Microsoft mouse for use during the review.

The KRIS SYSTEM 48E-3 has a lot going for it, especially its Extended Industry Standard Architecture. It would certainly provide a good starting point for anyone looking for a machine that won't be obsolete for many years to come and that offers plenty of room for future expansion.

TOM BENFORD

Circle Reader Service Number 306

LUCKY 486/33

The Lucky 486-33 has a rather large AT-style case (21 inches wide x 16¾ inches deep x 6½ inches high) with plenty of room for drives and other peripherals.

The review unit was outfitted with both 3½-inch and 5¼-inch high-density floppy drives as well as a 122MB IDE hard drive. An additional half-height drive bay is accessible from the front of the machine, and another half-height drive bay is available inside the system for mounting an additional hard drive. The five-bay configuration is the accepted standard format for full-size AT-style cases like this one.

There are eight 16-bit expansion slots built into the motherboard, but only six of these slots are vacant, since the I/O board and video board occupy two of them. Four of the six available can handle full-length cards, while the other two can accommodate only half-length cards.

A 1MB Super VGA card provides plenty of video power for the ViewSonic 6 Super VGA color monitor supplied with the system, and color rendition is excellent. Video resolution on the .28-mm dot pitch display is crisp with no ghosting or image lag.

You can expand RAM to a maximum of 16MB using 1MB SIMMs or up to 64MB using 4MB SIMMs in the motherboard's 16SIMM sockets. A socket is also provided for

a Weitek floating-point math coprocessor on the motherboard, but the i486 CPU's on-board math coprocessor should prove to be more than adequate in the vast majority of applications.

MS-DOS 5.0 came already loaded on this review system's 124MB Maxtor IDE hard drive, which posted an average seek time of 15.21 milliseconds but a disappointing data transfer rate of only 321.6 kilobytes per second. While the system itself is a very fast performer (clocking in with a Norton computing index value of 71.2), the drive brought the Norton overall performance index down to 48.9; a faster drive would undoubtedly improve the overall performance, especially with disk-intensive applications.

The only real weak spot in this Lucky package is documentation. Individual manuals were supplied for the Micronics 486 motherboard, the IDE-BUS Multi I/O card, the Micro Labs Ultimate VGA card, and the monitor itself. Lucky's generic user manual, Getting Started with Your LSI Computer, provides very general information which could apply to virtually any PC rather than specifically to the Lucky 486-33. While the dedicated manuals are excellent in providing very technical information about the specific components they apply to, they probably won't be too helpful to novice users.

On the plus side, the Lucky seems to be a well-built unit which should give you many years of trouble-free service while providing plenty of room for expansion as your needs grow.

TOM BENFORD

Circle Reader Service Number 307

For further information about this month's Test Lab, see the COMPUTE area on GENIE and America Online. In addition to regular Test Lab information, you'll find our HDBENCH.EXE, proprietary benchmark software developed especially for the Test Lab.



KICK BACK

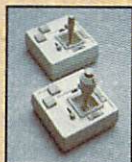
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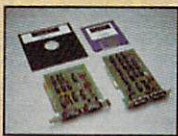
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Circle Reader Service Number 207

TEST LAB

MICRO GENERATION 386SX/20

Micro Generation's parent company, Continental Technology, is a leading supplier of computer components. With experience and a wealth of component brands to choose from, it's in a good position to put together high-quality systems. The Micro Generation 386SX/20 is a good case in point.

A minitower case measuring 7¾ inches wide by 16 inches tall by 16 inches deep houses the review system. It's about the same size as a baby-AT case turned on its side.

The review unit came configured with 5¼-inch and 3½-inch high-density drives, an 84MB IDE hard drive, and a Super VGA card with 256K on board (expandable to 1MB). A DigiView HR-1428 high-resolution Super VGA monitor with .28-mm dot pitch was also provided, along with a Z-Nix two-button serial mouse, MS-DOS 5.0, and *Windows* 3.0.

The minitower case provides lots of room for expansion with two half-height 5¼-inch drive bays and a 3½-inch drive bay available. Of the six bus slots, four 16-bit expansion slots were vacant, and the multi-I/O and video cards occupied the other

MICRO GENERATION
300 McGaw Dr.
Edison, NJ 08837
(800) 872-2841
List Price: \$1,425
Warranty: one year,
parts and labor; 30
days, money back;
one year, on-site
service by TRW

two. Dual serial ports, a parallel port, and a game port round out the I/O connectors.

The Micro Generation system turned in consistently good times for all the test applications. The CPU earned a 14 on the Norton computing index while the 84MB Western Digital IDE hard disk really flew along. This drive was a real surprise with an average seek time of 12.55 milliseconds and a data transfer rate of 642 kilobytes per second. The combination of fast CPU, 4MB of RAM, and this superquick drive makes it perform more like a 25-MHz DX machine than an SX/20. If you need—or want—more computing power, you can expand the RAM up to a maximum of 16MB directly on the motherboard using 256K, 1MB, or 4MB SIMMs.

Because each system is built



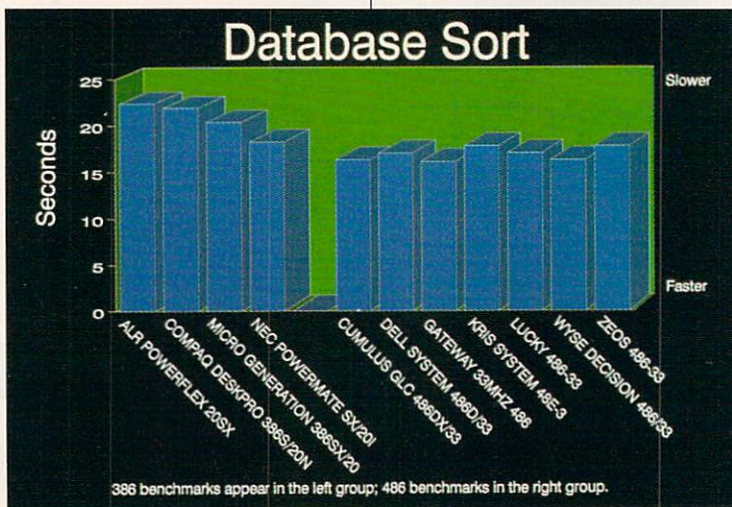
to customer specs from various components, no standardized user's manual comes with the Micro Generation systems; instead, the dedicated manuals (or booklets) for the various components are provided. While this isn't the best way to supply documentation (especially for novice users), the information contained in these documents is generally complete.

The minitower case features an illuminated display on its front panel with a dual-digit LED display of the CPU speed (20MHz/10MHz), which you can select either via the keyboard or by depressing the Turbo button located just below the display. Also included on this display panel are lights signifying power-on and turbo-on status. A smoked plastic pull-down dust cover protects the drive compartments when they aren't in use.

If you're looking for a 20-MHz 386 desktop computer that has everything you need for today and gives you room to grow for tomorrow, investigate this system from Micro Generation.

TOM BENFORD

Circle Reader Service Number 308



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.

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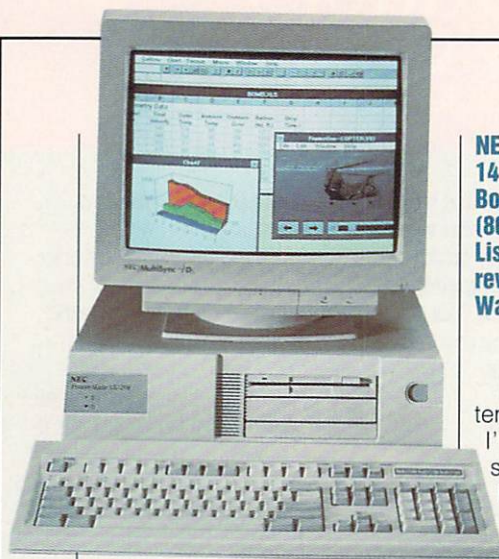
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TEST LAB



NEC POWERMATE SX/20i

There are plenty of 20-MHz 386SX desktops on the market, but this one gives you quality components and a graphics coprocessor for speedier graphics.

The NEC PowerMate SX/20i comes with a Phoenix BIOS, Tseng Labs video controller, and Western Digital chip set. To meet your expansion needs, it also comes with four 16-bit expansion slots and an 80387 math coprocessor socket. The standard 4MB RAM (expandable to 26MB) and 65MB hard disk should be adequate for most users. If the system's one 3½-inch floppy drive isn't enough, there are two more drive bays where you could add another floppy drive, a tape backup system, or a CD-ROM drive.

The PowerMate's plastic case makes for a very light computer. That's a nice change from those huge steel cases that used to surround the old 8088s. There's plenty of room for the computer to breathe, and the fan located on the back of the computer is larger than usual, which should keep it cool. Opening the case is as simple as turning one knob and popping the top. Being able to get into the computer this easily should allow you to upgrade quickly and without many tools.

NEC TECHNOLOGIES
1414 Massachusetts Ave.
Boxborough, MA 01719-2298
(800) 388-8888
List Price: \$2,049 configured as reviewed
Warranty: one year, parts and labor

NEC sent me this review system with the new MultiSync 4FG. I've never seen a monitor as sharp or as bright as this one. It's a real treat.

With one meg of RAM, the Tseng video controller can show 256 colors in 1024 x 768. Tseng Labs is fast becoming one of the leaders in state-of-the-art video controllers, and this controller proves it. There's no fading or distortion of colors when you push this controller to its limits.

Today's graphics-intensive applications look great but can slow your system considerably. To speed things along, NEC has developed Image Video Technology. A bus built into the video controller allows the video processor to operate at the same speed as the CPU, 20 MHz, rather than the

standard 8 MHz of most cards. As a result, you can operate in Super VGA mode and display 256 colors without sacrificing performance. At the same time, since this new technology takes some of the heat off the main processor, your whole system should operate faster.

With this system, you also get software—DOS 5.0, *Windows* 3.0, and *PFS: Windows Works*, which includes a word processor, spreadsheet, database, and more. Realize, however, that although you get the *Window Works* software, you do not get Spinnaker's printed documentation; for that, you must send in \$35.00. However, NEC does include its own brief documentation, and there is documentation built into the software itself. Whether you need to spend the extra money on Spinnaker's manual depends on how much experience you have with this kind of software.

This system is designed to be upgradable, allowing the CPU, cache, memory bus, and video all to be upgraded by simply swapping boards.

SPEED FACTORS

The microprocessor may be the "brains" of a computer, but it takes more than brains to move and manipulate information. That's why computers with identical microprocessors can turn in quite different performances. Lesson: It pays to understand how the parts of a computer affect overall performance.

A hard drive, for example, can affect performance in a dramatic way. Slow read/write access times can keep an otherwise speedy computer from working up to its full potential. That's why the industry offers all kinds of ways to keep the drive from slowing down the flow of information. For example, optimization software reorganizes disk information into contiguous areas so that the read/write heads don't waste time searching out the contents of a file, and disk caches hold the most frequently accessed information in memory

so that you avoid accessing the disk more often than is necessary.

RAM speed can also affect performance; that's why you often find the speed of the RAM listed among the system specs. Static RAM offers a faster cache than the more conventional DRAM. If you run *Windows*, you should find that extra RAM speeds your applications along.

A coprocessor can provide considerable speed gains in calculation-intensive applications by allowing the microprocessor to work on other tasks. One advantage of the 486DX is that this extra number-crunching capability is built right into the 486 chip.

The bottom line: Compare the benchmark performances, and think carefully about what applications you'll be using and how much speed you'll actually need.

—MIKE HUDNALL



For the person who uses graphics heavily, this could be the perfect system. The NEC PowerMate comes ready to go right out of the package. As is, this machine will make a wonderful stand-alone or an excellent station on a LAN.

PEER PLAUT

Circle Reader Service Number 309

WYSE DECISION 486/33

The Wyse Decision 486/33 is based on the Intel i486 CPU, which has an integrated math coprocessor. This muscular CPU, when coupled to other quality components, leaves little to be desired in computing performance.

The Decision has a standard desktop case approximately 17 inches wide by 16½ inches deep by 6 inches tall, so it doesn't take up an inordinate amount of space on your desktop. This case provides plenty of room for internal expansion options, and that's important for users who intend to add peripherals and accessories as needed in the future. With the video and I/O cards in place, there are still six full-length expansion slots available—four 16-bit and two 8-bit.

A socket for an optional Weitek 4167 floating-point math coprocessor is also provided on

WYSE TECHNOLOGY
3471 N. First Street
San Jose, CA 95134
(800) GET-WYSE
List Price: \$5,677

Warranty: one year, parts and labor; on-site service warranty available for \$99

the motherboard, although the built-in coprocessing power of the 486 should be plenty for most users.

The standard configuration for the system consists of 2MB RAM. It can be expanded to a maximum of 16MB directly on the motherboard using either 1MB or 4MB SIMMs. A 128K static RAM cache augments the internal 8K cache built into the i486 CPU, which operates at either 33-MHz or 8-MHz clock speeds.

The review unit came with a 210MB hard disk that performed admirably, yielding an average seek time of 16.5 milliseconds and a data transfer rate of over 700 kilobytes per second. This very fast hard drive perfectly complements the i486 chip, which is no slouch in the performance department—the Norton computing index for the Decision 486 is a blistering 72.1.

One 3½-inch 1.44MB floppy drive came with the Decision 486

I reviewed. There are two front-access half-height drive bays, so you can install an additional drive—floppy, hard, or CD-ROM.

MS-DOS 5.0 is the operating system supplied with the Wyse Decision 486, and the software was preinstalled on the hard disk as received. The complete DOS manuals and disks are also packed with the unit as well as a setup/test/utilities disk for changing system parameters and options.

The documentation provided with the Decision 486 is excellent in its scope and organization. A thorough index makes locating specific sections in the manual easy, and the text is written in an easy-to-understand style.

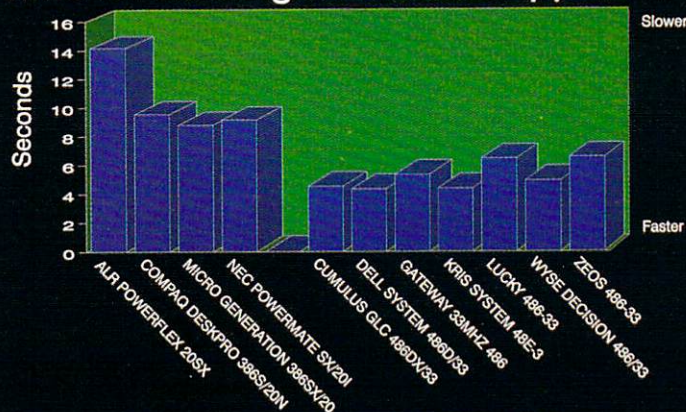
The 14-inch color monitor supplied with my review unit, the Wyse Model WY-670, offers crisp resolution and bright colors with no image lag or ghosting. Since the video card had only 512K RAM on it (it can be expanded to 1MB), it wasn't possible to run the video in Super VGA (1024 × 768) mode.

While there are some areas that could be improved or enhanced (like adding more video RAM and a second floppy drive), overall the Wyse Decision 486 is a well-constructed machine that provides excellent performance.

TOM BENFORD

Circle Reader Service Number 310

Time for Loading a Windows Application



386 benchmarks appear in the left group; 486 benchmarks in the right group.

TEST LAB

ZEOS 486-33

This ZEOS 486-33 really zooms. It packs enough power and expansion capability to meet the demands of just about any computer user, and you have the comfort of knowing it's a ZEOS.

With this 486 review system, I got 4MB of RAM, an 88MB hard drive, *Lotus 1-2-3 for Windows*, *Windows 3.0*, *DOS 5.0*, and *Ami Pro*. ZEOS offers a variety of options with its systems, so be sure to check with the manufacturer to see how you might configure your system.

Opening the case on this computer reveals a spacious interior with drive bays galore. This is the way I like to see a computer. There really isn't any way you could outgrow the case. This computer is expandable up to 32MB of RAM and offers seven expansion slots, one of which is a standard 8-bit slot.

The serial ports are built into the motherboard; I really prefer a separate I/O card for easier repairs in case of problems. In this particular system, however, the integration of the ports into the system board is not a problem—if one of the on-board ports fails, all you have to do is install a \$45 I/O card, and you still have six slots left. Although I haven't had a lot

ZEOS INTERNATIONAL

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List Price: \$1,795

Warranty: one year, parts and labor;
five years, keyboard; 365-days-
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of experience with Award BIOS, I would have to assume that if ZEOS is going to use it on a high-end system, it will work. There's no math coprocessor socket, but the 486 chip has its own coprocessor built right in. On the hottest of days, the centrally located power supply should keep this machine running cool, and its 300 watts should handle any and all devices you could install.

Having Super VGA and a SpeedSTAR VGA card really speeds up graphics-intensive software packages like *Windows* and the rest of the software packaged with the ZEOS 486-33 computer. This SpeedSTAR VGA board has a VGA controller manufactured by Tseng Labs, one of the leading VGA controller manufacturers, and you should find that it provides trouble-free operation with few, if any, software compatibility problems. With its 1MB of RAM, the adapter is capable of support-



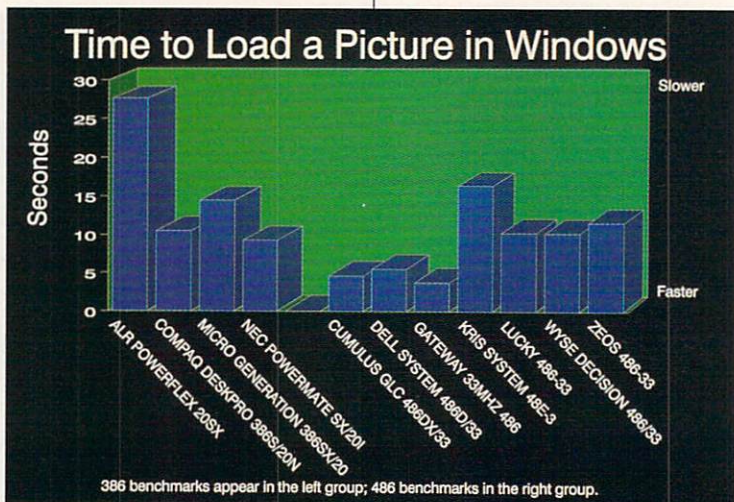
ing 256 colors in 1024 x 768 mode.

The monitor that came with this ZEOS 486-33 review system is a 14-inch noninterlaced Super VGA with a .28 dot pitch, which is fast becoming the standard in monitors today. If you spend much of your day staring at your computer screen and need to give your eyes a break, I recommend this dot pitch; it's easy on the eyes. As I pushed the monitor to the limit, there was nary a flicker. The controls of this CTX monitor are conveniently located on the front.

The ZEOS 486-33 appears to be a well-manufactured machine offering the best of everything to the purchaser who spends the few extra dollars to buy a quality machine. If you need a high-powered system backed by a quality company, take a close look at this computer. With its ease of serviceability and expansion capabilities, the power-hungry should not outgrow this machine for some time to come.

PEER PLAUT

Circle Reader Service Number 311



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For tickets and sponsorship information 617-426-2800 ext. 346.

Engraving
HK Graphics

NEWS & NOTES

Jill Champion

PC Couture

High fashion has finally trickled down to the world of personal computing. Now you can have your computer's coverings—including those of the monitor, mouse, and keyboard—tailored to your personal specifications. Advertising its products as "the cure for the common clone," Personal Enclosures of Phoenix, Arizona, says designer PCs, the ultimate in conspicuous consumption, are the wave of the future—so the company builds customized casings for computers and peripherals.

Whether you want a mahogany slimline, a dark maple desktop, or a stark white futuristic model, Personal Enclosures says it can customize casings to almost any specifications using a variety of materials and colors. For dealers, three predesigned models are currently available: Stealth Black, Natural Oak, and Southwestern Copper.

If the idea takes off, what's next? A Calvin Klein Obsession model for hackers burning the midnight oil? Or a Chanel line for those who use elegantly written software?

Designer PCs are the thing of the future—so says Personal Enclosures of Phoenix, Arizona, a company that builds customized casings for computers and peripherals.



PC users with discriminating tastes can contact Personal Enclosures at P.O. Box 44296, Phoenix, Arizona 85064; (602) 952-8983.

Collector Series Software

Deciding which computer to buy when there are so many choices is difficult enough for a lot of home PC users. Add to that the time and energy required to thoroughly research and decide upon software, and choosing a PC system becomes a major undertaking.

Leading Technology is hoping to lighten the task of choosing software by offering its customers packages of best-selling software bundled according to theme—children's educational software, for example—and with significant savings over what the programs would retail for individually.

Collector Series Software features six separate subtitles: *Pre-School Learning*, *Grammar School Learning*, *High School Learning*, *Entertainment*, *Personal Home Manager*, and *Business Manager*. Each package features six best-selling programs. For instance, the *Grammar School Learning* package includes *Super Spellicopter* and *Designasaurus II* from Britannica Software, *2nd Math* and *PCcrayon* from Stone & Associates, *The Spy's Adventures in North America* from Merit Software, and *Once upon a Time* from Compu-Teach.

Collector Series Software packages are available wherever Leading Technology computers are sold. For more information, contact Leading Technology, 10430 SW Fifth Street, Beaverton, Oregon 97005-3447; (800) 999-5323 or (503) 646-3424.

The Radio Shack House

With crime statistics soaring in even the sleepest all-American towns, home security is much on people's minds. And what better tool to keep your home secure than your PC? What's more, buying the necessary software is now as easy as visiting your local Radio Shack store.

Radio Shack has simplified home security with its *Automatic House Companion* software, which is designed for home PC users to set and control home lights, appliances, and security devices.

The software includes Radio Shack's Plug 'n Power computer interface, which works with individual Plug 'n Power remote modules, wireless devices like motion detectors, door sensors, window sensors, and appliance controls that physically carry out instructions from the software. *Automatic House Companion* can be programmed to control up to 128 separate timer events for up to 256 modules.

The program runs on any Tandy or DOS-compatible PC and requires *DeskMate* version 3.0 or higher. *DeskMate*, Tandy's graphical interface for PCs, guides the user through the three main functions of the *Automatic House Companion* software: Floor Plan, Routine Maker, and Schedule Manager.

Floor Plan allows you to create an onscreen floor plan of your house on which you position icons representing electrical devices in various rooms. Each icon and its corresponding remote module is assigned a combination letter and number code.

Routine Maker allows you to group together events you want to occur on a daily basis—for example, turning on the lights and the television set in the den before you arrive home from work in the eve-

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nings, along with the garage light and the front-door light.

Schedule Manager schedules days, times, and actions for individual devices or for routines set up with Routine Maker. Schedule Manager also features a security mode that varies on-off times by as much as 30 minutes—on a random basis—to make your home appear occupied at all times.

One very convenient feature of the Plug 'n Power interface is that once it has been programmed, you can detach it from your computer and op-

formed enterprise, called Cyberstudio, will have exclusive rights to develop and distribute software for Virtuality systems in the U.S. and Mexico.

And what better company to tackle such an endeavor than Spectrum HoloByte? It's the simulation software developer that continues to produce topnotch entertainment packages like *Falcon 3.0* and *Flight of the Intruder*.

Virtuality is actually more than an entertainment system. A better description would be a type of holodeck—

one step beyond the *Brainstorm* headsets that took Natalie Wood and Christopher Walken to the outer limits yet much less sophisticated than the holodeck seen on the *Enterprise* in the TV program "Star Trek: The Next Generation."

Still, Virtuality makes regular computer games look primitive by comparison. According to Spectrum HoloByte CEO Gilman Louie, "Virtuality represents a quantum leap in entertainment technology and should be considered the recreation vehicle of the 1990s and beyond. With this system, any world or fantasy can be created to totally immerse the user in an extraordinary sensual experience." Horizon president Andy Newman agrees, "Virtual reality is the ultimate entertainment adventure. Anything that can be imagined is possible. Once the Virtuality units are in place, videogame playing will never be the same."

If all this sounds pretty heady, it is. Equipped with special headsets, gloves, and joysticks, players either sit or

stand inside the Virtuality deck, where they're thrust into a 3-D computer-generated world that tricks the senses through stereoscopic depth vision, full-color visuals, quadraphonic sound, and 360-degree action. The experience is so real that, according to one player, "the line between reality and illusion is dissolved."

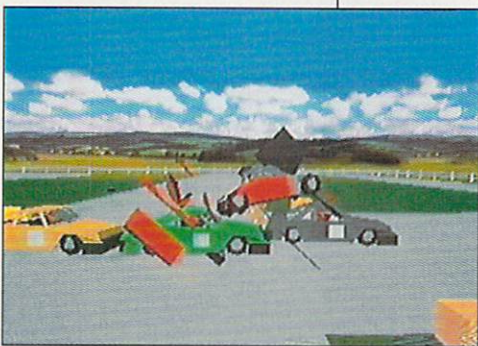
While Cybervision will first modify and enhance some current Virtuality titles, the company will develop original titles as well, the first of which should be ready by early 1993. Also, Spectrum HoloByte's entire Electronic Battlefield series will be converted to Virtuality, beginning with the *Falcon 3.0* flight simulator.

Virtuality systems were scheduled to begin appearing in malls last December. Game time costs a dollar per minute, with most games taking about three minutes to play. As the technology becomes more commonplace, the price will probably go down, but this is as close as most of us can get to true 3-D virtual reality today.

Since virtual reality is still in its infancy, you can expect to see some pretty fantastic upshots from this system once it's firmly grounded in the mall-arcade landscape. Expect to be able to star in your own interactive movie someday or to take a walk through time for a true history lesson. Talk about escapism!

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 inclusion. □

A virtual pileup—just one of the risks you'll face in the world inside Virtuality.



erate it independently, freeing your PC for other tasks.

The *Automatic House Companion* application software (which comes packaged with the Plug 'n Power computer interface) is available through Radio Shack's Consumer Mail Center for \$69.99. Plug 'n Power remote modules can also be purchased through the Center. You can order these and any other items available from the Consumer Mail Center through your local Radio Shack store.

Step into My Virtual Parlor

The folks at Spectrum HoloByte have entered into an agreement with W Industries of Leicester, England, and Horizon Entertainment of St. Louis, Missouri, to create software for W's Virtuality entertainment system. Horizon is the system's U.S. distributor. The newly

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Click on the chimney and it puffs out smoke.

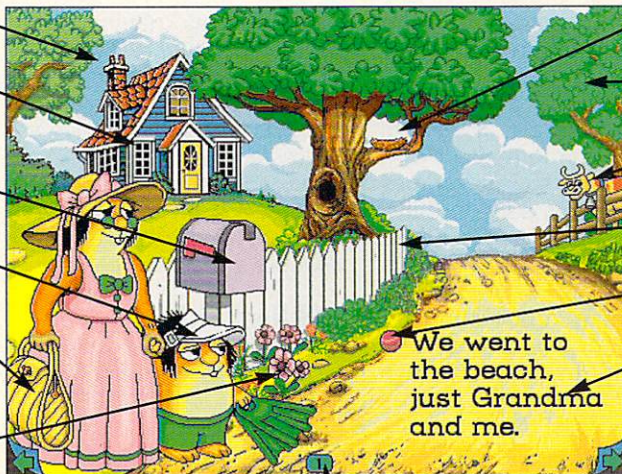
Click on this window and wake up Grandma's dog.

Click on the mailbox and see what comes out!

Click on Little Critter and he talks to Grandma.

Click on Grandma's magic purse and hear what's inside.

Click on this flower and a bee buzzes out to bug Little Critter.



Click on the nest and wake the baby bird.

Click on the tree and a bluebird flies down to scare the cow.

Click on the cow and it moos.

Click here and the fence comes alive.

Click on the ball and the sentence is read aloud.

Click on any word and hear it pronounced.

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Click on the page number to go back to the beginning.

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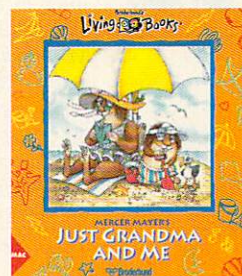
and music all combine to bring stories vibrantly to life. What's more, many *Living Books* will contain foreign language translations, as well as the English version.

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Mercer Mayer is the award-winning author and illustrator of more than 100 books, including the *Little Critter* and *Little Monster* series.



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See your local dealer or call 1-800-521-6263.

Brøderbund

Atex Redux

My wife works out of our home for a local newspaper. She would like to take on more work with them, taking information for ads in the paper.

We would like to be able to communicate with the system there via modem. We've been told by several sources within the company that this would not be possible. These same people can't tell us what an Atex is. They asked us to bring in our computer so they could use some of our data files. We don't have a modem currently and don't know what is involved in using one.

Could you enlighten us as to what an Atex is and whether it's possible to work from our home via modem?

PETER CACOPARDO
GERMANTOWN, MD

Atex is a hardware/software combination for professional typesetting. COMPUTE recently abandoned Atex in favor of a PC-based system, so we're all very familiar with Atex. Many of us worked from home via modem after hours or when inclement weather prevented us from getting to work.

Atex is based on a minicomputer, but it works with ASCII files just like your personal computer. All the paper would need to do is install a modem to let you communicate with Atex. A modem is a very useful thing for a paper to have. It allows reporters to file stories instantly from remote locations and freelancers to work from their homes.

Installing a modem and telecommunications software shouldn't cost you more than \$200 and could cost less than \$100. See your dealer.

The modem that attaches to Atex—and the software to support it—would come from

Atex Corporation, the company that makes and maintains Atex, and might cost considerably more. (Ours cost \$3,000 and required that a technician come to Greensboro to install it.)

Incidentally, if the paper is interested in purchasing some Atex terminals and other hardware, have them give us a call. We might be able to work out a good price.

Cold Hard Disk

When I first turn on my computer, I get a message that says HARD DISK FAILURE PRESS F1. When I press F1, nothing happens. If I leave the computer on for 15 minutes and then reboot, it will come up and work normally. When I turn it off long enough to cool down, it again requires a 15-minute warmup. The drive has been high- and low-level formatted since the problem started. It won't even boot from a floppy until it has warmed up.

CHARLES W. GRAHAM
HAMPTON, VA

The first recommendation would be to low-level format the drive on the theory that the tracks and the heads aren't in proper alignment until the disk has a chance to warm and expand slightly. Since you've already tried that and since your computer won't boot from a floppy, it's likely that one or more of your chips has begun to fail, either on the controller or on your motherboard.

If you have a friend with a similar drive, you might try swapping another controller board in to see whether that clears up the problem. If not, it would be a good idea to take the machine in to a competent repair facility.

Meanwhile, consider running the machine continuously. If you leave the machine

on and shut off the monitor, the computer uses very little power, and you'll always have access to it.

More Education

I liked your article about education via computer conferencing (September 1991) and plan to contact some of the listed organizations. I'm currently taking classes through the American Open University. I've also taken classes through the Electronic University Network (EUN) located in San Francisco. EUN is associated with a number of institutions throughout the U.S. including Edison College in New Jersey.

NEIL SERDINSKY
MILFORD, CT

Mystery Driver

I've heard of ANSI.SYS, but what's TANSI.SYS, which my system uses? Also, how do I copy disks on my 1.2MB high-density disk drive so my friends can read them on their 360K drives?

RAYMOND ROBIDOUX
CORNWALL, ON, CANADA

ANSI.SYS is a device driver that makes your screen behave in a standard manner so that programmers don't have to worry about inconsistencies in displays. This driver is named for the American National Standards Institute, which had a hand in developing this generic terminal-control language.

Device drivers such as TANSI.SYS or FANSI.SYS are enhancements that take ANSI.SYS a few steps further. These drivers, which often come with video hardware, do everything that ANSI.SYS does, plus they tap into the extended features of the hardware. For example, ANSI.SYS can handle text-mode displays of up to 80 characters per line. Some hardware, how-

Plugging into
Atex, waiting for
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learning online,
screening
scripts, and more

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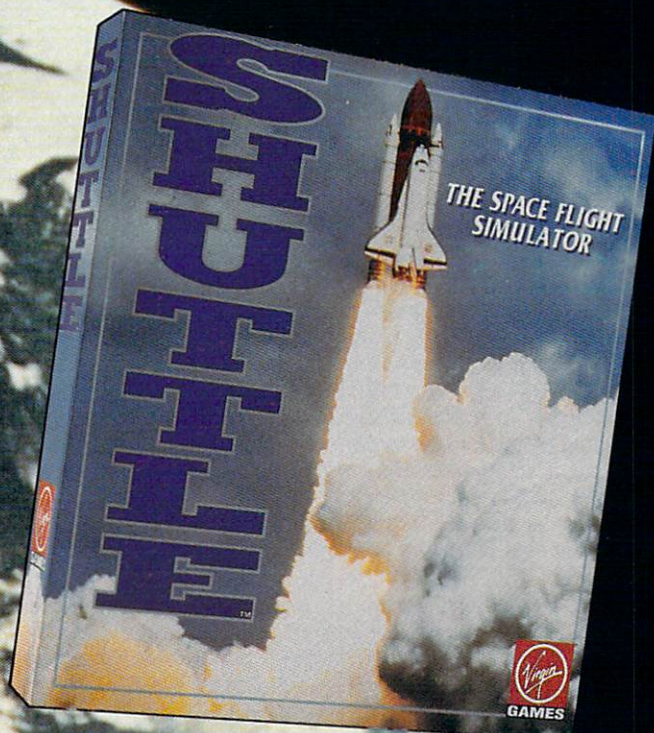
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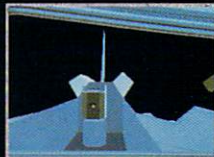
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Circle Reader Service Number 145

FEEDBACK

ever, is capable of 132-character lines, and the extended ANSI driver supplied with that hardware would address problems related to that extended capability.

For information about exactly what the TANSI.SYS driver does in your system, consult the documentation for your video board.

Getting data from high-density drives to low-density disks is possible, but it doesn't always work well. High-density drives use more power, allowing them to read and write narrower tracks of data. For example, a 5¼-inch high-capacity drive writes 80 tracks (divided into 15 sectors each) of information on a disk while a double-density drive writes only 40 tracks of 9 sectors each.

It's possible to format a disk on a high-capacity drive with only 40 tracks using the /4 switch in the FORMAT command. The resulting disk, however, has 40 narrow tracks. A standard 360K disk drive, which has a less powerful read/write mechanism, may or may not be able to read the information on those narrow tracks.

Therefore, to copy files for your friends, be sure to use disks formatted with only 40 tracks. Once your friends have the files, encourage them to copy them again to disks formatted on their machines. That way they'll have the information stored safely in the wide-track format that their disk drives prefer.

It's in the Script

Writing television and movie scripts without paying a bundle for complex software is relatively simple. For me, the key was a Samsung One Page 15-inch monitor, which permits editing and polishing a full page of script without having to scroll around the screen, a procedure which I find annoying.

However, by mere chance, I was using Galaxy 2.0, the only word processor I've been able to find that's compatible with the monitor. Incredibly, the new version—Galaxy 3.0—works only with 25-line screens.

Is there any other software compatible with full-page monitors? Local experts say no.

CLEMENT G. SCERBACK
SEMINOLE, FL

Your local experts must have neglected to call Samsung. A call to (800) 446-0262 would have informed them that there's a long list of word processors and other programs supported in the full-page format.

They include AutoCAD, AutoSketch, AutoShade, DOS, GEM 3.0, Lotus 1-2-3, Symphony, Microsoft Windows, PageMaker, Ventura Publisher, WordStar, CorelDRAW!, Microsoft Word, and WordPerfect.

Rather than have each software product provide a myriad of drivers for every conceivable computer-monitor combination, most special-purpose monitor makers provide drivers custom-made for their monitors. Note that among the products listed are GEM and Windows.

That means most products that operate within these environments can also make use of the special monitor, which multiplies your software choices. Don't stop considering software packages until you've looked over Ami Pro, WordPerfect for Windows, Describe, and Word for Windows. If you're concerned about whether or not any individual product will work with your monitor, call the company and ask.

Call the number listed above to request that a disk of special drivers be sent to you. Or, if you have a modem, call to get the number for the Samsung bulletin board, from which you can download the drivers.

One question: If you're happy with Galaxy 2.0, why upgrade? Just because a new version of a product comes out, that doesn't mean the old one is no good anymore. We know of at least one professional writer who stuck with WordStar 4.0, for example, and WordPerfect 5.0 offers almost exactly the same package as 5.1, with the exception of mouse support.

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

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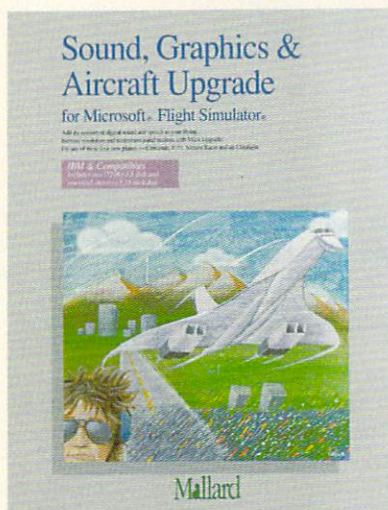
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POINT & CLICK

Clifton Karnes

EASIER WINDOWS PROGRAMMING

It's true that *Windows C* programming is more difficult than DOS C programming, but it's not *that* much more difficult, and nothing makes this point more strongly than Microsoft's *QuickC for Windows*.

You still have to learn the *Windows* API and message-based way of doing business, but with *QuickC for Windows*, intermediate to advanced DOS programmers can write real *Windows* apps.

QC/Win offers an almost ideal environment for program development. The editor is fully

ample, it's easy to set up.

Perhaps the best feature of this color control, however, is that *QC/Win* lets you specify colors for just about everything. You can put C keywords in one color, comments in another, errors in another, and so on. This may not sound exciting at first, but careful use of this feature will make your programs much easier to create and edit.

Microsoft is famous for its on-line help, and the help with *QC/Win* is excellent. The entire *Windows* API is documented, and it's easier to use than a manual. The explanations of the functions are very good, but I'd like to see more examples.

QC/Win comes with several additional modules to aid program development. Included is a dialog editor, which allows you to draw a dialog box *Visual Basic* style; a bitmap editor, for creating and altering icons and other bitmaps; and *QuickCASE:W*, an excellent interface design tool and code generator.

Now, to create a program. Getting back to the *Windows*-programming-is-difficult issue, you've probably heard that even a "Hello, world" program takes hundreds of lines of code. Well, that's true, because creating a window involves a lot of overhead. But there are many useful programs that don't require that you create a window.

My first *QC/Win* program was one of these. It's a utility that I used every day for months. You probably know that most *Windows* applications start with a window size

that seems chosen at random. Since I like to run most of my applications maximized, I wrote a simple program that does just that. The code is just the following single line.

```
return WinExec(lpCmdLine,  
SW_SHOWMAXIMIZED);
```

The command line syntax for this program is *RUNMAX programname [parameters]*. It simply accepts the name of the program you want to run along with any parameters, executes the program with *WinExec*, and specifies *SW_SHOWMAXIMIZED*, which says to run the program maximized.

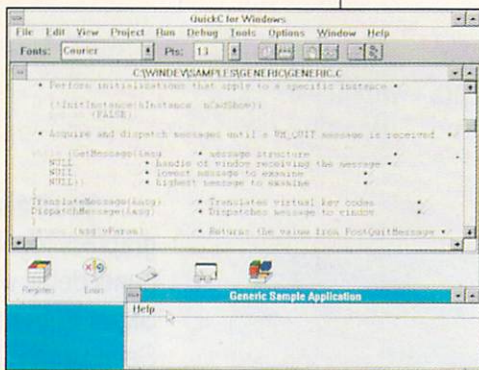
It's fast and useful, and it uses little more than one line of code. In addition to the main file, *QC/Win* requires that each program include a definition file and a make file. The definition file contains house-keeping info for *Windows*. For this program, both are short.

To create a make file with *QC/Win*, you simply use a browser to select the files your program uses. *RUNMAX* uses just two files: *RUNMAX.C* and *RUNMAX.DEF*.

After using this program for a while, I decided I wanted it to do more. Specifically, I wanted to be able to specify whether the program would run minimized, maximized, hidden, or optimized (an optimized window fills the screen except for a band at the bottom to display your icons). This program, *WinRunner*, took a little more work, but I completed it in a couple of hours. If you subscribe to *PC Disk*, you'll find it on next issue's installment.

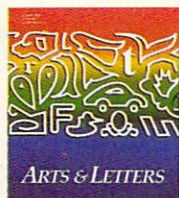
The point is this: If you know some C and you're familiar with *Windows* as a user, you have the background to get started with *QC/Win*. You won't be creating a killer database right away, but you can write neat, useful applications almost right off the bat. □

If you know some C and you're familiar with *Windows* as a user, you have the background to get started with *QC/Win*.

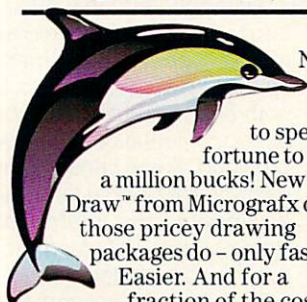


MDI compatible, which means that you can handle multiple files easily. There's also a toolbar that quickly becomes indispensable. It sports buttons for compiling, building, adding breakpoints, calling the watch window, tracing, and stepping.

The editing environment is the most customizable I've ever seen. It even puts some *Windows*-based word processors to shame. For starters, you can choose your default font. Included is the fixed system font, which is ideal for programming. Next you have a choice of colors for the background and foreground text. If you want a deep blue background with a white foreground, for ex-



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INTRODOS

Tony Roberts

HELP WITH HARDWARE

One of the secrets to getting the most out of your hardware is to take advantage of support services offered by vendors. Although many vendors provide phone numbers that you can call for information, it can be difficult to get a straight answer from someone by telephone. Fortunately, there are alternatives.

The bulletin board systems operated by many hardware and software manufacturers can be a real gold mine for anyone who has a modem. On these systems, you'll usually find the latest information about a product, as well as notices about bug fixes, workarounds, and upgrades.

Not long ago I purchased a new Super VGA adapter. I ordered it from a supplier who bought it from a distributor who got it from who knows where. Although my supplier tries to keep up-to-date, I know he doesn't always have the latest information on every piece of equipment he sells.

So after I installed the video board, I called the manufacturer's BBS and checked out the message base and the files available for downloading. I discovered that the ROM for the board recently had been upgraded, giving the board additional capabilities.

When I tested my board, I found that I had the old ROM and called the company about getting an update. There was nothing to it. I gave the receptionist my name and address, and three days later I had the new chip. It took a little work, but in the end I received all the capability I'd paid for. If I hadn't investigated, I might never have learned about the upgrade.

In addition to picking up the news about the new BIOS

chip, I also located a couple of interesting video utilities that demonstrated the capabilities of my new board.

Many manufacturers have forums on GENie and CompuServe in addition to separate company-based bulletin boards. These forums are great places to discover whether or not anyone else has already unscrambled the problem that's vexing you.

Don't overlook these BBS systems as a way to get the most out of your equipment. In many cases, these systems are maintained by the programmers and designers who created the products you're asking about. What better source of information could there be?

Manufacturers also can be of assistance in helping you reclaim castoff parts. Many offices accumulate boxes of memory boards, modems, and input/output cards that have become separated from their documentation. These mystery boards could be of value if only someone knew how to set the dip switches and jumpers. With a little detective work, you may be able to enhance your system with some of these rejects.

First try to determine whether the hardware is in the junk box because it doesn't work (is it burned, broken, or missing chips?) or because no one knows how to make it work.

If you find a board that appears to be in good shape, check its markings for either the name or initials of the manufacturer. Sometimes these will appear as part of a copyright notice. Also, make note of the board's serial number, and if it has a revision number, make note of it, too.

Next, determine exactly how you want to use the hardware. In the case of an I/O card you might want to configure its parallel port as LPT2 and its serial port as COM3. Dig up the phone number of

the manufacturer and place a call to technical support.

If you have good information on the board's markings and serial number and if you know exactly how you want to use it, chances are you can get the help you need to return the board to service. Also, ask technical support how you can get a copy of the pertinent documentation so you can change the configuration again later if necessary.

Unfortunately, this mystery hardware is all over the place. In some cases, documentation for these boards was lost or thrown out; but in many cases, documentation was never provided. Some vendors fail to give you the booklet for the video adapter, the internal modem, or the I/O card when they build a system for you.

Perhaps they assume that if you get the system home and it works, you'll be happy forever. Sorry, but that doesn't suit me. Computer boards are modular—designed for mix and match—and in an office environment there's value in moving hardware to the station where it'll do the most good.

In addition, more and more homes are housing multiple computers, and being able to swap components is essential. You may want to let your children use an older system for their schoolwork and game-play, but you may want to keep that system's I/O card for your new computer. Without the documentation, you have a problem. If you have easy access to the switch and jumper settings, reconfiguration is pretty simple.

Keep this in mind as you shop for computers and demand adequate documentation for every component you purchase. I've had computer dealers tell me I didn't need any documentation. My reply has been that I may not *need* it, but I *want* it because I *might* need it later on. □

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PROGRAMMING POWER

Tom Campbell

MAKE BASIC RUN PDQ

This month we'll look at software and a book by the same author, and we'll examine a program that requires a commercial toolkit.

Ethan Winer, a widely published BASIC columnist, has released a superb \$29.95 Ziff-Davis Press book-and-disk combination, *BASIC Techniques and Utilities*, that should find its way onto the shelf of anyone who wants to go beyond the *QuickBASIC* and *PDS 7* manuals.

This is one of the few books available for the serious BASIC programmer who's advanced beyond the fundamentals, and it hits every target in the bull's-eye.

The example code is always useful: random access files with indexing, reading and writing *dBASE* files, soundex pattern matching, directory searching with DOS services, and quite a bit more. One of my favorites is a section on sorting files—that is, quantities of data that won't fit into memory. Most authors shy away from this subject because it's just too difficult, but Winer makes short shrift of it. That's one of his strongest points; in fact, he's made a lucrative career giving away valuable information by the boatload.

The file-sorting program is a good example of the scope of Winer's code; the book and disk are crammed with eminently usable routines wrapped in effective demo programs.

Winer doesn't blink at discussing ways to make use of undocumented *QuickBASIC* internals or making explicit the secrets he uses to write his own software, and his lucid writing is a remarkable contribution to BASIC literature.

There are always a few more topics you could cram in-

to a book like this—I would've appreciated help on dealing with pointers to BASIC's compound data types in MASM and debugging such code under *CodeView*—yet in no way is the technical content of this excellent book incomplete.

Basic PDQ

Winer also happens to be founder of Crescent Software (203-438-5300), a BASIC tools vendor. This month we'll take a look at Crescent's *PDQ*, a \$149 toolkit that lets you create BASIC memory-resident programs almost effortlessly, reduces the size of BASIC EXE files dramatically by replacing the BASIC runtime library, and offers scores of routines from Sort to StuffBuf.

PDQ works this magic at the cost of some compatibility, but the differences are explained in complete and forthright detail at the front of the manual, and they're all solid decisions (limited but quite adequate support for floating-point numbers, background PLAYS eliminated, arrays limited to only 32K elements per dimension, fewer runtime errors, case preserved in COMMAND\$, and so on).

The upshot of it is that you can create very useful TSRs in 10 or 12K, and a version due to be out soon will also support swapping TSRs.

PDQ is also the ideal product for those unfortunate souls who are still using very early versions of the IBM BASIC compiler (which can essentially do nothing more than compile GW-BASIC) in order to keep code size down to the barest minimum. The extra routines (such as Sort, which QuickSorts string arrays, and StuffBuf, which writes directly to the keyboard buffer) aren't meant to form a coherent body; I regard them as bonuses to an already tremendous value.

There are lots of great example programs on the disk, and the manual explains everything beautifully, but it lacks an index and needs more example programs.

PDQ in Action

This month's example presents a rather personal project of mine, a TSR that lets you draw, move, and resize a box onscreen, printing the coordinates so that you can experiment with the box before writing a DrawBox statement. I can't count the times I've had to recompile programs solely because of one changed parameter in a box-drawing routine or the times I've wished for such a TSR. Since I didn't have time to write one in assembly, I did without. *PDQ* let me write one in almost no time.

To understand how *PDQ* does what it does and to come to terms with the very few limitations it places on your BASIC programming, you may need a short review of compiler theory and BASIC itself. Some BASICs translate to inline assembly. For example, assigning a value of 1 to the integer variable CurrRow, like this:

```
CurrRow = 1
```

translates into this modest amount of assembly code.

```
MOV AX, 1  
MOV _CurrRow, AX
```

But more often than not, BASIC's simplicity as a language belies an incredibly complicated group of subroutines to handle even many apparently simple operations. For example, you've probably already guessed that at the heart of such statements as CIRCLE, DRAW, and INPUT# are pages upon pages of assembly code. And you're right. Take

There are lots of great example programs on the disk, and the manual explains everything beautifully.

this program as an unlikely illustration of the iceberg principle (90 percent of an iceberg lies unseen beneath the surface of the water).

- ' Use integers by default.
- DEFINT A-Z
- ' Allow user to enter two integers separated by a comma.
- INPUT X, Y
- ' Divide them and print the quotient.
- PRINT X / Y

This program, compiled as a stand-alone EXE file without debugging, requires a huge 29K. That's because *QuickBASIC* is making a lot of the decisions for you when it links in the runtime code, and a lot of unnecessary routines wind up in the EXE.

The subroutines that make up such statements as DRAW, INPUT#, and so on are called the runtime library. If you linked all these routines in by hand, you could compile smaller programs.

BASIC also assumes your input will be bad in some cases. For example, if you entered a value of 0 for Y in the short program above, BASIC would issue a runtime error and quit the program. Sounds bad, but if you did the same thing in a C program, the operating system would print *Divide error*, and your system would hang! So if you eliminated some of the error checking or streamlined the existing error checking, you'd save even more space. That's just what Crescent did with *PDQ*. I easily reduced the EXE size of the program above to 6K using *PDQ*.

BOX.BAS shows how I used *PDQ* to write that box-drawing program. (Note that you need *PDQ* to compile this program.) *PDQ* is an astounding product, and it makes things possible in BASIC that you couldn't do before. □

```

* BOX1 -- TSR to draw a box, showing its coordinates, by Tom Campbell.
* Requires PDQ and QuickBASIC or PDS 7.
* To compile:
* BC BOX1 /S/O;
* LINK /NO/D /NOE %1 STR00256 _NOREAD _NOVAL _LOCATE,, NUL, BASIC7 5MALLDOS PDQ;
DEFINT A-Z
DECLARE SUB DrawBox (AtRow%, AtCol%, AtHeight%, AtWidth%, Frame$, Fore$, Back%)
DECLARE FUNCTION GetKey% ( )
%INCLUDE: 'PDQDECL.BAS'
CONST Esc = 27, CtrlU = 21
CONST RightArrow = -77, LeftArrow = -75, UpArrow = -72, DownArrow = -80
CONST PgUpKey = -73, PgDnKey = -81, HomeKey = -71, EndKey = -79
CONST Write = 7, Black = 0
CONST MinWidth = 9, MinHeight = 1
CONST UpLeft = 1, UpRight = 2, LowLeft = 3, LowRight = 4, Horiz = 5, Vert = 6
CurrHeight = MinHeight
CurrWidth = MinWidth
CurrRow = 10 : CurrCol = 1
Frame$ = "++++!"
ASCII codes for Frame$ are, in order: 201, 187, 200, 188, 205, 186
EmptyFrame$ = " "
IF PCMonitor < 3 THEN
  ScnSeg = &HB000
ELSE
  ScnSeg = &HB800
ENDIF
DEF SEG = 0
ScreenCols = PEEK(&H44A)
ScreenRows = PEEK(&H484)
IF ScreenRows < 0 THEN ScreenRows = 24
ScreenRows = ScreenRows + 1
ScnSize = ScreenCols * ScreenRows * 2
BUFSEG = AllocMem(ScnSize)
IDS = "Press Ctrl-Alt-B to use BOX."
PRINT IDS;
IF TSRInstalled(IDS) THEN
  PRINT "BOX is already installed, thank you."
ENDIF
CALL PopUpHere(&H0C30, IDS)
GOTO EndIt
BlockCopy ScnSeg, 0, BUFSEG, 0, ScnSize
SaveCsr = CursorSave%
LOCATE ScreenRows - 1, 1
PRINT "Arrow keys move box. PgDn and PgUp to grow/shrink vertically."
PRINT "End and Home to grow/shrink horizontally."
LOCATE CurrRow, CurrCol + 1
PRINT "R"; CurrRow; "C"; CurrCol;
LOCATE CurrRow + CurrHeight, CurrCol + 1
PRINT "W"; CurrWidth; "H"; CurrHeight;
DO UNTIL NextKey = Esc
  NextKey = GetKey%
  Draw the box with an empty frame to erase the screen or previous box.
  DrawBox CurrRow, CurrCol, CurrHeight, CurrWidth, Frame$, Black, Black
  SELECT CASE NextKey
    CASE LeftArrow
      IF CurrCol > 1 THEN CurrCol = CurrCol - 1
    CASE RightArrow
      IF CurrCol + CurrWidth < ScreenCols THEN CurrCol = CurrCol + 1
    CASE DownArrow
      IF CurrRow + CurrHeight < ScreenRows THEN CurrRow = CurrRow + 1
    CASE UpArrow
      IF CurrRow + CurrHeight > MinHeight AND (CurrRow > 1) THEN CurrRow = CurrRow - 1
    CASE HomeKey
      IF CurrWidth > MinWidth THEN CurrWidth = CurrWidth - 1
    CASE EndKey
      IF CurrCol + CurrWidth < ScreenCols THEN CurrWidth = CurrWidth + 1
    CASE PgDnKey
      IF CurrRow + CurrHeight < ScreenRows THEN CurrHeight = CurrHeight + 1
    CASE PgUpKey
      IF CurrHeight > MinHeight THEN CurrHeight = CurrHeight - 1
    CASE CtrlU
      Okay = PopDeinstall(0, IDS)
      IF NOT Okay THEN
        Msg$ = " Sorry. Can't deinstall BOX."
        LOCATE ScreenRows / 2, (ScreenWidth - LEN(Msg$)) / 2
        PRINT Msg$;
      ELSE
        BLOCKCOPY BUFSEG, 0, ScnSeg, 0, ScnSize
        CALL CursorRest(SaveCsr)
        CALL PopDown
      ENDIF
    END SELECT
    ' After each keystroke, draw the box with its new coordinates and size.
    DrawBox CurrRow, CurrCol, CurrHeight, CurrWidth, Frame$, White, Black
    LOCATE CurrRow, CurrCol + 1
    PRINT "R"; CurrRow; "C"; CurrCol;
    LOCATE CurrRow + CurrHeight, CurrCol + 1
    PRINT "W"; CurrWidth; "H"; CurrHeight;
  LOOP
  ' After ESC has been pressed, return to the foreground app.
  BlockCopy BUFSEG, 0, ScnSeg, 0, ScnSize
  CALL CursorRest(SaveCsr)
  CALL PopDown
  EndIt:
  CALL EndTSR(IDS)
SUB DrawBox (AtRow, AtCol, AtHeight, AtWidth, Frame$, Fore, Back)
Colors = (Fore AND 15) * 8 + ((Back AND 7) * 15) + (Fore AND 15)
FOR EachHoriz = AtCol TO AtCol + AtWidth
  CALL PDQPrint (MIDS(Frame$, Horiz, 1), AtRow, EachHoriz, Colors)
NEXT
CALL PDQPrint (MIDS(Frame$, UpLeft, 1), AtRow, AtCol, Colors)
CALL PDQPrint (MIDS(Frame$, UpRight, 1), AtRow, AtCol + AtWidth, Colors)
FOR EachHoriz = AtCol TO AtCol + AtWidth
  CALL PDQPrint (MIDS(Frame$, Horiz, 1), AtRow + AtHeight, EachHoriz, Colors)
NEXT
FOR EachSide = AtRow + 1 TO AtRow + AtHeight - 1
  Draw left and right verticals.
  CALL PDQPrint (MIDS(Frame$, Vert, 1), EachSide, AtCol, Colors)
  CALL PDQPrint (MIDS(Frame$, Vert, 1), EachSide, AtCol + AtWidth, Colors)
NEXT EachSide
Draw lower corners.
CALL PDQPrint (MIDS(Frame$, LowLeft, 1), AtRow + AtHeight, AtCol, Colors)
CALL PDQPrint (MIDS(Frame$, LowRight, 1), AtRow + AtHeight, AtCol + AtWidth, Colors)
END SUB
FUNCTION GetKey%
  Key% = 0
  DO WHILE KeyHit = 0
    KeyHit = BIOSInkey%
  LOOP
  GetKey% = KeyHit
END FUNCTION

```

More often than not, BASIC's simplicity belies an incredibly complicated group of subroutines.

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TIPS & TOOLS

Compiled by Richard C. Leinecker

Subdirectory Confusion

In December 1991 I wrote a short program that showed only a directory of subdirectories and got a flood of letters. Most people said something to the effect that DIR *. did the same thing. DIR *. shows all files and subdirectories with no extension. And since subdirectories can have extensions and files might not, DIR *. isn't a valid way of showing a directory listing that contains only subdirectories.

The rules for naming files and subdirectories are the same: up to eight valid characters for the name and up to three characters for the extension. While it's true that subdirectories usually don't have an extension, this is only a convention—not a limitation imposed by DOS.

RICHARD C. LEINECKER
REIDSVILLE, NC

**Subdirectories
can have
extensions and
files may
not. DIRDIR.COM is
your best bet.**

Can't See the Forest?

If you have DOS 5.0, make use of the handy TREE command. This shows the directory structure for all subdirectories on the drive. Two capable alternatives are shareware programs, ZDIR.COM and HDIR.COM. Both are customizable so you can make them show whatever you want in different display configurations. (And both of these programs can be found in the COMPUTE/NET PC Magazine online software library.)

WAYNE RICE
RUTLAND, MA

Mousing QuickBASIC

Here's a way to add basic mouse support to *QuickBASIC* programs.

```
DEFINT A-Z
' $INCLUDE QB.BI
DECLARE SUB HIDEMOUSE ()
DECLARE SUB SHOWMOUSE ()
DECLARE SUB GETMOUSECORD
(K%, K3%, M4%)
```

```
DECLARE SUB STARTMOUSE ()
DIM SHARED Inregs AS RegType,
Outregs AS RegType
```

```
STARTMOUSE
SHOWMOUSE
```

```
DO
  GETMOUSECORD K, X, Y
  LOCATE 1, 1
  PRINT X, Y, K
LOOP WHILE K=0
```

```
HIDEMOUSE
END
```

```
SUB GETMOUSECORD (K%, M3%,
M4%)
Inregs.ax% = 3
CALL INTERRUPT(&H33, Inregs,
Outregs)
M3% = Outregs.cx% / 8 + 1
M4% = Outregs.dx% / 8 + 1
K% = Outregs.bx%
END SUB
```

```
SUB HIDEMOUSE
Inregs.ax% = 2
CALL INTERRUPT(&H33, Inregs,
Outregs)
END SUB
```

```
SUB SHOWMOUSE
Inregs.ax% = 1
CALL INTERRUPT(&H33, Inregs,
Outregs)
END SUB
```

```
SUB STARTMOUSE
Inregs.ax% = 0
CALL INTERRUPT(&H33, Inregs,
Outregs)
MouseInitialize% = Outregs.ax%
END SUB
```

MIKE KONESKY
PITTSBURGH, PA

Customizing PC/GEOS

If you're like me, you enjoy customizing programs for your own personal tastes. Sometimes I'd like a higher resolution display, but I can't afford Super VGA. Here's another way to boost your display screen resolution in *GeoWorks Ensemble*.

In your GEOS.INI file, find lines similar to this. Don't be

confused if they have different capitalization.

```
fontID = Berkely
fontSize = 10
```

Replace them with these two lines.

```
fontID = University
fontSize = 8
```

Changing these two lines will allow more text on the screen. If you don't change both lines, you'll probably encounter problems. Make sure you change them both.

To change to any font, you need to use the name that appears in the font menu. That may be different than the disk file that contains the font. You can see the actual font name by loading a font file into a text editor. The first 30 characters you see will be the actual font name.

PIERRE ROCHEFORT
HAWKESBURY, ONTARIO

CONFIG.SYS from Ensemble

If you modify your CONFIG.SYS file often, you can change the GEOS.INI file so that CONFIG.SYS loads into the Notepad for editing when you double-click on it from the Tree window. Simply add this line in the fileManager section just before the closing brace (}).

```
CONFIG.SYS =
"FILE",0,"NPAD",0
```

Now, whenever you double-click on the CONFIG.SYS file, it'll load into the Notepad ready for editing.

PIERRE ROCHEFORT
HAWKESBURY, ONTARIO

Renaming Subdirectories

Have you ever tried to rename a subdirectory? Whether it's possible or not depends on the version of DOS you're using. Here's a short program

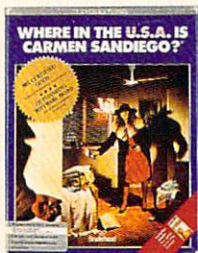
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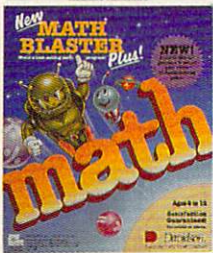
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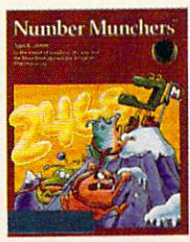
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 Apple II family & compatibles with 5.25" disk drive
 Macintosh & compatibles with 3.5" disk drive
- Child's name _____
 Child's birthdate: Month _____ Day _____ Year _____
- Please check below if you have a:
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- Parent's signature _____

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Save typing when copying files or importing text into a desktop publishing package.

that you can type in using the DOS Debug command.

Make sure the DOS program called DEBUG is in your path or the current directory. In these examples, the italic text is what the computer prints; the roman text is what you should type. One way to be sure you get these programs exactly right is to have someone read the numbers to you as you type them in. Another way suggested by one of our readers is to read the numbers into a tape recorder and then play them back as you enter the program code.

DEBUG RENSUB.COM

File not found

```
-e 100 be 80 00 ac 0a c0 74 22
-e 108 e8 23 00 8b d6 4a e8 27
-e 110 00 3c 0d 74 15 c6 44 ff
-e 118 00 e8 12 00 8b fe 4f e8
-e 120 16 00 c6 44 ff 00 b4 56
-e 128 cd 21 b4 4c cd 21 ac 3c
-e 130 0d 74 f7 3c 20 74 f7 c3
-e 138 ac 3c 0d 74 04 3c 20 75
-e 140 f7 c3
-RCX
CX 0000
:42
-W
Writing 0042 bytes
-Q
```

To use it, just type the command with its two parameters: RENSUB *CurrentName NewName*.

RICHARD C. LEINECKER
REIDSVILLE, NC

Formatting with Style

Editing and formatting text in desktop publishing programs can be excruciatingly slow. I always try to do as much of the work in my word processing software as possible before importing the text file into *PageMaker* or *Ventura Publisher*. Depending on the compatibility between your word processor and page-layout program, many text attributes—bolds, italics, fonts, tabs—can be import-

ed directly from one program to another. Another helpful option is tags.

Tags are codes you can embed in your text with your word processor to tell the desktop publishing software what styles to apply to the text. A style is a set of predefined instructions that include font, indent, alignment, and other formatting information. Styles can be applied to a block of text with just a few keystrokes or the click of a mouse.

To use style tags you should first define a style sheet for your *PageMaker* or *Ventura* document. Each program has a set of default styles containing designated choices for headlines, body text, subheads, and so on. You can use the default styles, modify them, or create your own. *PageMaker* uses Define Styles, located on the Text menu, to define styles. In *Ventura* you define styles by assigning attributes to paragraphs and then giving the style a tag name. Defining styles is discussed thoroughly in your desktop publishing software manual.

Embedding codes in your word processor files is similar for both *PageMaker* and *Ventura*. *PageMaker* uses <> symbols, and *Ventura* uses @=. For example, if I wanted to format the above paragraph as body text in *PageMaker*, I would use this tag:

<Body text>To use style tags, you define a style sheet.

Ventura would understand this tag:

@Body text = To use style tags, you define a style sheet.

I would have to select the Read Tags box in the Import dialog box for *PageMaker* to use the tags. *Ventura* would read them automatically.

Both programs would assign all the style information to the block of text. Both programs would continue to format all the following paragraphs as body text until encountering a different style tag.

Often, you can preformat entire documents this way, saving time in the layout process.

WILLIAM HARRELL
VENTURA, CA

Seeing Stars

I found a shortcut to copy all files in a directory. Instead of typing *.* you can simply type . (a single dot) to stand for the entire directory. For example, to copy all files from the current directory to the disk in drive A, just type COPY . A: and press Enter. If you want to copy all files from drive A to the current directory, just type COPY A:. and press Enter.

There's a short cut for copying files to a parent directory, too. You can use . . . instead of typing the full destination path. If you're in C:\WORK\TEMP\STUFF and you want to copy all the EXE files to the TEMP directory, which is the parent of STUFF, you'd just type COPY *.EXE . . . and press Enter. You can copy files two directories back, in this case the WORK directory, by typing COPY *.EXE . . . \ . . . and pressing Enter.

SEN TAN
ROSELLE, NJ

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COMPUTE/NET

Richard C. Leinecker

STRETCH YOUR MIND ONLINE

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There's an extra bonus to this type of communication media. Ongoing conversations can be read for months. That way, anyone reading the messages for the first time can go back to the beginning, read what's happened, and get right into the swing of things.

To find what I'm talking about, log on to GENie, type COMPUTE and arrive at the COMPUTE/NET main menu, pick the first menu choice, and set to category 2. You'll be in the COMPUTE/NET bulletin board category 2, Celebrations of the Mind.

Here's one interesting question found within the Logic Puzzle topic. (Someone actually got it right, and if you read the messages in this topic, you'll find out what the answer is.) A man is in a room with two doors. Beside each door is a computer. The man knows that the first door leads to freedom and the second to a horrible fate. The man also knows that one of the computers always lies and the other always tells the truth. The last thing he knows is that there's only enough power for one answer from one computer. What single question can the man ask in order to achieve his freedom?

Here's a question in the Paradox Box topic that sparked hot debate. The barber shaves only those men who don't shave themselves. Who shaves the barber? Among some of the comments were the following: "The barber is a babe" and "The barber isn't in the set of those men who don't shave themselves and therefore does shave himself." What do you think?

My favorite of the topics is Minds and Computers. The discussion is primarily concerned with the question of whether computers can or will ever be able to think. There are lots of comments about the need for more powerful computers and why the human spirit can't exist within silicon.

There are more practical categories than these brain benders. One is devoted to introductory DOS topics, and another covers DOS hints and tips. You'd be surprised at how many valuable and useful things you can pick up in these categories. I learned about loading TSRs and device drivers into high memory with DOS 5.0. There are some informative conversations about installing equipment, too. And you'll encounter some controversy over hard drive types.

For the programmers or programmer wannabes, there's the Programming Power category. The well-known languages are all covered. If you read through the messages, you'll see questions and answers on a wide range of subjects. There are even examples of how to load PCX pictures. If you've read Tom Campbell's "Programming Power," this area will be of special interest to you. Tom frequents this category and will answer any of your programming questions.

This month's COMPUTE/NET choice download is *TurboPaint*, a full-featured paint program you won't believe. Her-

cules, CGA, EGA, Tandy 16-color, VGA, and Super VGA video modes are supported. And it loads PCX, IFF (LBM), and GIF file formats. One of the really cool things about it is that you don't have to have a mouse to use it. Keyboard and joystick support included.

All of the draw tools are there. Line, box, airbrush, cut-and-paste, text, and fill tools, along with plenty more, give you all you need to draw professional-looking pictures. You can even use the draw tools in the magnify mode. Some special effects will help you with your drawing. You can automatically mirror draw operations or add automatic shadows in different colors, too. One nice feature *TurboPaint* has that's missing from most other paint programs is the ability to define custom line and fill patterns.

Here's one thing you'll really like. You can change video modes without quitting the program. And for programmers, there's a special animation feature that lets you design images for use by other programs.

An early version of *TurboPaint* was featured in *COMPUTE* magazine. It was a good program then and has gone through several revisions since. Now it could give *DeluxePaint* and *PC Paintbrush* a real run for their money. To find *TurboPaint*, get on COMPUTE/NET on America Online or GENie and go to the software library. Then download the file TPAINT21.ZIP. Use *PKUNZIP* to decompress it into the individual files.

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 RLEINECKER; America Online, screen name Rick CL; or CompuServe, user ID 75300,2104. I'll look forward to hearing from you. □

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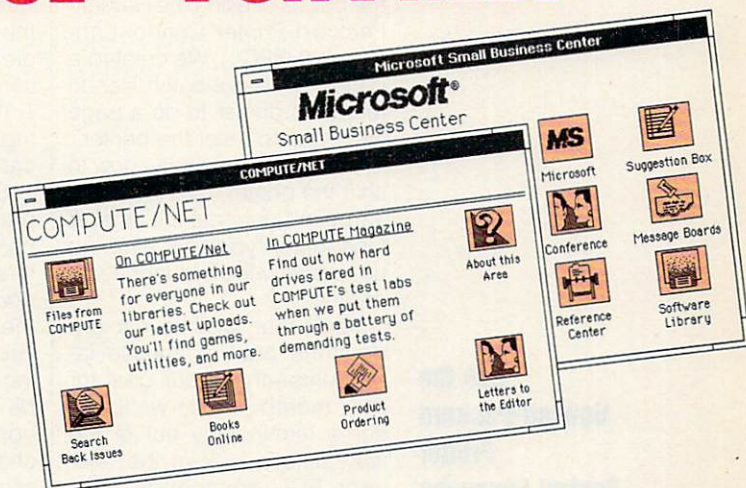
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HARDWARE CLINIC

Mark Minasi

FUN WITH FONTS

Last time, we got started with the basics of using the Hewlett-Packard Printer Control Language (HPPCL). We created a couple of useful batch files to force the printer to do a page eject and to reset the printer.

This month, we'll see how to shift the printer from the usual 12-point Courier to the smaller Lineprinter typeface, allowing us to print wide spreadsheets or files.

To do that, we'll have to understand how to choose laser fonts—that's our goal for this month. First, we'll get some terminology out of the way, take a look at the relevant PCL commands, and then build the batch file.

Courier Isn't a Font

My friend Jane Mitchell, the LaserJet expert, says "You can always tell a LaserJet novice. She calls Courier a *font*." Courier isn't a font. (Jane is a printer snob.) It's a typeface, at least in HP terminology. Suppose you've printed a document using the Courier, err, typeface—that's all just one font, right? Wrong. You change the font if you use boldface, italics, different sizes, or go to landscape mode, to name just a few possibilities.

Fonts are described by eight attributes: orientation (portrait or landscape), symbol set (don't worry about this one just yet), spacing (fixed or proportional), pitch (width of characters), points (height of characters), style (upright vs italic), stroke weight (light, normal, boldface), and typeface (Courier, Times Roman, and so on).

Orientation just refers to whether the text prints across the width of the page (as with the text that you're reading now), called portrait mode, or up the length of the page,

called landscape mode. Orientation is selected with the <ESC>&l#O code sequence, where # equals 0 for portrait or 1 for landscape. (I'll use <ESC> as my shorthand for the ESCAPE code in this article.) Note that's an ampersand followed by a lowercase L, not the numeral 1. The ending character is an uppercase letter O, not a zero.

Symbol set dictates how particular computer (ASCII) codes relate to particular letters. For example, the ASCII code for A is 65. But what if the printer were to print Greek or Japanese? Then being able to print an A would be of no value, so 65 would correspond to some other character. That's what symbol sets describe. In most cases, you'll choose the IBM-US symbol set, also known as PC-8. This symbol set includes the IBM box-drawing characters.

A symbol set is selected in software with the sequence <ESC>(<### sequence, where ### is the symbol set ID. The IDs for Roman-8 and IBM-US are 8U and 10U, respectively. Check your font documentation for the symbol sets of the fonts that you've purchased. You can also find out the symbol sets on a LaserJet II by taking the printer offline and typing PRINT FONTS/TEST.

Spacing allows you to specify either fixed spacing, as in a typewriter's printing, or proportional spacing, as in this text where smaller characters take up less space than larger characters. In fixed spacing, all characters take up the same amount of space, which must be the amount required by the largest character in the character set. The escape sequence is <ESC>(<#P, where # equals 0 for fixed, and 1 for proportional.

Pitch is the width of a character. Note that pitch is only used for fixed-spaced fonts—

you'd never specify pitch when selecting a proportionally spaced font. Pitch is measured in characters per inch. Courier typefaces are typically 10 or 12 pitch, line printer faces usually have a pitch of 15 or 16.6. Pitch is selected with the <ESC>(<s##.##H sequence, where ##.## is the pitch. To select a 16.6-pitch font, use <ESC>(<s16.6H. The common 10-pitch Courier could be selected with <ESC>(<s10H. When specifying decimal values, don't use more than two decimal places.

Height is sometimes called the font's points because height is measured in points. A point is 1/72 of an inch. Height is reported in the font printout as point size. It's selected with the <ESC>(<s##.##V sequence. For example, the 10-point type used in this text could be selected with the <ESC>(<s10V sequence.

Style indicates whether the font is upright or italic. <ESC>(<s#S sets this, where # is 0 for upright or 1 for italic. Note that this doesn't direct the printer to italicize an existing upright font—the printer isn't capable of that. I make that point because people get confused about it. These commands can't change existing fonts—they only select fonts that are already in the printer. If no font matches the criteria—tough. Beginners often think that the series II printers will make a font with an upright style into a font with an italic style; they don't realize that you must create (or buy) a font that has an italic style. Only then, once it's been downloaded to the printer, can you issue a font-select command that includes a request for italic style.

Stroke Weight specifies whether to select a font that is lightly drawn, normal, or boldface. Activated with the <ESC>(<s#B sequence, where

Use the
Hewlett-Packard
Printer
Control Language
to select
your laser printer
fonts.

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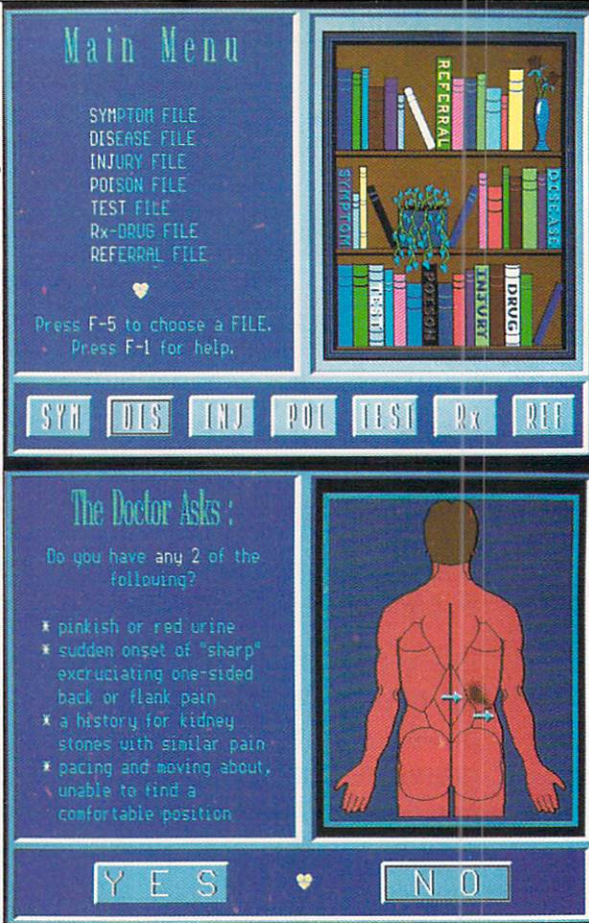
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is an integer from -7 to 7. Normal is 0; normal bold is 3.

Typeface describes how the typeface is drawn. Times Roman text is shaped differently from Helvetica, which in turn looks different from Courier, and so on. Typefaces are selected with the <ESC>(s#T command; # refers to the typeface number. You can look up the typeface numbers in your HP documentation, but the most common ones are 0 (Lineprinter), 3 (Courier), 4 (Helvetica), and 5 (Times Roman).

Using Font Attributes

Now you understand the eight attributes (seven if you're talking proportionally spaced, 12 point height, upright, normal weight, and Times Roman typeface). You understand that a particular font is a particular combination of these eight attributes. So how do you select a particular font?

Suppose you want to select a font with the following attributes: portrait orientation, IBM-US symbol set, proportionally spaced, 12 point height, upright, normal weight, and Times Roman typeface.

Now we match up the attributes with commands.

Portrait orientation <ESC>&I00
IBM-US symbol set <ESC>(10U

Proportionally spaced <ESC>(s1P
12 point height <ESC>(s12V
Upright <ESC>(s0S
Normal weight <ESC>(s0B
Times Roman <ESC>(s5T

String them all together, and you get the following: <ESC>&I00<ESC>(10U<ESC>(s1P<ESC>(s12V<ESC>(s0S<ESC>(s0B<ESC>(s5T.

Now, this'll work, but there's no reason to type all that if it's not necessary. That's where LaserJet Shortcut #1 comes in handy. It says: When issuing several Escape commands, all of which begin with the same two-character string, you can omit the Escape and the two characters on commands after the first command.

However, you must indicate that the shortened command is part of a series of commands by ending it with a lowercase letter rather than the uppercase letter used in the manual. The last command in the string should retain the uppercase letter. For example, rather than <ESC>(s0X<ESC>(s0B<ESC>(s5T, use <ESC>(s0x0b5T.

Apply LaserJet Shortcut #1 to the previous string, and it becomes <ESC>&I00<ESC>(10U<ESC>(s1p12v0s0b5T.

We then can apply LaserJet Short-

cut #2: When a numeric parameter's value is zero, you can omit the number. That'll let us remove the two 0s from 0s0b: <ESC>&I00<ESC>(10U<ESC>(s1p12vsb5T.

For some reason, you can't remove the 0 from the first part of the command.

Understanding the Process

Once people start using font-selection commands, they get hung up at some point because they haven't made an important intellectual leap. They must understand that they aren't controlling fonts—they're merely selecting fonts.

Asking for a boldface font when there isn't one already in the printer won't get a boldface font—it'll get the closest thing that's already in the printer. You see, choosing fonts in a laser printer is kind of like horse-shoes and hand grenades—almost counts.

For example, suppose the printer contains only two fonts in its memory at the moment: a landscape Courier and a portrait Lineprinter. You request a portrait Courier. What do you get? The printer basically has to say, "Which is closer to portrait Courier, landscape Courier or portrait Lineprinter?"

The printer uses the following set of criteria, in descending order, to de-

HARDWARE CLINIC

side: orientation, symbol set, spacing, width, height, style, and (finally) typeface.

So the laser has a choice—it can match orientation and miss typeface (that's the portrait Lineprinter), or it can match typeface and miss orientation (that's the landscape Courier). As orientation is more important, it'll give you the portrait Lineprinter.

IID and Later Printers

The series IID and later printers have an extra feature that the series II doesn't—they can rotate fonts. You needn't worry about whether a font is landscape or portrait. Just specify whether you want portrait or landscape.

You need to understand the difference. The series II uses orientation as a means to narrow down which printer font to use. The IIP and IID use this information as a command about whether

or not to rotate an already selected font. That means that IID and IIP font-selection strings look like the II commands with one difference—the orientation part goes at the end of the string.

That means that the previous font selection example would look like the following on the IID or IIP: <ESC>(10U<ESC>(s1p12vsb5T<ESC>&I00.

Let's finish off with what we came here to do in the first place: set up the laser to print Lineprinter. The Lineprinter font has the following characteristics: portrait orientation, symbol set PC-8, fixed spacing, pitch of 16.67 characters per inch, height of 8.5 points, upright, normal weight, and Lineprinter typeface. That adds up to a command string of <ESC>&I00<ESC>(10u<ESC>(s0p16.67h8.5v0s0b0T.

Whew! I keep that in a file I call SMALLPRT.TXT, and I have an accompanying SMALLPRT.BAT that shoots it out to the printer. □

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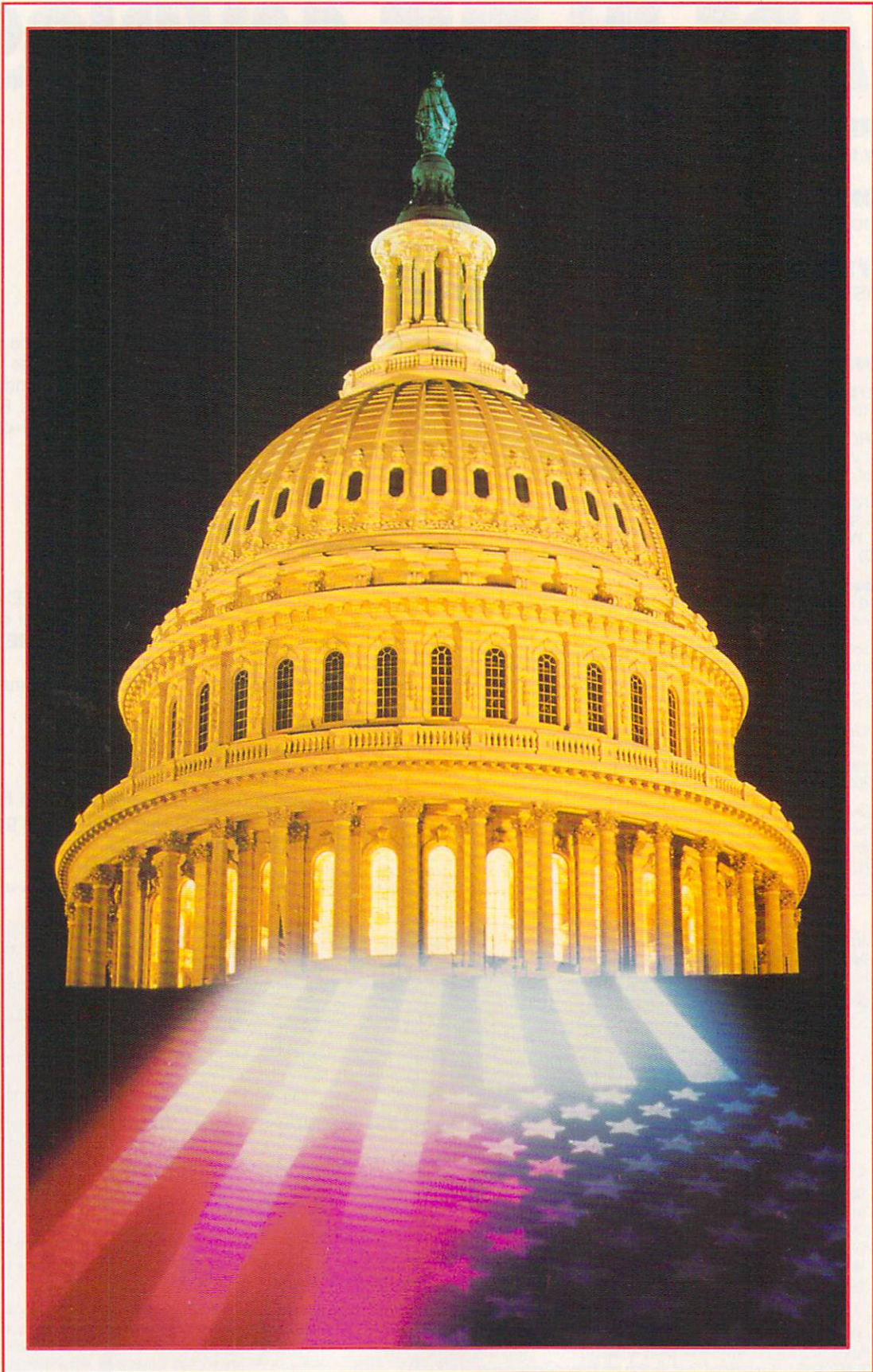
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IF INFORMATION
IS THE GOLD OF THE FUTURE,
WHO HOLDS
THE KEY TO THE VAULT?

ACCESS AND SECURITY: FREEDOM OF INFORMATION

BY GREGG KEIZER

It all comes down to this—information is the current currency. If you rake in information, power, control, and influence will follow. Let it slip through your fingers, and you're suddenly an Information Age pauper. Worse yet, if you let others take what's yours, you might as well put money in their pockets.

It's no surprise, then, that someone like Michael Milken, major-domo of the junk bond business and one of America's most audacious white collar criminals, made *hundreds of millions* on illegal inside information.

A digital tsunami has already hit business, government, and the sciences, scouring the institutions that couldn't make sense of the new volumes of information and rewarding those that could. The deluge will pour into the home this decade—already you can accumulate an extraordinary amount of data with your household computer. And if they're to survive, schools, too, will have to digest vast quantities of information.

Data tidal waves may put images in your mind of immense amounts of information free for the asking and of an unrestricted

freedom to use that information any way you see fit. Those images are not entirely accurate.

Information may be more plentiful today than it was ten years ago, near the time of the birth of the PC, but it's anything but free. It's not something to toss around thoughtlessly. How will information be channeled into the home? How will we pay for it? And how will we protect it?

Tap the Phone

Almost all of the digital information rushing into your home is carried in on a disk or over the phone line.

Disks work well in delivering large amounts of information that isn't time-critical. Computer software—applications, games, educational programs—is delivered on magnetic media. When you bring work home, you probably throw a floppy in your briefcase or stick a disk in your pocket.

Smaller, more timely chunks of consumable information come in on the phone lines, courtesy of online services like Prodigy, CompuServe, GEnie, America Online, and others. News, stock quotes, sports scores, and weather predictions trundle across your screen when you have a modem hooked to your PC.

Data delivery methods are unlikely to change, even though the quantities involved will multiply. Rather than receive noncritical information on dozens of floppy disks, for instance, you'll begin to work with CD-ROMs that hold as much as 660MB of data.

More timely information will keep coming over the phone. In fact, a recent Supreme Court decision cleared the way for communications companies to become *providers*, not just conveyers, of information. And last fall, the Federal Communications Commission (FCC) proposed that local telephone companies be allowed to compete with cable companies in transmitting TV programming over fiber-optic cables.

The general movement to fiber optics—bundles of glass threads theoretically capable of carrying hundreds of video channels, as well as multiple voice, fax, and data lines—means wider information conduits and offers up the possibility of even greater volumes of data for the home.

Pay the Piper

Information doesn't come cheap. Like cable television, most information providers assess a flat fee—from \$4.95 to \$12.95 per month—and often tack on additional charges for special services. Almost any data you receive in a digital form costs more than similar information on paper. CD-ROM-based referenc-

es, for example, can cost several times what you'd spend to put identical works on a bookshelf.

Because bringing information home costs so much, it's no surprise that a majority of home computer users do without. Freedom of information is only available to those who can pay for it.

Hints of economy *do* exist. Competition among information providers has fueled a minor price war among online services; if the telephone companies themselves enter the fray, that trend may continue. And lower prices for CD-ROM drives have sparked the recent interest in home CD-ROM and multimedia. A few CD-ROMs actually cost *less* than the paper versions they replace.

Still, since estimates for replacing the country's existing communications network with fiber-optic lines range as high as \$250 billion and since those lines are virtually a prerequisite for more extensive information access, it's unlikely that you'll soon be reading the equivalent of your morning paper for the price you now pay your carrier. (That didn't stop the Newspaper Publishers Association from attempting to block the Baby Bells from beginning to provide information, though.)

Home office and home business workers can most easily absorb the costs by pegging them to increased productivity and by carrying them as a business tax deduction. The rest of us won't necessarily get left with a dry data well; we just have to watch the information calories we consume.

Four Steps to a Data Diet

Wading through the Information Age takes time and, unfortunately for anyone not hooked up to a corporate budget, too much money.

You might be able to skimp on paper clips, even pens, by hitting the office discount stores. But information is never discounted.

One of the best data sources for the home and home office computer user is CompuServe, the monolithic online service. Forget about the scads of shareware software and the fragmented special interest groups—though both are places of unparalleled information—and head directly to the reference section on CompuServe by typing GO REFERENCE.

It's here that you can search through the back issues of several hundred publications or hit more specialized databases like Medline, the medical profession's information collection. Ringing up online research charges is all too easy, though. You need some money-saving strategies.

- Know what you're after. Before you trip the online meter, plan your quest

for information. Narrow the search by focusing your efforts and cut down on-line time. If you're casting your data net for information on Pan Am's financial crises, for instance, use a keyword search like PAN AM & FINANCIAL.

- Know where to look. CompuServe keeps online copy from 48 newspapers—a much better resource on breaking information than magazines, which labor under a two- to three-month lag time. Some papers are better than others. The *San Jose Mercury News*, for example, excels at technology reporting. Turn first to the *Washington Post* for news on government shenanigans.

- Know what it's going to cost. Balance the need for immediate information against the price you'll pay. Even the slickest searches—where you quickly find what you're looking for—rarely run less than \$5. A ten-minute look-see at three newspaper articles rings up as \$14.

- Know when to quit. Don't flog a dead horse. If you come up empty-handed after a search and one alternate, drop it. Although you may want to continue—at any cost—just to get that one tidbit of information, resist the temptation. You can spend staggering amounts if you're not careful. Reconsider your need for the information, or head for the local library instead.

Apply these tactics to any information quest—they're general enough to work anywhere—and you're guaranteed to spend less time—and less money.

How to Keep What's Yours, Yours

With all the hazards to your information and the high price you pay for it, you have to put a high value on the data you accumulate. Here are just a few ways to make the world safer for your files.

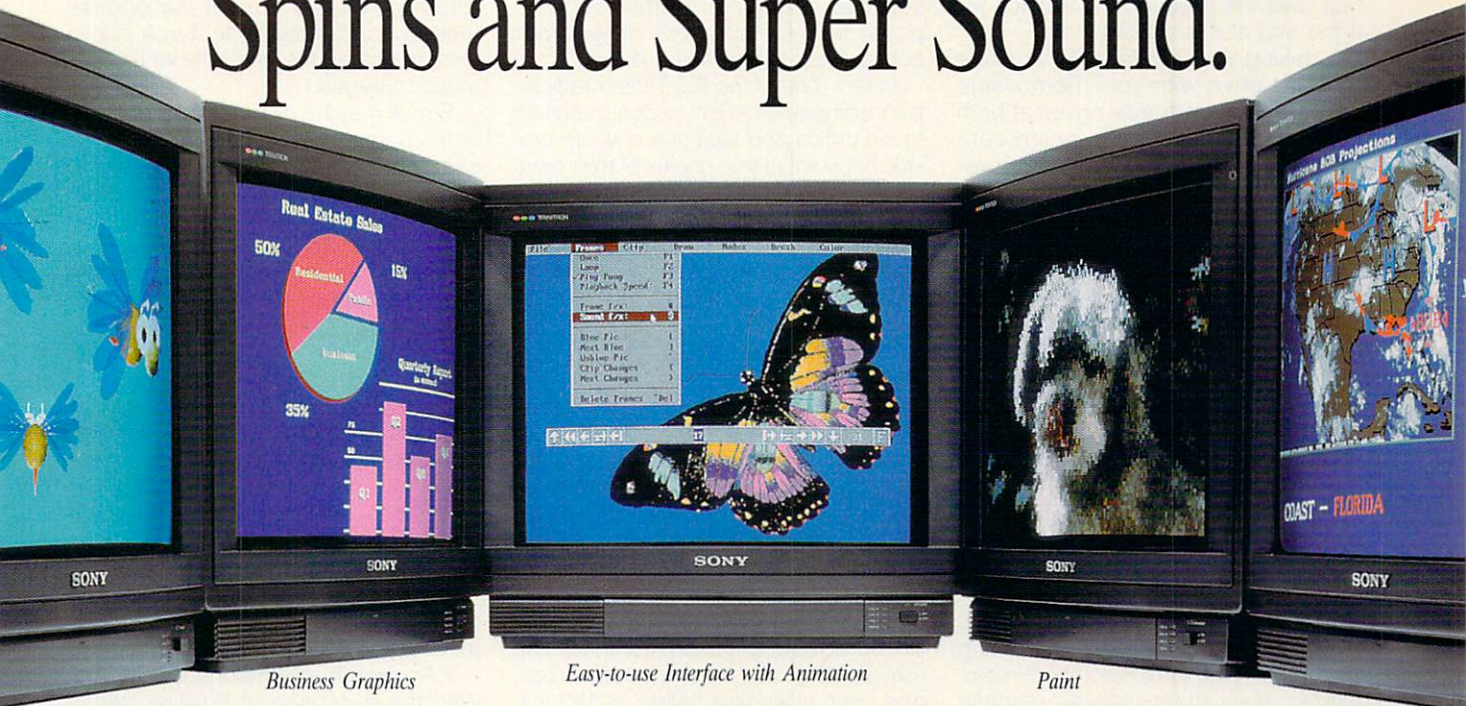
1. Buy a tape backup drive if your PC's hard drive is larger than 40MB. You're much more likely to back up your data—and ensure its survival—if you can simply stick a tape in the drive and sit back, rather than feed floppies to the computer for an hour or two.

2. If you can't afford a tape backup drive, go ahead and back up to floppies using *Fastback* or some other backup utility. But back up only your document, file, and work directories—forget about the applications. Re-creating the entire hard disk will be a headache (when isn't it?), but you can always reinstall applications and games.

3. At home, lock up your PC to keep unwanted hands off the machine. Some PCs include a literal lock—just pocket the key. For those that don't, consider something like *MenuWorks Advanced*, which demands a password before it lets you get to the computer's contents.

4. Viruses are vastly overrated—for

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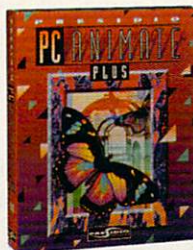
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now. But some particularly nasty bugs may migrate from Europe, where they're raising Cain. Do what you can by using an antivirus package like *Viruscide* (see the product and service list at the end of this article).

5. Taking work home? Why not take the hard drive with you? Removable hard drives or cartridge drives at both locations let you take the entire contents of your drive with you, wherever you work.

6. Encrypt sensitive files. *PC Tools 7.1* lets you scramble data files—even directories—and then decode them only with the right password.

7. Those people hanging around the fax machine know your business before you do. Invest in a fax board for your office PC—Intel's Satisfaction is relatively foolproof—and receive faxes at your desktop rather than at the communal information trough.

8. If you compute remotely from the road with your home or office PC, secure the host by using passwords, restricted calling lists, or any other security features the remote software offers.

9. Walk around with your computing world under your arm. A notebook computer is never more than a briefcase lock away. At home or the office, you can quickly connect it to an adult-sized monitor and keyboard for door-to-door security.

10. The paperless office is a myth. Play like the CIA and shred sensitive documents and printouts. A personal paper shredder that fits over the top of a wastebasket costs less than \$200.

Don't Get Paranoid, But . . .

The information glut has a dark side, one that hits closer to home than you might think. In a world where digital records are de rigueur, electronic databases track our Social Security payments, driver's license numbers, credit histories, and nearly everything else that makes up modern life. When records that extensive exist, so does the potential for mistakes. And worse—abuse.

Hackers and viruses may grab the biggest headlines when they invade computer networks and crash systems, but a more invisible invasion occurs every day. Computer databases containing data on consumers—you and me—are a prime information source for companies eager for new customers, banks considering loan applications, and even private investigators hoping to hunt down missing persons.

The trouble is that it's impossible, difficult, or expensive for individuals even to check the validity of those records. Because they're so often used—before a home loan is approved or a credit

card issued—credit reports have drawn the most attention. Last year, the consumer research group Consumer Union released the startling information that nearly half of the reports it pulled from the country's major credit bureaus contained some errors.

In fact, one of the Big Three credit report companies, TRW, recently bowed to the critics and said that it would provide consumers free copies of their credit reports on request. But with two other companies of similar size—each of which owns around 150 million records—and hundreds of smaller companies, it's impossible to check every file.

Take My Number? No Way!

Mailing lists and junk mail are nothing new. If you subscribe to almost any magazine, if you've ever returned a product registration or warranty card, or if you just happen to live in an area with the right ZIP code, you already receive a ton of unsolicited mail.

What has some of us scared is how easy it's becoming for almost anyone to get those mailing lists. Last year, Lotus scrapped a CD-based database that spotlighted names, addresses, and even spending habits of 120 million consumers. *MarketPlace: Households* would've made it much easier and more economical for small businesses to pinpoint customers. Over 30,000 people requested that their names be removed from the list; after taking a negative publicity bath, Lotus junked the idea.

MarketPlace: Households may be dead, but your name's on lots of other lists. It's virtually impossible to expunge your name from every one, but you can begin by writing the Direct Marketing Association, 1101 17th Street NW, Washington, D.C. 20036. A phone call won't do; you've got to write a letter. Ask that your name be removed from the Association's lists: It passes along such requests to DMA-member mailing list and electronic database makers.

Is Anybody Listening?

You probably dash off electronic mail messages to coworkers across the office or to friends across the country without thinking about security. After all, who'd want to read what you write?

Perhaps plenty of people. In Springfield, Oregon, city hall's intraoffice electronic mail is now made available to the public on paper. Accusations by the mayor that a trio of conservative city councilmen conspired over E-mail to eliminate a human rights commission led to the public airing of private messages. Prodigy, the Sears- and IBM-backed online service, recently weathered yet another E-mail storm

when the recipient of a private message that spouted anti-Semitic sentiments attempted to post it to one of the service's public bulletin boards. (Prodigy refused to post the original message or a rebuttal to it in a public area and drew the ire of the Anti-Defamation League.)

E-mail may be as quick and convenient as the phone, but it's not the same. For one thing, it's much easier to capture, reproduce, and repeat an electronic message than it is to do the same with a telephone conversation. In essence, that's what makes possible the ongoing, constantly changing discussions that set E-mail apart. Messages can remain on bulletin boards for days; if someone saves your message to disk, it may never disappear.

What can you do about it? Plenty.

- Never send something you wouldn't have the nerve to say. It's easy to let your emotions run rampant when you can hide behind the impersonal nature of E-mail. If you wouldn't dare say something to someone face to face or on the phone, why say it in a form that's far more permanent?

- Assume that someone is listening. With the exception of Prodigy, which screens messages before they're posted, online and E-mail services promise privacy. Still, if you're sending sensitive information, don't take risks. While the transmitting service may not eavesdrop, it's possible that critical information transmitted via computer could fall into the wrong hands once it reaches its destination.

- Request a receipt. Most E-mail services—MCI Mail and CompuServe, for instance—will, on request, send you a receipt when your message is received and read. Note the time and date the message was read—it's your proof that the message arrived, and it documents who read it.

- Protect your password. Guard any E-mail passwords carefully and change them frequently. If someone uncovers your password and account information, they can assume your electronic identity. That's asking for trouble.

- Consider extraordinary precautions. In some situations, you may not want to transmit "in the clear." For the ultimate in security, put the information in a file, encrypt that file with a data-security program, and then send it.

From the common sense to the clandestine, these E-mail security techniques could save you from embarrassment or even save your job.

Getting It and Keeping It

You'll want to make sure that you get the information you need in the most economical and efficient way possible

and, once you have it, make sure that you keep it for your own use, secure from virus infestation and hardware failure, and out of the wrong hands.

You may be at a disadvantage when it comes to accessing the files compiled from your driver's license, warranty cards, and catalog purchases, but you're certainly not an underdog when it comes to culling and securing information.

All you need are the tools and techniques, the strategies and systems to manage and protect your lifeblood in this Information Age. □

INFORMATION PRODUCTS

PC Tools—\$179.00

Central Point Software
15220 NW Greenbrier Pkwy.
Beaverton, OR 97006
(503) 690-8090

Requirements: IBM PC or compatible,
640K RAM; mouse optional; some utilities support *Windows*.

CompuServe

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Requirements: IBM PC or compatible,
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Virucide—\$49.00

Parsons Technology

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MenuWorks Advanced—\$89.95

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PC-cillin—\$139.00

PC Rx (a software version of *PC-cillin*)—
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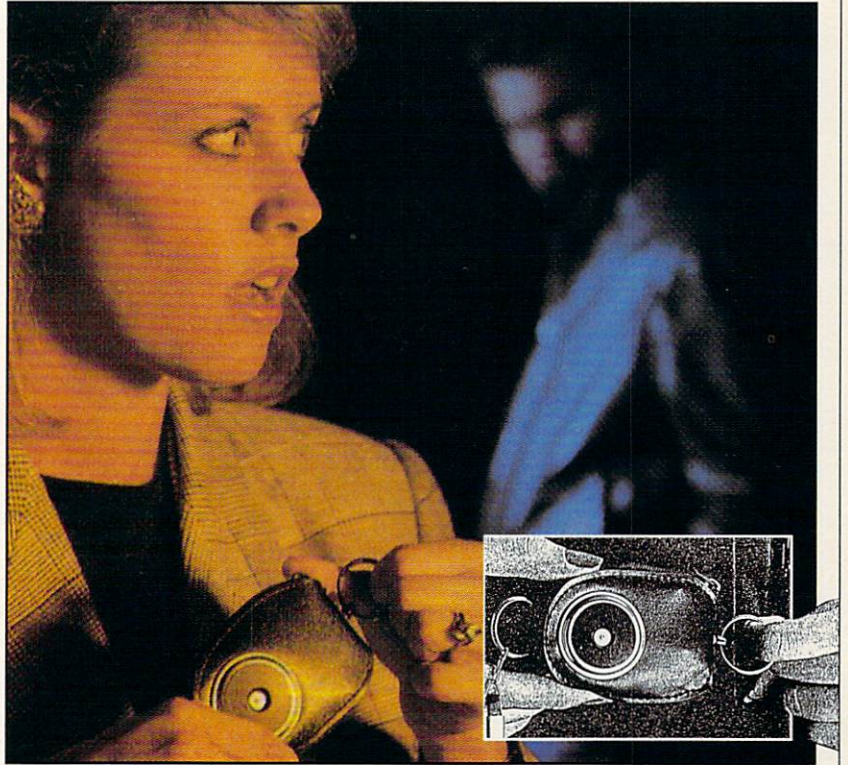
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Alfred Giovetti

TURBOTAX FOR WINDOWS

If you liked *TurboTax* or *MacInTax for Windows*, you'll love this newly updated tax-preparation program, *TurboTax for Windows*. It combines the best features of the two older packages and boasts a number of new options.

After last year's tax season ended, ChipSoft, maker of the award-winning *TurboTax*, acquired Softview, producer of *MacInTax for Windows*. ChipSoft is dedicated to supporting former Softview customers and using its newly purchased technology to enhance both product lines.

It took me only about five minutes to install *TurboTax for Windows*, using *Windows 3.0*, and that included running the *Windows*-based printer installation procedure with the soft fonts. You may also install the program via *DOS* if you prefer. Once you've installed the program, you can execute it from *DOS* or *Windows*.

With *TurboTax for Windows*, basically you have a tax form on your screen that looks like the IRS paper form. As you fill in the information, line-sensitive instructions, help, and cross-linking to other relevant forms and summaries are available. Or you can use the interactive method called Interview with *TurboTax*, which asks you basic income-tax questions much as a tax preparer interviews a client. Your answers fill check boxes with yes, no, or numerals and open up new schedules that need to be prepared. Another helpful feature is Logical Next Step, which is a set of pop-up windows that help you decide what to do next.



You may answer questions in any order, and when you're ready to save the forms, you simply access a pull-down menu or press F3 from any location in the program. Double-clicking on the text portion of any line in the official forms gives you access to the official IRS instructions for that line. Clicking on the consult button of the onscreen status bar or the help bar gives you access to additional instructions and explanations of the tax code. The cross-reference button of the help bar immediately pops up the form or schedule where the number originates. Numbers and answers to questions are automatically carried to the appropriate blocks or lines in all other applicable forms. Double-clicking on any line or block will open an itemization or the related form that develops the figure, allowing you to prepare that form or schedule immediately.

Several interesting features make tax preparation with *TurboTax for Windows* a real joy. (Well, maybe not exactly a joy; after all, this is tax preparation.) Immediately after they've been entered, conflicting answers are pointed out by a pop-

up warning screen that explains the problem in easy-to-understand language, which helps you answer the questions correctly. You can enter estimates and questionable items followed by the letter E or a question mark to allow these items to be used for what-if situations or to give you an early estimate of your refund or tax due. The program then identifies these estimates and questionable entries so that you can enter the correct data later.

Once you've finished entering all of your data, *TurboTax for Windows* helps you check your forms for completeness, review them for audit potential, and make a final check before printing out the return. Also, once you've finished your federal return, you can transfer the data to one or more of the 15 available state income tax packages. The state forms show the same smooth linking of forms and schedules, all accessible by double-clicking on the appropriate numeric field.

The override function, a carry-over from earlier versions of *TurboTax*, continues to be useful. Override allows you to bypass normal calculations and

defaults with otherwise correct information or to prepare forms where even the IRS instructions have proven incorrect. Many other programs don't have such a function, the lack of which makes it virtually impossible to prepare a return correctly.

TurboTax for Windows has a slew of new features for its 1991 version, but the one that I like the most will be a real time-saver for users of the 1990 *TurboTax*. You can now import the repetitive data from last year's *TurboTax* Personal 1040 into the new program. Names, addresses, bank account numbers, and other such constant data will be transferred to this year's schedules, leaving only the amounts blank for you to fill in. This feature is standard on professional tax-preparation packages but unique among personal packages.

TurboTax for Windows is the only true *Windows*-based tax-preparation program on the market today. Other *Windows*-oriented tax-preparation programs are strictly character-based ports of DOS programs. The true *Windows* application gives this program the unique features of *Windows*. The screen looks like the IRS forms, and the printout looks like the IRS forms. *TurboTax for Windows* is the only program I know of that prints all the IRS forms that it supports in true WYSIWYG fashion. What you see on the screen is what actually prints, whether it be a 9-pin, 24-pin, or laser printer that controls the output. The dot-matrix forms are so close to the IRS forms that the IRS accepts them as official forms, not as facsimiles.

With 55 forms and schedules, *TurboTax for Windows*

will accommodate many of the simpler income-tax calculations and some of the most complex, including the new four-page Earned Income Credit calculation. It also accommodates some 52 other schedules, work sheets, and supporting statements for specific calculations.

The program supports the forms for nine sole-proprietorship businesses, 27 rental properties, nine farms, 62 depreciation schedules for an unlimited number of assets, two employee business-expense schedules, 11 sales of personal residence, and ample multiples of many other forms. Except for the two employee business-expense forms, there should be enough forms for the average individual's personal tax return.

The ability to exchange information with other programs is a very important feature in modern software. Software that can update information to incorporate new items is a real boon. *TurboTax for Windows* allows you to import personal and business information from *Quicken*, the popular accounting and budgeting program. Also, you can import data from any text file produced by popular packages such as *Lotus 1-2-3*, *WordPerfect*, and others. And you can use the cut-and-paste feature of *Windows* to import data from other applications within the *Windows* environment.

TurboTax for Windows is not perfect. There's still room for improvement. My wish list includes an automated error-checking routine that would give a printable listing of possible problems. In addition to pop-up supporting schedules that merely add up a list of numbers, pop-up minispreadsheets and notepads would

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make the program more versatile. The program also suffers from the lack of a financial calculator. The final review of completed forms should have an automated audit-potential screen that offers normal ranges for many items and warns taxpayers of potential audit problems. Expansion of the excellent but limited interview feature of the program would also make this great package better.

While Congress seems to think that tax simplification is another form of making the tax code more complex and less fair, *TurboTax for Windows* takes tax simplification seriously and has made real inroads into making the process easier and more pleasant. While most of us can't say that we look forward to preparing our taxes, with the guidance and help of *TurboTax for Windows*, at least preparing our taxes can be a bit less painful.

Circle Reader Service Number 314

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PERSONAL PRODUCTIVITY

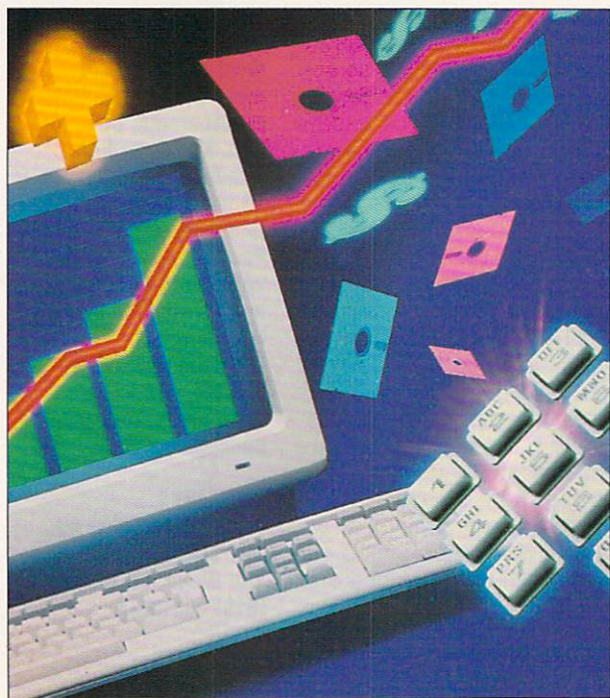
Daniel Janal

DON'T GO HOME WITHOUT IT.

Don't start a business without it. "It" is a bank's merchant card account that allows businesses to accept credit cards for purchases. Consultants, professionals, designers, desktop publishers, and others who use their computers to work at home can benefit from merchant cards, too. These accounts can be used to ring up quick sales instead of waiting for checks to arrive in the mail. Credit cards work.

Commercial banks have traditionally looked down their noses at home-based businesses, however. A misguided folklore at banks says that home businesses are fraught with fraud and abuse that will cost banks millions, so they give preference to businesses with storefronts. As a result of this questionable stereotype, many home-based businesses are being unfairly denied access to merchant cards.

Designers, consultants, professionals, and publishers who use their computers to work at home need the benefits of a merchant card.



I was lucky and got a card from my bank—but I had to jump through many hoops and find a bank officer willing to fight for me. I submitted a three-page business plan that outlined my company's goal; its successes in dealing with high-profile clients over five years; and my biography, which included profiles in *USA Today* and *Success Magazine*. (If you need help writing a business plan, use *Biz Plan Builder*, software from JIAN Tools for Sales). The business-plan method worked well for me. In the end, I was issued the card.

Others, like Bill Goodman of Cyclos, a San Francisco-based shareware company, haven't been so lucky. He had a merchant account in another state but ran into obstacles when he moved to California.

"I spent about two weeks working with the vice president at my branch trying to get a merchant account. She was very enthusiastic and seemed convinced I was a good credit risk. She argued with the board at length trying to get them to accept my application," said Goodman, a shareware author of a Macintosh data compression program called *Compact Pro*. "I took in statements showing large assets for the company, no debt, offered to put up \$15,000 in a security account, showed them a year's worth of statements from my previous VISA account (with one chargeback for the year), and still they didn't think I was acceptable. I am convinced that this bank officer did her best to get me approved—in fact, I went ahead and opened my business accounts there later because I was impressed with her attitude."

He isn't giving up so easily. "I don't think it's impossible—it just takes time. The last time I got an account it took me

about four months of going to different banks."

Where there is a need, vultures surely follow. The credit card industry is no exception. Small ads in business journals around the country say they can provide merchant card access. I called one company and found that I qualified for such service—if I paid a \$200 application fee, paid a 5-percent charge on orders, and leased an electronic terminal to verify purchases for \$79 a month—for four years! This is highway robbery to say the least. Unless you are doing a landslide business, you won't make money.

Here are tips you might find useful in applying for a merchant card.

- Don't emphasize the red flags of "home business" or "mail order." If you sell your product at seminars, conventions, or face to face, accentuate those dealings.

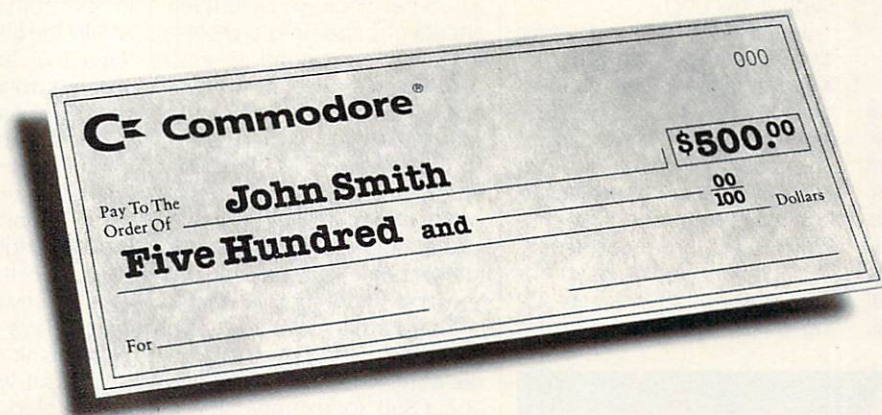
- Indicate that your business doesn't have large sales and its customers aren't likely to be fraudulent.

- Offer to provide a security deposit. The bank will hold this money in an interest-bearing certificate of deposit.

- Check with your professional associations to see if they have affiliations that can secure a card for you. For example, the American Bar Association can provide details for its members.

- Ask your peers where they received their accounts. At one time, seven out of ten new businesses failed. However, since the advent of the home-based business, that figure has dropped to three in ten. Obviously, home-based businesses have had a lot to do with the success of American enterprise. It's time for the banks to wake up to this fact and make it easier for home-based businesses to obtain merchant status. □

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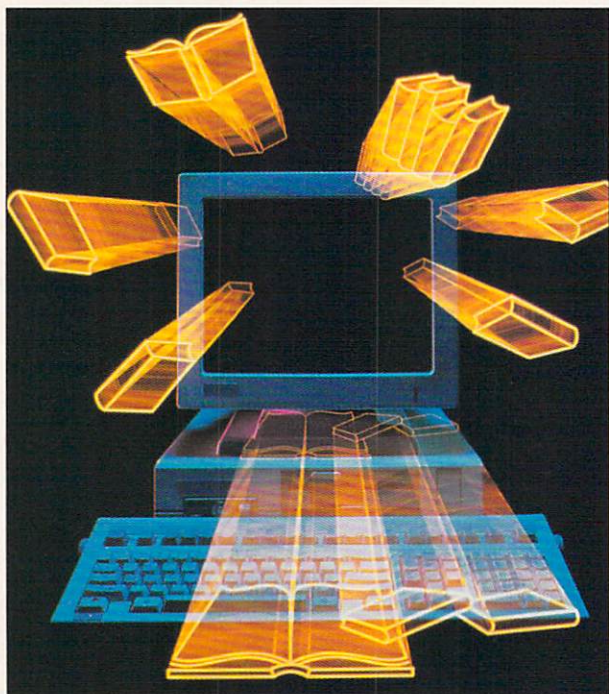
Robert Bixby

REAL DESKTOP PUBLISHING

Last month we took a practical look at putting together one of the simpler desktop publishing projects—a brief saddle-stitched booklet often called a chapbook in literary circles. This same inexpensive design is perfect for advertising material, catalogs, self-help booklets, instruction manuals, recipe books, and so on. The simplicity of the binding is what makes it so attractive. There is no more professional-looking binding that can be had for such a low cost.

I have all of my printing done by photocopying at Kinko's, a nationwide chain of copy shops. If you have a college or university in your town, you're likely to have a Kinko's, too. But there are many lesser-known companies that provide the same services. Though your pricing will probably vary, I've found that folding costs \$0.03 per fold. If a

Desktop publishing isn't just for corporations and universities. You can create professional-looking publications on a tabletop for under \$2 per copy.



book is 40 pages long, that means I've used ten sheets of paper and the folding will cost \$0.30 per book. Stapling costs \$0.05 per staple, or \$0.10 per book. When you fold a saddle-stitched book in half, the inner pages—the ones nearest the center—will poke out a short distance from the ones nearer the cover. (Take a dozen sheets of paper and fold them in half to see what I mean.) Many people can live with this irregularity, but for a professional look, I prefer to have the edges trimmed, which costs \$0.50 per book. For a grand total of \$1.35 per book, you'll turn ten sheets of paper into a professional-looking bound volume.

If I have one complaint about Kinko's, it has to do with the limited paper selection. If you don't like the dozen or so types and colors of bond paper available, you'd be better off going to a printer instead of a copy shop, but you'll pay more for everything.

There are even less expensive ways to do things. A saddle-stitch stapler only costs about \$50, for example. If you intend to do 500 or more books, it will pay for itself in the savings over having the copy shop staple your books for you. You can also fold your books by hand, but my experience in this area has been that hand folding is a hit-or-miss affair. You'll often find yourself making a crooked fold. Trimming is one thing you won't be able to do adequately at home without a large investment in machinery.

So far we've talked a great deal about the production aspects of your publication: getting it on paper and binding it. But before you walk through the front door of the copy shop, you should make sure that your booklet is perfect. This involves more than simply proofreading it carefully. It al-

so means that you need to work on the design.

Last month we talked about getting the body of the text on paper, but if you open a book—even a simple chapbook—you'll find that there's more to a book than its body. There's a cover, usually with the title and author on the right side (the front is on the right when the cover lies flat) and the blurbs, author bio, price, ISBN, and author photo on the left side.

You might want to have a blank sheet just inside the cover, or to save weight and money, you might want to have the inside front cover next. This will list the title of the book and the author, and if you are starting a publishing company, you might want to put your colophon on this page. A colophon is a symbol, like the little house Random House uses or Knopf's borzoi. I usually put the copyright page right on the back of the inside front cover, but many people would prefer to leave the back of this page blank. Other pages that you might want to put in the front include a table of contents (which should begin on a right page), a table of figures, acknowledgments, and a dedication (which should appear on a right page).

If you have a book whose design you admire, use it as a guide. If not, invest in *The Chicago Manual of Style*, which has guidelines for putting a book together, as well as hundreds of pages of detailed instructions on formatting and proofreading.

So far, I haven't found a way to include color economically. Most copy shops with color copiers charge up to \$2 per page for color copies. The technology has to come down in price before you can start mass-producing with it. For economical color, seek out a printer with a four-color press. □

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SO YOU THOUGHT
THE COMPUTER WOULD MAKE
THE PEN OBSOLETE?

THE RETURN OF THE PEN

BY SCOTT LEIBS

The key to the next generation of computers is the writing instrument that started it all 5000 years ago, when the burgeoning Sumerian harvest surpluses were tracked by making cuneiform marks in gobs of wet clay. The instrument was the stylus. But the technology is as new as tomorrow.

Pen-based computers have been heralded for months as the Next Big Thing. Lightweight, portable, and certainly easy to use, they're touted as great second computers for mobile professionals—a reliable way for foremen and quality control technicians to keep track of conditions at multiple points on an assembly line or in a processing plant, and a way for foot patrols to make use of station computers. And they're the first computers designed to welcome computerphobic consumers who blanch at the sight of a keyboard.

The machines are designed to be held in one hand and written on by the other. The computer translates hand-printed text into computer-based characters. The computer can also be trained to recognize a number of typical gestures—for example, drawing a line through text erases it. Applications software for pen-based portables often features boxes that can be checked and menus that can be pulled down, al-

lowing the user to enter data with a flick of the wrist. In fact, despite the image most people have of writing with a pen on a computer, actual applications for these machines are designed to minimize text input, to make it a matter of checking boxes and following menus.

The skepticism many have about a pen operating system being responsive and flexible enough to cope with real-world handwriting has led to a series of manufacturers waffling on the whole pen concept. Instead, they offer computers with a touch-sensitive screen for graphics and fill-in-the-blank operations and a keyboard for straight entry of text. First among these computers was Momenta, a powerhouse laptop with a proprietary "pen-top" environment in conjunction with MS-DOS. Recently Momenta was joined by DFM Systems' "multimodel PC" called the Travelite. It uses *Eazy-Touch*, a database product specifically designed for use with a touchscreen. The software is DOS-based and is compatible with databases written in C, C++, Clipper, and Foxbase.

Handwriting on the Wall

Despite the flurry of excitement, there are relatively few pen-based computers available today and very little in the

way of off-the-shelf software for them. The models that are available are expensive, and they're aimed at large corporations, particularly at those with employees out in the field gathering data from policyholders, hospital patients, or electric meters.

Industry watchers say, however, that high demand for those uses will drive down prices and inspire a range of software specifically aimed at consumers and small business owners. "This is the first PC technology that could get a computer into the hands of everybody," says Tim Bajarin, executive vice president of Creative Strategies International, a research and consulting organization based in Santa Clara, California. Bajarin believes sales of pen-based portables, which now number only in the tens of thousands per year, will reach 2 million per year by 1995. Other predictions from Forrester Research in Cambridge, Massachusetts, and BIS Strategic Decisions in Norwell, Massachusetts, estimate sales at about half of that figure. But even the more conservative figures suggest that the pen-based computer will find mainstream acceptance very quickly. Bajarin believes that by 1995, over 40 percent of all portable PCs sold will be pen-based.



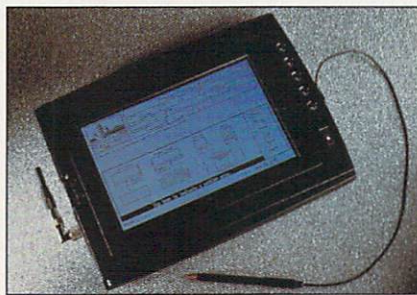
Dataquest states that in 1990 there were about 8,000 pen-based computers shipped in the U.S. Dataquest expects the figures to be about 41,000 units in 1991 and anticipates that in 1995 about 3,000,000 pen-based computers will be shipped in the U.S. That would be 14 percent of all PCs and 30 percent of all portable PCs.

The Theory of Evolution

Observers generally agree about how these computers will evolve. Pen-based portables are already being used in a number of industries where workers fill out forms—on loading docks, in realtors' offices, and in a host of similar places. It's a fairly easy task to design software that resembles a form and can transfer data entered by a stylus into a centralized database.

A little further down the road—just over the horizon, in fact—is the machine that will interpret both printed letters and script, include wireless modems and other peripheral devices, weigh only a pound or so, use long-life batteries, and carry a price tag well below the daunting \$3,000–\$5,000 average cost of today's machines.

GRiD Systems (owned by Tandy), the first to offer a true pen-based computer, is one manufacturer that plans to pursue the technology wherever it leads, from large corporations to home users. While Microsoft and GO have squabbled over whether the standard for pen environments should be based on a proprietary operating sys-



Connect to radio LANs.

tem (GO) or the heavy equipment requirements of *Windows* (Microsoft), GRiD has sold pen-based computers by the thousands that use nothing sexier than MS-DOS operating on an 8088 CPU. Exciting changes are afoot, however. New GRiDPADs have been add-

ed to the line that provide for radio linkage to local area networks, 386 microprocessors, and hard disks. GRiD is also licensing its PenRight! application development environment to third-party software vendors so GRiD will be able to offer a selection of applications for its successful pen computers. While most of its sales have been to major American corporations (including Kellogg and Phillips Petroleum) and the U.S. Army, it is actively pursuing distribution to the individual computer user, and GRiDPADs may soon appear on the shelves of Tandy's new retail arm, the Computer City stores.

Ken Dulaney, director of marketing for portable computers at GRiD, says, "We draw a distinction between pen-based hand-held computers, which is what we are marketing today to business, and tablet computers, which we think will hit the home market in a big way about 1993–1994." Dulaney says the home market will require durable machines priced under \$1,000 for which plenty of basic software—word processors, spreadsheets, and the like—is available. WordPerfect, Lotus, and others are already planning pen-

TAKING PEN IN HAND

Two words you often hear in discussions of pen-based computing are *horizontal* and *vertical*. Vertical computing refers to programs written for a particular application, such as a database form specifically designed to mimic the forms used by an insurance or shipping company. Horizontal applications include things like word processors and graphics packages that can be used by anyone. Naturally, the emphasis in pen-based computing has been on the vertical applications because getting the computer into the hands of salesmen and shipping clerks is the key to getting the industry off the ground. However, this market is highly volatile, and it makes sales of thousands of machines or adoption of a particular operating system hostage to a few hundred or a few thousand MIS (Management Information System) directors at giant companies across the country. Initial success must depend on the immediate usefulness of the pen-based computer for electronically gathering the same information now gathered on paper forms. The future is a different story.

Where do you think the PC would be in schools, small businesses, and individuals hadn't seen it as essential to their work? It would be a curiosity seen only in a few corporate offices, and it most likely would've been replaced by terminals—dumb or otherwise—hooked to mainframes. The success of nearly all consumer electronics is based on acceptance by individuals. Therefore, the real question of whether pen-based computing will succeed or be another footnote in computer history will be

decided by those of us who use computers in our own lives. How will you decide which technology is for you?

Microsoft, developer of *Windows with Pen Computing*, is pinning its hopes on the fact that *Windows* is already almost universally installed. Only minor modifications would be necessary for a *Windows* program to be pen-based, and dozens of applications now in use could be pen-driven with no modifications at all. Microsoft doesn't see any significant disadvantage in the relatively rigorous hardware requirements necessary to run *Windows* because GO's PenPoint also requires a 386 CPU and GRiD is also offering a unit with PenPoint and *Windows with Pen Computing* capability.

In contrast to Microsoft's entry, PenPoint from GO is targeted at new users. Seeing that there has been very little penetration of the microcomputer into the workplace beyond the personal computers on the desks of white-collar workers, GO intends to win the competition for new users based on its good looks and charm.

Anyone who has attempted to use *Windows* with a light pen has discovered that this operating environment, designed around the mouse, is awkward to use with a pen. PenPoint hopes to sidestep the assumptions built into *Windows* with a new approach based on the pen and paper metaphor, which new users tend to find more comfortable. GO describes PenPoint as a leading edge graphical user interface, similar to the Macintosh interface and preferred by many Macintosh users.

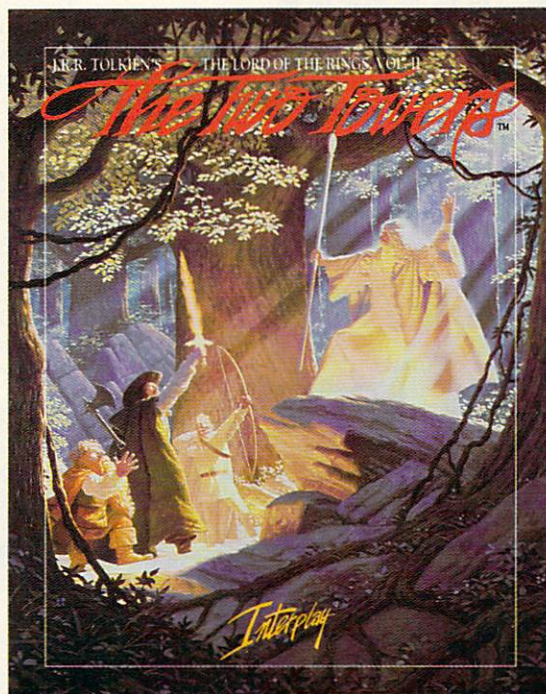
Because the PenPoint operating system has such a complete library of routines, development costs are reduced, and applications are very small; although the operating system is expected to top out at 4MB, programs will average 200K. Furthermore, unlike *Windows*, PenPoint won't be processor- or hardware-dependent. It could be ported to any 32-bit device.

So far, PenPoint software development has been split evenly between job-specific and general applications. GO sees this as a sign of health because, after corporations and early adopters (individuals attracted to new technology for its novelty as much as its usefulness) have had their fill, pen-based computer makers and the software writers serving them will have to depend on individuals for sales.

What individuals? People who've worked with computers for years and see the new pen-based computers as an improvement over what they've used in the past. But also—and more importantly—people who've never bought a computer and like the pen-and-paper metaphor. "Your mother will have one," one industry spokesperson told me. Well, maybe. But I certainly will, and on that machine I'll want a word processor and a graphics package and a complete selection of support software. I'll want the computer to fit in my briefcase or jacket pocket, and I'll want it to be faster, friendlier, and more powerful than the behemoths that fill up my desktop today. And, if the industry oracles are correct, I won't be disappointed.

—ROBERT BIXBY

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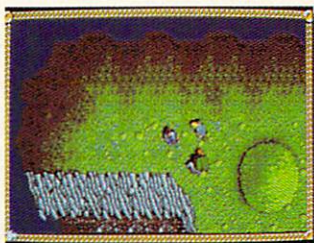
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based versions of their products.

Dulaney also says GRiD intends to offer machines that support the two best-known operating systems designed specifically for pen-based computers: GO's PenPoint and Microsoft's *Windows with Pen Computing* (more commonly called *Pen Windows*). Other hardware vendors, including IBM and NCR, have made similar pledges.

In Search of the Right GUI

You might wonder why a special pen operating system is necessary in light of the fact that GRiD and others have already demonstrated models that are DOS compatible. The new operating systems tap the power of the pen. Vern Raburn, chairman of Slate (a



Collect vital signs on rounds.



Simplify remote data entry.

small Scottsdale, Arizona, startup that's focusing exclusively on pen-based software), says the major benefit of the new machines is their "pencentricity." He says Slate's litmus test for new software is simple: Is it as good as paper and pencil? "Every time we come up with new technology," Raburn explains, "we try to [tack] it onto existing technology instead of using it in new ways."

Slate makes a product called *Pen-Apps*, a software tool set that makes it easier for application developers to develop software for pen-based machines. The idea is to give the user as much freedom as possible. "You don't have to stay within the lines when you write something, for example," Raburn



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PEN-ULTIMATE COMPUTING

Not all pen-based computing is following the GRiD/Microsoft/GO model. There are a couple of very interesting sidelights, or penlights, in pen computing. Data Entry Systems, a pioneering company in the field, offers ScriptWriter, a machine that uses actual paper and pen with a touch-sensitive pad underneath to capture the input for a computer.

SuperScript offers a pen-input device called the SuperScript II. It attaches to a desktop machine via the VGA cable and accepts pen input for use with database software. Using existing hardware keeps the cost low, but it doesn't do a lot for portability. Special software called *Pen-Sieve* uses artificial intelligence techniques involving context and pattern matching to determine the meaning of otherwise indecipherable handwriting. The SuperScript II device is like an LCD graphics tablet, providing pen-based desktop computing.

—SCOTT LEIBS

says, "and the machine can know what you mean in different contexts. Sometimes a circle can be an edit mark, other times a graphic, and other times simply the number 0 or the letter O."

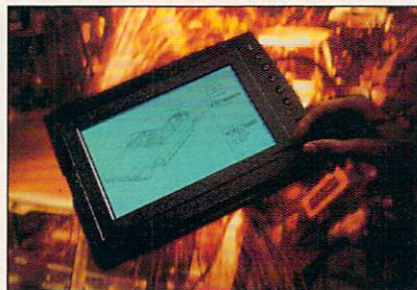
The main advantage of pen-based computers over other portables is their ability to recognize handwriting. Today's machines only read printed text, but the ability to read script is only a few years away. Observers say that it's vital if the machines are to fulfill their promise of feeling as natural to users as pen and paper.

Today machines employ a number of different techniques to recognize the user's printing. Pattern-recognition—matching the user's scrawl against a known set of letters and numbers—is one way. Typically, it accounts for about 35 percent of the job. Another technique is heuristics, a set of rules, such as "I before E except after C," that help the machine narrow the likely options. Pen-based computers also capture dynamic stroke information, such as the direction, speed, and intensity of a stroke, which can be useful in differentiating a V from a check mark.

Users of pen-based machines that employ the PenPoint operating system from GO spend about an hour to 90 minutes in training mode, during which the machine essentially gets to know the handwriting of its user. As Raburn says, "It becomes the most personal of computers." Experts predict that in a few years this process will happen online and will be invisible to the user.

Slate has also announced *PenBook*, which turns a book in PostScript format into a virtual book that can be read on a pen-based computer. The user can

add notes or search for text within the book but can't actually edit it. This is intended for creating easily carried editions of technical manuals and other kinds of guides that might be better stored in electronic form.



Track production on the plant floor.

Like others in the industry, Raburn says that while the near-term market for pen-based portables is the business world, a much bigger market is just around the corner. "Today we're selling PCs mainly to people who already have one and are upgrading. There's a large percentage of people who have said, 'Thanks, but no thanks,' to PCs. This technology will renew the industry with a whole set of new users."

The potential of pen-based machines hasn't escaped the notice of in-

ternational computer makers. More than a dozen Japanese companies are already developing machines. But Raburn predicts that most Japanese companies will focus their efforts on their domestic market, giving U.S. companies a rare opportunity to get the upper hand in a rapidly emerging technology.

A Canadian company, MicroSlate, has a line of Datellite "Pen 'N Touch" computers specially hardened to meet NATO military specs (you can drop them from waist level to the pavement without damaging them). MicroSlate claims to have had the first pen-based computer on the market but has been delayed in its bid for FCC approval to sell its machines in the U.S. Now the machines are available, and they've already started to make inroads into the market, particularly where the ability to resist damage is crucial (such as in emergency medical services). For just under \$6,000 they offer 4MB of RAM and a 60MB hard disk. They're ready to run *Windows with Pen Computing* when Microsoft begins marketing it.

Given all the activity in this field, it's clear that many U.S. firms are ready to face the challenge. However the pen-based market plays out, computer users are certain to see the prices of pen-based portables drop and the features improve at a dizzying pace. □

PRODUCT INFORMATION

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Circle Reader Service Number 163

DISCOVERY CHOICE

Battle strange life forms in the depths of the ocean in this math-powered submarine game.

Peter Scisco

OPERATION NEPTUNE

Your mission: to recover the wreckage and solve the mystery of a secret space mission gone awry.

Data canisters containing the logbook and observations of the crew on the space mission were spread throughout inhospitable undersea terrain when they were jettisoned back to earth from beyond the solar system. Once you've collected the canisters and broken their security codes, you not only will reveal the discoveries made by the scientists and astronauts on the space mission but may also learn whether the toxins at the crash site are linked to the canisters or are just a coincidence.

This ecologically correct scenario forms the backdrop for the educationally sound *Operation Neptune*, one of the most ambitious programs to emerge from The Learning Company. Designed for kids age 10 and up, *Operation Neptune* combines fast-paced arcade action and great graphics presentation with well-grounded mathematical principles. The result is a game that's as addictive as any videogame you're likely to buy. You and your children will have so much fun playing it that you might not realize you're getting a refresher course in math.

This is a key point in The Learning Company's strategy: to design educational software that teaches subtly, if not surreptitiously. *Operation Neptune* succeeds by presenting math problems in a thoroughly entertaining way. Few kids will be able to resist playing it all the way to the end.



The arcade portion places you in command of the *Neptune*, a small deep-sea submarine equipped with a sophisticated on-board computer and the capability of grabbing small objects from the ocean floor.

To make progress, you must solve any number of equations and problems—applied math that tests your abilities to deal with fractions, decimals, and whole numbers in several different contexts. You might, for example, have to indicate the distance your sub has traveled, given its rate of speed and time in the water. Or you might have to compute the square kilometers left to search in a given sector. It's more than a little challenging.

Kids, of course, are less enthralled with the educational elements of such programs than they are captivated by the entertainment, and *Operation Neptune* captivates. You must maneuver your small ship through treacherous underwater trenches and canyons, avoiding obstacles such as outcroppings of rock,

coral reefs, and the like. These arcade elements prevent *Operation Neptune* from evaporating under the pressure of solving math problems.

Moving the submarine is not overly difficult, but precise movements aren't easily executed. Occasionally, your craft will be tossed by undersea currents. Part of the challenge in piloting the *Neptune* is in using these currents to slip past obstacles and retrieve parts of the wreckage.

As if maneuvering your sub weren't enough to keep you occupied, you must also deal with a deadly mix of strange sea creatures. These odd animals aren't just the fantasies of a back-room game designer; they're modeled after actual creatures that you might encounter in the second world beneath the ocean's surface.

You and your kids will have hours of fun trying to avoid these undersea inhabitants, which range from angelfish to anemones, puffer fish to octopuses. The Learning Compa-

ny takes some license in the name of entertainment—some fish throw rocks, for example. But what fun would it be to dodge these creatures if they were no more dangerous than goldfish in an aquarium?

You have a supply of weapons to get you through especially tricky parts. The Learning Company gets good marks here for keeping the game's underwater theme in mind when designing its defensive system: ink pellets. When faced with a menace, you can temporarily surround it with dark ink, allowing you and your sub to slip past.

The rest of the game also offers attractive, carefully designed graphics. The underwater environment is rendered in brilliant pastels in a sea of blue hues, fish and other creatures you meet during your explorations are well designed and presented, and the animation is smooth and fun to watch.

The game's universe is quite large, so your kids will be able to enjoy playing for many hours. Five separate zones, which increase in difficulty, are each divided into three sectors. Combine that with the customization options, and *Operation Neptune* offers plenty of gameplay.

If all this talk about arcade action and gameplay makes you uneasy, don't fret—*Operation Neptune* provides plenty of mathematical challenges. You can customize it along four levels: Whole Numbers Only; Fractions and Whole Numbers; Decimals and Whole Numbers; or Decimals, Fractions, and Whole Numbers.

The math problems range from simple addition and subtraction to more advanced problems involving compass headings, volumes, area, per-

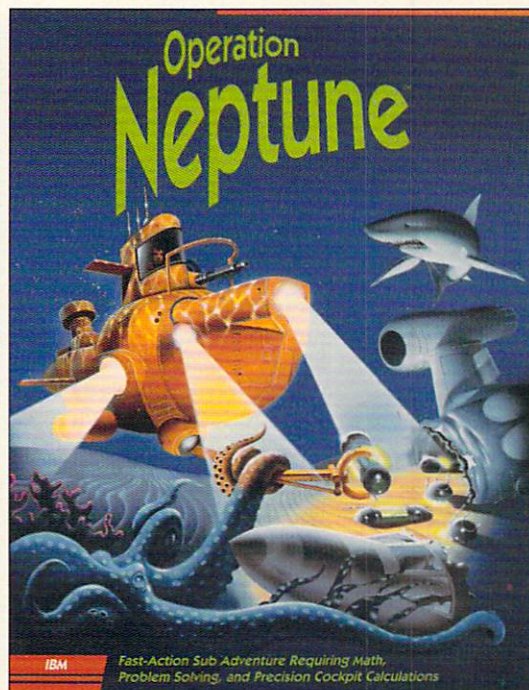
centages, and sequence patterns. To help you, a calculator is available. Not all of the problems allow you to use it, however. And there's an option for turning off the calculator—great for parents who want their children to have more practice in solving problems with pencil and paper.

The game doesn't use timed questions, thus eliminating unnecessary and artificial pressures. Instead, you start each sector with three full oxygen tanks, each containing four units of oxygen. Crashing into a sea wall or the floor, incorrectly answering a problem, or getting attacked by a sea creature costs you one unit of oxygen. Keep your eyes peeled for Zoom, the friendly dolphin that's trained to bring you more oxygen tanks.

Although you're penalized for incorrect answers, *Operation Neptune* teaches you how to solve problems. After the first incorrect answer, it offers a hint as it prompts you to try again. If you miss again, another unit of oxygen is used up, and the program explains how to solve the problem.

The short-term goals of making it through three sectors and then through a zone are enhanced by the underlying premise of the game—solving the riddle of the data canisters. If you're able to break the code that grants access to its contents, each canister provides a short entry to the space crew's logbook. Placing these entries together lets you slowly unravel the mystery behind the secret space voyage.

Only a few small technical improvements could make *Operation Neptune* better. An option to start a new game without completely exiting the pro-



gram would be useful for families with children at different skill levels. Also, given the game's arcade quality, joystick support is conspicuously absent. My only other complaint is the startup sequence, which calls for you to type the letters *on* to launch the game. I prefer something more memorable, like *neptune*. These are small quibbles, however, in an otherwise excellent piece of work.

Once considered not much more than electronic flashcards, learning programs today are hardly recognizable as educational. Now they rival videogames for arcade excitement and simulations for special effects. And the best educational software retains the ability to teach, to excite, and to maintain an interest in learning. *Operation Neptune* sets sail in grand fashion.

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PATHWAYS

Steven Anzovin

ARTIFICIAL MUSICIAN

The advent of MIDI (Musical Instrument Digital Interface), an interface that lets electronic instruments talk to a computer, has revolutionized music composition. With a computer and a few MIDI-controlled instruments, one composer can write and perform what in the preelectronic era required an entire orchestra. But live performers who sit in on the jam have to follow the computer, since the computer is unable to follow them. That stifles a human performer's style and makes for mechanical-sounding music.

In a new research project called AICP (Artificially Intelligent Computer Performer), artificial intelligence (AI) researcher and amateur violist Bridget Baird is trying to reverse that situation—to create a computer system that can listen to and follow along with one or more live performers.

AICP exists only in the for-

mer whaling town of New London in a lab at tiny Connecticut College, where Baird is a professor. (Baird's address is Department of Mathematics, Connecticut College, Mohegan Avenue, New London, Connecticut 06320. Her E-mail address is bbbai@conncoll.bitnet.)

Three years ago, Baird, fellow mathematician Donald Blevins, and music professor Noel Zahler came up with the idea of a program that could play a synthesizer to accompany MIDI input from an instrument played by a live musician. Similar projects have been undertaken at MIT and Carnegie-Mellon.

By last year, AICP could expertly follow one human player—as long as he or she played only a string of single notes. The program, running on a Macintosh equipped with a MIDI interface, "listens" to a person playing another MIDI instrument—for example, a keyboard or a MIDI-miked violin—and uses artificially intelligent rules to figure out how to stick to the score while keeping up with the live performer. If the live performer changes tempo or key in a way not specified in the score, AICP can still follow along without missing a beat. AICP does depend on a score, so improvisation isn't within its capabilities. Yet.

Last summer, Baird snagged a National Science Foundation grant to enhance AICP to follow multiple players. "Usually the NSF tosses any proposal right into the trash can if it has the words *art* or *music* in it," says Baird, "but to my surprise, they gave us the money." Since no single processor could handle the input, Baird turned to parallel processing. She installed several Inmos Transputer boards in the Mac, one to handle MIDI from each live performer, thereby obtaining the processing

power of a mainframe for a few thousand dollars (though the temperamental Inmos and Mac operating systems crash each other daily). Three students—Miriam Fendel, who is a bassoonist and psychology major; Chris Amorossi, who did the coding; and Dave McClen- don, who designed the interface—got AICP to respond to as many as eight players.

AICP raises larger philosophical questions. "The main challenge," says Baird, "is to figure out what people are really doing when they make music together." For example, Fendel, the psychology major, is trying to figure out how musicians choose between conflicting inputs—whether to follow the first violin, who might be off-tempo, or the first flute, who might be off-key. AICP must learn to make the same decisions. Baird notes, "As programmers we have to verbalize what we are doing as musicians and then crystallize that into computer code."

Down the road, it should be possible to turn AICP into a music tutor, a professional-level accompanist, or maybe even a French horn in a first-rank orchestra. It should even be possible to make an AICP-controlled instrument sound like it's being played by a famous virtuoso—keyboard by Vladimir Horowitz or Jerry Lee Lewis—whose style could be reduced to an algorithm. So far, there's nothing like AICP in the world of consumer music software. Baird says she'd like to see AICP become a commercial product someday, but without more money (her NSF grant will run out at the end of the summer of 1992), that's unlikely to happen. For now, string trios looking for a fourth will just have to hire a real live person. Given the current dearth of jobs for human musicians, maybe that's not such a bad thing. □

Could a computer be a music tutor, a professional-level accompanist, or even a performer in a first-rank orchestra?

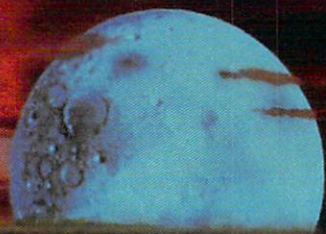


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Circle Reader Service Number 167

MULTIMEDIA PC

David English

PRESENTATIONS THAT SPARKLE

Multimedia is finally here. Some of you may already have bought a Multimedia PC. Even more of you are probably thinking about buying one. You've seen the flashy multimedia demos at your local computer store or industry trade show, and you want in on the action. Some of you may even want to take the bull by the horns and create your own multimedia applications or presentations. The hardware is easy—pick a certified MPC

With MacroMind Action!, you can create instant multimedia presentations.



computer or appropriate MPC upgrade kit—but which software should you choose?

If you want to create a self-contained multimedia application, your best bet is probably Asymetrix's *Multimedia Resource Kit*, which adds support for CD-ROM, laser disc players, animation software, audio- and overlay-video cards, and MIDI synthesizers to *Asymetrix ToolBook 1.5*. But if you want to create a presentation—much like the kind you can produce with *Microsoft PowerPoint*, *Aldus Persuasion*, or *Harvard Graphics*, with extensive animation and digitized sound—take a good look at *MacroMind Action!* (MacroMind, 600 Townsend Street, Suite 310W, San Francisco, California 94103; 415-442-0200; \$495).

MacroMind is best known for its Macintosh program, *MacroMind Director*, which is currently the best program on any platform for creating multimedia applications. While officials from the company have hinted that we'll eventually see a version of *Director* for *Windows*, MacroMind's first PC program is actually a traditional presentation program—though one that offers a surprisingly large number of *Director*-like features. Like its older brother, *Action!* lets you quickly combine sound, motion, text, and graphics and even make the whole thing interactive. The programs are so similar that you can use *Action!* to playback *Director* files on your PC—though imported files do lose their interactivity.

Like *Director*, *Action!* offers a variety of tools in floating windows that let you view and alter the objects in your presentation. The Tool Palette window has the usual drawing program tools (pointer, text, circle, oval, and so on) as well as some unique multimedia tools. The multimedia tools include an Action tool for applying movement, duration, and special effects to an object; a Sound tool for attaching a WAV-format digitized sound or CD-audio sound to an object; and a Link tool for creating interactive buttons or linking an object so that it operates like a button.

The other floating windows include a VCR-like Control Panel with play, stop, rewind, fast forward, half-second-forward, and half-second-back buttons; a Timeline panel that lets you quickly view and shift objects over a linear time line;

a Scene Sorter that lets you rearrange the order of your scenes and select each scene's duration, color palette, template, and transition; and a Content List that provides yet another view of the structure of your presentation—this time as an outline. If you have a NTSC video card, you can use the Print to Video option to copy your presentation to a videotape recorder.

Fortunately, all this is laid out so you only have to deal with the tools and controls that you need at the moment. In addition, the package includes more than 100 professionally designed templates; a ClipMedia Library of sounds, graphics, and animations; and *Adobe Type Manager* for smooth type in any size. In many cases, you can simply load a template, edit the text and graphics, and create an instant presentation. You can also use the *Windows* clipboard to import graphics and charts (in DIB and BMP formats) from other applications. You could scan your company's logo, import it into *Action!*, and have it zip across the screen to the sound of a speeding rocket.

MacroMind has billed *Action!* as "instant multimedia presentation software." On the one hand, this is marketing hype—don't expect to be able to learn this program completely in an hour or two. There are just too many elements involved. On the other hand, once you do learn it, you can put together an impressive presentation in just 15 or 20 minutes. *MacroMind Action!* comes as close to a cut-and-paste multimedia construction kit as we've seen on the PC. The fact that a program this powerful is so easy to use means we're likely to see more great things from the fertile minds of MacroMind. □

GAMEPLAY

Orson Scott Card

FOR (IM)MATURE AUDIENCES ONLY

The stereotype of a computer programmer is a permanent melvin who has never had a date. The stereotype isn't true. Programming attracts no more nerds than any other brain-intensive profession. And yet some games make you wonder if their game-wrights have complexes lingering from junior high.

When *Crime Wave* came out, Access had a state-of-the-art mystery game with all of the ingredients: a hard-boiled detective in the Raymond Chandler mode, a high-tech near-future underworld where life is cheap and greed is king, and sex as casual as a cup of coffee.

Access does games right, providing multiple named saves at any point; a built-in hint system; and a quick, clean exit from the game. And when you're given a choice of dialogue, it makes a difference which questions you choose—maybe you'll get information from another character, and maybe you won't.

There's humor in the story and good writing throughout. The visuals are a stunning mix of recorded video and drawn animation, so that reality blends in with unreality.

But that's where we get into trouble, too. *Crime Wave* begins with a scanned video of the president's daughter being kidnapped. Later, we see her struggling in the grip of a thug. The image is of an attractive actress in a red spaghetti-strap gown. It's set off as a special moment of reality in the underlying unreality. It's disturbing that the sexiest image is of a woman struggling to resist being abducted by a stronger male figure.

At another point in the game, the player accesses a da-

tabase in which the images of several characters are stored for reference. The president's daughter is apparently nude, but you can only see her upper chest. As you watch, her image is smoothly rotated in video. But the database listing for a man shows him wearing a shirt, and nothing is shown below the collar. And instead of a lovingly transferred video, you flip from front to profile to one-quarter views. The implication is clear: Women are sex objects; men are people.

If the president's daughter were Jessica Rabbit, an exaggerated caricature of a woman, there would be a great distance between the scene on the screen and reality.

She isn't Jessica Rabbit, however. And so we're back to the image of computer programmers as guys who can't get a date.

Martian Memorandum is perhaps less disturbing, but considering that there is no warning on the package, I wonder how happy many parents would be to know that one of the experiences their teenagers might have during the playing of the game is a sexual encounter with the character Rhonda. The gamewrights aren't taking themselves all that seriously. They videotaped Rhonda pressing her lips against a glass screen in order to suggest that she's kissing the player, which looks silly and gets a laugh. And they certainly weren't trying to be pornographic—when Rhonda gets you to her room, she undresses only to her underwear, and then you skip to seeing her in bed

afterward. Nor does the game flow force you to go through this encounter—indeed, the game seems to steer you away from it. But it's there for any player to find.

Access is hardly the only company engaging in this behavior. *Rise of the Dragon* (Dynamix) is in the same league as the Access games, and because it's a cyberpunk game, it also takes us through some lowlife experiences. *Dragon* isn't videotaped; it's drawn. The artists did a good job at tricky moments (the Pleasure Dome,



Some of the best games have R-rated scenes. It's time for the industry to take responsibility for games created by the immature for the underaged.

for instance) of putting the nudity and suggestive activities in a grayed-out background. Still, kids discover soon enough that in playing this game you can "do it" with your (the hero's) girlfriend. Nothing is shown, but having sex is one of the options in the game experience.

While parents can preview a videotape or movie or read a book before giving it to their kids, they can't possibly preplay a difficult computer game and be sure they've seen every scene that their kids might end up seeing.

It's time for game developers to do some serious thinking about who their audience is—and how they're affecting that audience with their R-rated computer games. □

ENTERTAINMENT CHOICE

Rediscover lazy summer days, tree forts, and pranks as a nine-year-old boy in this fun, satirical adventure game.

David Sears

THE ADVENTURES OF WILLY BEAMISH

Consider average nine-year-olds: They play videogames, hunt for trouble, and, most important, have fun. Burdened with careers and carpools, adults can forget what summer vacation means. (Remember lazy days spent in tree forts and staying up late on weeknights?) Adults may consider their lives to be pretty important, but given the opportunity, how many wouldn't trade places with a kid for a few days? Wouldn't you attempt to recapture the exuberance lost to responsibility? Wouldn't you try to rediscover the feeling that you can do anything, given a few close friends and three summer months?

The creative minds at Dynamix must know what lost childhood means to us grown-ups. Certainly only the young at heart could produce the juvenile wonderland of *The Adventures of Willy Beamish* with such mature wit and style.

You say you've never cared much for adventure games? Forget creeping around dungeons or conquering the universe for a while. Instead, imagine yourself holding the title of regional Nintari videogame champ and try to figure out a way for your pet frog to win the annual frog-jumping contest. The grand prize of \$25,000 will see you to the Nintari championships in style, but even second prize gives you a shot. As Willy Beamish, nothing could please you more than the national Nintari title. But alas! Born with a predilection for trouble and possessing yup-

pie parents all too willing to ship you off to military school, you have to stay on your best behavior. Even kids can have serious problems.

On the last day of school before summer vacation, you'll find yourself locked in a battle of wills with both your crabby teacher and your despised PE instructor. Escape detention, and you must contend with a towering bully. Make your way home, and you'll find that a not-so-good report card has preceded you.

Should you take it from the mail slot and hope Dad never asks to see it, or should you leave it for him to find? Should you swing your little sister so high that she goes into orbit? Should you feed the dog at the table? Moral dilemmas such as these will plague you, and depending on how you want to play your preteen alter ego, you'll sway from angelic to downright malicious.

Occasionally, the ghost of Grandpa Beamish will materialize and offer counsel, but you can't always depend on his advice to be lots of fun. Besides, whether you prefer to play Willy as brash or timid, you must still defeat a gang of local toughs, worm your way inside a seedy bar, and thwart the wick-

ed plans of the despicable Leona Humpford—rather unsavory assignments.

Veterans of *Rise of the Dragon* and *Heart of China* will find the interface of *The Adventures of Willy Beamish* familiar but perhaps somewhat more evolved. Like its predecessors, this Dynamix adventure runs just fine without a parser—all actions result from pointing and clicking with the mouse or, more rarely, from keyboard controls. To pick up an object, just move the mouse pointer until an arrow appears and points to whatever you want to grab. Click the left mouse button, and you have the merchandise. If you want to place the goods in Willy's knapsack, click on Willy. Want to take something out for inspection? Click on Willy again; an inventory screen appears, complete with selectable images of all the objects that are in his possession.

Willy walks almost everywhere in his hometown of Frumpton. Whether he wants to have pizza at The Slice of Life or meet his friends Perry and Dana at the tree fort, he'll travel there on foot. To send Willy on



his way, you just move the mouse pointer over the on-screen location you want him to visit. When the pointer changes to EXIT, you can click the left mouse button, and Willy will trot off.

Instead of the now passé first-person perspective of many adventure games, *Willy Beamish* puts the main character on the screen with the rest of the cast. Paired with the point-and-manipulate mentality of the interface, Willy can move through his world at a frantic pace—one approaching real life. On a 40-MHz 386 machine, Willy seems hyperkinetic; at only 20 MHz, you want to offer the sluggish boy a Slam Dunk Cola.

Dynamix outdoes itself with the backgrounds in this one. Each screen, first painted by brush and then scanned by color scanner, shows what 256-color VGA can do for a game. Disney or Hanna Barbera animation fans might recognize the work of some talented artists here. For instance, Rene Garcia, who painted the gloomy visual environment for Ursula in *The Little Mermaid*, does an equally fine job here for the stills of Leona Humpford's mansion.

Solving all the puzzles, locating all the essential objects, and winning the frog-jumping contest require more than a bit of trial and error. Fortunately, you have a suitable soundtrack to accompany you in your endeavors—one that miraculously never grows tiresome or threatens your sanity. Sure, some parts repeat too frequently—in movies, these repetitious melodies are called themes—but at worst you'll just walk around humming the music from the introduction. Sound effects are prominent,

and the Dynamix team coaxes some surprisingly appropriate noises out of even the most basic Ad Lib card.

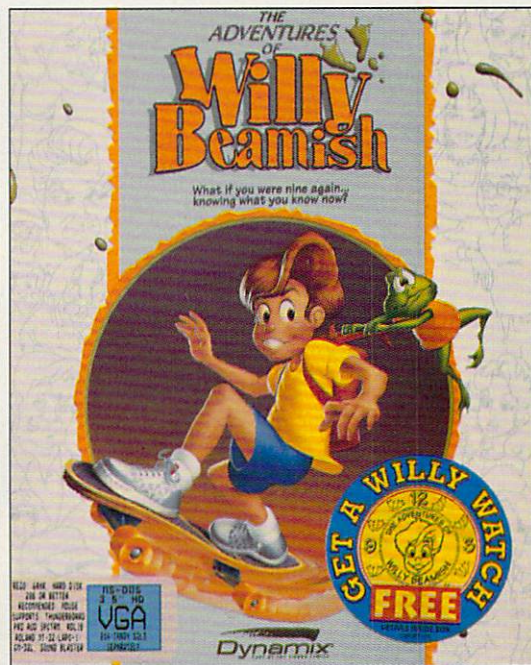
Characters communicate via pop-up panels and thought balloons. Designer Jeff Tunnell envisioned *Willy Beamish* as an interactive cartoon—a goal not beyond the reach of modern PCs—but the clear digitized speech necessary for a complete cartoon effect comes at a premium. With all the words the characters in *Willy Beamish* bandy about, most of a PC's resources would go toward playing back samples. Instead, more like a comic strip than an animated feature, *Willy Beamish* makes extensive use of text.

Willy's possible responses to other characters' statements can at times prove infuriating, especially if they don't jibe with your concept of Willy. Sometimes the little guy might seem too precocious for your tastes. Still, we can forgive a nine-year-old for many indiscretions, and you must remember that when you play Willy, you play a child—a cartoon child at that. *Willy Beamish* offers you the chance to laugh at adults and the adult world without really suffering the consequences.

Take time to examine the immovable objects scattered throughout the game as well; a tour of Frumpton should evoke more than a few laughs as you uncover the history and hilarity behind almost everything in sight.

Younger players might miss some of the rampant innuendo, but most world-weary adults can't miss the running commentary on crime, pollution, and the evil of artificial sweeteners.

In almost every regard a delight, *The Adventures of Willy*



Beamish delivers a manageable challenge with astounding replay value. Puzzles, neatly paired with multiple clues, won't cause any protracted, hair-pulling frenzies after your bedtime, but the gnawing mystery of what happens at the Nintari championships won't let you rest, either. With 20 save-game slots available, you really can't help but make some progress in every gaming session.

Admittedly, *Willy Beamish* relies heavily on animated interludes to relate much of the information that makes the game a story as well as a series of puzzles. You might overlook this flaw for the sheer charm of the segues themselves, but, more likely, you'll forgive it for the second chance at youth it offers. No one can resurrect lost summers, but thanks to Dynamix, now you can have a second childhood—Willy's.

Circle Reader Service Number 313

IBM PC and compatibles, 286 processor recommended; 640K RAM; EGA, VGA, or Tandy 16-color; hard drive; supports Ad Lib, Roland, Sound Blaster, and Thunderboard—\$59.95

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SOUNDINGS

Whether it's biff-bam sound effects or a narrator telling you that you just inserted the wrong disk in drive A, sound adds an important new dimension to computer interaction. PC games and tutorials make increasing use of sound, and many require sound cards to achieve their full potential. Although other computers like the Apple IIcs, the Commodore 64, and the Amiga were designed around sound chips, the PC has been justly famous for its tinny little speaker and poor sound reproduction. As a result, an entire industry has grown up around this shortcoming—an industry entering its second generation and enjoying an unexpected boost from the movement to multimedia.

BY LAMONT WOOD

Two items typify recent changes in sound: the introduction of inexpensive single-purpose boards for gameplay and the movement to more expensive cards that rival studio-quality synthesizers of only a few years ago. The new sound boards may have input jacks for microphones or recording devices and often (since they're intended for use with games) joystick ports.

The Great Divide

There are several types of computer audio, but the main split is between waveform and MIDI (Musical Instrument Digital Interface). Waveform, also called digitized sound, involves encoding and storing sound in digital format by sampling it many times a second. Output can be almost indistinguishable from input. The quality varies according to the sampling rate, which can run from 4,000 to 44,000 times a second. Since these sample rates are so high, even compressed waveform files can be huge, straining even CD-ROMs.

MIDI files, meanwhile, can be dramatically smaller, with bytes representing musical notes rather than fragments of sound waves. However, the MIDI device must be able to synthesize each instrument the music calls for, and a "saxophone" being played by one MIDI device may sound more or less realistic than a "saxophone" on another MIDI device.

Aside from this variability, the main drawback of the MIDI standard is that there's no entirely satisfactory way of producing the human voice with it. Sound boards used for *Windows with Multimedia*, for instance, are required to offer both MIDI and waveform circuitry so they can provide hardware support for music and speech.

The Electronic Ocarina

For this feature article I looked at PC sound boards from the leading vendors—Creative Labs, Ad Lib, Covox, and ATI. All offer both MIDI and waveform support. The waveform files can sound remarkably life-like, depending on the quality of the speakers being used. (You'll find that large, powered speakers provide better reproduction from any sound card.)

The MIDI files sound about the same, regardless of the card, because the eight-bit cards all use the same basic Yamaha synthesizer chips, which can play 11 instruments at a time. Whether that quality of music is acceptable or exceptional depends entirely on your expectations.

If you're used to beeps and boops from your PC or if you've grown accustomed to the sound quality of Nintendo games, you'll be pleasantly surprised.

REALLY INEXPENSIVE: ACCESS REALSOUND

Amidst subdued bird noises, you address the ball, hear the swoosh of the club, and watch the golf ball sail over the landscape. And when it flies into a tree, you can hear the shredding of leaves.

"Looks like he hit a tree, Jim," says the robot sports commentator, as monotonous and vacuous as his real-life counterparts.

Yet, these noises, part of *Links* from Access Software, are produced without any special equipment. They come out of your system's internal speaker—an item generally limited to making warning beeps. Spokesman Steve Witzel explained that Access has developed RealSound as

a way to send pulses to the PC's speaker to make it produce speech. Unfortunately, because of the quality of the hardware, the speech is of the quality of a voice on a long-distance telephone connection—everything is comprehensible, but you wouldn't confuse it with the real thing. Only digitized sound is handled—there's no MIDI music synthesizer. And the piezoelectric speakers used in some laptops tend to be faint.

About 65 other software vendors have licensed RealSound technology so far, most for the creation of sound effects, theme music, and narration.

REALLY HIGH QUALITY: ROLAND LAPC-1

Take heart—you can have professional-quality sound from your PC. You just have to pay for it. You can, for instance, get the \$595 LAPC-1 from Roland.

The same MIDI files were played with the boards reviewed above. Then they were played on the stereo LAPC-1 using the same speakers at the same settings. The results were memorably different. The music sounded like an electric guitar with live orchestral backup. The effect is the result of using sophisticated custom synthesizer chips instead of the standard Yamaha chips. *Windows with Multimedia* has a driver to support it.

Besides the price, there are other draw-

backs. No software comes with it—you're expected to run it with a game or acquire music composition software separately. And waveform audio isn't supported—if you want voice narration as well, you'll have to get a separate board.

Meanwhile, the LAPC-1 is slated for eventual replacement by the new Roland SCC-1 board at the same price. This new Roland board is touted as offering even better sound quality, but the main difference I noted is that it's smaller and uses fewer chips. The other differences are that you can't create new instruments as you can with the LAPC-1 and the SCC-1 comes with more external connectors.

REALLY ENTERTAINING: DISNEY'S SOUND SOURCE

It used to be that if you were out of expansion slots or you used a laptop that had no expansion slots to begin with, you could either use RealSound or suffer in silence.

But now there's the Sound Source from Disney Software. It's a simple \$39 box (it only costs \$20 when purchased bundled with Disney software packages) about the size of a business telephone. The Sound Source connects with your PC's parallel port. What if you need to use your printer? The parallel plug has both a male and a female end so that you can plug your printer in and still use the Sound Source. (But if the printer is connected, you have to turn it on for the Sound Source to work correctly.) The Sound Source itself is powered

by a standard nine-volt battery.

The main drawback is that parallel ports aren't as standardized as you might think. The Sound Source relies on a couple of pins in the connector that are rarely used, and some board makers save a few cents by leaving them disconnected. The Sound Source won't work with those boards at all.

Windows with Multimedia drivers are available, and you're likely to encounter Sound Source circuitry more and more in the future, since Phoenix Technologies has licensed it for use in the ROM BIOS chips it makes for PC clones. This should lead to broader support and might result in a long-awaited PC sound standard.

Yet the music doesn't measure up to your home stereo, unless you've purchased an expensive MIDI synthesizer as your output device.

But even if you find the sound itself similar, nothing else is—software support, auxiliary inputs and outputs, and other options differ greatly from board to board. (Incidentally, because of space limitations, all of the sound boards use 1/8-inch miniature jacks on their ports.) Some offer stereo output, although a MIDI file has to have been recorded in stereo in order to be reproduced in stereo. Some boards offer joystick ports that could also be used

to interface to an external MIDI synthesizer for those PC users who are serious about music reproduction.

Getting Creative

Creative Labs undoubtedly offers the most diversity. For \$849.95 you get not just a sound card but a whole upgrade kit to turn your PC into an MPC (Multimedia PC). This includes a Creative Labs Sound Blaster Pro sound card which also controls an internal CD-ROM drive, *Windows with Multimedia* on CD, and four other CD titles: *Microsoft Bookshelf* (don't miss the animated encyclopedia entries), a game, a col-

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SOUND INVESTMENTS

	Price	MIDI Port	Mike Port	MIDI Voices	Stereo Output
Stereo F/X ATI Technologies 3761 Victoria Park Ave. Scarborough, ON Canada M1W 3S2 (416) 756-0718	\$199.00	yes	1	11	yes
Sound Master II Covox 675 Conger St. Eugene, OR 97402 (503) 342-1271	\$229.95	yes	2	11	no
Sound Blaster Pro Creative Labs 2050 Duane Ave. Santa Clara, CA 95054 (408) 986-1461	\$299.95 (\$849.95 MPC kit)	yes	2	22 (11 stereo)	yes
Ad Lib MSC	\$119.95	no	no	11	no
Ad Lib Gold Ad Lib 220 Grande-Allee East #850 Quebec, PQ Canada G1R 2J1 (418) 529-9676	\$299.95	yes	1	20	yes
LAPC-1 Roland 7200 Dominion Cir. Los Angeles, CA 90050-0911 (213) 685-5141	\$595.00	yes	no	32	yes
Sound Source Walt Disney Computer Software 500 S. Buena Vista Burbank, CA 91521 (818) 841-3326	\$39.00	no	no	n/a	no

To Master Sound

Meanwhile, there's the \$229.95 Sound Master II from Covox. It's fully compatible with the Ad Lib card, but it has many more features—as you'd expect from looking at the price.

The board has two microphone inputs (for powered and unpowered mikes), a joystick/MIDI connector, and a volume control. The unit comes with two small, unpowered speakers; however, if quality sound reproduction is of high importance to you, you would get better-quality sound using almost any set of headphones or powered speakers.

Notable among the provided software is what might be called a voice-command utility. It lets you speak a phrase up to 1½ seconds long into the microphone. You repeat the phrase three times and tell the system that the phrase equals a particular keyboard input. Thereafter, when you say the phrase, your computer will execute the keyboard input. This feature could be used as an attention-getting gimmick at a presentation, allowing you to command your computer to change slides or sum a column of figures just by speaking to it.

Sound Master II also comes with a music composition program called *Lyra* (which produces staff notation) and a waveform editor. *Windows with Multimedia* drivers for Sound Master II are reportedly in the works.

Special F/X

Meanwhile, the \$199 Stereo F/X card from ATI Technologies offers both Ad Lib and Sound Blaster emulation. The board has stereo input and output jacks, a volume control, and a MIDI/joystick interface. DOS and *Windows with Multimedia* drivers, MIDI players, waveform editors, and animation synchronization software are provided, but the board isn't shipped with any music composition software as such.

All of these boards will launch you fairly painlessly into the brave new world of PC sound. But sound is a big world, and MIDI constitutes a whole industry unto itself. Before getting involved, you might want to consider the alternatives discussed in the accompanying sidebar.

Whatever sound decision you make, you'll find that many of your action and adventure games—most games now support sound cards—are more enjoyable when you can hear them. And who knows? Once you become familiar with some of the MIDI music-composition software available on the market, you might discover that you or someone else in your family is a budding musical genius. □

lection of sound effects, and a software sampler. By itself, Sound Blaster Pro sells for \$299.95.

The *Windows* CD includes several utilities geared to the Sound Blaster, including *Chatterbox* to play waveform files, *Jukebox* to play MIDI files (although both types can be played by the standard *Media Player* multimedia utility from Microsoft), and a sound mixer. The CD also has a collection of music files and sound effects you can use with the *Multimedia Alarm Clock*—the car-crash effect is sure to rouse you.

Other DOS software bundled with the Sound Blaster includes a voice editor that lets you edit waveform files, complete with an oscilloscopelike display that lets you cut and paste; MIDI music composition software; and software to integrate Sound Blaster sound with existing onscreen animations. There's also a voice synthesizer that will read ASCII files aloud. (Predictably, the output can be quite stilted; if, for instance, it encounters a page divider of 60 equal signs, it will pronounce "equal sign" 60 times.)

Trump Card

At the opposite end of the feature spectrum is the Ad Lib MSC (Music Synthesizer Card), which is intended to be

plugged in and used by the application software without much user involvement. There are no settings or jumpers or drivers to worry about—you tell your game software to use Ad Lib, and suddenly you have sound.

For \$119.95 you get the card itself and a utility called *Jukebox* that plays music files in Ad Lib's own ROL format. Ad Lib does additionally offer musical composition software called *Visual Composer* that represents the notes in player-piano format (that is, as holes in a sliding display adjacent to piano keys) rather than in the musical staff. (*Visual Composer*, bundled with the board, costs \$199.95.)

The only outputs on the board are the speaker jack and the volume control—there is no jack provided for microphone input.

As this was being written, Ad Lib was readying its Ad Lib Gold card, a \$299.95 package that will offer higher-quality MIDI, stereo output, microphone input jacks, *Windows with Multimedia* drivers, and other auxiliary features. The Ad Lib Gold Card won't use the standard Yamaha chips. For PC users who are seeking the illusion of being in a concert hall, a Surround Sound add-on module is available to add the appropriate reverb.

64/128 VIEW

New titles trickle into North America as the 64 continues to create interest abroad.

Tom Netsel

When was the last time you saw an ad for the 64 on television? If you live in England, you probably saw a ten-second spot tacked on the end of an Amiga ad that ran during the Christmas season.

Commodore started its important before-Christmas ad campaign in early November, pushing the Amiga, CDTV, and the 64, spending about £4.5 million on the TV spots. This marked the first time the 64 has made a television appearance in the United Kingdom since the mid-1980s.

In Germany last year, sales were the highest ever for the 64, with more than 400,000 of them making their way into German homes. Commodore claims there are more than 3 million 64s in Germany now.

It appears that not everyone has written off the plucky little 8-bitter. Too bad interest isn't as great in North America. Take the ninth annual World of Commodore in Toronto, for example. It was a lack luster show for 64/128 owners. There were no 64s on display at the huge Commodore Canada booth, and this was the first year the company didn't hire Jim Butterfield to conduct seminars.

One of the few bright spots of 64 activity came from Free Spirit Software. It announced a new series of education titles from Satchel Software in Australia. Prices weren't firm then, but the following products should be available by this time.

Picture Book lets students create stories with words and pictures. *Dr. Spellstein* helps with spell-

ing when he's not too busy combining body parts in his lab with laser beams.

Granny's Garden is a structured adventure game for grades 1-4, and *Math Booster* allows elementary school children to improve number skills by playing an exciting arcade-style game.

Flowers of Crystal is a graphic adventure game in which players must face burning deserts, rugged mountains, and other dangerous areas with spells and magic. The teaching activities associated with the program cover most areas in an elementary school curriculum. It comes with teacher's guide, audio cassette, map, and storybook. *Dragon World* is another adventure game that provides a range of resources.

In *The Lost World*, the theme of dinosaurs provides a springboard for developing a wide range of problem-solving skills in language, math, science, social studies, and more. Another package with a theme is *Jara Tava—The Isle of Fire*. Students must cross shark-infested waters, avoid pitfalls, explore dank caverns, and try hang gliding to solve this graphic adventure game.

Creative Micro Design officials at the show were excited about a German product they plan to distribute. They didn't have samples at the show, but be on the lookout a new GEOS program called *Perfect Print LQ*. This enhancement package provides near laser quality from dot-matrix printers. It offers more than 50 fonts and is capable of 360 x 360 dpi on a 24-pin printer and 240 x 216 dpi on a 9-pin. □

GAZETTE

64/128 VIEW

G-1

New 64 software was scarce at the World of Commodore, but products from abroad are trickling in. By Tom Netsel.

FEEDBACK

G-2

Questions and comments from our readers.

AN UPDATED GUIDE TO COMMODORE USER GROUPS

G-5

Here's an update to the user group listing that we published last summer. Edited by Dana Stoll.

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Tony LaRussa's Ultimate Baseball, Medieval Lords, and The Write Stuff.

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Questions
and answers about
disk life,
different model
64s, drive
belts, magnetic
interference,
and more

Bug-Swatter

A couple of readers noted that syntax errors occur in lines 580 and 585 of *CoilCalc* (June 1991). Author Robert Marcus offers these corrections to the program.

580 IN=.2*VAL(CD\$)↑2*

(TN(GA)*VAL(CL\$))↑2

585 IN=IN/((3*VAL(CD\$))+ (9*VAL

(CL\$)))

590 IN=INT(100*IN+.5)/100

Disk of Ages

For how many years will data written on a disk by the 1541 drive be accessible? Some disks have lengthy warranties, but does the information stored on them eventually fade to the point of illegibility? Should you copy all your disks periodically?

DOREEN HORNE
BRISBANE, QUEENSLAND
AUSTRALIA

It's always a good idea to back up important disks, but the reason isn't degradation of the medium per se. In fact, with care, floppies can be expected to hold their data in readable form for decades. Data loss usually results from handling, when disks are exposed to magnetic fields, airborne pollutants, grime, and deformation. Since there is no way to avoid handling your disks, make backups!

Different Model

What is the difference between the Commodore 64 and 64C computers? Are all peripherals and software for the two models compatible?

MILES NOONAN
TINLEY PARK, IL

All peripherals and software which work with the 64 will work with the 64C. The reason for this is that the 64C is functionally identical to the 64 on the inside. The only noticeable differences between the two models are cosmetic.

Side by Side

When I bought a refurbished 1581 disk drive and put it next to my 1571, *GEOS 128* 2.0 would crash every time I clicked on the 1581 icon. All I could get was a *disk error* message. I tried every tip friends could offer, but nothing worked. I even sent the disk drive back to the mail-order company for repair. When I got it back, the problem persisted.

The drive sat unused for months until I decided to take it to a local technician. To my shock and surprise, when I got to his shop, there was nothing wrong with the drive, and *GEOS* worked perfectly. Why had it worked in the shop and not on my desk? The drives were separated at the shop, and they worked fine. When I took them home and put the 1581 to the left of the 1571, I had the same problem again.

I think it must be some sort of magnetic interference. When the drives are separated, they work fine. They even worked when I switched them around and put the 1581 on the right and the 1571 on the left. No more problem. Maybe this information will help others who may experience a similar problem.

JIM KVARNBERG
EDMONTON, AB
CANADA

Thanks for sharing that information, Jim. Perhaps it will help someone else.

Blue Chip Drive

I am in desperate need of a drive belt for a Blue Chip (BXD 5.25) disk drive. If any reader knows where I can acquire one or knows of anyone who repairs those drives, I would greatly appreciate being contacted.

DAVID R. STEELE
P.O. BOX 75
VERNON, MI 48476

Long Printouts

When I use *geoPaint* and print out the results, I always get a page-and-a-half printout. I have the same problem with *geoWrite* and *geoPublish*. I use a 64, a Super Graphics Jr. interface, a Panasonic KX-P1123 printer, and *GEOS*. *SpeedScript* doesn't give me this problem, only *GEOS* programs. Do you know why I keep wasting paper with these programs?

LARRY NESSRALLAH
LAVAL, PQ
CANADA

It sounds like the trouble is your printer driver. You didn't mention which driver you've placed first on your boot disk, but if you're using a driver designed for an 8- or 9-pin printer, the result will be an elongated printout just as you describe. GeoWorks recommends the NB-15 driver from your system disk for your 24-pin printer, although it will print a reduced image.

There are better drivers available for 24-pin printers. *GeoWorks* (2150 Shattuck Avenue, Berkeley, California 94704) has released one called LQ-1500, which is available on its Printer Driver Disk (\$10). On *QuantumLink* you can download a number of good printer drivers for 24-pin printers written by George Wells. His EPSON24PIN is an excellent regular driver, one called EPSON24PIN90DPI rivals laser printing for quality, and his EPSON24PIN DRAFT allows for a much faster printout at the expense of print quality. These public domain drivers are also available on *BBS Post* at (616) 534-1346. This *BBS* is in Michigan, and the *sysop* allows first-time callers to download programs.

By the way, while you are at it, check the DIP switches on your printer interface. These switches should be set

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Problems with spaces in BASIC, detecting modes of operation, and comments about our format

as follows: 1 off, 2 on, 3 and 4 off, 5-7 optional, 8 off.

Pen Pal Wanted

I like computers a lot. I would like to have pen friends who are interested in computers. I know BASIC and machine language. If you would like me as a pen friend, write to the following address.

XAVIER JOHN
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(via) AUSTRALIA

XOR or X OR?

When I run *Fraction Practice II* (November 1987) on my 128, I get a syntax error in line 150. What gives?

JOHN E. POTTER
NEW LEXINGTON, OH

The program line in question reads like this.

```
150 A=FNC(Z1):IFA=XORA=Y
    THEN150
```

This is a classic example of a problem often encountered when programming in Commodore BASIC. Because the operating system doesn't strictly require spaces between commands, keywords, or variables, many programmers like to save time and space by running everything together. To a human, it's obvious that when spaces are added, the line is meant to be read as follows.

```
150 A=FNC(Z1):IF A=X OR A=Y
    THEN 150
```

The 128, however, has an XOR command. When the interpreter looks at the same line, the first part of the code presents no problem. The problem occurs when it tries to execute the IF statement. It reads it this way.

```
IF A=XOR A=Y THEN 150
```

The syntax of the XOR func-

tion is XOR(n1,n2). So the computer interpretation balks not only at the fact that there are two comparisons run together (A=XOR and A=Y) but also because the XOR function has no arguments. This is where the syntax error comes from.

Another common syntax error comes from using an AND comparison after the variable T and running the two together. The computer misinterprets the code as a TAN function. The specific solution to this problem, then, is to enter the line as a human would read it—with spaces. The way to avoid similar problems cropping up in your own code is to take the time to separate the components of a program instruction with spaces. It may save you a lot of debugging time later.

Mode Detection

I am writing a text adventure game that is supposed to work in both 128 mode and 64 mode. How can I check to see if a 128 is running in 64 or 128 mode and if it's in 40- or 80-column mode? Then, how can I make the program switch automatically to 40- or 80-column mode?

HENRY WILLIAMS
COALDALE, AB
CANADA

There's a difference between the 64 and the 128 in the way system memory is laid out. This fact can be utilized to determine which mode a program is running in. Some programmers will simply poke a value into the memory range from 16384 (\$4000) to 40959 (\$9FFF) and try to read it back. Since this is an area of free RAM in 64 mode but it's overlaid with BASIC ROM in 128 mode, the test is whether or not the value being poked can be peeked again. The following code fragment utilizes this principle.

```
10 V=PEEK(40000):POKE
    40000,V+1:PRINT 64*(V-
    PEEK(40000)+2)“MODE”
```

If you don't want to take chances with BASIC RAM memory, use the fact that the contents of the zero page vary between modes. For example, on both the 64 and the 128, addresses 768 and 769 form a vector to the BASIC error-handling routine. On the 64, the address being vectored is 58251 (\$E38B), but on the 128, the address is 19910 (\$4DC6). Peeking the address carried within this vector will tell your program what mode is being used.

To check whether your 128 is using 40- or 80-column mode, peek address 215, the active screen flag. Try this.

```
10 IF PEEK(215) AND 128 THEN
    PRINT “80-COLUMN MODE”:
    ELSE PRINT “40-COLUMN MODE”
```

To switch between 40- and 80-column screens, use the following line.

```
PRINT CHR$(27)“X”
```

Printing CHR\$(27) is like pressing the Esc key.

Format Feedback

I appreciate the present Gazette format because it gives me information about other computers and their applications. I am 70 years old, and I use a 64; my grandchildren use IBM computers.

HUGH F. SAUTTER
PERRYSBURG, OH

I am disappointed in your “replacement” magazine. Good-bye, Gazette. It was sure fun while it lasted.

DOYLE R. PAYNE
BILOXI, MS

Write to Gazette Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. □

AN UPDATED GUIDE TO

COMMODORE USER GROUPS

EDITED BY DANA STOLL



Last August and September, we published a two-part list of Commodore user groups across the United States, Canada, and the rest of the world. Since then, we have updated our list, adding more than 90 additional groups. Under each state heading, the groups are listed according to ZIP code.

User groups offer Commodore 64 and 128 owners a great deal of support and information. If there is a group near you, we hardly recommend that you attend a meeting and offer your support in return.

If your group was not listed last summer and it does not appear in this update, send your club name, address, and bulletin board telephone number (if available) to this address.

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Your group will be listed in an update in a future issue.

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Amiga/Commodore Club of Mobile, 3868-H Rue Maison, Mobile, AL 36608

ARIZONA

Commodore Club South, P.O. Box 324, Pinson, AZ 85126

Thunder Mountain User's Group, P.O. Box 1796, Sierra Vista, AZ 85636

Catalina Commodore Computer Club, P.O. Box 32548, Tucson, AZ 85751

ARKANSAS

Pine Bluff Users Group (PBUG), P.O. Box 1083, Pine Bluff, AR 71613 (BBS# 501-536-5915)

Commodore Computer Club, P.O. Box 6000, Fort Smith, AR 72906

CALIFORNIA

Commodore 64 West User Group, 2306 W. 180 St., Torrance, CA 90504

Southern California Commodore Users Group (SCUG), 11018 E. Rosecrans Ave., Ste. 203, Norwalk, CA 90650 (BBS# 213-927-5016)

Los Angeles County Commodore Club, 5947 Reno Ave., Temple City, CA 91780

K-North, 1616 Wagon Wheel Dr., Ocean side, CA 92057

Commodore Users Group of Riverside (CUGR), P.O. Box 8085, Riverside, CA 92515

FOG International User's Group, P.O. Box 3474, Costa Mesa, CA 92628 (Postal group)

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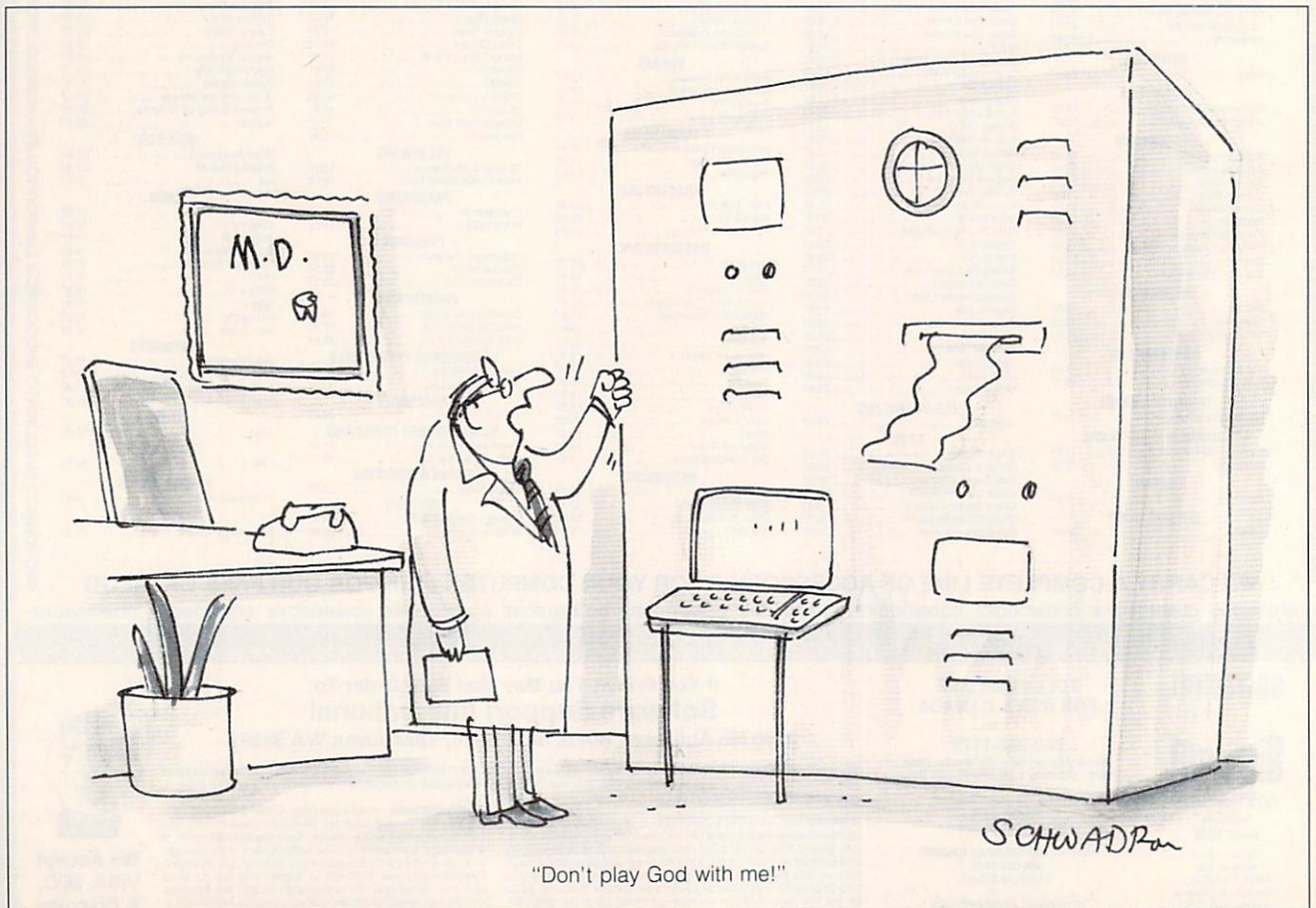
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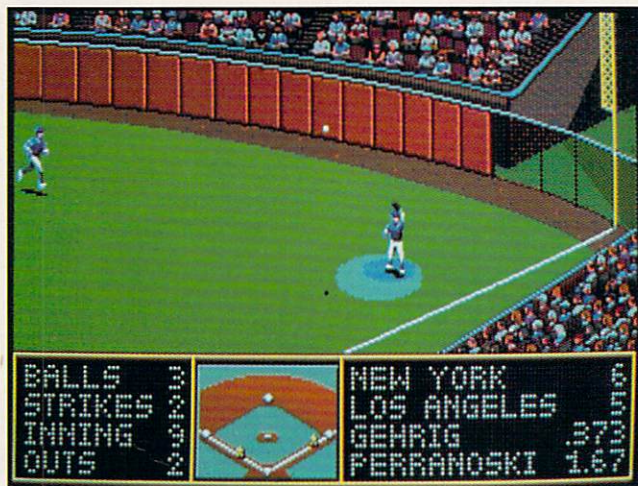
TONY LARUSSA'S ULTIMATE BASEBALL

Recently, there's been a wave of sports games for home computers released with celebrity endorsements. From Joe Montana to Jack Nicklaus, famous sports figures are lending their names to computer sports titles, some excellent and some only average.

The Oakland A's Tony LaRussa is the latest baseball manager to put his name on a game. The result, *Tony LaRussa's Ultimate Baseball*, has smooth graphics and simple gameplay. It's a whole lot of fun, but I'm not sure the word *ultimate* fits well in the title. That's because no game has everything that players want, but *Ultimate Baseball* is definitely one of the best baseball games out for the 64/128.

The game's interface is easy to learn. The main screen shows the bases and a little bit of the outfield, and the view shifts when necessary. During a pitch, a closeup of the pitcher and batter appears in the center of the main screen. The view is from behind the batter. When the ball is hit, the view tracks the flight of the ball. The statistics (score, runs, balls, strikes, and outs) are displayed beneath the main playing screen. Also, *Ultimate Baseball* displays the pitcher's name and average and the batter's name and batting average. Importantly, in the center of the strip along the bottom is a radar view with a black dot that represents each runner. This lets you keep track of the men on base when the view shifts into the outfield and bases are no longer visible.

Action begins after a short setup phase. Players select the difficulty level first. The Pro difficulty level requires the player to do everything. In the Rookie level, the computer fields the ball but doesn't throw it to the right plate. Also in the Rook-



Smooth graphics and simple gameplay, make Tony LaRussa's *Ultimate Baseball* a whole lot of fun.

ie level, when the player turns pitching over to the computer, it always tries to throw a strike. The difficulty option allows newcomers to *Ultimate Baseball* to jump right in and have a fighting chance. Next, players choose the starting lineup and batting order. Then the real fun begins!

Ultimate Baseball has a lot of features that make playing the game effortless, with all of the attention placed on the game itself. The feature that separates this game from other baseball simulations is the manager option. At any time in the game, you can interrupt the current play and make a managerial decision or turn control over to the computer. If your team is at bat, the manager options are pinch hit, pinch run, and bullpen (to warm up a relief pitcher).

When your team is fielding, there are more options. You can bring in a new pitcher; change your infield defense strategy; and play the outfield deep, shallow, or normal. These manager options require only a push of the joystick and allow complete con-

finding the right view.

Expansion disks are on the way to complete the *Ultimate Baseball* playing environment. The teams that come with the game have the best players from the history of baseball on each team. From Mike Schmidt and Nolan Ryan to Wade Boggs and the infamous Pete Rose, players are represented by their average career stats. Future expansion disks include the greatest teams from 1901 to 1968, the greatest teams from 1969 to 1989, and the 1990 teams. These disks will add more excitement to the game, but nothing beats head-to-head play in *Ultimate Baseball*. The game allows single- and two-player games and even lets you place both teams under computer control so you can sit back and watch the action.

Although 64/128 owners miss out on some features found in other versions of the game, this one is still quick moving and a lot of fun. Unlike some other baseball games I've played, batting doesn't require unforgiving accuracy. This is important in the heat of a battle on the dirt diamond. The sound effects are nice, and the opening theme gets you in the mood. If you're looking for a fun, expandable baseball game for your home computer, *Ultimate Baseball* makes a strong argument for your adding it to your library.

Tony LaRussa should be happy to have his name on *Ultimate Baseball*. Play ball!
RUSS CECCOLA

trol of your team's strategy. You make your selections and all other choices in *Ultimate Baseball* by moving the joystick.

Graphically, *Ultimate Baseball* is very nice. The stadium is big, and it takes a good wallop to knock a ball out of the park. The animation is very good, especially in the closeup view of the pitcher and batter. Their movements are realistic. Also, if there's a runner on second base, you can see him shifting back and forth in the background.

Ultimate Baseball pans the view to follow the ball quickly. This is important for close plays. The radar view completes the graphics information both players need. Overall, *Ultimate Baseball* is a slick-looking game with a well-organized screen. Players can focus on the game and not have to worry about

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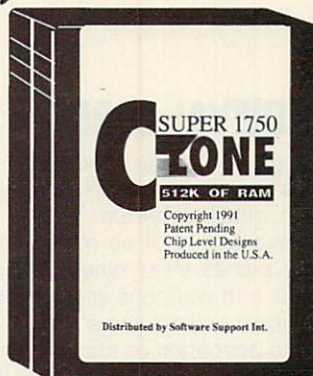
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MEDIEVAL LORDS

War games set in modern times sometimes contain too much detail to be fun. With the availability of so many tanks, planes, ships, other vehicles, and weapons in your electronic arsenal, there's no limit to scenarios or focus.

Medieval Lords takes the player back to a time where such machines didn't exist. It puts the emphasis on the power of soldiers to win battles. With the feel of the conquest board game Risk and enough pseudohistorical events to make the game more realistic, *Medieval Lords* is a challenging romp through the Middle Ages in Europe, North Africa, and the Middle East.

Your role in *Medieval Lords* is that of an adviser to a leader (king, emperor, sultan, or duke) of a number of provinces. Each group of provinces is a domain. The goal of the game is to help expand your lord's domain through diplomacy, politics, economics, and battles. Points earned throughout the game determine your overall success.

The game system is flexible and lets you alter the computer player's skill level, game length, portion of map used, and number of actions per turn. *Medieval Lords* allows as many as ten players, with up to six computer players. Each turn phase in *Medieval Lords* represents one game year. With six scenarios in the game and variable game length, players can enjoy simple ten-year challenges or undertake century-long conquests.

Medieval Lords starts the player with only a few provinces in a domain. It takes only a few moves to get used to the game's interface. From then, you'll be building

empires of which Napoleon himself would be proud. The game is controlled entirely by joystick. You enter commands by making selections from various menus. A map of nearby provinces takes up almost the entire screen, with room left on the bottom for the current command menu. The map scrolls and shows only a small portion of the overall game map.

Each turn in *Medieval Lords* consists of three phases: an events/tax collection phase, an action phase, and an end year phase. The first phase is largely informational. It itemizes any significant events and tells you how much money you'll take in that year.

One of the setup options at the beginning of the game concerns display mode. The choices are to display all actions, war actions only, actions affecting players only, and actions affecting humans only. You will initially notice the differences in display mode in the events/tax collection phase.

You can waste a lot of time reading messages in *Medieval Lords*. To speed gameplay, I would suggest setting the display mode to actions affecting players only to eliminate extra information that may not affect the game. After the events/tax collection phase, you'll know how you stand financially as well as politically. Deaths, births, crusades, plagues, and invasions are all revealed during this phase. Note each event and use that information to guide your actions in the next phase of the game.

You make all your decisions and important moves in the action phase. You can perform as many minor actions and information requests as you want, but only as many major actions as

you selected during game setup. Major actions include raising armies, subverting nobles, building castles, and supporting towns. Minor actions include moving armies, declaring war, and proposing an alliance.

You'll quickly learn the best approach to some situations. If you make the wrong decisions, you have another chance to better your position during the next year. The first phase sets up the situation, and the action phase lets you react. The action phase is the fun part of the game.

The end year phase informs you of your financial situation and updates your score. You quickly learn whether or not you've made the right moves in the action phase. In the first few turns of the game, you'll probably fall into debt. If you go into debt beyond double your income for that year, you have to correct your status in this phase. A deficit strategy menu pops up from which you may choose such actions as bluffing it out or depriving forces by not paying soldiers.

Medieval Lords is set up logically, and gameplay goes smoothly. The variety of conditions under which you may play increases the game's replay value. The manual is well organized, and a reference section takes up half of the text.

Martin Champion, a professor of history, designed the game and brought his professional expertise into the gameplay. Events like the Black Plague, nomadic invasions, and the influential presence of a Pope make *Medieval Lords* more historically accurate. Champion's goal was to design a game in which you can take an active part in the Middle Ages

through your advice to a powerful ruler. He succeeds in this goal and provides us with a game that's fun and challenging as well as informative and dynamic.

Instructors can easily use *Medieval Lords* as an effective teaching tool. It would certainly make a history class more interesting. Graphics are nothing special in *Medieval Lords*. The map consists of rough shapes to represent provinces. It does its job and nothing more.

There's no sound in the game. The strength of *Medieval Lords* is in its detail and successful attempt to bring the Middle Ages to life. Medieval times have always fascinated me. Life was simple by today's standards, but people who lived then had to be tough to survive.

Medieval Lords is perfect for anyone either interested in this time period or looking for a dynamic game of conquest that puts the action back in the hands of players.

RUSS CECCOLA

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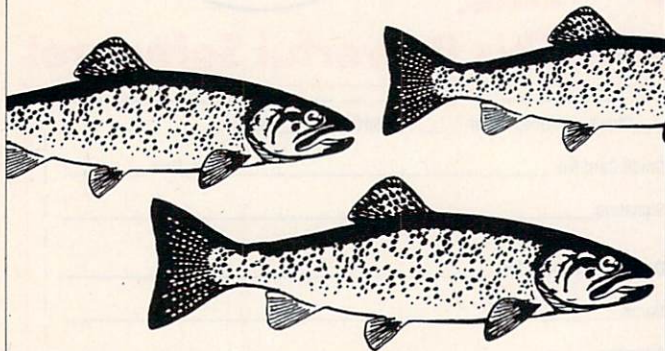
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productivity on a 64 system.

I love the way the program automatically loads the most recent rough draft (saved with a special filename) when it boots, as well as the convenience of being able to toggle multiple drives. *The Write Stuff* has all of the essential formatting features one expects in a fully endowed word processor.

Two text areas can be opened at one time to hold different documents, allowing for cutting and pasting between the two. Moreover, the size of the two areas can be varied in steps of 256 bytes for maximum flexibility and optimum usage of available memory.

Yet another welcome feature of *The Write Stuff* is its support of more than 60 user-definable keyboard macros. Commands which would normally require you to press three or four keys, such as the Search-and-Replace function, can be redefined and activated by keys of your choice. You could assign that function to the Commodore key and the S key, for example. Defined macros can be saved as defaults so that when the program is used again, those keys already are defined. The same holds true for printer macros.

A child can easily use this program with its onscreen menus. The keys that invoke various commands and functions are logical, and learning them requires little help from the manual. On the other hand, a seasoned writer can really put this word processor through its paces in command mode with the program's macros and other advanced features.

The manuals are very well laid out, indexed in detail, clear, and informative (almost pithy in places). Plenty of help files and tutorials exist on the disks for those who need more assistance. The program isn't copy-protected; therefore, you don't have to shell out extra dollars for backups.

The integrated spelling checker is reasonably fast

and intelligently designed. It uses two dictionaries, a short one (17,000 words) for quick checking and a larger one (61,000 words) for more thorough checking. If you need additional words, another 15,000 can be added, bringing the total to more than 93,000 words!

The REU can hold the dictionary and speed up the spelling-check process immensely, providing you don't mind the initial loading time. If you plan to check the spelling of several documents in one session, then using the REU is a worthwhile option.

A readable high-resolution 80-column preview helps you check page formatting and the layout of any tables. All colors (menu, background, clock, and so on) can be modified and saved as defaults.

The program's 16 printer toggles and 20 printer macros enable you to invoke advanced printer functions. Up to eight predefined printer control codes can be sent for each macro. You can even change the printer's secondary address while printing. Thus, Commodore graphic characters can be printed using secondary address 0 (Commodore emulation) and advanced printer functions can be accessed using secondary address 4 (transparent emulation) in the same document. Since all printer codes are user-definable, *The Write Stuff* can support most dot-matrix, letter quality, and laser printers.

Now to voice some beefs. The manual glosses over the actual method of invoking printer macros, although a help file makes it easy to figure out. Also, the program indicates the cursor position by column and paragraph numbers, but not by line number. That added feature would help when formatting nonstandard page lengths or pages with a mixture of fonts that print six or eight lines per inch.

One gripe that I have against this and most other 64 word processors (except *geoWrite*) is the limited size

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of documents it can hold in RAM. A 15K–22K text space is simply not adequate for serious work. Linked files (supported by *The Write Stuff*) are all right when printing, but not for editing. One cannot search and replace a phrase or check the spelling across several linked files. For its price, however, I can't realistically expect *The Write Stuff* to be any better.

The other problem I have is with tables. This complaint isn't aimed specifically at *The Write Stuff*, but at all similar 40-column word processors. Programs like *Omniwriter* or *geoWrite* with their scrolling displays make it much easier to line up columns. Word processors with an 80-column editing mode are better, but 40-column editors wrap the rows of a table over two lines, making it tough to check alignment.

For preschool children and visually impaired users, there's even a talking version of *The Write Stuff*. The quality of the speech can be altered using up to nine voices with different pitch, mouth, throat, and speed controls. A very useful feature is the phoneme generator. As *The Write Stuff* with the required Software Activated Mouth reads a document, it can generate a phoneme file, which can be edited like a word processor file to produce a less robot-like pronunciation and inflection.

In summary, I can confidently state that 64 users will rarely come across a program in any category that offers so much power, flexibility, and ease of use at such an affordable price.

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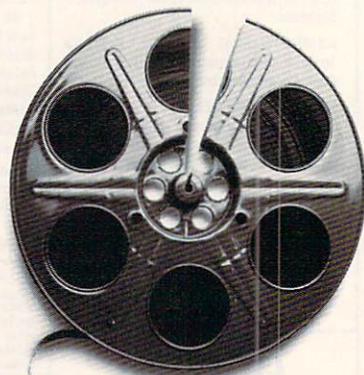
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MACHINE LANGUAGE

Jim Butterfield

PUTTING A HEX ON YOUR OUTPUT

Sometimes, a program needs to print a value in hexadecimal. The byte to be printed must be broken in two. The high nybble is obtained by performing four LSR operations, and the low nybble by ANDing # $\$0F$ with the original value. Each of the two values will then be a binary number 0-15. All you need to do is change this value into a printable ASCII character from 0 to 9 or A to F.

If the binary value is in the range from 0 to 9, you can OR a value of $\$30$ to get the ASCII equivalent. If the value is in the range from 10 to 15, you must add $\$37$ to put it in the range A-F.

Assume that a four-bit value, 0-15, is in the A register.

```
ORA # $\$30$ 
CMP # $\$3A$ 
BCC GOTDIG
ADC # $\$06$ 
GOTDIG. . . .
```

The program adds $\$30$. If the value exceeds $\$3B$, it adds $\$07$ more. It looks as if we're adding $\$06$, but the set carry bit makes a total of $\$07$.

The method described uses eight bytes of code and does the job well. You might occasionally see an interesting alternative method which uses the computer's decimal mode. Decimal mode for hex calculations? Read on. Decimal mode operates only on the ADC (Add with Carry) and SBC (Subtract) commands. In decimal mode, the normal binary add or subtract is performed; then the computer inspects the result to see if it needs decimal adjustment. Thus, binary $\$08$ plus binary $\$07$ would add to produce binary $\$0F$; in decimal mode, the computer would say, "I'll

adjust that to hex $\$15$, since F is not a valid decimal digit." Consider what would happen if we added 0 in decimal mode to a nybble value in the range from 0 to 15. Decimal mode performs the addition: 0 to 9 remain unchanged, but value 10 to 15 (hex A to F) are adjusted to new values of $\$10$ to $\$15$. We've added six to those numbers—without a program test!

There's still a piece missing. We wish to add seven, not six, to these high values. Can we do it? Yes, if we use a trick. Instead of adding 30 to your original nybble, we'll use two additions to add a total of 130—in decimal mode, of course. The extra hundreds digit will disappear. It's a carry that we'll never use.

In the following code, see if you can detect how the carry bit is triggered.

```
SED
CLC
ADC # $\$90$ 
ADC # $\$40$ 
CLD
```

This month's program will read any program file you name and print out the first two bytes as a hexadecimal address. If the load address is $\$0801$, the program file is likely from a 64. A value of $\$1C01$ signals a 128, and $\$0401$ will spot a program that's load-compatible with the early PET/CBM type computers. Addresses from the VIC-20 will vary, depending on how much memory has been fitted.

The 128 will produce a variant address if you save a program while in graphics mode. Almost all BASIC programs will have addresses that end in the digits 01. Addresses that don't end in 01 signal a program that starts in an unusual way. Such programs will usually be machine

language programs loaded with LOAD "filename",8,1.

The machine language program is poked into addresses $\$2000$ to $\$2040$. When it's called by the BASIC program, the selected file will already be open as logical file number 1. Our program connects to this file, grabs two bytes, and puts them into addresses $\$2200$ and $\$2201$. Then it prints a dollar sign. It calls a subroutine at $\$202A$ to convert to hexadecimal and print. A carriage return is printed to wind up the job neatly; then control is passed back to BASIC.

The subroutine at $\$202A$ splits the value it finds in the A register into two pieces of data (a high nybble and a low nybble). At $\$2035$, it converts each nybble to a printable hex digit and prints it. The decimal mode method is used.

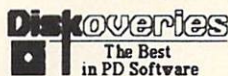
BASIC pokes the machine language program into place, asks for the filename, opens the file, calls the machine language program, then closes the file. The file could have been opened and closed within the machine language program, but it's often more convenient to do a job like this in BASIC.

```
100 DATA 162,1,32,198,255
110 DATA 32,228,255,141,0,34
120 DATA 32,228,255,141,1,34
130 DATA 169,36,32,210,255,162
140 DATA 1,189,0,34,32,42,32
150 DATA 202,16,247,32,204,255
160 DATA 169,13,32,210,255,96
170 DATA 72,74,74,74,74,32,53
180 DATA 32,104,41,15,120,248
190 DATA 24,105,144,105,64,216
200 DATA 88,76,210,255
300 FOR J=8192 TO 8256:READ X
310 POKE J,X:T=T+X:NEXT J
400 INPUT "FILENAME";F$
410 OPEN 15,8,15:OPEN 1,8,3,F$
420 INPUT#15,E,E$,E1,E2
430 IF E<>0 THEN PRINT
    E;E$;E1;E2:END
440 SYS 8192:CLOSE 1
```

This program will read any file you name and print the first two bytes as a hex address.

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GEOS

Steve Vander Ark

CLEANING MY DESK

It's about time I did something with the odds and ends that have been accumulating on my desk, tidbits of information which don't lend themselves to a whole column or are follow-ups to previous columns.

Some of this information has been sent in by readers, some I've picked up on Q-Link, and some has come from chatting with people like Jim Collette (geoProgrammer extraordinaire) and Doug Cotton (chief something-or-other at Creative Micro Designs). I figure we can't go wrong with a column like this once in a while. I gain mouse-space on my desk, and you get a few gems of geoKnowledge to improve your work with GEOS.

Probably the most important addition you can make to your GEOS system is RAM expansion of some kind. While 512K is great, it's not the top of the line. REU upgrades are available from Melvin Montgomery (1504 Amherst Drive, Plano, Texas 75075); he will turn your 1750 into a 2MB powerhouse for \$200. If that's a little too expensive for you, he offers a variety of configurations for any of the 1700-series expanders or for geoRAM. He also sells RAM chips with instructions enabling you to do the upgrade yourself. If you want more information, write or talk to him on Q-Link, where his screen name is CMDR FIXER.

In my the August 1991 column, I discussed graphics utilities. I mentioned *ScrapIt!*, which clips large photo scraps from *geoPaint* pages. Several readers have written or sent me E-mail to suggest other useful graphics utilities.

Dick Estel of Fresno, California, recommends another utility called *ScrapIt!*—same name but with an exclamation

point. This program has the added feature of being able to import oversized scraps into *geoPaint*, not just *geoPublish*. *ScrapIt!* is by Michael W. Schell. It's shareware, with the fee to be donated to the Cystic Fibrosis Foundation.

ScrapIt! is also a graphics conversion program, translating *Doodle* and even *Koala* files with colors pretty much intact. Now that's quite a trick! You can download *ScrapIt!* from Q-Link. The files you need are SCRAPIT.SDA64 and SCRAPIT.DOC.SDA, uploaded by MichaelS30. I'll also put copies in BBS Post's GEOS section. Its telephone number is (616) 534-1346.

Also in the August column I mentioned *Screen Grabber*, which allows you to clip any section of the screen into a photo scrap. A similar program called *geoFetch* appeared on Lodestar disk #65. Back issues of Lodestar disks are available for \$14.95 plus \$1.50 shipping and handling from Softdisk Publishing, P.O. Box 30008, Shreveport, Louisiana 71130-0008. Make sure you request the disk by number.

I was getting very frustrated the other day trying to get a new AUTO.EXEC file to run on my boot disk. I called Jim Collette, the program's author, and he assured me that it should work, even with geoRAM, which occasionally causes troubles. As it turned out, the culprit wasn't the program but my boot disk. I had created a double-sided boot disk using *Maverick* so that I could put more files on it. I use a routine to load my RAM automatically as I boot, so I wanted *geoWrite* and some associated files on the boot disk. The AUTO.EXEC wouldn't run.

When I mentioned this problem to Collette, who has written plenty of AUTO.EXEC programs (*geoWizard* for example), he told me that the *Mav-*

erick routine for creating a double-sided boot disk has a bug in it. It makes the disk's boot routine forget that it's double-sided during the boot process. By the time the boot is over everything is back to normal, but if an AUTO.EXEC file is stored even partially on the back side of the disk, it will be inaccessible during the boot. Obviously, this would prevent the AUTO.EXEC from running.

A partial solution to this problem is to put your AUTO.EXEC files onto a new double-sided boot disk, before filling the disk with other files. This will ensure that the program is stored entirely on the front of the disk. Unfortunately, if your AUTO.EXEC is a file copier, as mine was, the files it'll be trying to copy might also be invisible on the back of the disk. As if that weren't enough, there's another possible problem. If you're booting in 80 columns, an AUTO.EXEC written only for 40 columns will be ignored during the boot routine. It simply won't run.

If you bought your *geoPublish* when it was first released, you probably received the one-disk version. This program is currently shipped in a two-disk version which has fixed several niggling little bugs. The version is still 1.0, although I'm told some files created with the second version difficult for the earlier version to read. The second disk is a clip art disk. If you want the upgraded version of *geoPublish*, send your old disk and a \$7 upgrade fee to BSW Replacement Department, 2150 Shattuck Avenue, Berkeley, California 94704. Include a note requesting the free upgrade/fix.

There! My desk is somewhat cleaner, but feel free to help me add to the clutter. Write to me in care of this column or send me E-mail on QuantumLink (SteveV14). I'll pass the word along. □

Here's a collection of odds and ends, that include REUs, graphic utilities, and AUTO.EXEC programs that refuse to run.

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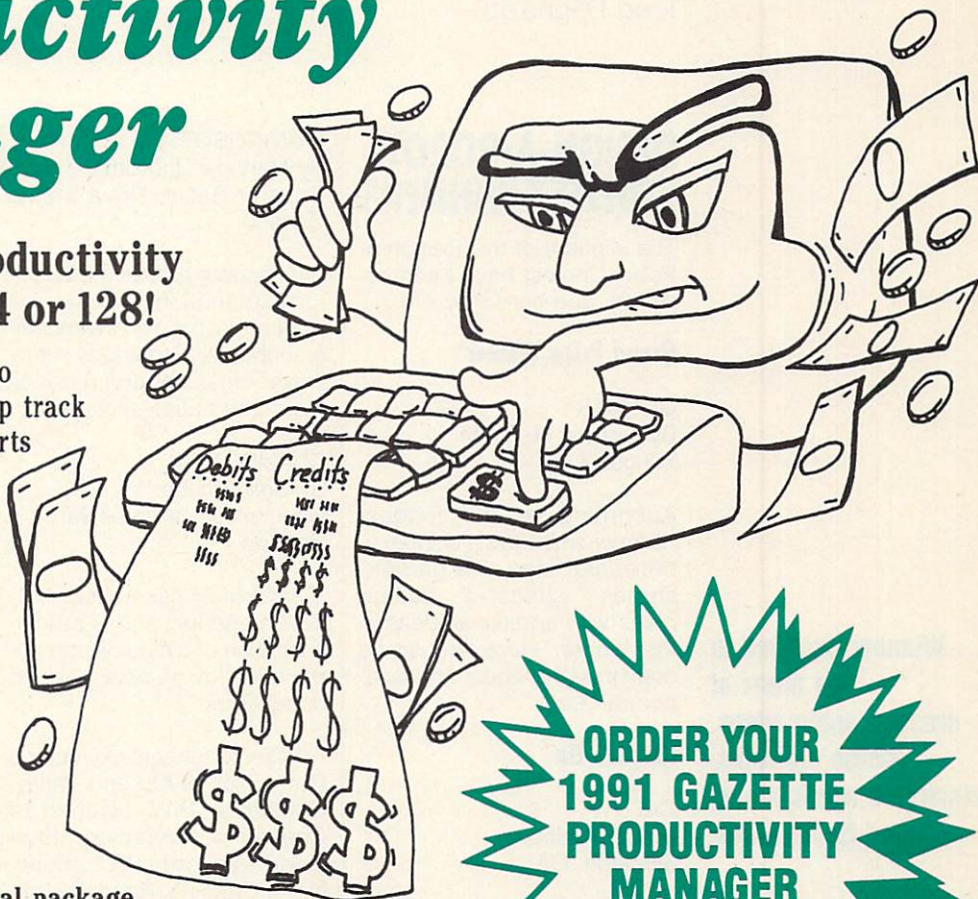
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D'IVERSIONS

Fred D'Ignazio

DESIGN-A-ROBOT CONTEST WINNERS

The winners of the Design-a-Robot Contest have been selected, and here they are.

Grand Prize Winner

GOLMER
By Gordon H. Smith
Kenosha, WI

According to the judges, "Golmer embodies a unique robot-rental idea. He demonstrates extensive design plans with additional ideas in the works. Here are some great thoughts about what a robot can be!"

Runners-Up

CAT
By Lin Tholborn
Stockton, CA

"CAT (Certified Actual Tool) has clever adaptive attachments, both whimsy and precision in the design, and well-thought-out remarks on functions and purpose: Robots are the outstretched arm of mankind."

ALFRED
By Michael Tennant
Washington, PA

"Alfred shows a delightful adaptation of butler features (a solar cell bowler, for example). It combines a match of robot design and personal robot experiences and ideas."

ISAAC
By David Barrett
Saginaw, MI

"Isaac indicates a clear understanding of robot elements and exemplifies a unique idea of robot software. With Isaac around, there would be many less worries."

IMMACUBOT
By Matthew Boardman
Chester Basin, Nova Scotia
Canada

"Immacubot acts as a thoughtful explanation of what will work and what won't work. Immacubot demonstrates many clever ideas about a robot as maid and house servant."

CRAMBOT 64
By Colin Wiebe
Guernsey, Saskatchewan
Canada

"Crambot 64 has a great illustration and key and is a demonstration of a nice design application of general robotic capabilities."

Additional runners-up include Gary Croll of Moreno Valley, California; R.W. Hansen of Cheyenne, Wyoming; Raymond Ellsworth of Charlotte, North Carolina; Randall Slinkard of San Diego, California; and Anthony Dannello of Whitestone, New York.

Judges' Summary

As a judging team we were first impressed with the variety of responses. Each designer clearly created a robot of his or her own imagining. The robots' functions ranged from home security to maintenance of a golf ball driving range. In all, the most favorable entries were those which, more than supercomputers, fit the definition of a robot as a reprogrammable, multifunctional manipulator with mobility and sensory capabilities as defined by job needs. Furthermore, the contest winners demonstrated extensive thinking in the areas of creative applications, design concepts, electronic applications, and future plans.

With these parameters, neither the age of the designer nor the actuality of the design

(several entries are possible fantasies) seemed relevant. The ability of the entrants to communicate their ideas became the great equalizer.

The Judges

Julie Thomas is an elementary teacher who caught the robot bug from her students. She has been recognized by US West, the Cooper Foundation, and the National Science Teachers Association for her work in teaching robot classes for teachers and kids in Nebraska. Thomas is a graduate teaching assistant at the University of Nebraska at Lincoln while working on a doctorate in science education. Thomas has an art teacher husband and two teenage daughters.

Edward Radanovich was our other judge. He is a math teacher, computer science teacher, and computer specialist at Omaha South High School in Nebraska. Radanovich became interested in the use of robots in education while teaching at South High. During the last five years he has included units on robotics in his computer literacy classes. He and his classes have programmed the RB5X robot and have assembled several of the MOVIT robots like those offered as prizes in the contest.

Prizes for the contest include a CompuBot robot, a Capsela 2000 robot, and MOVIT robots.

I want to thank everyone for your delightful, humorous, and ingenious robots! They were a pleasure to review, and they've given the judges and me hope that the robot revolution may one day still happen.

In my column next month, we'll take an in-depth look at the grand prize-winning robot, Golmer, and its designer, Gordon H. Smith. □

Winners excelled in the areas of creative applications, design concepts, electronic applications, and future plans.

BEGINNER BASIC

Larry Cotton

THE KEYBOARD BUFFER

This month I'll present a short program that makes use of the 64's keyboard buffer. For those who are unfamiliar with the buffer, it's a ten-byte long area in the 64's memory, from 631 to 640, which stores keystrokes until the computer has time to process them. There's also a memory location, 198, which contains the number of bytes currently stored in the keyboard buffer. We'll touch on that as well.

You may have noticed the buffer in action when you out-type *SpeedScript* or some other word processor. When you pause, the buffer gets its chance to spew its contents. You can also see its effect by listing a BASIC program and then, while it's listing, entering RUN and pressing Return.

To test the effects of the keyboard buffer in the immediate mode, enter a fairly long FOR-NEXT loop and then type a few (ten or less) keys while the loop is running. Make sure your loop is long enough to give yourself enough time to enter several numbers or letters. After the loop ends, the characters you typed will be displayed on the screen. Those characters were stored in memory locations 631-640, while the total number of characters entered was stored in memory location 198.

This type of buffer is known as FIFO. That stands for First In, First Out. This lets you enter characters or text faster than the computer can print them, without losing characters. The first character you type will be the first one the computer prints. Characters entered after the buffer is full will be ignored.

You can use this little buffer in an unusual way to simulate keystrokes. That is, you can

trick the 64 into thinking that you have typed characters, when in fact they were poked in. Tricking the computer in this way is called using the dynamic keyboard technique. The below program illustrates this technique.

COLORCALC

```
EA 10 REM TO DO SQR(X) ENTER X↑(1/2)
SM 20 C$=CHR$(175):D$=CHR$(20):E$=CHR$(61)
GF 30 POKE214,13:PRINT:PRINT"{GRN}PRESS ANY KEY. . ."
ME 40 POKE214,16:PRINT:PRINT"{6 SPACES}"
HB 50 GETA$:IFA$=""THEN50
DD 60 PRINTCHR$(147):POKE53280,1:POKE53281,1
BQ 70 POKE214,7:PRINT:PRINT"{RED}ENTER NUMBERS AND SIGNS, THEN PRESS ={DOWN}{BLU}"
AK 80 GOSUB150:X$=B$
BF 90 PRINT"{WHT}PRINT"X$
BK 100 PRINT"{3 DOWN}RUN{BLU}"
BD 110 FORT=631TO637:POKET,145:NEXT
GJ 120 POKE638,13:POKE639,13
AH 130 POKE198,9
CS 140 END
MR 150 B$="" :L=0
MH 160 PRINTC$;
BB 170 GETA$:IFA$=""THEN170
EQ 180 IFA$=D$THENGOSUB240:GOTO160
PJ 190 IFA$=E$THENPRINTD$:IFA$=RETURN
MQ 200 IFA$=CHR$(94)THEN220
XX 210 IFA$<CHR$(40)ORAS>CHR$(57)ORAS=CHR$(44)THEN170
BM 220 PRINTD$A$;:B$=B$+A$:L=L+1:IFL=39THENEND
MC 230 GOTO160
KG 240 IFL=0THENPRINTD$;:RETURN
JC 250 PRINTD$A$;:L=L-1:B$=LEFT$(B$,L)
CG 260 RETURN
```

This is a program that converts your 64 into a calculator. You may enter any string of numbers and signs, and the computer will process them in

the correct mathematical order. (This simple program will not accept trigonometric functions or scientific notation, but it will accept parentheses and exponents.)

Briefly, here's how it works. The calculation line, as it's entered, is stored as B\$ (line 220). Illegal characters are screened out, except for the Insert/Del key. When the user presses the equal sign, X\$ becomes B\$ (line 80). The tricky part is line 90, where the word PRINT and X\$ get printed in the same color as the screen. Since that color is white, you can't see it, but it's there.

Then the cursor moves down three lines and prints the word RUN—again in white—so it's hidden from the user. Now it's simply a matter of bringing the cursor up to the line which contains PRINT and simulating a press of the Return key. This is where the dynamic keyboard comes in. Line 110 pokes seven cursor-ups into the keyboard buffer, while line 120 pokes CHR\$(13) twice. Line 130 pokes the number of keystrokes to memory register 198. Meanwhile, the cursor has been changed from white back to blue (end of line 100), so the answer is printed in blue on a white background—quite readable. The second carriage return is strategically placed on the line where RUN has been entered and is waiting for a new calculation, which effectively starts the program from the beginning again. If you'd like to see what's happening—albeit rather quickly—POKE 53280 and 53281 with a 0 in line 60.

Next month we'll write a handy little program that will print amortization schedules. It can be of use to anyone who is buying a home and has a mortgage. □

The 64's keyboard buffer holds keystrokes until the CPU is ready to process them.

PROGRAMMER'S PAGE

Randy Thompson

PEEKABLE POKES

I remember how frustrating it was when I wrote my first BASIC sound program. Poking the proper numbers into the 64's SID chip registers was difficult enough, but every time I peeked those registers to manipulate the values stored there, all I got was a 0. Nothing seemed to work.

No doubt you veteran 64 programmers out there know what I was doing wrong. As most of us have already learned, all but the last four SID chip registers are write-only. In other words, they can be poked but not peeked. Peeking any one of the SID chip's first 25 registers returns a value of 0, no matter what value that register actually contains. When trying to create and edit sounds, this limitation can be quite irritating.

A few years ago I solved this problem with a little machine language routine I call *Peekable Pokes*. As the title suggests, this program allows you to peek the SID chip registers (locations 54272-54300) and receive the value of the last number poked there. For example, to find your 64's volume setting, all you have to do is peek location 54296.

Peekable Pokes is listed below in the form of a BASIC subroutine. When executed, this subroutine stores *Peekable Pokes*' machine code in memory at locations 49152-49295 and then installs the routine with a SYS command. You can include this subroutine in your own programs and execute a GOSUB 1000 to activate *Peekable Pokes*. Of course, you may change the subroutine's line numbers if you need to. Line 1030 returns you to your main program.

Peekable Pokes works by intercepting the computer's normal PEEK and POKE routines.

When one of these two BASIC commands is used, *Peekable Pokes* is called instead. At this point, *Peekable Pokes* determines whether or not the memory location being accessed is a SID chip register. If not, control is given back to the normal ROM routines. If it is, one of two things happens, depending on whether the statement intercepted is a PEEK or a POKE.

In the case of a POKE, the value being poked is stored in two places. Not only is it placed in the appropriate SID chip register, but it is also placed in a special storage buffer located in memory at locations 49295-49323. By placing this number into normal RAM, we can peek it later.

The way this new PEEK routine works is simple. Instead of fruitlessly peeking the specified SID chip register (as the BASIC command would do), *Peekable Pokes* retrieves the corresponding value from its storage buffer.

When using *Peekable Pokes*, keep in mind that you must install the machine code before you poke any values into the SID chip. And unless you have previously poked a number into a register, you cannot reliably read that register via PEEK.

Speaking of the SID chip, this music and sound effects generator gives the 64 impressive audio capabilities. Each of its three separate voices has 16-bit frequency resolution, waveform control, envelope shaping, oscillator synchronization, and ring modulation. When you add high-pass, low-pass, and band-pass filters, it's no wonder programmers can make the 64 talk.

How about sending me some small sound programs for possible publication here in "Programmer's Page." What I'm looking for are crazy sound effects—no songs, just

some good honest weird noises. I'd like to build a collection of laser zaps, engine roars, squeals, blips, kabloooooees, and so on. If your sound is published, you'll receive our usual monetary compensation.

So, please, mail in those sound effects. Send your programming tips and tricks to Programmer's Page, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We pay \$25-\$50 for each tip we use.

PEEKABLE POKES

```
CK 1000 REM PEEKABLE POKES
MB 1010 FOR I=49152 TO 49295:READ D:CK=C
      K+D:POKE I,D:NEXT
ED 1020 IF CK<>15281 THEN PRINT "*** ERROR IN DATA STATEMENTS ***":END
JD 1030 SYS 49152:RETURN
HA 1040 DATA 169,21,141,8,3,169,192,141
GG 1050 DATA 9,3,169,70,141,10,3,169
RK 1060 DATA 192,141,11,3,96,32,115,0
FP 1070 DATA 32,30,192,76,174,167,208,1
FF 1080 DATA 96,233,128,144,7,201,23,240
BD 1090 DATA 6,76,243,167,76,165,169,32
GR 1100 DATA 115,0,32,235,183,32,132,192
XR 1110 DATA 208,9,32,39,184,164,20,153
DC 1120 DATA 143,192,96,76,39,184,169,0
KR 1130 DATA 133,13,32,15,0,201,194,240
KJ 1140 DATA 6,32,121,0,76,141,174,32
GQ 1150 DATA 115,0,32,241,174,169,107,133
RR 1160 DATA 85,169,192,133,86,32,84,0
JM 1170 DATA 76,141,173,165,21,72,165,20
KE 1180 DATA 72,32,247,183,32,132,192,208
QK 1190 DATA 8,164,20,185,143,192,76,26
FQ 1200 DATA 184,76,22,184,165,20,201,24
JE 1210 DATA 176,4,165,21,201,212,96,0
```

Here's a way to peek the SID chip's first 25 registers to determine what values have been poked there.

PROGRAMS

GRAPHOS For c-128

By Frank Gordon

Certain aspects of math and science can be difficult to comprehend in a purely theoretical presentation. For many people, it helps to have such material presented in the form of a graph. That's where *Graphos* comes in.

Graphos (graph operating system) is a graphics tool for studying math and science formulas. It serves as electronic graph paper, enabling a student to rapidly explore and plot different math and science equations.

Typing It In

Graphos is written entirely in machine language, but it loads and runs like a BASIC program. To enter it, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts you, respond with the values given below.

Starting address: 0801

Ending address: 0BE0

Be sure to save a copy of the program before you exit *MLX*.

Graphos installs a modified copy of BASIC in RAM, giving you four new programming commands.

SCREEN1 turns the hi-res screen on, and SCREEN0 turns it off.

HUE0,1 provides for a plot of black lines on a white background. HUE1,0 would print white on black. Use any of the 64's 16 colors for the combination of your choice.

WIPE rapidly clears the hi-res screen.

PLOTx,y (or other defined variables) graphs a function.

Since *Graphos* operates with a modified BASIC in RAM, certain error conditions and pressing the Run/Stop-Restore keys will cause the original ROM to reappear. To reengage *Graphos*, enter POKE 1,54. These new functions are illustrated in the demonstration programs *Axis* and *Vibration*.

Using the Program

When you load and run *Graphos*, it sets up the graph operating system with its new BASIC commands. You can then load and run your own BASIC plotting programs such as *Axis*, which

serves as a demonstration program.

Let's take a look at *Axis* to examine some useful features. Because the x-axis prints differently to the screen and printer, line 110 gives you a choice between the two. The default is S. For either the screen or printer, the constants Z, Z1, and Z2 are set to give an undistorted graph. The position of the coordinate system is controlled by the variables XT, YT, XS, and YS in line 155. These establish the position of the x- and y-axes and their starting positions. Then EX and EY expand or scale the graph. Setting these variables in line 155 means that you can rapidly change the axis positions. For example, list *Axis* and change a few of the variables. Here are three different versions you may want to try. The first changes only line 155; then a few additional changes are added.

155 XT=159: YT=10: XS=Z1: YS=10: EX=5*Z: EY=2

155 XT=Z2: YT=10: XS=Z2: YS=10: EX=20*Z: EY=2

250 FOR X=0 TO 8 STEP .05

155 XT=Z2: YT=100: XS=Z2: YS=0: EX=3*Z: EY=10

250 FOR Y=-8 TO 8 STEP .05

260 X=Y*Y

270 X1=EX*X+XT: Y1=EY*Y+YT: PLOTX1,Y1: NEXTY

Once the x-axis and y-axis have been set, the program can be used as a template for others.

Vibration is another sample program. It illustrates a common curve found in science. The vibration is damped by friction or some other outside force, such as a shock absorber. Change variable DF to modify the degree of damping.

GRAPHOS

```
0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 A0 00 84 C7
0811:61 A9 A0 85 62 B1 61 91 D6
0819:61 C8 D0 F9 E6 62 A5 62 34
0821:C9 C0 D0 F1 A0 02 B9 D9 D9
0829:08 99 BE A0 88 10 F7 A0 9A
0831:03 B9 DC 08 99 E5 A0 88 7B
0839:10 F7 A2 05 BD E0 08 9D 13
0841:F1 A0 CA 10 F7 A2 03 BD DA
0849:E6 08 9D 09 A1 CA 10 F7 63
0851:A9 4B 8D 1C A0 A9 C4 8D 3F
```

```
0859:1D A0 A9 82 8D 30 A0 A9 95
0861:C4 8D 31 A0 A9 35 8D 40 E4
0869:A0 A9 C4 8D 41 A0 A9 0B 90
0871:8D 36 A0 A9 C4 8D 37 A0 EF
0879:A9 4C 8D 3A A4 A9 00 8D 20
0881:3B A4 A9 C4 8D 3C A4 A0 21
0889:EA 84 FB A9 08 85 FC A0 3B
0891:00 84 FD A9 C4 85 FE A0 F7
0899:00 B1 FB 91 FD C8 D0 F9 5D
08A1:E6 FC E6 FE B1 FB 91 FD CF
08A9:C8 C0 31 D0 F7 A0 1B 84 7E
08B1:FB A9 0A 85 FC A0 00 84 B2
08B9:FD A9 CC 85 FE A0 00 B1 51
08C1:FB 91 FD C8 D0 F9 E6 FC B9
08C9:E6 FE B1 FB 91 FD C8 C0 D9
08D1:C5 D0 F7 A9 36 85 01 60 BC
08D9:48 55 C5 50 4C 4F D4 53 BD
08E1:43 52 45 45 CE 57 49 50 DB
08E9:C5 20 18 C4 8A 0A AA C4 52
08F1:3D A4 50 46 53 20 9E B7 48
08F9:E0 01 90 05 F0 13 4C 48 D1
0901:B2 A9 1B 8D 11 D0 A9 15 47
0909:8D 18 D0 A9 97 8D 00 DD 6D
0911:60 A9 3B 8D 11 D0 A9 08 25
0919:8D 18 D0 A9 94 D0 EE A2 15
0921:20 A9 E0 85 FC A0 00 84 11
0929:FB 98 91 FB C8 D0 FB E6 B9
0931:FC CA D0 F6 60 20 7B C4 3D
0939:8A 0A 0A 0A 85 02 20 7F
0941:FD AE 20 7B C4 8A 05 02 16
0949:A0 C0 84 FC A0 00 84 FB 46
0951:A2 02 91 FB C8 D0 FB E6 8F
0959:FC CA 10 F6 91 FB C8 C0 DC
0961:E8 90 F9 60 20 9E B7 E0 1D
0969:10 B0 11 60 20 EB B7 86 7E
0971:02 A9 C7 38 E5 02 85 02 AF
0979:C9 C8 90 03 4C 48 B2 A5 73
0981:15 F0 0A C9 01 D0 F5 A5 15
0989:14 C9 40 B0 EF A9 00 85 D6
0991:FB A9 E0 85 FC A5 14 29 50
0999:F8 18 65 FB 85 FB A5 15 17
09A1:65 FC 85 FC A5 02 29 07 B4
09A9:18 65 FB 85 FB 90 02 E6 06
09B1:FC A5 02 4A 4A 4A 0A AA CA
09B9:BD F7 C4 18 65 FB 85 FB E4
09C1:BD F8 C4 65 FC 85 FC A5 7D
09C9:14 29 07 AA A0 00 78 A9 5B
09D1:34 85 01 B1 FB 1D 29 C5 07
09D9:91 FB A9 36 85 01 58 60 8D
09E1:00 00 40 01 80 02 C0 03 9C
09E9:00 05 40 06 80 07 C0 08 4F
09F1:00 0A 40 0B 80 0C C0 0D 02
09F9:00 0F 40 10 80 11 C0 12 B4
0A01:00 14 40 15 80 16 C0 17 68
0A09:00 19 40 1A 80 1B C0 1C 1B
0A11:00 1E 80 40 20 10 08 04 16
0A19:02 01 AD 00 DD 29 03 49 07
0A21:03 A0 06 0A 88 D0 FC 8D 4F
0A29:84 03 AD 18 D0 29 08 F0 A3
0A31:09 18 A9 20 6D 84 03 8D 18
0A39:84 03 A9 00 20 BD FF A9 27
0A41:04 AA A0 FF 20 BA FF 20 22
0A49:03 FF A2 04 20 C9 FF B0 2B
0A51:03 4C 3D CC 4C 20 CD A9 96
0A59:08 20 D2 FF A9 0D 20 D2 68
0A61:FF A2 00 A9 01 8D C6 CD 52
0A69:A9 00 8D C7 CD A9 00 8D 23
0A71:C8 CD A9 C7 8D C9 CD 20 5E
0A79:E1 FF D0 03 4C 20 CD 8A D1
0A81:48 98 48 20 29 CD 68 A8 E4
```


PROGRAMS

```

0A89:68 AA AD CD CD 2D CB CD 97
0A91:F0 0C AD CA CD 0D C6 CD 81
0A99:8D CA CD 4C 8F CC AD C6 77
0AA1:CD 49 FF 2D CA CD 8D CA 35
0AA9:CD 0E C6 CD AD C6 CD C9 CB
0AB1:80 F0 14 18 AD C7 CD 69 D7
0AB9:01 8D C7 CD AD C8 CD 69 1D
0AC1:00 8D C8 CD 4C 5D CC AD 4E
0AC9:CA CD 09 80 E0 2D 90 0A C6
0AD1:AD CA CD 29 1F 09 80 8D 67
0AD9:CA CD 8E CF CD A6 02 8E 31
0AE1:CE CD A8 20 D2 FF 98 CE 7E
0AE9:CE CD D0 F6 AE CF CD A9 5C
0AF1:01 8D C6 CD A9 00 8D CA D2
0AF9:CD 38 AD C7 CD E9 06 8D E4
0B01:C7 CD AD C8 CD E9 00 8D 54
0B09:C8 CD CE C9 CD AD C9 CD F3
0B11:C9 FF F0 03 4C 5D CC E0 AC
0B19:2D B0 1F 18 AD C7 CD 69 E8
0B21:07 8D C7 CD AD C8 CD 69 89
0B29:00 8D C8 CD E8 A9 C7 8D A3
0B31:C9 CD A9 0D 20 D2 FF 4C 3E
0B39:5D CC A9 0D 20 D2 FF 20 A3
0B41:E7 FF 60 AD C9 CD 29 07 11
0B49:8D CC CD AD C9 CD 4A 4A 52
0B51:4A A8 B9 92 CD 85 FB B9 4D
0B59:AC CD 85 FC 18 A5 FB 6D 76
0B61:CC CD 85 FB A5 FC 69 00 B5
0B69:85 FC 18 AD 84 03 65 FC 57
0B71:85 FC AD C7 CD 29 07 49 26
0B79:07 A8 C8 A9 00 38 2A 88 AE
0B81:D0 FC 8D CB CD 18 AD C8 A0
0B89:CD 65 FC 85 FC AD C7 CD D3
0B91:29 F8 A8 8A 48 78 A2 34 D5
0B99:86 01 B1 FB AD 26 86 01 25
0BA1:58 A8 68 AA 98 2D CB CD A4
0BA9:8D CD CD 60 00 40 80 C0 7C
0BB1:00 40 80 C0 00 40 80 C0 B6
0BB9:00 40 80 C0 00 40 80 C0 BE
0BC1:00 40 80 C0 00 40 00 01 06
0BC9:02 03 05 06 07 08 0A 0B 1A
0BD1:0C 0D 0F 10 11 12 14 15 22
0BD9:16 17 19 1A 1B 1C 1E 1F 2A

```

AXIS

```

QA 100 REM -- AXIS --
CE 105 PRINT"{CLR}"
QH 110 PRINT"OUTPUT TO SCREEN
{SPACE}OR PRINTER (S/P)
{4 SPACES}S{3 LEFT}";:I
NPUTA$
KB 115 IF A$="S" THEN Z=1.33:Z
1=0:Z2=26.4:GOTO130:REM
VALUES FOR SCREEN OUTP
UT
BE 120 IF A$<>"P" THEN110
SC 125 Z=1.208:Z1=2.01:Z2=38.2
4:REM VALUES FOR PRINTE
R OUTPUT
QJ 130 SCREEN 1:HUE0,1
BE 135 WIPE
FJ 140 REM -- SET UP CONSTANTS
--
HS 145 REM -- XT AND YT SET X
{SPACE}AND Y AXES. XS A
ND YS SET START OF X AN
D Y AXES.
DG 150 REM -- EX AND EY ARE EX

```

```

PANSION FACTORS FOR X A
ND Y COORDINATES.
EX 155 XT=159:YT=100:XS=21:YS=
0:EX=5*Z:EY=1
GX 160 REM -- CALIBRATE X COOR
DINATES --
HM 165 FORX=XS TO319 STEP5*Z
KJ 170 Y=YT:PLOTX,Y:NEXTX
JF 175 FORX=XS TO319 STEP10*Z
BP 180 FORY=YT-1 TO YT+1:PLOTX
,Y:NEXTX:NEXTX
XH 185 FORX=Z2TO319 STEP50*Z
XE 190 FORY=YT-2 TO YT+2:PLOTX
,Y:NEXTX:NEXTX
AE 195 REM -- CALIBRATE Y COOR
DINATES --
JB 200 FOR Y=YSTO199 STEP5
KP 205 X=XT:PLOTX,Y:NEXTX
BX 210 FOR Y=YS TO 199 STEP 10
RM 215 FOR X=XT-1 TO XT+1:PLOT
X,Y:NEXTX:NEXTX
EB 220 FOR Y=YS TO 199 STEP50
FG 225 FOR X=XT-3 TO XT+3:PLOT
X,Y:NEXTX:NEXTX
BS 249 REM -- AXIS.1 GRAPH --
SQ 250 FOR X=-8 TO 8 STEP .05
HP 260 Y=X*X
GX 270 X1=EX*X+XT:Y1=EY*Y+YT:P
LOTX1,Y1:NEXTX
PQ 999 REM -- SCREEN OR HARDCO
PY --
GE 1000 GET A$:IF A$="" THEN10
00
JK 1010 PRINT "{CLR}":SCREEN 0
:PRINTCHR$(14)
RF 1020 PRINT"HARDCOPY (Y/N)
{4 SPACES}N{3 LEFT}";:
INPUTA$:IF A$="N" THEN1
080
JR 1030 IFA$<>"Y"THEN1010
GF 1040 PRINT"SINGLE OR DOUBLE
WIDTH (S/D){4 SPACES}
S{3 LEFT}";:INPUTA$
XB 1050 IFA$="S" THEN POKE2,1:
GOTO1070
KS 1060 POKE2,2:IFA$<>"D"THEN1
040
CR 1070 SCREEN 1:SYS52224
KS 1080 SCREEN 0:PRINTCHR$(14)
:LIST

```

VIBRATION

```

BA 100 REM -- DAMPED VIBRATION
--
CE 105 PRINT"{CLR}"
QH 110 PRINT"OUTPUT TO SCREEN
{SPACE}OR PRINTER (S/P)
{4 SPACES}S{3 LEFT}";:I
NPUTA$
KB 115 IF A$="S" THEN Z=1.33:Z
1=0:Z2=26.4:GOTO130:REM
VALUES FOR SCREEN OUTP
UT
BE 120 IF A$<>"P" THEN110
SC 125 Z=1.208:Z1=2.01:Z2=38.2
4:REM VALUES FOR PRINTE
R OUTPUT

```

```

QJ 130 SCREEN 1:HUE0,1
BE 135 WIPE
FJ 140 REM -- SET UP CONSTANTS
--
HS 145 REM -- XT AND YT SET X
{SPACE}AND Y AXES. XS A
ND YS SET START OF X AN
D Y AXES.
DG 150 REM -- EX AND EY ARE EX
PANSION FACTORS FOR X A
ND Y COORDINATES.
KB 155 XT=Z2:YT=100:XS=Z2:YS=0
:EY=1
GX 160 REM -- CALIBRATE X COOR
DINATES --
HM 165 FORX=XS TO 319 STEP 5*Z
KJ 170 Y=YT:PLOTX,Y:NEXTX
JF 175 FORX=XS TO 319 STEP 10*
Z
BP 180 FORY=YT-1 TO YT+1:PLOTX
,Y:NEXTX:NEXTX
XH 185 FORX=Z2 TO 319 STEP 50*
Z
XE 190 FORY=YT-2 TO YT+2:PLOTX
,Y:NEXTX:NEXTX
AE 195 REM -- CALIBRATE Y COOR
DINATES --
JB 200 FOR Y=YS TO 199 STEP 5
KP 205 X=XT:PLOTX,Y:NEXTX
BX 210 FOR Y=YS TO 199 STEP 10
RM 215 FOR X=XT-1 TO XT+1:PLOT
X,Y:NEXTX:NEXTX
EB 220 FOR Y=YS TO 199 STEP 50
FG 225 FOR X=XT-3 TO XT+3:PLOT
X,Y:NEXTX:NEXTX
AD 249 DF=5:REM --- DAMPING FA
CTOR --
CK 250 FOR X=.001 TO 20 STEP .
05
QB 260 Y=80*SIN(3*X)*EXP(-X/DF
)
MJ 270 X1=EX*X+Z2:Y1=EY*Y+YT:P
LOTX1,Y1:NEXTX
PQ 999 REM -- SCREEN OR HARDCO
PY --
GE 1000 GET A$:IF A$="" THEN10
00
JK 1010 PRINT "{CLR}":SCREEN 0
:PRINTCHR$(14)
RF 1020 PRINT"HARDCOPY (Y/N)
{4 SPACES}N{3 LEFT}";:
INPUTA$:IF A$="N" THEN1
080
JR 1030 IFA$<>"Y"THEN1010
GF 1040 PRINT"SINGLE OR DOUBLE
WIDTH (S/D){4 SPACES}
S{3 LEFT}";:INPUTA$
XB 1050 IFA$="S" THEN POKE2,1:
GOTO1070
KS 1060 POKE2,2:IFA$<>"D"THEN1
040
CR 1070 SCREEN 1:SYS52224
KS 1080 SCREEN 0:PRINTCHR$(14)
:LIST

```

Frank Gordon lives in Orono, Maine.

THE CUBE

By Michael J. Pope Jr.

If you like mind games, you'll love *The Cube*. The object of this simple but perplexing game is to move the 15 colored blocks to create the shape shown in the upper right-hand part of the screen.

Getting Started

The Cube is written entirely in BASIC. To avoid typing errors, use *The Automatic Proofreader*; see "Typing Aids" elsewhere in this section. Be sure to save a copy of the program before you exit *Proofreader*.

Playing the Game

When the game begins, you'll see four rows of colored blocks. All but one of the rows will contain four blocks. One row will contain a blank space. You'll see a gray frame around the first block; this frame represents your cursor. Use the cursor keys to move the frame from block to block.

To move the colored blocks around the screen, place your cursor on any block adjacent to the blank space and press f1. That block will move into the space that formerly was blank. (Diagonal moves are not allowed.) By moving blocks around in this fashion, you can eventually re-create the shape shown in the corner. To check your progress during the game, press f7. Press f7 at the end to see how many moves it took you to complete the puzzle.

THE CUBE

```
AS 0 CLR
EQ 10 REM COPYRIGHT 1992 - COM
    PUTE PUBLICATIONS INTL L
    TD - ALL RIGHTS RESERVED
CQ 60 PRINT "{CLR}":POKE53281,1
    :POKE53280,1
GR 70 R=0:PRINT"{8 SPACES}THE
    {SPACE}CUBE "
DQ 80 A=1138:B=55410:FORK=1TO4
    :READG:FORT=1TO4:POKE A,
    160:POKEB,G:A=A+1:B=B+1
MG 90 NEXTT:A=A+36:B=B+36:NEXT
    K:POKE1141,32
RD 100 DIM A1(16):B1=1:TR=0
AG 210 R=R+1:K=INT(RND(0)*16+1
    ):IF A1(K)=0THEN T=T:
    {4 SPACES}READL:A1(K)=L
    :GOTO230
QQ 220 R=R-1:GOTO210
BX 230 IF R<>16THEN210
RF 235 A=1105:C=55377:Z=1
```

```
JH 240 FORM=Z TOZ+3 :B=A:D=C
QS 250 FORK=1 TO4:FORT=1 TO6:P
    OKED,A1(M):POKEB,160:B=
    B+1:D=D+1
CX 260 NEXT T:B=B+34:D=D+34:NE
    XT K:A=A+7 :C=C+ 7:NEXT
    M:A=B+19:C=D+19
SE 270 IFB>1690THENPRINT"
    {3 UP}":GOTO300
SK 280 Z=Z+4:GOTO240
BB 300 V=53248:POKE2040,13:FOR
    S=832TO832+62:READG:POK
    ES,G:NEXT
EF 310 POKEV+21,1:POKEV+39,15:
    POKEV,32:POKEV+1,60 :PO
    KEV+23,1:POKEV+29,1:X=3
    2:Y=60
JS 320 GET A$:IF A$="{UP}"AND
    {SPACE}Y>=100THEN Y=Y-4
    0:POKEV+1,Y:B1=B1-4:GO
    TO320
KR 330 IF A$="{DOWN}"AND Y<=14
    0THEN Y=Y+40:POKEV+1,Y:
    B1=B1+4:GOTO320
DH 340 IF A$="{RIGHT}"AND X<=1
    44THEN X=X+56:POKEV
    {2 SPACES},X:B1=B1+1:G
    OTO320
MM 350 IF A$="{LEFT}"AND X>=88
    THEN X=X-56:POKEV
    {2 SPACES},X:B1=B1-1:GO
    TO320
GD 360 IF A$="{F1}" THEN 400
GX 370 IF A$="{F7}" THEN 760
XP 380 GOTO320
GP 400 FORG=1TO16:IF A1(G)=1TH
    EN 420
EM 410 NEXT
DE 420 ON G GOTO 430,440,450,4
    60,470,480,490,500,510,
    520,530,540,550,560,570
    ,580
CE 430 IF B1=2 OR B1=5 THEN600
AS 435 GOTO320
SP 440 IF B1=1 OR B1=3 OR B1=6
    THEN600
EX 445 GOTO320
CH 450 IF B1=2 OR B1=4 OR B1=7
    THEN600
KA 455 GOTO320
JS 460 IF B1=3 ORB1=8 THEN600
RB 465 GOTO320
AS 470 IF B1=1 ORB1=6 ORB1=9 T
    HEN610
BB 475 GOTO320
ES 480 IF B1=5 ORB1=2 ORB1=7OR
    B1=10THEN610
FC 485 GOTO320
BF 490 IF B1=6 ORB1=3 ORB1=8OR
    B1=11THEN610
KD 495 GOTO320
FH 500 IF B1=7ORB1=4 ORB1=12TH
    EN610
AC 505 GOTO320
GS 510 IF B1=5 ORB1=10ORB1=13T
    HEN620
ED 515 GOTO320
JB 520 IF B1=9 ORB1=6ORB1=11OR
```

```
B1=14THEN620
JE 525 GOTO320
BX 530 IF B1=10ORB1=7ORB1=12OR
    B1=15THEN620
QF 535 GOTO320
GQ 540 IF B1=11ORB1=8 ORB1=16T
    HEN620
AF 545 GOTO320
BA 550 IF B1=9 ORB1=14THEN630
EG 555 GOTO320
QF 560 IF B1=13ORB1=10ORB1=15T
    HEN630
JH 565 GOTO320
XB 570 IF B1=14ORB1=11ORB1=16T
    HEN630
QJ 575 GOTO320
EQ 580 IF B1=15ORB1=12THEN630
AJ 585 GOTO320
JB 600 IF G=1 THEN B=1105:D=55
    377:GOTO 640
MM 601 IF G=2 THEN B=1112:D=55
    384:GOTO 640
XB 602 IF G=3 THEN B=1119:D=55
    391:GOTO 640
RP 603 IF G=4 THEN B=1126:D=55
    398:GOTO 640
FK 610 IF G=5 THEN B=1305:D=55
    577:GOTO 640
GC 611 IF G=6 THEN B=1312:D=55
    584:GOTO 640
MK 612 IF G=7 THEN B=1319:D=55
    591:GOTO 640
KD 613 IF G=8 THEN B=1326:D=55
    598:GOTO 640
BB 620 IF G=9 THEN B=1505:D=55
    777:GOTO 640
SH 621 IF G=10THEN B=1512:D=55
    784:GOTO 640
JR 622 IF G=11THEN B=1519:D=55
    791:GOTO 640
RH 623 IF G=12THEN B=1526:D=55
    798:GOTO 640
CC 630 IF G=13THEN B=1705:D=55
    977:GOTO 640
DX 631 IF G=14THEN B=1712:D=55
    984:GOTO 640
QF 632 IF G=15THEN B=1719:D=55
    991:GOTO 640
CX 633 IF G=16THEN B=1726:D=55
    998:GOTO 640
HP 635 GOTO 320
SS 640 J=0:TR=TR+1
QS 650 J=J+1:FORT=1 TO6:POKED,
    A1(B1):POKEB,160:B=B+1:
    D=D+1:NEXTT
XM 660 B=B+34:D=D+34:IF J>3THE
    N 670
AX 661 GOTO650
SB 670 IFB1=1 THEN B=1105:D=55
    377:GOTO 710
RM 671 IFB1=2 THEN B=1112:D=55
    384:GOTO 710
JA 672 IFB1=3 THEN B=1119:D=55
    391:GOTO 710
MM 673 IFB1=4 THEN B=1126:D=55
    398:GOTO 710
DK 680 IFB1=5 THEN B=1305:D=55
    577:GOTO 710
```


PROGRAMS

```
BC 681 IFB1=6 THEN B=1312:D=55
584:GOTO 710
RJ 682 IFB1=7 THEN B=1319:D=55
591:GOTO 710
SC 683 IFB1=8 THEN B=1326:D=55
598:GOTO 710
HB 690 IFB1=9 THEN B=1505:D=55
777:GOTO 710
HP 691 IFB1=10 THEN B=1512:D=55
784:GOTO 710
GR 692 IFB1=11 THEN B=1519:D=55
791:GOTO 710
CJ 693 IFB1=12 THEN B=1526:D=55
798:GOTO 710
CE 700 IFB1=13 THEN B=1705:D=55
977:GOTO 710
SC 701 IFB1=14 THEN B=1712:D=55
984:GOTO 710
BF 702 IFB1=15 THEN B=1719:D=55
991:GOTO 710
PD 703 IFB1=16 THEN B=1726:D=55
998:GOTO 710
GX 705 GOTO 320
XG 710 J=0
CX 720 J=J+1:FORT=1 TO6:POKED,
A1(G):POKEB,160:B=B+1:
D=D+1:NEXTT
DJ 730 B=B+34:D=D+34:IF J>3THE
N 750
FC 740 GOTO720
KA 750 A1(0)=A1(B1):A1(B1)=A1(
G):A1(G)=A1(0):G=B1:GOT
O320
XF 760 R=0:IF A1(1)=0 AND A1(2)
=0 AND A1(3)=0 THEN R=
R+1
QB 770 IF A1(5)=2 AND A1(6)=2
{SPACE}AND A1(7)=2 AND
{SPACE}A1(8)=2 THEN R=R
+1
MQ 780 IF A1(9)=6 AND A1(10)=6
AND A1(11)=6 AND A1(12)
=6 THEN R=R+1
SQ 790 IF A1(13)=5 AND A1(14)=
5 AND A1(15)=5 AND A1(1
6)= 5{2 SPACES}THEN R=R
+1
XG 800 IF R=4 THEN PRINT"
{HOME}{21 DOWN}CONGRATU
LATIONS IT ONLY TOOK YO
U";
EE 810 IF R=4 THEN PRINT TR;"T
IMES TO SOLVE THE PUZZL
E":END
GQ 820 PRINT"{HOME}{22 DOWN} K
EEP TRYING":FORT=1 TO 3
0
AM 830 POKE209,0:POKE210,212:P
OKE211,0:PRINT"0D HU{V}
{RVS}{U}{OFF}@@@@@<U
@*@@@@0";
RF 840 N=54296:NEXT:POKEN,0:PR
INT"{HOME}{22 DOWN}
{12 SPACES}":GOTO320
PX 850 REM *****
KM 860 REM "{RIGHT}" = RIGHT M
OVEMENT
MK 870 REM "{LEFT}" = LEFT MOV
```

```
EMENT
RH 880 REM "{UP}" = UPWARD MOV
EMENT
AC 890 REM "{DOWN}" = DOWNWARD
MOVEMENT
HK 900 REM "{F1}" = SWITCHES T
HE BLOCKS
PD 910 REM "{F7}" = CHECKS TO
{SPACE}SEE IF PUZZLE IS
SOLVED
SX 920 REM PROGRAM WRITTEN BY
{SPACE}MICHAEL POPE
FC 930 REM *****
RG 1000 DATA 0,2,6,5,0,0,0,1,2
,2,2,2,6,6,6,6,5,5,5,5
,0,0,0,255,255,255
MR 1010 DATA 255,255,255,192,0
,3,192,0,3,192,0,3,192
,0,3,192,0,3,192,0,3,1
92,0,3
JM 1020 DATA 192,0,3,192,0,3,1
92,0,3,192,0,3,192,0,3
,192,0,3,192,0,3,192,0
,3
AQ 1030 DATA 192,0,3,255,255,2
55,255,255,255
```

Michael J. Pope Jr. lives in Raleigh, North Carolina.

GEOLYNX For C-128

By Stephen Van Egmond

Telecommunication has revolutionized computers. We can send electronic mail across the country at the push of a button; we can chat with hundreds of other people; and we can get to know people without ever seeing their faces.

For some time now, *GEOS* and telecommunication haven't merged well because of *GEOS*' new file format. I imagine that some people have attempted to transfer a *GEOS* file and have been surprised by the fact that most or all of the file has disappeared.

GeoLynx converts *GEOS* files so that they can be sent via modem. It doesn't combine files, as the name would seem to imply. I thought it best to leave that to the other programs made to do this, such as *Archive*, *LHArchive*, and the like, rather than make my own compression routine.

The files that *geoLynx* creates are only one block longer than the original ones, and the program works with either *SEQ* or *VLIR* (Variable Length Indexed Record) files. The program can't be used for sending applications by modem for the purposes of pirating because of the *GEOS* serial number copy protection.

Getting Started

GeoLynx is written entirely in machine language. To type it in, use *MLX*, our machine language entry program; see "Typing Aids" elsewhere in this section. When *MLX* prompts, respond with the following values.

Starting address: 0247

Ending address: 1526

After you've typed in the program, be sure to save it before you exit *MLX*. Next, you'll have to convert the program so it will run under *GEOS*. To do that, you'll need a copy of *geoConverter*. *GEOS* users may already have a copy of this utility since we have published it before. You can also find a copy on Gazette's *GEOS Collection* disk. A copy of the program is printed below. It is written entirely in BASIC. To help avoid typing errors, enter it with *The Automatic Proofreader*. See "Typing Aids" again.

When you have both programs on disk, run *geoConverter*. When it asks for a file name to convert to *GEOS* format, give it the filename you used to save *geoLynx*. It will then copy the program and convert it into a file that *GEOS* will recognize. Your new *geoLynx* file will then be ready to use when you boot *GEOS*.

Using the Program

GeoLynx works with any model floppy drive that works with *GEOS*. I don't know of its performance on the *CMD HD* series, but I suspect that *CMD* knew what it was doing when it made its hard drive 100 percent compatible with *GEOS*. *GeoLynx* allows you to enter a description for each file that you pack and displays this description while it's unpacking the file.

After running the program from the deskTop, you are presented with a colored screen with three options: Pack, Unpack, and Quit. The screen is divided into several areas. The middle of the screen is your main work area. Here, you will highlight your files and select different icons to do different tasks. At the bottom left of the screen is an information area that gives you statistics on how *geoLynx* is progressing through your files.

The Quit option takes you back to

the deskTop on the most recently accessed drive. Pack converts a *GEOS* file into a Commodore file. Unpack does the reverse, converting files from Commodore to *GEOS*.

Selecting Files

After selecting your desired option, you're presented with the files to choose from. If you decide to pack a *GEOS* file, the program will load a list of all the *USR* files on the drive. Since all *GEOS* files are of the *USR* type, you should have no problems. If you decide to unpack files, the directory will be loaded, and all the *PRG* files will be searched for a special *geoLynx* flag in the first block. All files that match this search are listed, and those that don't match are rejected. Only files eligible to be unpacked will be listed; your ordinary files are at no risk, unless they should contain the *geoLynx* flag.

One problem which may result with the Pack routine is that while all *GEOS* files are *USR*, not all *USR* files are *GEOS*. If you should, by chance, happen to pack a *USR* file that isn't a *GEOS* file, then *geoLynx* might complain; if it doesn't, then your program has all the looks of a *GEOS* file.

The current disk name and the amount of room available are displayed in the top window. To select the files you wish to work with, simply click on the needed files in the selection window, toggling them on and off. The window doesn't display all the files. To see more, use the up and down arrows. To cancel your Pack or Unpack choice, use the Cancel icon to return to the initial dialog box.

To move to another drive, use the Drive icon. *GeoLynx* cycles sequentially through the drives that you have connected. To work with another disk, click on the Disk icon, insert a new disk in the current drive, and click on OK.

To have *geoLynx* start work on your files, click on the Go! icon. If you are packing files, you will be prompted to enter a description for the files you highlighted. If you click on Yes, *geoLynx* will pause at the beginning of each file and allow you to enter a text description of it. Enter the description and press Return. If you click on No, *geoLynx* will place the description "Not giv-

en" in each of the files. If you are unpacking the files, *geoLynx* will get to work right away, displaying the description of each new file it works on.

When the operation is complete, you are returned to the Pack/Unpack/Quit dialog box. One final note about the packing operations. For the filename, *GEOS* uses standard ASCII, and the 64/128 uses Commodore ASCII. Standard ASCII lowercase characters can't be accessed when the computer is using Commodore ASCII. To make your life easier, *geoLynx* converts all the characters into *GEOS* uppercase characters, which are considered lowercase in Commodore ASCII.

Disk Errors

Under normal conditions, *geoLynx* will perform without a hitch. The program checks for disk errors whenever it attempts to write a block to the disk, but it doesn't bother when reading. If a disk error occurs, the entire operation is aborted, all the files are deselected, and you are shown what the *GEOS* Kernel thinks the error is. If the error occurred in a file, then the file is probably corrupt. If you have a disk editor, you may be able to recover the file; refer to the next section for more information on the file format.

File Format

GEOS supports Sequential and VLIR file formats. *GeoLynx* doesn't care which one you are working with. The only difference between the two is that the Sequential files are processed with *geoLynx* considerably faster than VLIR, because every single block of the VLIR file must be visited for accurate information. What follows is a description of what *geoLynx* does to each file type and what's located where.

Sequential File Format

Block	Index	Description
1		<i>GeoLynx</i> information block, null-filled except for:
	1-2	Pointer to next block.
	3-31	Original directory entry of file.
	64-73	<i>GeoLynx</i> indicator.
	128-	Variable length file description.

2		Original header block.
	1-2	Pointer to first block of the actual program.
3-		The complete <i>GEOS</i> program.

VLIR File Format

Block	Index	Description
1		<i>GeoLynx</i> information block, null-filled except for:
	0-1	Pointer to next block.
	2-30	Original directory entry of file.
	63-72	<i>GeoLynx</i> indicator.
	127-	Variable length file description.
2		Original header block.
	0-1	Pointer to VLIR record information block.
3		Block with detailed info about records; null except:
	0-1	Pointer to first block of first used VLIR record.
	2N	Length, in blocks, of record #N.
	2N+1	Number of bytes in last block of record #n.
4-		The complete file, with each VLIR record chained one after the other.

From the above table, it's obvious that the *GEOS* Sequential files are not guaranteed to be the exact length after transmission over the modem because of padding brought in by such protocols as XMODEM. Thus, if your files seem to grow by up to 128 bytes each time you transmit them, try a decent protocol or terminal program.

GEOLYNX

```

0247:5F 03 15 BF 00 00 00 7D D7
024F:FF F8 47 30 CC 6E D7 B4 02
0257:2E F7 B4 2E F1 B4 2E 97 40
025F:B4 2E D7 B4 2F 30 CC 2F 92
0267:FF FE 2E 6A 6A 2F AD B6 B9
026F:6E AD B6 40 89 2A 7F EF D4
0277:FE 00 E8 26 00 9B FA 00 DE
027F:F2 B6 00 02 2E 00 03 62 A4
0287:00 01 FE 83 06 00 00 04 18
028F:FF 03 00 04 67 65 6F 4C 90
0297:79 6E 78 5F 05 00 20 56 B7
029F:32 2E 30 00 00 00 00 53 A1
02A7:74 65 70 68 65 6E 20 56 4F
02AF:61 6E 20 45 67 6D 6F 6E 96

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PROGRAMS

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02B7:64 5F 2D 00 00 43 6F 6E C5 04E7:91 0E C8 C0 13 D0 F7 A9 D6 0717:FF 81 3F 05 FF 0C BF D3 41
02BF:76 65 72 74 20 66 69 6C C7 04EF:00 91 0E 18 A9 11 65 0E 0A 071F:07 00 04 06 10 C0 08 05 2A
02C7:65 73 20 66 6F 72 20 6D B8 04F7:85 0E 90 02 E6 0F EE F1 BB 0727:FF 82 FE 80 04 00 82 02 E4
02CF:6F 64 65 6D 20 74 72 61 41 04FF:1B D0 03 EE F2 1B 18 A9 F6 072F:80 C4 00 BE 03 80 07 C0 53
02D7:6E 73 6D 69 73 73 69 6F DA 0507:02 65 FD 85 FD 90 02 E6 A0 0737:0C C0 03 80 0C 60 00 C0 86
02DF:6E 2E 20 42 61 74 63 68 DA 050F:FE 20 33 90 20 09 15 F0 50 073F:03 80 0C 6C DD E0 03 80 30
02E7:20 6F 70 74 69 6F 6E 2E 41 0517:03 4C AC 04 A5 0D C9 80 01 0747:0C 6C CC C0 03 80 0C 6C BA
02EF:5F 2D 00 00 A9 00 8D B5 0D 051F:F0 AA AD 37 16 D0 03 4C BB 074F:CC C0 03 80 0C 6C CC C0 C8
02F7:84 A9 35 85 01 AD 20 D0 77 0527:D4 06 A9 17 85 FC A9 3D 74 0757:03 80 0C 6C CC C0 03 80 3F
02FF:8D 35 16 A9 0B 8D 20 D0 15 052F:85 FB A9 80 85 0B 85 19 B4 075F:0D ED CC C0 03 80 07 C7 05
0307:AD 27 D0 8D 36 16 A9 04 02 0537:A9 40 85 18 A9 13 85 15 12 0767:CC 70 03 80 00 60 00 00 E1
030F:8D 27 D0 A9 30 85 01 A9 9D 053F:A9 89 85 14 A9 00 85 0A D4 076F:03 80 04 00 81 03 06 FF C3
0317:FF 85 30 A9 8C 85 05 A9 4D 0547:85 FD 85 FE 85 16 85 17 DA 0777:81 3F 05 FF 0C BF 33 08 84
031F:00 85 04 A9 0B A2 27 A0 73 054F:A9 F3 85 10 85 12 A9 1B BE 077F:00 04 06 10 8F 0D 61 20 E3
0327:18 20 4E 0D A9 8C 85 05 6B 0557:85 11 85 13 A0 00 B1 FB AE 0787:47 45 4F 53 20 66 69 6C 83
032F:A9 29 85 04 A9 0D A2 25 31 055F:85 04 C8 B1 FB 85 05 20 81 078F:65 2E 00 61 20 43 6F 6D 4C
0337:A0 0E 20 4E 0D A9 8E 85 AB 0567:E4 C1 A2 14 A0 18 20 6B FA 0797:6D 6F 64 6F 72 65 20 66 8B
033F:05 A9 A9 85 04 A9 0A A2 3D 056F:C2 D0 18 A2 12 A0 10 20 8F 079F:69 6C 65 2E 00 74 6F 20 DD
0347:15 A0 06 20 4E 0D A9 8E 4B 0577:68 C2 18 A9 11 65 10 85 C7 07A7:64 65 73 6B 54 6F 70 2E D5
034F:85 05 A9 C0 85 04 A9 DE 09 057F:10 90 02 E6 11 E6 16 D0 85 07AF:00 A9 00 1C A9 01 8D 37 8D
0357:A2 0E A0 06 20 4E 0D 20 1B 0587:02 E6 17 18 A9 11 65 12 1F 07B7:16 4C BF C2 81 13 32 D0 D1
035F:A8 C1 05 00 01 00 00 00 92 058F:85 12 90 02 E6 13 18 A9 70 07BF:0B 05 11 D8 08 0B 05 1F D9
0367:03 3F 01 C7 05 01 01 0C 95 0597:02 65 FB 85 FB 90 02 E6 E0 07C7:F9 08 0E 00 18 50 6C 65 D6
036F:00 0C 03 3B 01 84 01 0C B4 059F:FC E6 FD D0 02 E6 FE A5 FD 07CF:61 73 65 20 69 6E 73 65 6B
0377:00 8C 03 3C 00 C4 01 C4 A6 05A7:FE CD F2 1B D0 07 A5 A5 FD 98 07D7:72 74 20 61 20 6E 65 77 53
037F:00 8C 03 3B 01 C4 01 08 E1 05AF:CD F1 1B 90 A7 A5 17 8D 19 07DF:20 64 69 73 6B 20 69 6E 98
0387:00 08 07 37 01 80 01 08 F7 05B7:F2 1B A5 16 8D F1 1B A0 23 07E7:20 74 68 65 00 64 72 69 66
038F:00 88 07 B8 00 C0 20 47 05BF:A0 A9 00 91 10 88 10 FB 2C 07EF:76 65 20 61 6E 64 20 63 55
0397:AB C1 1C 0B 18 88 0F 38 51 05C7:A9 00 85 20 8D 39 16 8D 64 07F7:6C 69 63 6B 20 74 68 65 C2
039F:20 A8 C1 05 00 01 09 00 7E 05CF:3A 16 A9 1B 85 FC A9 F3 CA 07FF:20 6D 6F 75 73 65 20 62 92
03A7:09 03 36 01 7F 01 09 00 DB 05D7:85 FB A9 00 85 19 A9 18 D4 0807:75 74 74 6F 6E 2E 00 81 22
03AF:89 03 B7 00 BF 06 0B 00 5E 05DF:85 18 A5 20 09 04 F0 23 CC 080F:13 32 0D 0B 05 15 30 09 6D
03B7:94 1B 18 46 69 6C 65 73 71 05E7:0A 0A 0A 0A 18 69 3B 85 BD 0817:0B 06 23 53 09 03 01 48 66
03BF:20 52 65 6D 61 69 6E 69 E4 05EF:05 E6 20 A5 FC 85 03 A5 3E 081F:04 11 48 00 18 44 6F 20 4F
03C7:6E 67 3A 16 20 00 A0 46 67 05F7:FB 85 02 20 48 C1 18 A9 C6 0827:79 6F 75 20 77 69 73 68 31
03CF:69 6C 65 73 20 50 72 6F 20 05FF:11 65 FB 85 FB 90 02 E6 D0 082F:20 74 6F 20 65 6E 74 65 8F
03D7:63 65 73 73 65 64 3A 16 D5 0607:FC D0 CF A9 1B 85 FC A9 EC 0837:72 20 64 65 73 63 72 69 E2
03DF:0B 00 B8 46 69 6C 65 3A E8 060F:A3 85 FB A9 8D 8D AA 84 09 083F:70 74 69 6F 6E 73 00 66 70
03E7:16 10 00 14 53 65 6C 65 AC 0617:A9 E1 8D A9 04 A9 1A 85 41 0847:6F 72 20 61 6C 6C 20 74 8F
03EF:63 74 20 66 69 6C 65 73 6A 061F:FE A9 5D 85 FD 60 81 13 A0 084F:68 65 20 66 69 6C 65 73 92
03F7:3A 20 43 75 72 72 65 6E 79 0627:32 0D 12 04 16 CB 07 12 12 0857:3F 00 81 13 32 0D 0B 07 4B
03FF:74 20 64 69 73 6B 3A 20 49 062F:04 2A 2B 08 12 04 44 8A 61 085F:12 73 09 01 11 49 00 18 4C
0407:16 DC 00 22 46 72 65 65 9F 0637:08 0B 06 0E 5A 07 0B 55 06 0867:4F 70 65 72 61 74 69 6F 2E
040F:3A 00 A9 09 85 03 A9 88 0E 063F:21 92 08 0B 55 35 9F 08 F8 086F:6E 20 63 6F 6D 70 6C 65 8D
0417:85 02 20 5A C1 A9 07 85 54 0647:0B 55 4F B1 08 00 18 53 F6 0877:74 65 2E 00 06 64 00 19 CB
041F:03 A9 32 85 02 20 56 C2 B1 064F:65 6C 65 63 74 20 67 65 64 087F:BC 09 02 18 02 10 3B 0F B7
0427:20 73 0D A9 01 85 03 A9 26 0657:6F 4C 79 6E 78 20 6F 70 D7 0887:DF 09 04 18 02 10 45 0E B4
042F:DA 85 02 A9 1A 85 05 A9 7B 065F:65 72 61 74 69 6F 6E 3A 4E 088F:C2 0A 08 18 03 10 25 10 B8
0437:5D 85 04 20 78 C1 A9 0A F9 0667:00 05 FF 82 FE 80 04 00 DE 0897:00 0A 0C 18 05 10 4D 11 41
043F:85 03 A9 F5 85 02 20 36 0A 066F:82 02 80 04 00 B8 03 80 F6 089F:4D 0A 12 18 03 10 5B 11 BC
0447:C1 20 B8 0D 20 A1 C2 20 4D 0677:3F 00 00 C0 03 80 31 80 2C 08A7:80 0A 16 18 04 10 6C 11 09
044F:09 15 F0 03 4C AC 04 A5 32 067F:00 C0 03 80 31 9E 3C CC 0C 6D 08AF:A0 FF FF 80 01 80 01 81 A5
0457:0D 85 03 A5 0C 85 02 A9 26 0687:03 80 31 B3 66 D8 03 80 B3 08B7:01 83 81 87 C1 8F E1 9F 81
045F:9A 85 18 A9 14 85 05 A9 1E 068F:3F 1F 60 F0 03 80 30 33 CB 08BF:F1 BF F9 8F E1 8F E1 80 82
0467:00 85 19 A0 11 91 0C 20 05 0697:00 E0 03 80 30 33 60 F0 74 08C7:01 80 01 80 01 FF FF 1F C7
046F:48 C1 A9 82 85 0D A9 00 1D 069F:03 80 33 66 D8 03 80 A3 08CF:FF 04 BF 9C FF FE 80 02 A1
0477:85 0C 20 DB C1 A5 0B 85 47 06A7:30 1F 3C CC 03 80 04 00 0A 08D7:80 02 80 03 8F E3 8F E3 F7
047F:03 A5 0A 46 03 6A 46 03 69 06AF:82 03 80 04 00 81 03 06 20 08DF:BF 9F 9F F3 8F E3 87 C3 E0
0487:6A 85 02 A9 22 85 05 A9 DB 06B7:FF 81 3F 05 FF 0C BF 75 81 08E7:8F 83 81 03 80 03 80 03 0F
048F:00 85 19 A9 FC 85 18 A9 8E 06BF:07 00 04 06 10 BD 08 05 BC 08EF:04 FF 04 BF 04 FF C2 FE 23
0497:C0 20 84 C1 A9 20 02 02 C4 06C7:FF 82 FE 80 04 00 82 02 83 08F7:80 00 00 02 80 00 00 5A
049F:C2 A9 4B 20 02 C2 A9 1B 68 06CF:80 04 00 C3 03 98 C0 00 55 08FF:00 03 80 00 00 03 87 6E
04A7:85 0F A9 F0 85 0E 20 30 4F 06D7:00 01 83 98 C0 00 00 01 25 0907:00 00 00 33 8D 80 00 00 BA
04AF:90 20 09 15 F0 03 4C AC 53 06DF:83 98 DF 3E 3C 79 9B 98 4B 090F:33 8C 1E F1 C7 33 8C 36 1B
04B7:04 AD 37 16 A9 01 18 69 5D 06E7:DD B3 66 CD B3 98 D9 B3 E0 0917:DB 6D B3 8C 36 DB 0F B3 A4
04BF:02 8D 38 16 A9 17 85 FE 48 06EF:3E C1 E3 98 D9 B3 66 C1 BD 091F:8C 36 DB 0C 33 87 9E D9 10
04C7:A9 3C 85 FD A0 00 B1 0C B8 06F7:C3 98 D9 B3 66 C1 E3 98 1D 0927:E7 B3 80 00 00 03 80 B0
04CF:C9 80 90 3D 29 07 CD 38 FB 06FF:D9 B3 66 CD B3 8F 99 BE 5D 092F:00 00 00 03 80 00 00 75
04D7:16 D0 36 C8 B1 0C 91 FD 51 0707:3E 79 9B 80 00 30 00 00 CE 0937:03 05 FF 81 3F 04 FF 0A 38
04DF:C8 B1 0C 91 FD C8 B1 0C D5 070F:03 80 00 30 00 00 03 06 CD 093F:BF B0 FF FF FE 80 00 02 59

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0947:80	00	03	80	00	03	BC	C0	48	0B77:00	82	01	80	0D	00	82	01	C4	0DA7:69	11	85	FB	90	02	E6	FC	82
094F:C3	B6	00	C3	B6	CE	DB	B6	8C	0B7F:80	0D	00	82	01	80	0D	00	65	0DAF:A9	40	85	2F	A0	BF	A9	00	A9
0957:D8	F3	B6	CC	E3	B6	C6	F3	F1	0B87:82	01	80	0D	00	9A	01	81	ED	0DB7:99	10	6F	99	50	70	88	C0	40
095F:BC	DC	DB	80	00	03	80	00	97	0B8F:E0	00	0C	00	00	0C	C0	00	49	0DBF:FF	D0	F5	A5	FB	18	69	33	6D
0967:03	80	00	03	FF	FF	FF	3F	8A	0B97:07	80	00	00	00	61	83	0C	E9	0DC7:85	02	A5	FC	69	00	85	03	03
096F:FF	FF	06	BF	B8	FF	FF	FF	04	0B9F:00	0C	00	00	0C	C0	00	62	22	0DCF:A9	6B	85	05	A9	00	85	19	0C
0977:FE	80	00	00	02	80	00	00	3B	0BA7:04	00	CF	61	81	8E	73	CF	CC	0DD7:A9	18	85	18	20	48	C1	A0	45
097F:03	80	00	00	03	9E	06	00	D1	0BAF:1C	F0	0C	CF	78	06	1E	FE	A5	0DDF:04	B1	FD	85	FF	A0	BF	B9	3C
0987:03	9B	00	00	03	9B	36	CC	C1	0BB7:3C	F1	E1	80	CC	DB	6D	B6	14	0DE7:10	6F	45	FF	99	10	AF	B9	B4
098F:E3	9B	66	CD	B3	9B	66	CD	CA	0BBF:D8	0C	DB	6C	7F	B6	DB	66	B8	0DEF:50	70	45	FF	99	50	B0	88	EE
0997:F3	9B	66	79	83	9E	66	30	82	0BC7:DB	61	80	6C	FB	6D	BE	D8	E6	0DF7:C0	FF	D0	EB	E6	FD	D0	02	1E
099F:F3	80	00	00	03	80	00	00	E5	0BCF:0C	DB	6C	06	36	DB	66	DB	9A	0DFE:E6	FE	EE	39	16	D0	03	EE	A7
09A7:03	80	00	00	03	04	FF	84	08	0BD7:61	80	6C	C3	6D	B0	D8	07	6F	0E07:3A	16	AD	05	85	30	03	4C	0B
09AF:3F	FF	FF	FF	08	BF	B0	FF	02	0BDF:9B	6C	06	36	DB	66	DB	61	94	0E0F:5E	0E	A9	C0	85	2F	A9	18	73
09B7:FF	FE	80	00	02	80	00	03	AE	0BE7:83	C6	7B	CD	9E	D8	03	0F	2B	0E17:85	06	A9	27	85	07	A9	20	DA
09BF:80	00	03	8F	00	63	99	80	AC	0BEF:6C	07	9E	DB	3C	D9	E1	80	1D	0E1F:85	08	A9	2F	85	0A	A9	00	CF
09C7:63	98	1E	63	98	33	63	9B	9F	0BF7:00	03	07	00	88	06	00	00	0C	0E27:85	09	85	0B	4C	2A	C1	A9	E1
09CF:B3	63	99	B3	03	8F	9E	63	F9	0BFF:00	01	80	00	03	07	00	86	21	0E2F:18	85	06	A9	27	85	07	A9	1B
09D7:80	00	03	80	00	03	80	00	9F	0C07:0C	00	00	00	01	80	0D	00	49	0E37:10	85	08	A9	1F	85	0A	A9	25
09DF:03	FF	FF	FF	3F	FF	FF	06	73	0C0F:82	01	80	0D	00	82	01	80	16	0E3F:00	85	09	85	0B	20	2A	C1	25
09E7:BF	05	00	01	60	00	96	03	5E	0C17:0D	00	81	01	0F	FF	3D	0E	F6	0E47:AD	3A	16	D0	08	AD	39	16	18
09EF:82	00	8A	01	96	00	16	03	88	0C1F:83	BE	BE	BE	29	0E	A9	8C	CD	0E4F:D0	03	4C	0C	10	A9	AD	85	E6
09F7:2E	01	09	01	0E	00	2E	03	62	0C27:85	05	A9	A8	85	04	A2	18	9C	0E57:03	A9	D0	85	02	A9	B0	85	6F
09FF:D1	00	71	07	0E	00	2E	01	67	0C2F:A0	0C	A9	93	20	4E	0D	A9	07	0E5F:05	A9	50	85	04	A2	05	A0	20
0A07:FC	00	24	03	22	01	16	00	8F	0C37:0D	8D	C0	8C	A9	0B	8D	88	37	0E67:BF	B1	02	91	04	88	C0	FF	EC
0A0F:0F	FF	81	80	0D	00	82	01	51	0C3F:8E	60	8D	32	16	8E	33	16	F2	0E6F:D0	F7	A5	02	38	E9	40	85	36
0A17:80	0D	00	82	01	80	0D	00	FA	0C47:8C	34	16	AD	32	16	AC	33	C6	0E77:02	A5	03	E9	01	85	03	A5	C6
0A1F:82	01	80	0D	00	82	01	80	22	0C4F:16	91	04	88	10	FB	A5	04	9F	0E7F:04	38	E9	40	85	04	A5	05	79
0A27:0D	00	82	01	80	0D	00	82	DC	0C57:18	69	28	85	04	90	02	E6	80	0E87:E9	01	85	05	CA	10	D8	A5	C7
0A2F:01	80	0D	00	82	01	80	06	A4	0C5F:05	CE	34	16	10	E5	60	A9	18	0E8F:FB	38	E9	11	85	FB	B0	02	85
0A37:00	81	30	06	00	82	01	80	9E	0C67:8C	85	05	A9	A8	85	04	A9	6F	0E97:C6	FC	A9	40	85	2F	A0	BF	79
0A3F:06	00	81	60	06	00	82	01	C2	0C6F:D0	A2	18	A0	B8	20	4E	0D	46	0E9F:A9	00	99	90	67	99	D0	68	78
0A47:80	06	00	81	C0	06	00	82	D5	0C77:A9	0B	A0	28	99	80	8E	88	32	0EA7:88	C0	FF	D0	F5	A5	FC	85	0B
0A4F:01	80	06	00	81	C0	06	00	DF	0C7F:10	FA	60	A9	8C	85	05	A9	33	0EAF:03	A5	FB	85	02	A9	3B	85	41
0A57:DB	01	80	0F	FC	1F	F8	7F	70	0C87:00	85	04	AD	1E	85	A2	27	CF	0EB7:05	A9	00	85	19	A9	18	85	3E
0A5F:El	80	01	80	0C	FF	E7	03	DF	0C8F:A0	18	20	4E	0D	A9	35	85	E5	0EBF:18	20	48	C1	A5	FD	D0	02	DD
0A67:C1	80	3F	FE	3F	FC	FF	F1	34	0C97:01	AD	35	16	8D	20	D0	AD	DF	0EC7:C6	FE	C6	FD	AD	39	16	D0	0F
0A6F:80	01	80	1D	FF	F3	8F	01	D5	0C9F:36	16	8D	27	D0	A9	30	85	8F	0ECF:03	CE	3A	16	CE	39	16	A0	F1
0A77:80	70	06	70	1D	C0	3B	00	12	0CA7:01	4C	2C	C2	20	A8	C1	05	31	0ED7:00	B1	FD	85	FF	A0	BF	B9	34
0A7F:01	80	3B	80	71	DC	01	80	25	0CAF:00	01	60	00	96	03	82	00	D9	0EDF:90	67	45	FF	99	90	A7	B9	DE
0A87:E0	0E	E0	0D	80	33	00	01	4E	0CB7:8A	00	AD	EE	1B	85	03	AD	5C	0EE7:D0	68	45	FF	99	D0	A8	88	19
0A8F:80	73	00	30	F8	01	80	C0	51	0CBF:ED	1B	85	02	A9	94	85	05	16	0EEF:C0	FF	D0	EB	A9	80	85	2F	CE
0A97:0C	FF	FB	80	36	00	01	80	6D	0CC7:A9	00	85	19	A9	61	85	18	EC	0EF7:AD	05	85	30	03	4C	54	0F	E0
0A9F:E6	00	60	70	01	81	C0	0D	D6	0CCF:A9	C0	4C	84	C1	AD	05	85	13	0EFF:A9	18	85	06	A9	27	85	07	04
0AA7:FF	F3	00	66	00	01	81	C6	EC	0CD7:30	5E	A9	30	85	06	A9	6F	DE	0F07:A9	10	85	08	A9	1F	85	0A	0E
0AAF:00	60	F8	01	BF	81	80	19	29	0CDE:85	07	A9	10	85	08	A9	CF	22	0F0F:A9	00	85	09	85	0B	4C	2A	5E
0AB7:80	07	00	6C	00	01	C3	8C	AC	0CE7:85	0A	A9	00	85	09	85	0B	E0	0F17:C1	AD	ED	1B	D0	06	AD	EE	D9
0ABF:00	C1	DC	01	81	C0	1B	80	B5	0CEF:20	B3	C2	C9	00	F0	41	A5	E5	0F1F:1B	D0	01	F0	AD	F1	1B	1B	A8
0AC7:07	00	CC	00	01	E7	0C	00	B8	0CF7:3C	29	F0	48	4A	4A	4A	75		0F27:69	5D	8D	F1	1B	AD	F2	1B	B2
0ACF:C3	8E	01	81	FF	FB	FF	E7	79	0CFE:E9	02	48	CD	F1	1B	90	03	93	0F2F:69	1A	8D	F2	1B	AD	37	16	7D
0AD7:FF	DF	FF	E0	FE	18	01	87	D3	0D07:68	68	60	68	A8	B1	FD	49	53	0F37:D0	17	A9	09	85	03	A9	1B	EF
0ADF:07	01	80	FF	F1	FF	C3	FF	DE	0D0F:FF	91	FD	F0	0B	EE	ED	1B	67	0F3F:85	02	20	56	C2	20	73	0D	94
0AE7:1F	FF	C0	FC	18	01	9C	03	74	0D17:D0	03	EE	EE	1B	B8	50	0B	8E	0F47:A5	02	38	E9	03	85	FF	50	DC
0AEF:81	80	00	70	06	00	81	78	97	0D1F:AD	ED	1B	D0	03	CE	EE	1B	48	0F4F:25	20	A8	C1	05	00	01	09	6C
0AF7:04	00	84	01	80	00	0E	06	7A	0D27:CE	ED	1B	68	85	06	09	0F	73	0F57:00	09	03	36	01	7F	06	14	A1
0AFF:00	89	F0	7F	00	03	F0	01	0C	0D2F:85	07	20	2A	C1	4C	B8	0D	32	0F5F:00	1E	0E	46	69	6C	65	20	13
0B07:80	00	C0	05	00	8A	01	E0	D2	0D37:60	A9	18	85	06	A9	27	85	F1	0F67:64	65	73	63	72	69	70	74	44
0B0F:C1	80	00	61	81	80	01	C0	0D	0D3F:07	A9	20	85	08	A9	2F	85	6E	0F6F:69	6F	6E	3A	0F	00	A9	1B	76
0B17:05	00	8A	03	C0	01	80	00	3C	0D47:0A	A9	00	85	09	85	0B	20	BD	0F77:85	FC	A9	E2	85	FB	A9	1A	84
0B1F:61	81	80	03	80	05	00	8A	29	0D4F:2A	C1	AD	39	16	18	69	04	20	0F7F:85	FE	A9	5C	85	FD	18	A9	19
0B27:1F	80	7F	00	00	61	81	87	EC	0D57:AA	AD	3A	16	69	00	CD	F2	B4	0F87:11	65	FB	85	FB	90	02	E6	6C
0B2F:FF	3F	05	FF	8A	FE	00	C0	C6	0D5F:1B	D0	08	EC	F1	1B	90	03	2B	0F8F:FC	E6	FD	D0	02	E6	FE	A0	

PROGRAMS

```

0FD7:EE 1B CE ED 1B EE EF 1B 7C
0FDF:D0 03 EE F0 1B 20 B8 0D EB
0FE7:AD F0 1B 85 03 AD EF 1B 9E
0FEF:85 02 A9 A0 85 05 A9 00 24
0FF7:85 19 A9 61 85 18 A9 C0 0B
0FFF:20 84 C1 A9 B8 85 05 A9 B1
1007:00 85 19 A9 24 85 18 A5 53
100F:FC 85 03 A5 FB 85 02 20 E3
1017:48 C1 A9 00 8A 99 3B 16 39
101F:99 00 81 88 D0 F7 8D 96 DC
1027:84 A9 FF 99 01 81 A5 FC E3
102F:85 0F A5 FB 85 0E AD 37 41
1037:16 D0 03 4C 82 11 4C 9C 49
103F:13 A9 0A 85 03 A9 F5 85 1D
1047:02 20 36 C1 4C AC 04 A9 1A
104F:08 85 03 A9 C8 85 02 20 50
1057:56 C2 20 73 0D 4C 37 05 9B
105F:AE 89 84 8A E8 38 E9 07 75
1067:CD 8D 84 D0 02 A2 08 8A A4
106F:20 B0 C2 4C 37 05 A5 0F 11
1077:8D 31 16 A5 0E 8D 30 16 E4
107F:AD FF 00 D0 5D 20 A8 C1 02
1087:05 00 01 09 00 09 03 36 3B
108F:01 7F 06 14 00 1E 0E 45 EB
1097:6E 74 65 72 20 64 65 73 B0
109F:63 72 69 70 74 69 6F 6E D8
10A7:3A 0F 00 A9 16 85 03 A9 B9
10AF:BB 85 02 A9 00 85 04 85 8D
10B7:0A 85 0B A9 78 85 06 A9 C9
10BF:32 85 05 A9 00 85 19 A9 87
10C7:14 85 18 A9 11 8D A4 84 7D
10CF:A9 F9 8D A3 84 A9 01 8D 89
10D7:38 00 A9 36 8D 37 00 4C 42
10DF:BA C1 A0 0A B9 7E 13 99 0A
10E7:BB 16 88 10 F7 AD 31 16 6C
10EF:85 0F AD 30 16 85 0E 20 52
10F7:0B C2 20 09 15 F0 03 4C A1
10FF:AC 04 AD 14 84 85 09 AD 68
1107:13 84 85 08 20 92 C2 20 F5
110F:09 15 F0 03 4C AC 04 A0 07
1117:00 A9 82 91 0C C8 A5 08 E3
111F:91 0C C8 A5 09 91 0C C8 EF
1127:B1 0C C9 7B B0 08 C9 61 B0
112F:90 04 E9 20 91 0C C8 C0 E8
1137:13 D0 ED A9 00 91 0C C8 96
113F:C0 1C 90 F9 B1 0C 69 00 0B
1147:91 0C C8 B1 0C 69 00 91 01
114F:0C 20 E7 C1 20 09 15 F0 D8
1157:03 4C AC 04 A5 09 85 05 45
115F:A5 08 85 04 A9 16 85 0B 03
1167:A9 3B 85 0A A0 12 B9 89 C8
116F:13 99 7B 16 88 10 F7 A0 67
1177:1D B9 00 84 99 3D 16 88 55
117F:10 F7 AD 14 84 8D 3C 16 87
1187:AD 13 84 8D 3B 16 20 E7 09
118F:C1 20 09 15 F0 03 4C AC E5
1197:04 AD 14 84 85 05 AD 13 A0
119F:84 85 04 A9 80 85 0B A9 5A
11A7:00 85 0A 20 E4 C1 AD 02 F9
11AF:84 8D 01 80 AD 01 84 8D A7
11B7:00 80 20 E7 C1 20 09 15 32
11BF:F0 03 4C AC 04 20 4A C2 67
11C7:20 09 15 F0 03 4C AC 04 94
11CF:AD 15 84 D0 03 4C 92 10 2A
11D7:AD 02 84 85 05 AD 01 84 9F
11DF:85 04 A9 16 85 0B A9 3B 43
11E7:85 0A 20 E4 C1 A9 80 85 DC
11EF:0B A9 00 85 0A A0 00 98 C5
11F7:99 00 81 88 D0 FA AE 96 06
11FF:84 E8 E8 F0 4D 8E 96 84 21

```

```

1207:BD 3B 16 F0 F1 A8 AD 00 38
120F:81 D0 0A 98 8D 00 81 BD 20
1217:3C 16 8D 01 81 98 8D 00 2A
121F:80 BD 3C 16 8D 01 80 20 6D
1227:E7 C1 20 09 15 F0 03 4C 03
122F:AC 04 AD 00 80 85 04 AD 30
1237:01 80 85 05 20 E4 C1 AE C3
123F:96 84 FE 00 81 AD 00 80 F2
1247:D0 EB AD 01 80 9D 01 81 92
124F:D0 AC AD 02 84 85 05 AD CE
1257:01 84 85 04 A9 81 85 0B 77
125F:A9 00 85 0A 20 E7 C1 20 E2
1267:09 15 F0 03 4C AC 04 4C 0D
126F:92 10 4E 6F 74 20 67 69 FD
1277:76 65 6E 2E 00 67 65 6F B8
127F:4C 79 6E 78 20 66 6F 72 69
1287:6D 61 74 20 31 2E 30 00 ED
128F:20 0B C2 A5 05 48 A5 04 D1
1297:48 A5 0D 48 A5 0C 48 AD 0B
129F:02 84 85 05 AD 01 84 85 E6
12A7:04 A9 16 85 0B A9 3B 85 4E
12AF:0A 20 E4 C1 A5 05 85 0F F4
12B7:A5 04 85 0E 20 B9 C2 20 CE
12BF:A8 C1 05 00 01 11 00 34 C9
12C7:03 36 01 26 00 A9 16 85 D5
12CF:03 A9 BB 85 02 A9 32 85 50
12D7:05 A9 00 85 19 A9 14 85 5E
12DF:18 20 48 C1 68 85 0C 68 17
12E7:85 0D A0 1D B9 3D 16 91 78
12EF:0C 99 00 84 88 10 F5 A0 D9
12F7:13 AD 3B 16 91 0C 85 04 A5
12FF:AD 3C 16 85 05 C8 91 0C 9F
1307:A9 16 85 0B A9 3B 85 0A 38
130F:20 E4 C1 A0 01 AD 3B 16 0C
1317:91 0C 8D 30 16 C8 AD 3C 29
1327:8E 3B 16 CA 8E 3C 16 20 84
132F:E7 C1 68 85 04 68 85 05 F0
1337:20 09 15 F0 05 68 68 4C 48
133F:AC 04 A9 80 85 0B A9 00 A5
1347:85 0A 20 E7 C1 20 4A C2 1B
134F:F0 05 68 68 4C AC 04 AD 8D
1357:15 84 D0 03 4C 92 10 AD ED
135F:31 16 85 05 AD 30 16 85 84
1367:04 A9 16 85 0B A9 3B 85 10
136F:0A 20 E4 C1 AD 3C 16 8D 73
1377:01 80 AD 3B 16 8D 00 80 0F
137F:A9 80 85 0B A9 00 85 0A 5E
1387:AE 96 84 E8 E8 F0 51 8E 06
138F:96 84 BD 3B 16 F0 F1 AD 93
1397:00 80 9D 00 81 AD 01 80 D6
139F:9D 01 81 AD 01 80 85 05 F9
13A7:AD 00 80 85 04 20 E4 C1 39
13AF:AE 96 84 DE 3B 16 D0 EB 11
13B7:AD 01 80 48 AD 00 80 48 40
13BF:BD 3C 16 8D 01 80 A9 00 CC
13C7:8D 00 80 20 E7 C1 F0 05 F3
13CF:68 68 4C AC 04 68 8D 00 75
13D7:80 68 8D 01 80 B8 50 A8 4A
13DF:A9 81 85 0B A9 00 85 0A FE
13E7:AD 31 16 85 05 AD 30 16 A1
13EF:85 04 20 E7 C1 F0 03 4C 80
13F7:AC 04 4C 92 10 E0 00 D0 FC
13FF:01 60 8A C9 20 90 02 E9 DD
1407:12 0A AA BD 4F 15 8D 3D 13
140F:15 BD 50 15 8D 3E 15 A9 C5
1417:15 85 03 A9 31 85 02 20 E9
141F:56 C2 4C 73 0D 81 13 32 AA
1427:0D 0B 13 43 15 0B 0B BA
142F:24 00 00 01 11 49 00 18 3F

```

```

1437:44 69 73 6B 20 45 72 72 6E
143F:6F 72 20 3A 00 89 15 89 3D
1447:15 98 15 B0 15 B0 15 C0 24
144F:15 D8 15 D8 15 D8 15 D8 77
1457:15 D8 15 D8 15 D8 15 F8 9F
145F:15 EA 15 F8 15 F8 15 F8 AE
1467:15 F8 15 0C 16 F8 15 F8 73
146F:15 1E 16 F8 15 F8 15 F8 AB
1477:15 F8 15 F8 15 49 6E 76 BB
147F:61 6C 69 64 20 74 72 61 FF
1487:63 6B 2E 00 49 6E 73 75 62
148F:66 66 69 63 69 65 6E 74 1A
1497:20 64 69 73 6B 20 73 70 80
149F:61 63 65 2E 46 69 6C 65 F6
14A7:20 6E 6F 74 20 66 6F 75 9F
14AF:6E 64 2E 00 42 61 64 20 6E
14B7:42 41 4D 2E 20 56 61 6C 67
14BF:69 64 61 74 65 20 64 69 07
14C7:73 6B 2E 00 44 65 76 69 58
14CF:63 65 20 6E 6F 74 20 66 E1
14D7:6F 75 6E 64 2E 00 4D 69 9E
14DF:73 73 69 6E 67 20 64 69 A0
14E7:73 6B 2E 00 42 6C 6F 63 70
14EF:6B 20 61 63 63 65 73 73 43
14F7:20 65 72 72 6F 72 2E 00 A0
14FF:57 72 69 74 65 20 70 72 E3
1507:6F 74 65 63 74 20 6F 6E 5A
150F:2E 00 44 69 73 6B 20 49 42
1517:4A 20 6D 69 73 6D 61 74 38
151F:63 68 2E 00 00 00 00 00 DA

```

GEOCONVERTER 2.0

```

DS 10 REM COPYRIGHT 1992 COMPU
TE! PUBLICATIONS, INC. -
ALL RIGHTS RESERVED
SE 20 IF (PEEK(772)+PEEK(773)*2
56)=42364 THEN 40
PD 30 LIST0,1:LIST4,1:LIST6,1:
SA=PEEK(4625)*256+PEEK(4
624):GOTO50
SX 40 POKE56,PEEK(46)+40:CLR:P
OKE53280,0:POKE53281,0:S
A=PEEK(56)*256+PEEK(55)
RP 50 PRINT "{CLR}{8}{N}{DOWN}"
TAB(12) "{RVS}GEOCONVERTE
R 2.0{OFF}{GRN}{3 DOWN}"
:PRINTTAB(13) "COPYRIGHT
{SPACE}1990{DOWN}"
KR 60 PRINTTAB(7) "COMPUTE! PUB
LICATIONS INC.{DOWN}":PR
INTTAB(11) "ALL RIGHTS RE
SERVED{2 DOWN}"
MK 70 N=8:PRINT "DRIVE NUMBER "
N"{4 LEFT}";:INPUTN:IFN<
8ORN>11 THEN 70
QE 80 K$="N":PRINT "IS DRIVE"N
A 1581? "K$"{3 LEFT}";:I
NPUTK$:IFK$<>"N" AND K$<>"
Y" THEN 80
SB 90 T$=CHR$(18):S$=CHR$(1):I
FK$="Y" THEN T$=CHR$(40):S
$=CHR$(3)
RS 100 INPUT "FILE TO CONVERT";
NM$:OPEN15,N,15:OPEN1,N
,8,"0:"NM$+"",P,R"
BX 110 GOSUB440:IFEN<>0 THEN PRI
NT "{RVS}"EN$ "EM$SET$EE
$:GOTO400

```



```

FF 120 GET#1,K$,V$:IFK$<>CHR$(
71)ORV$<>CHR$(2)THENCLO
SE1:CLOSE15:GOTO220
BR 130 PRINT"{DOWN}DECOMPRESSI
NG...":Z$=CHR$(0):GET#1
,ESC$:ESC=ASC(ESC$+Z$):
AD=SA
RQ 140 GOSUB170:IFV<>ESCTHENPO
KEAD,V:AD=AD+1:GOTO140
PP 150 GOSUB170:CT=V:GOSUB170:
CT=CT+V*256:GOSUB170:GO
SUB160:GOTO140
DH 160 FORI=1TOCT:POKEAD,V:AD=
AD+1:NEXTI:CT=0:RETURN
PK 170 GET#1,V$:S=ST:V=ASC(V$+
Z$):IFST=0THENRETURN
SJ 180 IFS<>64THENGOSUB440:PRI
NT"{DOWN}LOAD ERROR -
{RVS}"EN$ "EM$ETSEES:G
OTO400
AF 190 IFCT<>0THENGOSUB160:AD=
AD-1
DG 200 PRINT"{DOWN}WRITING..."
:CLOSE1:PRINT#15,"S0:"+
NMS:CLOSE15
EF 210 OPEN1,N,8,"0:"+NMS+",P,
W":FORI=SATOAD:PRINT#1,
CHR$(PEEK(I));:NEXTI:CL
OSE1
GP 220 PRINT"{DOWN}CONVERTING.
..":HD$="":FORI=1TO4:RE
ADHE:HD$=HD$+CHR$(HE):N
EXTI
CF 230 FORI=1TO5:READIE:ID$=ID
$+CHR$(IE):NEXTI
DR 240 NL$="":OPEN15,N,15,"I0:
":OPEN2,N,2,"#"
MM 250 GOSUB410:GET #2,NT$,NSS
:FORE=0TO7:D$=NL$:GET#2
,B$:I=1:IFB$=NL$THEN310
PE 260 IF ASC(B$)<>130 THEN310
AE 270 GET#2,HT$,HS$:I=3:IFHS$
="THENHS$=CHR$(0)
DJ 280 GET#2,B$:I=I+1:IFB$="T
HENB$=CHR$(0)
BM 290 IF(ASC(B$)=160)OR(I=19)
THEN310
SF 300 D$=D$+B$:GOTO280
EB 310 FORI=1TO31:GET#2,B$:NEX
TI:IFD$=NM$THEN340
JX 320 NEXTE:IFNT$=NL$THEN340
CH 330 T$=NT$:S$=NS$:GOTO250
GA 340 IFD$=NL$THENPRINT"
{DOWN}DISK ERROR!":GOTO
400
PD 350 DT$=T$:SS$=SS$:T$=HT$:S$
=HS$:GOSUB410:GET#2,MT$,
MS$:IFMS$="THENMS$=CH
R$(0)
GF 360 FORI=0TO65:GET#2,B$:NEX
TI:GET#2,CT$,GT$:GOSUB4
10:PRINT#2,HD$:GOSUB42
0
RX 370 T$=DT$:S$=SS$:GOSUB410:
FORI=1TO32*E+2:GET#2,B$
:NEXTI:PRINT#2,CT$,MT$,
MS$;
MB 380 FORI=0TO15:GET#2,B$:NEX

```

```

TI:PRINT#2,HT$,HS$;CHR$(
0);GT$:ID$;:GOSUB420
GR 390 PRINTNM$". CONVERTED!"
HB 400 CLOSE1:CLOSE2:CLOSE15:E
ND
DQ 410 U$="U1":GOTO430
CS 420 U$="U2"
PA 430 PRINT#15,U$;2;0;ASC(T$+
"0");ASC(S$+"0"):RETURN
JJ 440 INPUT#15,EN,EM$,ET,EE:E
N$=STR$(EN):ET$=STR$(ET
):EE$=STR$(EE):RETURN
EH 450 DATA 0,255,3,21,87,10,1
,0,0

```

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HAG

By Bruce M. Bowden

HAG, which stands for High-resolution Animation Generator, lets you quickly create your own movies with the 64.

HAG combines a set of individual images into an animated sequence or, in other words, combines bitmapped pictures into a movie. The images must be two color and high resolution like those produced by programs such as *The Printshop*, *WorldMap 64*, and *WorldMap 128* (October 1991 *Gazette Disk* bonus). *LISA*, the Little Isometric Artist (January 1992), will also generate images of this type.

To use the images, place them on the same disk and name them SLIDExx, where xx is a two-digit number. The images must be numbered in the desired order: SLIDE00, SLIDE01, SLIDE02, for example. The numbering, however, may begin anywhere.

Getting Started

HAG is written entirely in machine language. Use *MLX*, our machine language entry program, to enter it. See "Typing Aids" elsewhere in this issue. When *MLX* prompts, respond with the following values.

Starting address: 0801

Ending address: 15F8

Be sure to save a copy of the program before exiting *MLX*.

Making Movies

To run *HAG*, load and run it like a BASIC program. The first prompt asks you

to place a disk containing your set of images in the disk drive 8. It then asks for a starting number, 01-99. An ending number is entered the same way.

Next, you are asked how you want the movie to run. Do you want a straight run from the first image to the last? Or do you want it to oscillate from start to finish and then back down to start? Press S for a straight run or O to oscillate. The graphic screen will appear after this selection, and you can watch as the first image is loaded. After loading, a new text screen will appear for selecting colors. Press a key to return to the picture, and choose suitable background and foreground colors by pressing the 1 (background) or 2 (foreground) keys. After you've made your selections, press Return, and the slides will be loaded, compressed, and merged one by one. The screen is updated as each new slide is appended.

After all of the slides have been loaded, a prompt will appear on the text screen, asking you to insert the disk upon which you wish to save the movie and to enter the movie name. You can abort the process by entering a percent (%) symbol. If you abort the save, you can still run the movie by entering SYS 16384. Vary the speed of the movie with POKE 16384+3, x, with x being any value between 1 and 255.

Showing a Movie

You can load a saved movie to the same location, 16384 (\$4000), with LOAD "filename",8,1. The advantage of this arrangement is that it allows you to run movies from within a small BASIC or machine language program under the movie data. It may be as simple as 10 SYS 16384:GOTO 10 or as complicated as something that loads several movies and varies the speed according to user input. Each time a movie is run, control is returned to the calling routine. That's the reason for the iterative example above.

If necessary, the calling routine must also recover text mode. This is done, from BASIC, with these three pokes:

POKE 53265,PEEK(53265) AND 223
 POKE 53272,(PEEK(53272) AND 260) OR 6
 POKE 53270,PEEK(53270) AND 239

PROGRAMS

Pressing Run/Stop-Restore also recovers from the graphics mode without disturbing the movie code.

If the storage required for the movie exceeds the 64's available memory, loading will stop with a message saying so. In that case, the generator program must be reloaded and an alternative series of images loaded. Choosing a sequential run over an oscillating one will also conserve memory.

Memory Locations

The loader code resides from addresses 16384 (\$4000) to 16806 (\$41A6), and the movie data is stored from 16807 (\$41A7) to a maximum address of 53247 (\$CFFF). This is 142 blocks, more than 36K of movie storage. The rate of speed at which the movie is run is stored in 16387 (\$4003) and has a default value which is normally adequate. Background and foreground defaults may also be modified by poking the colors to 16390 and 16393 respectively.

Any BASIC program using the movie must set a ceiling for storage at 16384 (\$4000). This is done with POKE 55,254:POKE 56,63:CLR.

HAG

```

0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 4C F7 08 93 97
0811:0D 0D 0E 0E 05 20 20 20 76
0819:20 20 73 61 76 65 20 4F 9E
0821:50 45 52 41 54 49 4F 4E BD
0829:53 20 41 52 45 20 63 61 0B
0831:6E 63 65 6C 6C 65 64 0D 93
0839:0D 74 48 45 20 4D 4F 56 75
0841:49 45 20 52 45 4D 41 49 0B
0849:4E 53 20 49 4E 20 4D 45 9C
0851:4D 4F 52 59 20 46 4F 52 C6
0859:20 52 55 4E 4E 49 4E 47 19
0861:0D 20 20 20 20 20 20 20 E7
0869:6A 55 53 54 20 73 79 73 E8
0871:20 54 4F 20 31 36 33 38 93
0879:34 20 28 24 34 30 30 30 E5
0881:29 2E 0D 20 20 20 20 20 37
0889:70 4F 4B 45 20 54 4F 20 74
0891:31 36 33 38 34 2B 33 20 86
0899:54 4F 20 56 41 52 59 20 37
08A1:53 50 45 45 44 2E 0D 0D 6E
08A9:20 20 20 63 4F 4E 54 52 BA
08B1:4F 4C 20 49 53 20 52 45 1A
08B9:54 55 52 4E 45 44 20 54 48
08C1:4F 20 54 48 45 20 43 41 03
08C9:4C 4C 49 4E 47 0D 20 20 EF
08D1:20 20 52 4F 55 54 49 4E 16
08D9:45 20 41 54 20 54 48 45 2A
08E1:20 45 4E 44 20 4F 46 20 4C
08E9:4F 4E 45 20 43 59 43 4C 32
08F1:45 2E 0D 00 00 00 A9 14 39
08F9:85 FC A9 4B 85 FB A9 40 A5
0901:85 FE A9 00 85 FD A2 15 49
    
```

```

0909:A0 F2 20 4F 0B 4C 32 12 21
0911:00 00 00 00 53 4C 49 44 C5
0919:45 30 30 30 30 30 31 20 A7
0921:D5 40 20 1C 41 A9 15 85 54
0929:FB A9 09 85 FC A9 0F A2 6C
0931:08 A0 00 20 BA FF A9 07 A1
0939:A6 FB A4 FC 20 BD FF A9 A3
0941:00 A2 00 A0 20 20 D5 FF 33
0949:60 AD 14 09 D0 03 4C 8A BF
0951:09 C9 AA D0 19 20 AA 09 64
0959:AD 1B 09 CD 1D 09 D0 0B C0
0961:AD 1A 09 CD 1C 09 D0 03 78
0969:4C A0 09 4C D2 09 AD 1B E0
0971:09 CD 1F 09 D0 23 AD 1A 78
0979:09 CD 1E 09 D0 1B A9 AA C8
0981:8D 14 09 20 AA 09 4C D2 67
0989:09 AD 1B 09 CD 1F 09 D0 4D
0991:08 AD 1A 09 CD 1E 09 F0 D0
0999:06 20 BE 09 4C 6C 09 A5 EA
09A1:01 09 03 85 01 58 4C 06 37
09A9:0C AD 1B 09 C9 30 F0 04 16
09B1:CE 1B 09 60 A9 39 8D 1B 81
09B9:09 CE 1A 09 60 AD 1B 09 D0
09C1:C9 39 F0 04 EE 1B 09 60 BB
09C9:A9 30 8D 1B 09 EE 1A 09 61
09D1:00 A5 01 09 03 85 01 58 B6
09D9:A9 15 85 FB A9 09 85 FC EF
09E1:A9 0F A2 08 A0 00 20 BA 61
09E9:FF A9 07 A6 FB A4 FC 20 3E
09F1:BD FF A9 00 A2 00 A0 E0 4F
09F9:20 D5 FF 78 18 A5 01 29 9B
0A01:FD 85 01 A0 00 8C 11 09 FC
0A09:AD 1F 40 C9 D0 90 A5 E2
0A11:01 09 03 85 01 58 4C FC 9F
0A19:0B AD 11 09 D0 03 8D 19 97
0A21:40 A0 00 AD 1C 40 85 FB 41
0A29:AD 1D 40 85 FC B1 FB 8D EF
0A31:F5 08 AD 1B 40 85 FC AD 69
0A39:1A 40 85 FB B1 FB CD F5 E9
0A41:08 D0 0B AD 11 09 F0 03 5B
0A49:20 9D 0A 4C 75 0A AD 11 1B
0A51:09 D0 14 AD 1C 40 8D 12 8A
0A59:09 AD 1D 40 8D 13 09 A9 79
0A61:AA 8D 11 09 4C 75 0A EE 1C
0A69:19 40 AD 19 40 C9 FF D0 5B
0A71:03 20 9D 0A AD 1D 40 C9 8F
0A79:3F D0 0A AD 1C 40 C9 3F 32
0A81:D0 03 4C F8 0A AD 1C 40 57
0A89:18 69 01 8D 1C 40 8D 1A 14
0A91:40 90 06 EE 1D 40 EE 1B 7C
0A99:40 4C 09 0A AD 1E 40 85 8E
0AA1:FB AD 1F 40 85 FC A0 00 68
0AA9:AD 12 09 91 FB C8 AD 13 C4
0AB1:09 91 FB C8 AD 19 40 91 9E
0AB9:FB 18 69 04 90 03 EE 1F CC
0AC1:40 18 6D 1E 40 8D 1E 40 40
0AC9:90 03 EE 1F 40 18 A5 FB 60
0AD1:69 03 85 FB 90 02 E6 FC 23
0AD9:AD 13 09 18 69 C0 85 FE 84
0AE1:AD 12 09 85 FD AC 19 40 DF
0AE9:B1 FD 91 FB 88 C0 FF D0 60
0AF1:F7 A0 00 8C 11 09 60 AD 53
0AF9:11 09 F0 03 20 9D 0A A0 0E
0B01:00 8C 1A 40 84 FB A9 00 E8
0B09:85 FD 8D 1C 40 A9 20 85 43
0B11:FE 8D 1D 40 A9 E0 8D 1B B8
0B19:40 85 FC A2 FF A0 3F 20 9B
0B21:4F 0B 20 D5 40 20 1C 41 FE
0B29:AD 1E 40 85 FB AD 1F 40 13
0B31:85 FC A0 00 98 91 FB C8 29
    
```

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0B39:91 FB C8 91 FB AD 1E 40 5C
0B41:18 69 03 8D 1E 40 90 03 0D
0B49:EE 1F 40 4C 4A 09 8E F6 F5
0B51:08 8C F5 08 A0 00 B1 FB 32
0B59:91 FD A5 FC CD F6 08 D0 67
0B61:08 A5 FB CD F5 08 D0 01 B3
0B69:60 E6 FB D0 02 E6 FC E6 82
0B71:FD D0 E3 E6 FE 4C 57 0B 88
0B79:8E F6 08 8C F5 08 A0 00 6F
0B81:B1 FB 91 FD A5 FC CD F6 35
0B89:08 D0 08 A5 FB CD F5 08 3E
0B91:D0 01 60 C6 FB A5 FB C9 01
0B99:FF D0 02 C6 FC C6 FD A5 35
0BA1:FD C9 FF D0 DB C6 FE 4C 7A
0BA9:81 0B 93 0D 0D 0D 0D 4A
0BB1:20 20 75 68 2D 6C 68 21 2E
0BB9:20 74 48 45 20 50 52 4F 90
0BC1:43 45 53 53 20 48 41 53 62
0BC9:20 42 45 45 4E 20 41 42 35
0BD1:4F 52 54 45 44 0D 20 20 B9
0BD9:20 20 20 44 55 45 20 54 A4
0BE1:4F 20 4C 41 43 4B 20 4F 1C
0BE9:46 20 53 54 4F 52 41 47 68
0BF1:45 20 4D 45 4D 4F 52 59 56
0BF9:2E 0D 00 20 F5 40 A0 0B 69
0C01:A9 AB 4C 84 10 A9 00 8D 5F
0C09:14 09 AD 20 40 C9 FA F0 35
0C11:14 AD 1E 09 8D 1A 09 AD 87
0C19:1F 09 8D 1B 09 A9 FA 8D D8
0C21:20 40 4C 4A 09 4A 10 46
0C29:93 0E 0D 0D 20 70 4C 17
0C31:41 43 45 20 54 48 45 20 D3
0C39:44 49 53 4B 20 54 4F 20 F5
0C41:42 45 20 57 52 49 54 54 F9
0C49:45 4E 20 54 4F 20 49 4E BC
0C51:20 54 48 45 0D 20 44 49 A6
0C59:53 4B 20 44 52 49 56 45 DF
0C61:2C 20 54 48 45 4E 20 45 8F
0C69:4E 54 45 52 20 54 48 45 B3
0C71:20 4D 4F 56 49 45 20 6E 4A
0C79:61 6D 65 2E 0D 0D 20 20 2A
0C81:20 70 4C 45 41 53 45 20 A5
0C89:4E 4F 54 45 20 54 48 41 9F
0C91:54 20 4F 43 43 55 52 52 60
0C99:45 4E 43 45 20 4F 46 20 8F
0CA1:54 48 45 0D 20 20 20 20 51
0CA9:20 25 20 53 59 4D 42 4F 28
0CB1:4C 20 41 42 4F 52 54 53 04
0CB9:20 54 48 49 53 20 53 45 9B
0CC1:4C 45 43 54 49 4F 4E 0D 30
0CC9:0D 00 24 30 00 00 00 00 EF
0CD1:00 00 00 00 00 00 00 00 E9
0CD9:00 00 00 00 00 00 00 00 F1
0CE1:20 AB FF 20 E7 FF 20 F5 6C
0CE9:40 A5 01 09 01 85 01 A9 06
0CF1:82 A0 0E 20 84 10 A9 00 EE
0CF9:8D 69 0E A9 00 8D 24 40 4E
0D01:A9 00 20 BD FF A9 0F A2 37
0D09:08 A0 0F 20 BA FF 20 C0 0A
0D11:FF A9 02 A0 0C A2 CB 20 82
0D19:BD FF A9 01 A2 08 A0 00 CD
0D21:20 BA FF 20 C0 FF A2 01 48
0D29:20 C6 FF 20 CF FF 20 CF 95
0D31:FF 20 CF FF 20 CF FF 20 AD
0D39:CF FF 8D 67 0E 20 CF FF F3
0D41:8D 68 0E A9 00 8D D3 40 B6
0D49:8D D4 40 AD 67 0E F0 03 9A
0D51:8D D3 40 AD 68 0E F0 03 6A
0D59:8D D4 40 AE D3 40 AD D4 32
0D61:40 20 CD BD A9 0D 20 D2 CD
    
```


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0D89:0E	AD	68	0E	C9	22	D0	E9	66	0FB9:52	49	47	48	54	20	31	39	7F	11E9:20	20	20	20	20	20	20	4F	3B	
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0DB1:68	0E	C9	22	F0	09	AD	68	4E	0FE1:4C	20	6C	54	44	2E	0D	20	16	1211:73	63	69	6C	6C	61	74	65	F2	
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0DC1:68	0E	C9	22	D0	E6	20	D2	24	0FF1:20	61	4C	4C	20	72	49	47	6B	1221:57	4E	20	54	48	45	20	50	B5	
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0EB9:CA	BD	A4	13	20	56	0F	B0	99	10E9:00	85	FB	A9	FB	AC	1F	40	96	1319:E6	FC	18	A5	FD	69	02	85	6E	
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0F41:09	CD	1A	09	0C	F0	01	C2		1171:2E	20	54	48	45	4E	20	3C	A1	13A1:4F	0B	60	00	00	00	00	00	00	3E
0F49:60	AD	1B	09	CD	1F	09	B0	A4	1179:72	65	74	75	72	6E	3E	0D	EA	13A9:00	00	00	00	00	00	00	00	00	CF
0F51:01	60	4C	9F	0E	C9	30	B0	34	1181:0D	0D	20	20	20	20	20	55											

PROGRAMS

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13F9:9D A4 13 EE 25 40 20 D2 A6
1401:FF AE 25 40 E0 11 D0 D0 3B
1409:4C 1A 14 C9 0D D0 01 60 0B
1411:C9 14 D0 D4 AD 25 40 F0 FD
1419:BF CE 25 40 A9 20 AE 25 CD
1421:40 9D A4 13 A0 14 A9 2F 6E
1429:20 84 10 4C D9 13 9D 20 BF
1431:20 9D 9D 00 8D 24 40 18 1A
1439:C9 20 90 09 E9 5B B0 05 14
1441:AD 24 40 38 60 AD 24 40 17
1449:18 60 4C 26 40 20 06 07 17
1451:2D 20 62 52 55 43 45 20 EB
1459:6D 2E 20 62 4F 57 44 45 93
1461:4E 20 2D 00 00 00 00 00 5E
1469:00 00 00 00 00 00 00 00 91
1471:20 53 41 20 1C 41 AD 11 FA
1479:D0 29 20 D0 03 20 D5 40 E9
1481:AD 21 40 85 FB AD 22 40 44
1489:85 FC 18 A5 01 29 FE 85 41
1491:01 20 BB 40 A0 00 B1 FB 22
1499:D0 2C C8 B1 FB D0 27 C8 A3
14A1:B1 FB D0 22 20 BB 40 18 66
14A9:A5 FB 69 03 85 FB 90 02 40
14B1:E6 FC CD 1E 40 D0 0F A5 31
14B9:FC CD 1F 40 D0 08 18 A5 38
14C1:01 09 03 85 01 60 A0 00 30
14C9:B1 FB 85 FD C8 B1 FB 85 E4
14D1:FE C8 B1 FB 8D 19 40 18 0B
14D9:A5 FB 69 03 85 FB 90 02 70
14E1:E6 FC AC 19 40 B1 FB 91 36
14E9:FD 88 C0 FF D0 F7 18 EE D0
14F1:19 40 AD 19 40 D0 02 E6 2E
14F9:FC 65 FB 85 FB 90 02 E6 DE
1501:FC 4C 4A 40 EA AD 03 40 5E
1509:8D 23 40 AE 03 40 AC 03 2B
1511:40 88 D0 FD CA D0 F7 CE CF
1519:23 40 D0 EF 60 00 00 AD AE
1521:11 D0 09 20 09 10 8D 11 DF
1529:D0 AD 16 D0 18 29 DF 8D A9
1531:16 D0 AD 18 D0 18 29 F0 FB
1539:09 08 8D 18 D0 18 60 AD 72
1541:11 D0 18 29 DF 8D 11 D0 E5
1549:18 AD 18 D0 18 29 F0 09 4B
1551:06 8D 18 D0 18 AD 16 D0 66
1559:29 EF 8D 16 D0 A9 00 8D E1
1561:20 D0 8D 21 D0 60 AD 04 FA
1569:40 8D 20 D0 A2 04 86 FC 57
1571:A2 00 86 FB A0 00 AD 05 E2
1579:40 0A 0A 0A 0A 0D 04 40 F4
1581:91 FB C8 A6 FC E0 07 F0 61
1589:09 C0 00 D0 F3 E6 FC 4C F6
1591:36 41 8C D3 40 AE D3 40 9A
1599:E0 E8 D0 E4 60 A9 A7 85 55
15A1:FB A9 41 85 FC A9 00 85 C8
15A9:FD A9 20 85 FE A0 00 B1 C5
15B1:FB F0 0E AA C8 B1 FB 88 10
15B9:91 FD C8 CA D0 FA 4C 78 75
15C1:41 60 98 18 65 FD 85 FD 65
15C9:90 08 E6 FE A5 FE C9 40 08
15D1:B0 EF 18 A5 FB 69 02 85 BC
15D9:FB 90 02 E6 FC A5 FC CD 1B
15E1:22 40 D0 0A A5 FB CD 21 C1
15E9:40 D0 03 4C 77 41 4C 63 4A
15F1:41 00 00 00 00 00 00 00 BC

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PEGMAN

By Alain Tremblay

You're in a world that is filling with water. Dripping faucets are everywhere, and it's your job to plug them. Climb ladders to escape the rising flood and leap from ledge to ledge to reach the errant faucets.

Pegman, written in machine language, is a one-player game for the 64. To enter it, use *MLX*, our machine language entry program. See "Typing Aids" elsewhere in this section. When *MLX* prompts, respond with the following values.

Starting address: 0801
Ending address: 1B90

Be sure to save a copy of the program before exiting *MLX*.

How to Start

Pegman loads and runs like a BASIC program. Press the fire button to bring up the first screen after the game loads.

Your task is to plug all the dripping faucets on a given screen. There are ten screens in all (levels 0-9), and they can be played at random. The computer will make the choice, or you can play them in order one after the other. When you are asked if you want to start again after a game, move the joystick (plugged in port 2) left to select random play or right to select sequential play. You may also choose between a fast or slow flooding speed by moving the joystick up or down. Push the fire button when you are ready to play.

How to Play

Move the joystick right or left to run. To plug a dripping faucet, simply come in contact with it. Use the ladders by moving the joystick up or down to reach higher or lower floors. Simply push the fire button to jump up or push it while holding the joystick in the appropriate direction to jump either right or left. You can jump to grab a ladder or leap onto another floor. Don't worry about falling; you won't lose a life by falling down to a lower floor.

If you fall into the water, you can swim in all eight directions to reach any faucets that happen to be below the surface. Sounds change depend-

ing on whether you are above or below the surface. The only way to get out of the water is to use a ladder.

Dangers

Once a big fish becomes aware of your presence, he will try to devour you. If you are swimming on the surface, he may bear down on you or leap from the water to get you. You can deal him a fatal blow if you are under him when he falls back into the water. Push the fire button to thrust at him. The timing is critical.

The only other threats to your life are two crabs. You can brush against them, but don't run into them. The ladder-eating snails and the fish that someone keeps tossing at you are harmless, but they can impede your progress.

You earn 20 points for each faucet plugged. After completing a screen, you get points according to the level the flood has reached. You gain an extra life as a bonus for every 1000 points.

After completing the tenth screen on a sequential game, you may continue with random or sequential play and fast or slow flooding speed, just as you did at the start of the game.

PEGMAN

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0801:0B 08 0A 00 9E 32 30 36 2E
0809:32 00 00 00 00 20 A1 14 0A
0811:20 F5 0F 20 F1 12 20 1E C8
0819:10 A2 07 A9 00 95 80 BD 6A
0821:17 10 9D 12 D4 CA 10 F3 7B
0829:A9 32 85 81 20 9B 08 A2 85
0831:40 A9 00 9D D0 CF 95 30 C6
0839:CA 10 F6 8E 04 D0 AD 9B D4
0841:0F 29 10 0A A2 0D 69 08 E9
0849:CA E4 83 D0 F9 85 56 8A 92
0851:20 91 13 A5 83 09 30 8D C0
0859:AE 07 A9 CC 8D FB 07 E6 D5
0861:3A A9 C8 8D F9 07 A9 CE F8
0869:8D FC 07 8D FD 07 A9 D0 69
0871:85 55 A9 08 85 52 20 F7 FC
0879:13 A5 08 10 FC A6 81 E0 E4
0881:30 D0 56 A2 0A A0 0E 20 E1
0889:23 15 A2 00 BD CD 08 F0 EA
0891:88 20 D2 FF E8 D0 F5 20 DE
0899:51 0F 20 2F 0F 8A D0 01 52
08A1:60 A5 02 F0 19 10 08 A9 5D
08A9:52 A2 4E A0 44 D0 04 A9 76
08B1:20 AA A8 8D 7F 0F 8E 80 40
08B9:0F 8C 81 0F D0 D9 A5 03 D1
08C1:F0 D8 AD 9B 0F 49 15 8D 45
08C9:9B 0F D0 CB 53 54 41 52 03
08D1:54 20 41 47 41 49 4E 3F BB
08D9:00 A9 50 8D 00 D0 8D 01 96
08E1:D0 A2 00 86 5D 20 08 0F F5
08E9:A5 5D D0 8D 20 14 0E A5 2A

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08F1:44	F0 08 C6 3F 10 0A A9 C5	0B21:DF	A9 0F 85 39 CA F0 06 A8	0D51:D0	FA A9 08 85 59 85 5A 3F
08F9:03	85 3F 20 BA 09 20 18 29	0B29:CA	F0 24 4C C3 0B 06 39 B9	0D59:AD	F8 07 29 D0 09 03 8D 3A
0901:0B	A5 58 D0 E3 85 08 A6 06	0B31:AD	1B D4 D0 1A A5 08 29 2D	0D61:F8	07 C6 5A D0 08 AD F8 33
0909:08	D0 FC A9 01 20 9F 0F 64	0B39:03	D0 03 20 B4 0B A2 01 7F	0D69:07	29 D0 8D F8 07 A5 3B AE
0911:A9	F0 C6 55 A6 55 E0 33 E1	0B41:AD	12 D0 10 03 CA F0 05 F7	0D71:30	DA AD 01 D0 38 E9 0F 6A
0919:B0	EB A6 83 E8 AD 7F 0F 97	0B49:4A	90 02 A2 FF 86 3B A0 44	0D79:ED	07 D0 10 02 49 FF C9 66
0921:C9	20 F0 07 AE 1B D4 E0 1B	0B51:01	20 02 0B C5 5B AD FB D3	0D81:03	B0 C9 AD 00 D0 ED 06 82
0929:0A	B0 F9 86 83 E0 0A F0 B8	0B59:07	29 10 90 03 D0 03 6A 14	0D89:D0	10 02 49 FF C9 08 B0 CC
0931:03	4C 30 08 A0 0A 20 23 EE	0B61:D0	16 A2 FF AD 07 D0 38 1D	0D91:BB	A2 00 86 38 8E 07 D0 75
0939:15	A2 00 86 08 A5 08 10 DD	0B69:ED	01 D0 10 04 A2 01 49 C7	0D99:E8	A9 50 20 9F 0F A9 0F 3A
0941:FC	BD 58 09 F0 06 20 D2 8F	0B71:FF	C9 18 B0 03 86 3B C8 79	0DA1:85	53 A9 03 A0 02 A2 50 5B
0949:FF	E8 D0 F5 85 08 85 83 E9	0B79:84	38 A5 3B A2 07 20 F3 AD	0DA9:4C	6B 10 AD F8 07 29 0F E6
0951:A5	08 10 FC 4C 2D 08 47 78	0B81:0E	CA A5 3A 20 F3 0E 20 B6	0DB1:C9	02 D0 04 A9 81 85 50 3A
0959:45	54 20 52 45 41 44 59 5D	0B89:E7	0A 98 F0 03 20 B4 0B 45	0DB9:06	47 A5 5A D0 A4 8A F0 22
0961:20	54 4F 20 47 4F 20 4F 8B	0B91:A2	00 AD 07 D0 C9 CF 90 FC	0DC1:8C	E8 20 F1 0E A5 03 10 9C
0969:4E	21 00 A5 38 C9 02 90 C2	0B99:01	CA 69 08 C5 55 B0 06 7B	0DC9:14	20 45 0D D0 0F A5 46 C3
0971:47	20 02 0B AD FB 07 29 B4	0BA1:A5	38 4A 90 07 E8 8A F0 CC	0DD1:F0	1B CE 01 D0 CE 01 D0 A9
0979:10	85 0C A5 5B E9 08 18 7B	0BA9:02	86 3B 60 E6 38 A9 00 3B	0DD9:A9	C3 4C 71 0E A5 03 E8 50
0981:65	0C 38 E5 5C 10 02 49 1F	0BB1:85	3C 60 A5 3A 49 FE 85 7A	0DE1:20	F3 0E AD 01 D0 C9 D4 59
0989:FF	C9 04 B0 2B AD 01 D0 7C	0BB9:3A	AD FB 07 49 10 8D FB E9	0DE9:90	03 CE 01 D0 A5 02 05 1D
0991:E9	02 ED 07 D0 10 02 49 5B	0BC1:07	60 46 39 46 39 A5 3C 6E	0DF1:03	A8 AD F8 07 29 D1 A6 24
0999:FF	C9 05 B0 1B A9 71 85 B1	0BC9:38	E5 3B 85 3C 10 04 A2 02	0DF9:02	F0 08 30 04 29 C1 D0 6E
09A1:53	A9 02 85 5D A0 55 A2 1B	0BD1:01	86 3B 20 26 0F C4 3D A7	0E01:02	09 10 C0 00 F0 0F 49 23
09A9:55	20 6B 10 C6 81 A9 00 6C	0BD9:F0	0B 84 3D A2 07 A5 3B 47	0E09:01	A6 52 D0 63 A2 08 86 E2
09B1:85	08 8D 01 D0 4C EF 0F F0	0BE1:0A	0A 0A 20 F3 0E C6 3E 10 DA	0E11:52	D0 5D A5 44 F0 03 4C C8
09B9:60	C6 41 10 4B A9 28 85 AD	0BE9:14	A9 05 85 3E A5 3A A2 0D	0E19:0C	0C C6 47 10 55 A9 14 C8
09C1:41	A2 0E B5 34 F0 39 20 32	0BF1:06	20 F3 0E 20 E7 0A 98 BF	0E21:85	47 20 2F 0F 20 45 0D 59
09C9:F3	0E BD 00 D0 29 07 D0 1B	0BF9:F0	03 20 B4 0B A6 3C E8 EC	0E29:B0	81 A5 45 F0 45 8A F0 A9
09D1:2F	BD 20 9D 18 75 34 9D 65	0C01:D0	08 A9 81 85 50 A9 01 92	0E31:4C	A4 A6 F0 04 A5 03 D0 02
09D9:20	9D A8 BD 00 9D 85 D1 A7	0C09:85	38 60 C6 4C 10 63 A9 7D	0E39:69	A5 02 F0 39 A2 00 20 37
09E1:BD	10 9D 85 D2 B1 D1 C9 AD	0C11:0C	85 4C A5 48 38 E5 49 AC	0E41:F3	0E AD F8 07 C0 FF F0 4C
09E9:40	F0 0A C9 47 B0 06 B5 F4	0C19:85	48 10 04 A2 01 86 49 B7	0E49:25	A6 4E C6 4F 10 16 A9 68
09F1:34	49 FE 95 34 C4 5E D0 EB	0C21:20	26 0F C4 4A F0 0C 84 B3	0E51:03	85 4F E8 8A 29 03 AA 72
09F9:07	BD 30 9D C5 5F F0 9D 0A	0C29:4A	A5 49 0A 18 6D 01 D0 E2	0E59:85	4E A4 50 D0 07 4A B0 4D
0A01:CA	CA E0 0A D0 BD C6 43 38	0C31:8D	01 D0 C6 4D 10 0B A9 41	0E61:04	A9 02 85 50 BD 22 0F 4F
0A09:10	44 A9 0C 85 43 A2 0A B4	0C39:08	85 4D A5 4B A2 00 20 BF	0E69:A6	02 F0 04 10 02 49 10 E2
0A11:BD	01 D0 F0 33 DE 01 D0 55	0C41:F3	0E 20 74 0C A6 48 E8 96	0E71:8D	F8 07 4C 74 0C 98 30 6D
0A19:29	07 D0 2C BC 20 9D BD BF	0C49:F0	10 A5 49 30 24 A5 2F B3	0E79:FA	A9 C9 D0 F3 A4 46 D0 53
0A21:00	9D 38 E9 28 9D 00 9D 97	0C51:05	2D C9 20 F0 1C A5 D6 8C	0E81:04	A5 45 F0 EE A2 00 86 49
0A29:85	D1 BD 10 9D E9 00 9D 5F	0C59:30	18 A2 00 86 44 86 45 7B	0E89:48	CA 86 49 A9 C4 A6 02 91
0A31:10	9D 85 D2 B1 D1 C9 47 42	0C61:86	60 A9 46 C5 2D 90 04 76	0E91:86	4B D0 06 98 30 DC A9 27
0A39:F0	07 A9 00 9D 01 D0 F0 40	0C69:C5	2F B0 06 E8 86 45 4C DE	0E99:CA	E8 86 44 A0 00 84 46 BE
0A41:07	A9 20 91 D1 C8 91 D1 07	0C71:23	D0 60 A2 00 20 E7 0A EE	0EAL:F0	C6 98 30 04 A5 03 10 CA
0A49:CA	CA E0 06 D0 C2 C6 31 42	0C79:98	20 F3 0E A5 2F 85 FF 3A	0EA9:90	A6 2B E0 00 07 A5 23
0A51:10	42 A9 06 85 31 A5 30 FF	0C81:AD	10 D0 4A AD 00 D0 AA EC	0EB1:03	10 03 4C 3A 0E A2 00 C7
0A59:30	3A D0 39 AD 12 D0 05 1E	0C89:6A	4A 4A A8 88 8A 29 04 02	0EB9:20	08 0F 20 91 14 26 02 F6
0A61:08	29 0F D0 2F A2 01 86 3F	0C91:D0	01 88 AD 01 D0 48 29 43	0ECL:69	0C 26 02 A6 2D E0 48 6E
0A69:37	AD 10 D0 29 04 D0 07 95	0C99:07	AA 68 4A 4A EA E0 05 D3	0EC9:18	F0 02 69 08 8D 00 D0 4C
0A71:AD	04 D0 C9 AA 90 02 A2 52	0CA1:E9	05 AA 20 23 15 A5 D6 D6	0ED1:B0	04 A5 02 F0 08 AD 10 2F
0A79:FF	86 36 A9 15 8D 05 D0 4A	0CA9:30	39 18 69 02 85 5F A2 49	0ED9:D0	09 01 8D 10 D0 A5 03 AB
0A81:AD	1B D4 29 03 85 34 49 40	0CB1:00	A4 D3 84 5E B1 D1 95 A8	0EE1:18	6D 01 D0 8D 01 D0 4A EE
0A89:03	AA E8 86 35 86 30 A9 1D	0CB9:2B	C9 49 F0 27 E8 E8 98 59	0EE9:90	89 AD F8 07 4C 6F 0E 4C
0A91:CD	8D FA 07 60 A2 05 D6 2E	0CC1:69	28 A8 E0 06 D0 EE A6 B3	0EFL:A5	02 18 7D 00 D0 9D 00 BA
0A99:2E	10 09 B5 30 95 2E B5 2F	0CC9:44	D0 18 A5 2D C9 47 B0 65	0EF9:D0	D0 08 AD 10 D0 1D 12 9E
0AA1:32	20 F3 0E CA 8A 4A 90 DB	0CD1:3B	A9 00 85 46 A5 2F C9 3B	0F01:F0	D0 0A C9 FF D0 09 AD BB
0AA9:EE	E8 20 E7 0A 98 D0 2E 74	0CD9:20	F0 55 C5 FF F0 04 A9 BA	0F09:10	D0 3D 13 0F 8D 10 D0 DB
0AB1:AD	05 D0 C5 55 F0 07 E9 BA	0CE1:01	85 45 60 C6 58 8A 48 7F	0F11:60	01 FE 02 FD 04 FB 08 9F
0AB9:13	C5 55 B0 21 60 A2 81 CF	0CE9:98	48 A9 01 85 53 A9 02 74	0F19:F7	10 EF 20 DF 40 BF 80 37
0AC1:86	50 CA 86 34 A9 14 85 E4	0CF1:A2	55 A0 55 20 6B 10 A9 92	0F21:7F	C5 C6 C7 C6 A0 07 0A 96
0AC9:35	A5 38 D0 10 A5 08 29 46	0CF9:20	20 9F 0F 68 A8 68 AA 70	0F29:B0	03 88 D0 FA 60 A2 01 1E
0AD1:07	65 83 C9 07 90 06 A2 F8	0D01:A9	01 85 53 A9 20 91 D1 D8	0F31:AD	00 DC A0 00 94 02 4A 6C
0AD9:88	86 38 86 30 60 A9 00 99	0D09:95	2B D0 B1 A6 45 F0 D3 ED	0F39:B0	02 D6 02 4A B0 02 F6 3B
0AE1:85	30 8D 05 D0 60 A0 00 10	0D11:A2	FF C5 2F F0 0C A5 2F 5A	0F41:02	CA 10 EF 4A A5 59 B0 60
0AE9:AD	10 D0 3D 12 0F F0 08 7D	0D19:C9	20 F0 06 A5 03 30 02 3A	0F49:04	10 01 E8 60 86 59 60 4C
0AF1:BD	00 D0 C9 50 90 09 88 FA	0D21:A2	01 E4 46 F0 BD 86 46 9F	0F51:A2	17 A0 00 20 23 15 B9 0C
0AF9:BD	00 D0 C9 0A B0 01 C8 81	0D29:10	B9 A9 C3 8D F8 07 60 E9	0F59:63	0F 41 20 D2 FF C8 34
0B01:60	AD 10 D0 4A AA AD 00 1A	0D31:20	45 0D B0 AA A9 00 85 DA	0F61:D0	F5 1C 20 53 43 4F 52 83
0B09:D0	6A 85 5B 8A 4A 4A E4	0D39:45	AD F8 07 29 10 09 C2 4F	0F69:45	3A 20 20 20 20 20 A0
0B11:AD	06 D0 6A 85 5C 60 A6 45	0D41:8D	F8 07 60 AD 01 D0 18 72	0F71:20	20 20 1F 4C 45 56 45 07
0B19:38	F0 E5 30 E3 C6 39 10 04	0D49:69	08 C5 55 60 20 45 0D 43	0F79:4C	3A 20 20 20 1E 52 4E BE

PROGRAMS

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0F81:44 0D 20 4C 49 56 45 53 4F 11B1:80 8D 12 D4 A9 3D 8D 1C 80 13E1:20 20 D2 FF C8 D0 02 E6 EE
0F89:3A 20 20 20 20 20 20 20 B4 11B9:D0 A9 0C 8D 21 D0 A9 18 C0 13E9:23 A5 D6 C9 17 90 B0 86 65
0F91:20 20 05 53 50 45 45 44 04 11C1:A6 55 A0 1E 4C D8 12 A9 16 13F1:57 86 58 4C 51 0F A9 00 4F
0F99:3A 28 53 29 00 AA 85 2A BB 11C9:35 8D 1C D0 A9 06 8D 21 1C 13F9:85 08 A2 0E 86 03 20 7F 1A
0FA1:86 28 A9 00 85 26 A9 9F F9 11D1:D0 A5 08 29 0F D0 3E AD 3F 1401:14 A5 08 30 17 A2 03 B1 9B
0FA9:85 24 A9 07 85 25 A0 05 40 11D9:FA 07 49 10 8D FA 07 AD 79 1409:D1 C9 40 D0 F1 C8 CA D0 BA
0FB1:F8 18 B9 7F 00 79 25 00 B1 11E1:15 D0 A6 30 10 2F 49 04 6E 1411:F6 20 4B 14 F6 34 CA CA 50
0FB9:99 7F 00 08 AA 29 0F 09 26 11E9:C6 30 30 26 AA A9 01 85 67 1419:E0 0A D0 E0 A9 00 85 08 BC
0FC1:30 91 24 88 8A 4A 4A 4A C5 11F1:38 AD 04 D0 8D 06 D0 AD FC 1421:A2 0A 86 03 20 7F 14 A5 EA
0FC9:4A 09 30 91 24 28 88 10 51 11F9:05 D0 8D 07 D0 20 DF 0A C5 1429:08 30 1E B1 D1 C9 47 D0 55
0FD1:E1 D8 C8 A9 30 D1 24 D0 AC 1201:AD 10 D0 29 F7 85 0C 29 C3 1431:F3 A6 D6 E8 20 21 15 B1 C7
0FD9:06 A9 20 91 24 D0 F3 A5 7C 1209:04 0A 05 0C 8D 10 D0 8A EB 1439:D1 C9 47 F0 F4 20 1E 15 2E
0FE1:85 C5 82 F0 02 B0 07 E6 5B 1211:09 04 8D 15 D0 A5 08 A6 91 1441:20 4B 14 CA CA E0 06 D0 32
0FE9:81 18 69 10 85 85 A5 81 0C 1219:38 CA F0 02 29 03 29 07 F8 1449:D9 60 A6 03 A5 D3 9D 20 53
0FF1:8D C7 07 60 78 A9 33 85 06 1221:D0 08 AD FB 07 29 07 8D 1E 1451:9D A5 D1 9D 00 9D A5 D2 5A
0FF9:01 A2 00 BD 00 D0 9D 00 9B 1229:FB 07 A5 08 29 0F D0 11 7A 1459:9D 10 9D A5 D6 9D 30 9D 8D
1001:38 BD 00 D1 9D 00 39 BD E6 1231:A2 01 BD FE 07 29 01 09 76 1461:20 91 14 26 02 69 13 9D 5C
1009:40 1B 9D 00 3A CA D0 EB 4E 1239:BE 49 01 9D FE 07 CA 10 C2 1469:00 D0 26 02 A5 02 F0 03 C4
1011:A9 36 85 01 58 60 8F 88 40 1241:F1 A9 08 A0 1E A2 E2 4C 61 1471:20 FC 0E A5 D6 0A 0A 02
1019:89 00 F0 F4 6F 78 A9 10 2C 1249:D8 12 A9 00 8D 21 D0 AD D3 1479:69 28 9D 01 D0 60 AC 1B A0
1021:8D 15 03 A9 7F 8D 14 03 A5 1251:1E D0 4A 90 3F 4A 4A 85 48 1481:D4 C0 28 B0 F9 AD 12 D0 CF
1029:A9 7F 8D 0D DC A2 1E A9 D7 1259:0C 90 31 20 45 0D B0 2C BB 1489:29 0F 69 05 AA 4C 23 15 69
1031:00 9D 00 D0 BD 41 10 9D B6 1261:A5 60 D0 28 AD 01 D0 38 58 1491:A9 00 85 02 A5 D3 C9 28 97
1039:10 D0 CA D0 F2 86 07 58 14 1269:ED 05 D0 10 02 49 FF C9 DF 1499:90 02 E9 28 0A 0A 0A 60 37
1041:60 1B E2 00 00 FF 00 00 B4 1271:0E B0 19 A9 20 85 60 85 E0 14A1:A9 40 8D 88 02 0A B1 15 F1
1049:1E 01 01 00 05 00 00 01 1279:48 A9 FF 85 49 A5 36 85 57 14A9:20 94 15 10 03 4C 54 15 B1
1051:FC FC F3 FE 00 F1 F6 FB 4F 1281:4B A9 01 85 44 A9 04 85 84 14B1:20 A5 15 2A 02 86 08 0A 64
1059:F6 FF F3 F3 F3 F3 A4 AE 1289:50 20 31 0D A5 0C 4A 90 57 14B9:2A A8 2A 29 03 85 03 98 C5
1061:51 D0 16 84 53 C8 A9 22 9C 1291:03 20 6C 09 A5 5D D0 35 D6 14C1:0A 2A 85 02 2A 29 03 85 CB
1069:A2 20 8D 0C D4 8E 0D D4 25 1299:20 45 0D B0 46 A5 44 D0 ED 14C9:04 A5 03 F0 44 4A F0 10 0A
1071:84 51 A9 11 8D 0B D4 A2 53 12A1:2C A5 46 30 28 A5 2F C9 11 14D1:90 04 A2 00 F0 0C A6 D6 73
1079:00 60 04 0F A0 03 A2 01 7A 12A9:20 F0 1F C9 47 B0 1B AD 7B 14D9:E8 20 21 15 A2 08 D0 02 CC
1081:8E 19 D0 CA E6 08 A5 58 F0 12B1:1F D0 4A A5 45 90 09 30 EB 14E1:A2 0E 86 05 A9 04 85 06 6E
1089:F0 74 A5 54 F0 1F 10 04 61 12B9:14 CE 01 D0 E6 45 D0 0D C3 14E9:20 32 15 20 1E 15 20 32 0B
1091:C6 54 30 19 AD 03 D0 69 46 12C1:10 02 A9 00 F0 02 A9 FF 86 14F1:15 A6 D6 E8 C8 20 23 15 D9
1099:03 8D 03 D0 C5 55 90 0D BD 12C9:85 45 EE 01 D0 A9 02 85 A6 14F9:C6 06 D0 EC A5 03 C9 03 BF
10A1:86 54 8E 03 D0 A2 02 20 51 12D1:07 A0 15 A9 08 A2 20 8D 77 1501:D0 03 20 1E 15 C6 04 10 16
10A9:08 0F 20 60 10 E6 09 A5 6F 12D9:16 D0 8E 12 D0 8C 18 D0 E9 1509:CF A5 02 C6 08 D0 A8 F0 6F
10B1:09 C5 56 D0 49 86 09 A5 BB 12E1:4C 81 EA F0 E8 A5 08 29 10 1511:9F A5 04 F0 93 0A 65 D3 67
10B9:55 C9 40 90 02 C6 55 A5 83 12E9:07 D0 E2 CE 01 D0 D0 DD D9 1519:85 D3 4C 0A 15 A6 D6 CA E0
10C1:54 D0 3B A6 0A BD 80 9E F8 12F1:A9 D4 85 22 A9 15 85 23 C2 1521:A4 D3 BD 00 9C 85 D1 BD A6
10C9:85 0B BD C0 9E 85 0C BC 13 12F9:A9 2F 8D 1C 13 A2 00 A0 F5 1529:20 9C 85 D2 86 D6 84 D3 D4
10D1:40 9E B1 0B C9 20 F0 1D 6E 1301:00 A9 01 85 FF B1 22 C8 DD 1531:60 A6 05 BD 3E 15 A4 D3 15
10D9:BD 80 9F C5 55 B0 16 8D 70 1309:D0 02 E6 23 F9 F9 D0 09 08 1539:91 D1 E6 05 60 46 43 45 B5
10E1:03 D0 BD 00 9F 8D 02 D0 77 1311:B1 22 85 FF C0 12 C8 A9 54 1541:42 44 41 20 40 44 41 45 A2
10E9:BD C0 9F 0D 10 D0 8D 10 CC 1319:00 9D 80 2F E8 D0 03 EE 29 1549:42 46 43 40 20 40 20 40 15
10F1:D0 A9 90 85 54 E8 E4 57 B6 1321:1C 13 C6 FF D0 F3 F0 D9 05 1551:20 40 20 20 94 15 30 1D 18
10F9:90 02 A2 00 86 0A A6 07 E7 1329:A9 10 85 05 A9 C0 85 26 AA 1559:20 A5 15 85 02 A9 47 20 5D
1101:D0 03 4C 4B 12 CA 86 07 5A 1331:A9 2F 85 23 A5 26 18 69 3A 1561:37 15 C8 A9 48 20 39 15 6A
1109:D0 03 4C C8 11 A6 51 F0 21 1339:40 85 26 85 22 85 24 A5 13 1569:88 A6 D6 E8 20 23 15 C6 69
1111:37 CA D0 0E A6 53 BD 7B F5 1341:23 69 00 85 23 09 04 85 76 1571:02 D0 EA F0 DE 20 94 15 F2
1119:10 E8 86 53 E0 04 F0 1C 98 1349:25 E6 24 E6 24 A0 00 A9 FB 1579:30 08 A9 49 20 37 15 4C DB
1121:D0 23 A5 08 4A 90 21 A5 26 1351:15 85 04 A9 03 85 03 B1 64 1581:76 15 E8 30 08 AD 88 02 56
1129:53 E8 30 0C 06 53 90 15 A9 1359:22 85 06 A9 01 85 02 4A B9 1589:69 04 4C A3 14 A9 04 8D 0A
1131:A9 80 85 53 85 51 D0 0D 4E 1361:06 06 90 02 05 02 06 02 7C 1591:88 02 60 20 A5 15 18 AA EA
1139:46 53 90 09 A2 10 8E 0B 73 1369:90 F6 AA 29 AA 4A 85 02 09 1599:30 09 20 A5 15 A8 20 23 2B
1141:D4 A2 00 86 51 8D 08 D4 84 1371:8A 29 55 0A 05 02 91 24 E9 15A1:15 A9 00 60 AD F8 18 EE 37
1149:A6 50 F0 46 30 1B 8A 4A A2 1379:E6 22 C6 24 C6 03 D0 D7 72 15A9:A6 15 D0 03 EE A7 15 60 57
1151:B0 1F 4A B0 0A 85 50 A9 98 1381:A5 24 18 69 06 85 24 C6 72 15B1:A9 93 20 D2 FF A2 00 A5 F6
1159:25 A2 00 A0 27 D0 25 C6 4E 1389:04 D0 C8 C6 05 D0 A5 60 82 15B9:D1 A4 D2 9D 00 9C 18 69 36
1161:50 A9 07 A2 11 A0 10 D0 1D 1391:0A 0A 69 40 85 23 20 B1 1B 15C1:28 48 98 9D 20 9C 68 90 D3
1169:1B CA 30 10 A9 70 8D 01 FD 1399:15 A0 00 84 22 A2 00 B1 08 15C9:01 C8 E8 E0 1A D0 EC 60 20
1171:D4 A9 00 85 50 A9 80 8D 78 13A1:22 C9 49 90 31 A5 D1 9D DE 15D1:00 00 00 2C 01 8C 6E 03 D8
1179:04 D4 D0 16 86 50 A9 30 47 13A9:80 9E A5 D2 9D C0 9E A5 6C 15D9:8E F7 9B 1E EE 67 8E EF C0
1181:A2 00 A0 09 8E 05 D4 8C 58 13B1:D3 9D 40 9E 20 91 14 26 B0 15E1:FF 9C 7C 89 F8 38 50 70 15
1189:06 D4 8D 01 D4 A9 81 8D 83 13B9:02 69 19 9D 00 9F A5 02 04 15E9:18 F8 E0 1F FF E0 2B FE 45
1191:04 D4 A6 52 F0 1E E0 08 AE 13C1:90 01 2A 0A 9D C0 9F A5 2B 15F1:D0 28 70 28 28 00 28 F9 AA
1199:D0 11 A9 81 8D 12 D4 A2 B6 13C9:D6 0A 0A 69 37 9D 80 A3 15F9:1C 2C 01 B0 6E 03 B8 F6 50
11A1:14 20 45 0D D0 02 A2 A0 C3 13D1:F6 E8 A9 00 F0 02 A9 0E 28 1601:CF 78 EF 33 B8 EF FF B8 A2
11A9:8E 0F D4 C6 52 D0 05 A9 67 13D9:8D 86 02 B1 22 29 4F 09 21 1609:7C 89 F0 18 50 E0 18 F8 A4

```


1611:C0	2F	FF	C0	53	FE	A0	90	DD	1841:41	80	2A	96	80	2A	AA	00	E2	1A71:19	01	10	1F	01	FF	01	01	71	
1619:70	A0	A0	00	A0	F9	2C	01	FF	1849:AA	A8	00	A0	00	00	00	00	F9	FD	1A79:14	05	01	07	01	11	08	00	E5
1621:00	00	05	4A	30	05	5A	7F	5C	1851:12	20	00	80	2A	A0	80	2B	9A	1A81:0A	10	08	20	05	22	04	10	8A	
1629:08	5A	4F	F5	55	03	F5	55	31	1859:E8	80	2B	68	A0	AB	EA	A0	34	1A89:FF	06	01	A0	0D	16	A0	10	7B	
1631:00	3D	04	00	FC	04	03	F0	1C	1861:AA	AA	2A	AA	AA	2A	AA	AA	7F	1A91:01	E0	09	16	E0	03	04	76	92	
1639:08	0F	00	00	1C	00	00	10	1E	1869:2A	AA	A9	2A	AA	AA	AA	AA	31	1A99:00	0B	00	60	0B	17	60	FF	0C	
1641:F9	1D	16	00	00	50	00	00	B5	1871:AA	A0	AA	AA	A0	2A	A8	80	9E	1AA1:08	0E	05	08	13	05	03	01	32	
1649:5A	00	00	5A	00	01	5A	00	01	1879:2A	A0	80	A0	00	00	A0	00	42	1AA9:01	03	23	01	FF	01	14	05	C4	
1651:35	50	00	F5	40	0F	FD	40	06	1881:00	80	F9	0C	A0	00	02	B8	93	1AB1:10	0C	03	07	00	08	1F	0C	2C	
1659:7F	FD	00	70	08	00	40	F9	86	1889:00	02	BA	00	02	AA	40	02	CE	1AB9:21	FF	03	12	40	05	0E	42	74	
1661:16	80	00	00	80	00	02	40	01	1891:AA	90	00	A6	80	01	A5	00	F8	1AC1:40	07	0A	40	07	1A	40	09	47	
1669:00	02	40	00	01	4A	00	01	50	1899:00	29	00	00	28	00	00	A8	FD	1AC9:06	40	09	1E	40	0A	01	B3	F3	
1671:5A	00	01	5A	00	00	5A	00	45	18A1:00	00	A0	00	15	A0	00	05	16	1AD1:F0	FF	0A	13	05	0D	05	05	5C	
1679:00	54	00	00	54	00	00	14	71	18A9:40	00	01	40	00	01	40	00	A2	1AD9:0D	20	05	FF	04	0F	14	13	D4	
1681:00	00	14	00	00	14	00	00	80	18B1:00	40	00	00	40	F9	0A	10	FF	1AEL:01	1A	05	23	06	1D	08	0D	B1	
1689:3F	C0	00	3F	C0	00	0F	C0	5E	18B9:00	05	44	00	10	43	00	30	71	1AE9:06	0D	08	1A	FF	08	08	C8	FF	
1691:00	0F	C0	00	03	00	00	07	B8	18C1:50	00	00	50	00	3D	50	00	B4	1AF1:00	09	08	8C	00	08	18	C8	4B	
1699:00	00	01	F9	0A	80	00	00	D7	18C9:2D	54	00	EF	54	00	EB	D4	F3	1AF9:00	09	18	8C	00	05	0C	9D	06	
16A1:40	00	28	40	00	28	40	00	18	18D1:00	FA	F4	00	BE	BC	03	AF	FD	1B01:00	10	0C	D9	00	12	06	A2	51	
16A9:29	40	00	29	00	00	15	00	37	18D9:AC	03	EB	EF	02	FE	FB	0F	B0	1B09:E0	FF	05	13	04	05	04	01	BE	
16B1:00	54	00	00	54	00	00	54	E9	18E1:AF	B0	3B	EB	B0	3E	FB	50	03	1B11:02	02	01	03	07	01	02	0B	64	
16B9:00	02	57	00	00	17	00	00	AD	18E9:2F	B1	50	3B	01	40	00	01	E5	1B19:01	01	06	01	01	10	01	01	2C	
16C1:3F	C0	00	FF	C0	00	F0	40	E5	18F1:F9	05	F9	00	00	00	00	0A	A9	1B21:15	01	01	1A	01	02	1E	01	31	
16C9:00	C0	00	00	C0	00	00	C0	EC	18F9:00	D1	91	D1	90	15	03	77	44	1B29:04	21	01	FF	01	01	01	09	E0	
16D1:00	00	C0	00	00	40	F9	0F	1A	1901:00	03	11	70	0E	03	60	0F	69	1B31:01	12	09	0B	09	1B	01	19	0E	
16D9:0A	00	00	0A	00	00	0A	02	C1	1909:18	60	FF	1D	14	13	07	08	82	1B39:02	20	04	1F	FE	00	00	00	E2	
16E1:00	0A	06	00	55	14	01	55	A3	1911:07	0F	1D	05	FF	05	05	0B	A7	1B41:FF	55	95	A6	95	55	FF	00	EB	
16E9:50	05	15	40	04	14	00	20	B6	1919:0C	10	10	14	20	05	23	0C	FF	1B49:00	00	FF	55	65	A9	65	00	71	
16F1:50	00	00	F0	00	00	FC	00	4F	1921:17	02	19	13	03	FF	0A	01	E0	1B51:00	00	00	00	FF	55	59	00	8F	
16F9:03	FF	00	0F	0F	00	3C	3C	C5	1929:E0	04	10	60	12	02	E0	0C	3B	1B59:00	00	00	00	00	00	FF	55	E4	
1701:00	30	10	00	40	F9	10	0A	51	1931:10	F0	14	18	E0	FF	06	20	DE	1B61:FF	00	00	00	00	00	00	6A	02	
1709:00	00	0A	00	00	0A	00	00	A0	1939:0C	07	07	0B	03	16	12	FF	59	1B69:59	55	FF	00	00	00	00	55	F6	
1711:0A	00	00	14	00	00	55	00	30	1941:04	07	09	11	0F	11	04	22	50	1B71:95	A6	95	55	FF	00	00	40	6A	
1719:01	55	00	01	14	60	02	14	67	1949:01	0D	01	19	13	05	0D	01	B8	1B79:40	55	40	40	40	55	40	01	0A	
1721:60	02	50	00	00	F0	00	00	CD	1951:0C	24	0E	1C	FF	03	03	40	68	1B81:01	55	01	01	01	55	01	7E	9B	
1729:F0	00	03	FC	00	03	0C	00	24	1959:03	0D	40	03	17	40	03	21	69	1B89:18	FC	FE	06	06	0F	00	00	B7	
1731:04	0C	00	00	0C	00	00	04	C8	1961:40	08	05	92	42	D0	11	03	F9										
1739:F9	0F	0A	00	00	0A	00	00	91	1969:63	60	FF	02	08	06	03	18	FB										
1741:0A	00	00	0A	00	00	14	00	3D	1971:05	08	10	08	01	26	14	11	84										
1749:00	55	00	00	55	00	00	55	CC	1979:01	04	01	13	01	FF	06	04	96										
1751:80	00	55	80	00	18	00	00	D2	1981:01	03	14	20	01	1D	06	13	15										
1759:3C	00	00	3C	00	00	3C	00	E1	1989:0D	03	0F	24	05	22	0C	1D	0D										
1761:00	3C	00	00	70	00	00	30	52	1991:FF	02	04	A3	E0	08	01	53	7B										
1769:00	00	10	F9	0F	0A	00	00	D9	1999:53	50	0D	0F	50	11	01	50	35										
1771:0A	00	00	0A	00	00	0A	00	59	19A1:11	1D	50	FF	07	05	0D	01	15										
1779:00	14	00	00	54	00	01	54	A5	19A9:12	12	07	20	0D	0C	0B	01	FB										
1781:80	01	15	40	02	15	00	00	3B	19B1:08	1A	01	FF	0A	0A	01	01	0A										
1789:50	00	00	F0	00	00	FC	00	E8	19B9:01	06	02	0E	01	18	02	25	A0										
1791:03	CC	00	1F	0C	00	00	03	C9	19C1:0C	03	0F	26	11	0D	0C	1E	F1										
1799:00	00	03	00	00	01	F9	05	25	19C9:FF	07	10	40	FF	06	08	01	EC										
17A1:04	00	00	04	00	00	0C	00	2A	19D1:0C	0E	01	0E	0F	01	05	13	28										
17A9:00	0C	00	00	1E	00	00	1E	E9	19D9:01	0E	03	01	10	20	02	04	89										
17B1:00	00	1E	00	00	0C	F9	34	FB	19E1:0A	01	0E	13	05	0C	1A	01	D9										
17B9:28	00	00	28	00	00	28	00	CE	19E9:05	21	07	0C	17	02	08	03	5C										
17C1:00	28	00	00	14	00	00	55	EF	19F1:01	0D	04	01	0A	19	01	08	37										
17C9:00	01	55	40	01	14	40	00	BF	19F9:17	01	06	1A	01	09	1C	01	BF										
17D1:55	00	00	96	00	00	3C	00	8C	1A01:05	17	01	FF	0D	01	08	0C	26										
17D9:00	3C	00	00	3C	00	00	3C	35	1A09:07	0E	15	1C	08	1F	0C	14	91										
17E1:00	00	3C	00	00	3C	00	00	88	1A11:FF	04	01	C0	06	01	83	42	EF										
17E9:14	F9	0E	08	28	20	04	28	D4	1A19:A0	0A	01	C2	40	0B	01	83	20										
17F1:10	05	28	50	01	69	40	00	A1	1A21:41	90	0F	01	C2	40	01	05	2A										
17F9:55	00	00	14	00	00	14	00	3C	1A29:B0	04	16	D0	03	11	D0	FF	84										
1801:00	14	00	00	14	00	00	14	EA	1A31:0A	1F	0A	0C	07	03	0E	0E	A2										
1809:00	00	3C	00	00	FF	00	00	C0	1A39:05	05	05	01	FF	06	0A	0F	1D										
1811:C3	00	03	00	00	03	00	C0	56	1A41:05	07	20	08	24	03	14												

PROGRAMS

low; then type in the remaining lines of code. When all of the data has been entered, save the program with a new name before exiting *MLX*.

Starting address: 0C51

PADLOCK

```

0C21:4F CD E6 FA D0 02 E6 FB 39
0C29:CA D0 DD F0 D9 20 29 CE 16
0C31:20 42 F1 F0 FB 20 EF CD 45
0C39:A6 FC BD A1 05 20 A8 CE 7E
0C41:9D EF CF CA D0 F4 A5 FC 6D
0C49:A2 F0 A0 CF 20 F9 FD A2 87
0C51:08 20 00 FE A9 01 85 C1 83
0C59:A9 08 85 C2 20 B6 CE E6 85
0C61:AE D0 02 E6 AF 20 EA F5 7D
0C69:A5 90 F0 06 20 BE CD 4C DA
0C71:9D CE 20 78 CE 20 FA CD 52
0C79:B0 03 4C 5D CB A9 0E 8D B8
0C81:20 D0 A9 06 8D 21 D0 A2 A8
0C89:20 BD 73 CF 20 16 E7 CA 80
0C91:D0 F7 A9 47 8D 18 03 A9 36
0C99:37 85 01 60 A9 03 85 D3 0D
0CA1:20 22 CE 20 8E CE A9 08 39
0CA9:20 09 ED A9 6F 20 C7 ED E5
0CB1:A9 00 20 16 E7 20 13 EE D8
0CB9:C9 0D D0 F6 20 EF ED 20 40
0CC1:8E CE A9 64 85 A2 A5 A2 F4
0CC9:D0 FC 4C EF CD A9 20 A2 0A
0CD1:27 9D 48 07 CA 10 FA 60 4B
0CD9:20 42 F1 C9 59 D0 02 18 97
0CE1:60 C9 4E D0 F3 20 EF CD 41
0CE9:38 60 A9 0A 85 D3 20 22 E9
0CF1:CE 20 8E CE A2 12 BD 94 A5
0CF9:CF 20 16 E7 CA 10 F7 60 2A
0D01:A9 15 85 D6 4C 6C E5 A9 DC
0D09:08 85 D3 20 22 CE 20 8E 20
0D11:CE A2 17 BD A8 CF 20 16 D4
0D19:E7 CA 10 F7 60 A6 FB 20 11
0D21:0E F2 20 3E F1 8D D5 08 60
0D29:8D 93 09 20 3E F1 8D D9 C0
0D31:08 8D 99 09 A5 FB 20 91 65
0D39:F2 A9 00 85 B9 4C 33 F3 E8
0D41:A9 09 85 D3 20 22 CE 20 A7
0D49:8E CE A2 13 BD C1 CF 20 98
0D51:16 E7 CA 10 F7 60 A9 07 66
0D59:85 D3 20 22 CE 20 8E CE 34
0D61:A2 18 BD D6 CF 20 16 E7 0B
0D69:CA 10 F7 60 A9 1C 20 16 06
0D71:E7 A9 12 20 16 E7 A9 20 F1
0D79:4C 16 E7 A5 B8 20 91 F2 F2
0D81:20 33 F3 4C 5D CB C9 20 89
0D89:90 07 C9 60 09 20 90 03 D9
0D91:18 69 40 60 A5 AE 8D A8 CB
0D99:08 8D 30 09 A5 AF 8D AE 67
0DA1:08 8D 36 09 A5 4B 8D 5B 4B
0DA9:09 A5 4C 8D 5C 09 A5 26 8C
0DB1:8D 57 09 60 0D 12 0A 0B 5F
0DB9:10 11 11 05 03 15 05 2A 33
0DC1:2A 2A 20 D3 45 43 55 52 F0
0DC9:49 54 59 20 D3 59 53 54 C9
0DD1:45 4D 20 2A 2A 11 11 B5
0DD9:11 11 00 0D D3 4F 55 52 6A
0DE1:43 45 3A 11 20 A3 A3 C1
0DE9:A3 A3 A3 A3 A3 A3 A3 04
0DF1:A3 A3 A3 A3 A3 00 0D C4 71
0DF9:45 53 54 49 4E 41 54 49 14
    
```

```

0E01:4F 4E 3A 11 20 A3 A3 A3 2B
0E09:A3 A3 A3 A3 A3 A3 A3 25
0E11:A3 A3 A3 A3 A3 00 0D D3 A1
0E19:59 53 20 24 11 A3 A3 A3 FE
0E21:A3 00 0D 24 30 30 30 31 C6
0E29:11 20 A3 A3 00 0D C3 4F 8F
0E31:44 45 20 57 4F 52 44 3A C0
0E39:11 20 A3 A3 A3 A3 A3 A3 2B
0E41:A3 A3 A3 A3 A3 A3 A3 5D
0E49:A3 A3 A3 A3 A3 A3 9E 00 B7
0E51:FF 11 11 21 44 52 4F 57 47
0E59:20 45 44 4F 43 20 52 55 E8
0E61:4F 59 20 54 45 47 52 4F FF
0E69:46 20 54 27 4E 4F C4 93 7A
0E71:9A 00 20 4B 53 49 44 20 FB
0E79:45 43 52 55 4F 53 20 54 05
0E81:52 45 53 4E 49 00 20 4B 3D
0E89:53 49 44 20 4E 4F 49 54 C2
0E91:41 4E 49 54 53 45 44 20 A8
0E99:54 52 45 53 4E 49 00 20 0A
0EA1:29 4E 2F 59 28 20 3F 45 E6
0EA9:52 55 53 20 55 4F 59 20 6B
0EB1:45 52 C1 00 20 29 4E 2F AE
0EB9:59 28 20 3F 45 4C 49 46 B8
0EC1:20 52 45 48 54 4F 4E 41 6D
0EC9:20 45 44 4F C3 00 00 00 E2
    
```

Janus

There are two misprints in the *Janus* program listing (December 1991). In lines 680 and 690, replace each of the { 1 } figures with a comma. □

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and *The Automatic Proofreader* are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each *Gazette Disk* and are printed in all issues of *Gazette* through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free copies of both of these handy programs. We'll also include instructions on how to type in Gazette programs. Please enclose a self-addressed, stamped envelope.

Write to Typing Aids, *COMPUTE's Gazette*, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

Gazette is looking for utilities, games, applications, educational programs, and tutorial articles. If you've created a program that you think other readers might enjoy or find useful, send it on disk to

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 324 W. Wendover Ave.
 Ste. 200
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Please enclose an SASE if you wish to have the materials returned.

ONLY ON DISK

In addition to the type-in programs found in the magazine, here's the bonus program found on this month's *Gazette Disk*.

Color Isolation Tool

By Bruce M. Bowden
 Greensboro, NC

Have you ever needed to pick a multi-color image apart? Perhaps certain colors define a specific part of an image which you'd like to isolate from the rest, perhaps for importing into another image. VIC multicolor graphics offer no convenient way of doing this. *Color Isolation Tool* gives you that power.

Color Isolation Tool will also give you exceptional power for manipulating the actual color content of multicolor Commodore 40-column graphics images. Each color in an image can be separated and viewed, printed, or saved to disk. When you use this program with a flexible graphics-manipulation program, such as Bowden's *Graphic Assault System (GAS)*, you'll have total control over all your graphic images.

Color Isolation Tool supports Koala, *Doodle*, *GAS* compressed/tagged format, and 8K bitmap images.

Gazette Gallery

Picture of the Month
 "The UFO"
 By Jack Modjallal
 Encino, CA

"Sword" and "Lissa"

By Dotan Haim
 Askelon, Israel

"Golden Age SF"

By Vince Zahnle
 Mt. Holly, NJ

Order this disk for \$9.95 plus \$2.00 shipping and handling from Gazette Disk, *COMPUTE Publications*, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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AMI PRO 2.0

With the second generation of *Windows* word processors, we're seeing a handful of packages create a new minicategory of software. Products like *Word for Windows* and *Ami Pro for Windows* are much more than traditional word processors, yet they're still less than full-blown desktop publishers. They're document-preparation packages.

The recently released *Ami Pro 2.0* offers significant enhancements on three levels. Power users will likely be pleased with some new sophisticated features like the improved macro language and the addition of power fields. Connectivity needs are better met with this version, too.

If you prepare documents in conjunction with other people, require sophisticated document-merging and revision-marking tools, or need integration with other Lotus products like *1-2-3*, *Notes*, and *cc:Mail*, version 2.0 offers you new capabilities. If you simply want better, faster access to information about a document in progress, tools for dressing it up and making its information more understandable through charts and tables, and customization features that make the program's most often-used functions quickly available, this upgrade offers significantly more power to you.

The cosmetic changes are visible the first time you run *Ami Pro*. Lotus has added SmartIcons, a row of icons that can be placed in different sections of the screen. The default group that comes up includes standards like the spelling checker and thesaurus, the open and save-file commands,

and some font and alignment features (bold, italic, centered). You can change this default set, even replacing the default icons with your own.

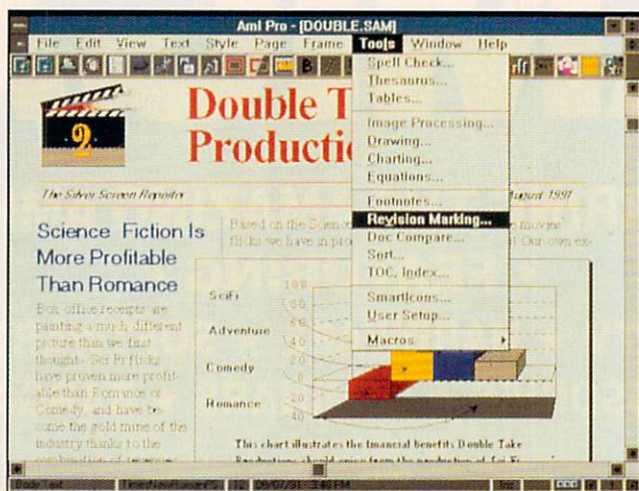
Furthermore, the Style box that once popped out in the upper right corner of the screen whenever you started

gives you an instant picture of the file size and word, page, and character count. (In the previous version, you had to run a spelling check to get a word count.) Unfortunately, when you enter text it still twitches and responds slowly to the cursor, though not as noticeably as

While *Ami Pro's* graphic capabilities don't compare to those of the best desktop publishing packages today, some of the features offered in earlier versions have been enhanced. You have more power to design and add frames, tables, drawings, and charts to your documents. Learning to use the program's tools for these graphics takes some time, but even a novice can start pulling art in quickly. One of the default SmartIcons pops up a list of pre-designed pictures that you can easily pull into your document, or you can import a picture file of your own.

The program also provides some new tools and enhanced features for users who must manage and merge multiple documents, and for those who must mark changes made to a piece. The Master Document feature lets you combine several documents and automates the merge process by, for example, creating one index or one table of contents that covers all of the documents together. Extensive revision-marking capabilities allow changes made to a document after a certain point to be indicated in a variety of ways. The Document Compare feature can blend and highlight changes made by more than one person.

Version 2.0 of *Ami Pro* contains improvements that utilize the real power of *Windows* at the functional level, well beyond the easier user interface. You can open up to nine documents at once within the program and display them in either a cascade or tile sequence, expanding each as you need to make comparisons. And using two *Windows* technologies, Dynamic Data Exchange (DDE) and Object



If you need a high level of sophistication for your documents, *Ami Pro* can give you professional quality.

the program has been reduced to a button found on the new status bar that runs along the bottom of the screen. To change body styles, you pop up the menu. Your current font style and point size appear in two other small buttons along the bar. Clicking on them pops up those menus for a quick change, and, by clicking on another button on the status bar, you can see the current date and time or a running report on where you are in your document (line number, column, and position).

A frustrating omission in the first version of *Ami Pro* was easy access to that last bit of information. A quick word-count function was also omitted. Version 2.0 offers some improvements, including a menu item called Document Information which

in the earlier *Ami Pro*.

As you dig deeper into version 2.0's improvements, you'll find that its increased ease of use and customization abilities, while significantly impressive and substantial, are joined by a spate of new and powerful functional capabilities. Using Outline mode, you can look at a document and see how it's broken down into the nine provided paragraph styles. These designations can be set prior to creating the document or edited after the fact. By specifying power fields (sets of instructions to be carried out at particular points in a file), you can further customize document production and request automatic prompts when information needs to be added or updated, wherever it occurs in the document.

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Linking and Embedding (OLE), you can transfer data from *Windows* applications that support those technologies into *Ami Pro* (for example, incorporating spreadsheet data into a report). *Ami Pro 2.0* also ships with *Adobe Type Manager*, a fine font-scaling package.

All these sophisticated functions come at a price: You have to read. You must carefully follow the steps outlined in the documentation or use the help screens. If you're a novice computer user or even a seasoned one who has never used document-formatting and design functions, don't expect to be able to click on a few buttons and experiment your way through these features.

If your word processing needs and software budget are absolutely minimal, then *Ami Pro 2.0* is too much bang for too many bucks. But if you're using an earlier version, or if you need a program that can produce professional-quality documents you design, this upgrade is worth serious consideration.

Minimalists who balk at the idea of experimenting with fonts and graphics should take a look around, but the kinds of documents you can produce with *Ami Pro* are state of the art. If your work is seen by other people in a professional setting or if you mass-produce documents for personal use, your finished products are being held up for comparison with documents that were created using products like this one. You might be surprised at how significantly you can improve the quality of your own work with this program.

KATHY YAKAL

IBM PC and compatibles (80286 or higher, 80386 recommended); EGA,

VGA, or higher graphics card; hard drive with 8MB available and at least 1MB RAM (2MB recommended); *Windows 3.0* or higher; mouse recommended—\$495

Upgrades—\$99; \$49 if earlier version of *Ami Pro* was purchased as of March 1, 1991; \$49 for current owners of *Lotus Manuscript* and *Samna Word IV*. Users of competing word processor packages can purchase *Ami Pro 2.0* for \$149.

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Circle Reader Service Number 361

PANASONIC KX-P2624

Most of us want a laser or ink-jet printer because we enjoy the benefits of reduced noise and dramatically improved print quality. In a bid to compete with the laser and ink-jet printer market, Panasonic has unveiled the KX-P2624 quiet printer.

Aside from some confusion about which paper-installation method to use, it took very little to connect my PC and the KX-P2624. You have to choose where you feed your paper—either front, rear, top, or bottom—and this allows you to place this unassuming hardware nearly anywhere in your office or home. With two of the most popular emulation modes, Epson LQ-850 and IBM ProPrinter X24E, the KX-2624 is compatible with just about any software.

Designed with the consumer in mind, the Operating Instructions manual should answer most questions that arise. The EZ Set operator panel located on the front of the unit offers menu-selectable fonts, pitch, text enhancements, form length, lines per inch, margins, quiet mode, and emulation. You can also install four macros and set

the LCD display in one of five user-selected languages. This panel eliminates the need for DIP switches.

To change the emulation mode from the standard Epson LQ-850 to IBM takes several keypresses. I set up a macro to switch to IBM mode at power-up because I like the more compact print style characteristic of the IBM mode. I needed only a couple of minutes to find the necessary information in the manual, and less than a minute to install the macro.

The KX-P2624 offers 300-cps draft mode and 100-cps LQ (Letter Quality) mode, and it features 40-cps SLQ (Super Letter Quality) mode. To the uncritical eye, SLQ almost rivals laser printer output. Graphics print at 360 x 360 dpi. The voluminous font options include three draft and seven LQ. Under the heading of SLQ, you'll find Courier, Prestige, Bold PS, Script, Sans Serif, Orator, and Roman.

Other features include three individual top-of-form settings, paper park, and an adjustable push-pull tractor feed. An optional 100-sheet cut sheet feeder is available for \$239.95.

The 26K buffer expands to 58K with a 32K chip. You can use either the standard Centronics parallel interface or one of two optional RS-232C serial interfaces.

With the wide carriage width of 16½ inches, you can print on just about any paper. You can also print envelopes or single sheets with the friction feed feature. With SLQ I created wedding and baby shower invitations using *Express Publisher*. The near laser quality output saved money; I didn't need to pay a printing service to print these professional-looking invitations.

Most notable of all the KX-P2624's lovable features is the insignificant noise level of the motor and printhead. In superquiet mode, I didn't have to raise my voice to be heard above the printer. In fact, typing on the keyboard made more racket than the printer.

Based on a consolidated chip design, the KX-P2624 delivers increased speed. The pins fire consecutively, one at a time, to disperse the noise created by their impact. In addition to the chip technology, Panasonic engineers packed rubber around the printhead and cushioned other areas around the printer with sound-absorbing materials.

Available through authorized dealers, the KX-P2624 sells for \$699.95 and comes with a two-year limited warranty for parts and labor. The competitive price, the print quality, and the reduced noise level make this printer a contender in the highly competitive dot-matrix market.

JOYCE SIDES

Panasonic KX-P2624—\$699.95

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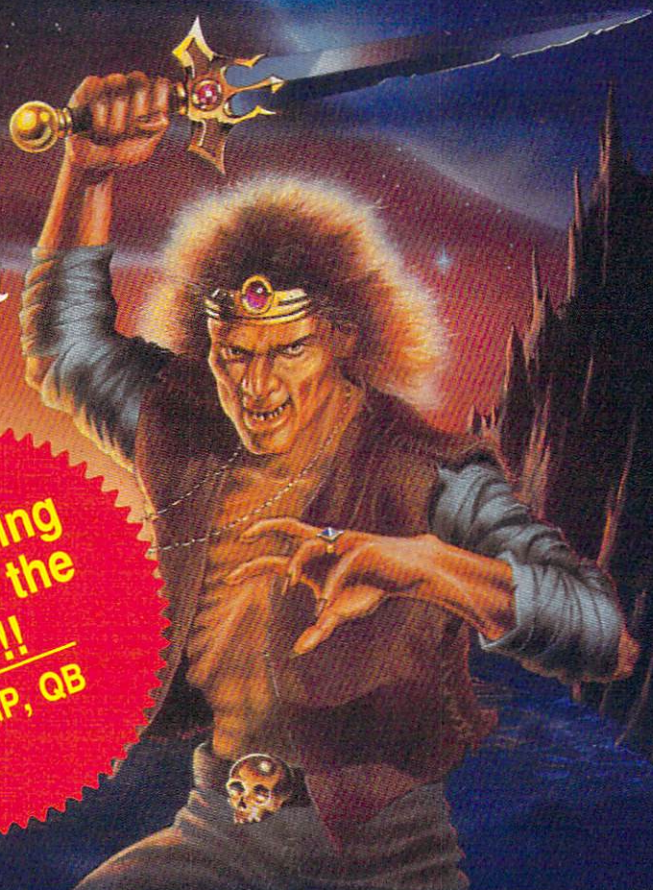
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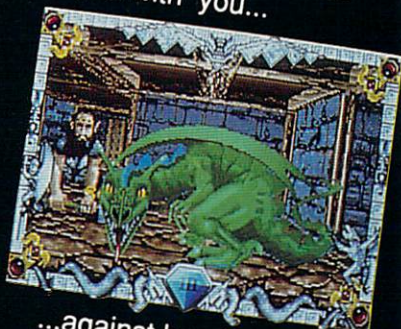
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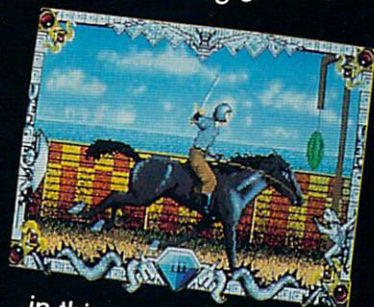
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ment, and the user interface seems much like most other desktop publishing packages. When you load a file, however, you'll notice a conspicuous difference. *Publish-It!* uses the library concept to list imported text files and graphics. Depending on the current mode (Frame, Paragraph, Text, or Graphics), the contents of the library change. For instance, in Frame mode, only the names of text and picture files used in your work appear. When you activate Text mode, the library fills with text style options.

Version 2.0 introduces many features, including expanded or extended memory support; text autoflow, which adds pages and extends the text to keep the layout intact; and Select All, which selects all the frames on a page.

Another added feature allows you to create your own fonts. *Typografica*, a program included in the package, generates fonts from 6 to 72 points in Sans Serif, Serif, Courier, Symbols, and several other typefaces. Make sure you use the correct printer driver when creating your fonts so that *Publish-It!* can read the new typefaces, though.

Even the best desktop publishers don't always think to stop and save their work when in the heat of the design process. This program's new automatic backup feature ensures your work against power failures. Simply specify a time interval, and the program takes care of the rest—no more disasters!

Draft printing, a feature that I haven't seen in other desktop publishing programs, allows you to inspect layouts without printing graphics. This timesaver gives you a relatively quick

hard copy for proofing and an excellent opportunity to correct typographical errors.

Unlike the previous version of *Publish-It!*, version 2.0 allows you to create custom page sizes when creating a new document. In addition to the standard size, you can create a document up to 22½ inches wide and 22½ inches long.

Not only can you import text and graphics with this version, but now you can export text, too. You can also name text by typing directly into a frame (instead of importing a story). Once you name the text, it becomes a story in the library.

The program supports several new printer drivers, including the Canon Bubble Jet, the NEC Pinwriter series, the Canon LBP II/III/IV series (bitmap fonts), and the Canon LBP III/IV series (scalable fonts). Previously, *Publish-It!* imported ASCII, *WordStar*, *Microsoft Word* 4.0, and *WordPerfect* files. Version 2.0 imports these file types as well as six additional word processor files, including heavyweights like *Microsoft Works*.

Publish-It! 2.0 not only includes greater versatility in importing text but also shows a big improvement in importing graphics. The new version imports PCX (*PC Paintbrush*), IMG (*GEM Paint*), GEM (*GEM Draw*), and PIC (*Lotus 1-2-3*) files like the previous version. It also imports LBM (*DeluxePaint*), EPS (*Encapsulated PostScript*), SS (*Splash*), and TIF (*TIFF*) files. Not only has Timeworks improved the import options, but it's also added an additional ruler option and additional text styles such as box and rounded box.

The Online Help option is adequate for simple explana-

tions but not for detailed descriptions. You'll have to look in the well-developed user's manual (which includes a quick-start minimanual) for details.

With the additional features and bonuses (two disks full of design ideas and the *Typografica* program), as well as the speed of this new version (screen redraw is significantly faster than with *Express Publisher*), *Publish-It!* 2.0 is worth a look. The price is right, and the quality of the product is outstanding.

JOYCE SIDES

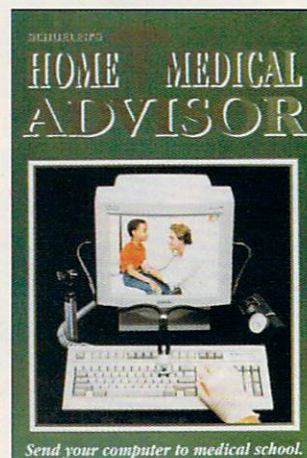
IBM PC and compatibles; 640K RAM; CGA, EGA, VGA, or Hercules; hard drive; supports most printers, mouse highly recommended—\$249.95, upgrade from earlier version—\$49.95, competitive upgrade (submit a page from another desktop publishing package manual or a program disk)—\$99.95

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Circle Reader Service Number 363

SCHUELER'S HOME MEDICAL ADVISOR

Schueler's Home Medical Advisor (HMA) claims to "send your computer to medical school." This program contains an up-to-date, encyclopedic database of information on common symptoms, diseases, injuries, drugs and poisons, and medical tests, with each category of information in its own module. By far the most interesting and useful capability of *HMA* is its medical expert system. Choose a general symptom like back pain, and the program will ask you a series of questions that lead to a specific diagnosis. Did you merely strain your back, or is it a



Consult Schueler's Home Medical Advisor for a quick diagnosis.

kidney stone? (The program warns you six ways to Sunday that it isn't meant to replace the services of a real physician.)

HMA is a valuable program, but it has a few rough edges. Sometimes the information isn't organized in the most logical way. For example, the article on AIDS begins with a lengthy discussion of how many people have AIDS or are at risk of contracting the disease and only then gives a definition of the term.

The interface is attractive but a bit awkward. You must scroll through long lists of keywords to find the information you need. (Pixel Perfect is working hard to improve this product, including implementing a way to search directly for text typed into a string gadget.) And *HMA* is copy-protected, which is a mistake. You have to hunt for a manual, find a word, and type it in before getting any information. Of course, I don't like spending an hour in my doctor's waiting room, either.

Overall, *Schueler's Home Medical Advisor* is a good first crack at what in the future will likely be an impor-

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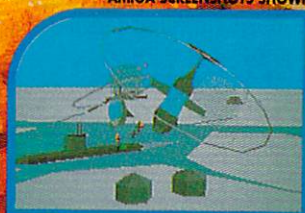
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REVIEWS

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MEGAFORTRESS

Armchair pilots who feel that getting there is the best part of the journey will thoroughly enjoy *Megafortress*, a remarkable strategic bombing simulation from Three-Sixty Pacific.

The game offers a sense of artistic redemption for designers Rick Banks and Paul Butler, cofounders of Artech Digital Entertainments. The company's two previous titles, *Blue Max* and *Das Boot*, were ambitious failures—thoughtfully planned but poorly executed. Neither simulation proved special enough to stand out in a competitive market.

There's nothing quite like *Megafortress*, however, an air combat simulator inspired by Dale Brown's gripping novel, *Flight of the Old Dog*. According to the story, the *Old Dog* is a heavily modified, 25-year-old B-52 Stratofortress. Engineers at Dreamland—the USAF's top-secret testing facility—used the stripped-down, redesigned craft as a test bed for stealth technology destined for the B-1 and B-2 long-range bombers. Although armed to the teeth, the *Old Dog* was never intended to see combat.

Instead, tragic circumstances force the aircraft into action. Players take full control of the EB-52 Megafor-

tress, so dubbed for its amazing array of advanced ordnance and high-tech defensive systems. It's a daunting challenge but full of reward for those who can handle the pressure.

Sixteen introductory mis-

ceptionally well, thanks in large part to Bruce Maurier's comprehensive 96-page instruction manual.

The EB-52 boasts a payload capacity of more than 50,000 pounds of mixed ordnance. State-of-the-art elec-

mission. The sheer number of interrelated actions is staggering.

The only thing more sensational than the game's eclectic avionics is its flawless execution. With *Megafortress*, Three-Sixty Pacific finally has an air-combat simulator to be proud of.

SCOTT A. MAY

IBM PC and compatibles, 640K RAM, VGA, 1.2MB 5¼-inch floppy drive, hard drive; 12 MHz or faster recommended, mouse recommended, supports Ad Lib and compatible sound boards—\$59.95

THREE-SIXTY PACIFIC
Distributed by Electronic Arts
P.O. Box 7530
San Mateo, CA 94403-7530
(800) 245-4525

Circle Reader Service Number 365



The Old Dog, an updated B-52 and namesake for Megafortress, has learned new tricks for riveting air-combat simulation.

sions offer hands-on training in such essentials as navigation, radar evasion, in-flight refueling, MiG defense, and precision bombing. Seasoned fliers can then test their mettle in 12 tough Persian Gulf scenarios. It all comes together in one final, tremendous mission: a spine-tingling re-creation of Brown's novel. Whoever walks away intact from this assignment deserves more than a victory screen.

Players are required to wear many uniforms in the game: pilot, copilot (flight engineer), navigator, and electronics warfare and offensive weapons officers. The bomber's five stations are rendered with exacting detail in 256-color VGA. Dozens of dials, displays, gauges, knobs, buttons, and switches—all completely operational—fill each screen. What could easily result in sensory overload flows ex-

tronics assure that the goods are delivered and the crew returns intact. Among the equipment you must master: terrain avoidance computers, satellite communications, "active" attack radar, an electro-optical guidance system, and numerous electronic countermeasures.

Success in the game demands not only a thorough understanding of all on-board systems but also a feel for the in-flight routine. The nature of the simulation dictates that much time be spent in mission planning, aircraft management, and electronic analysis. Although this sounds rather passive, the program evokes incredible atmosphere. Nervous anticipation explodes in a real-time flurry of activity. From last-second jamming of incoming missiles to the rerouting of burned-out hydraulic pumps, every action contributes to the success of the

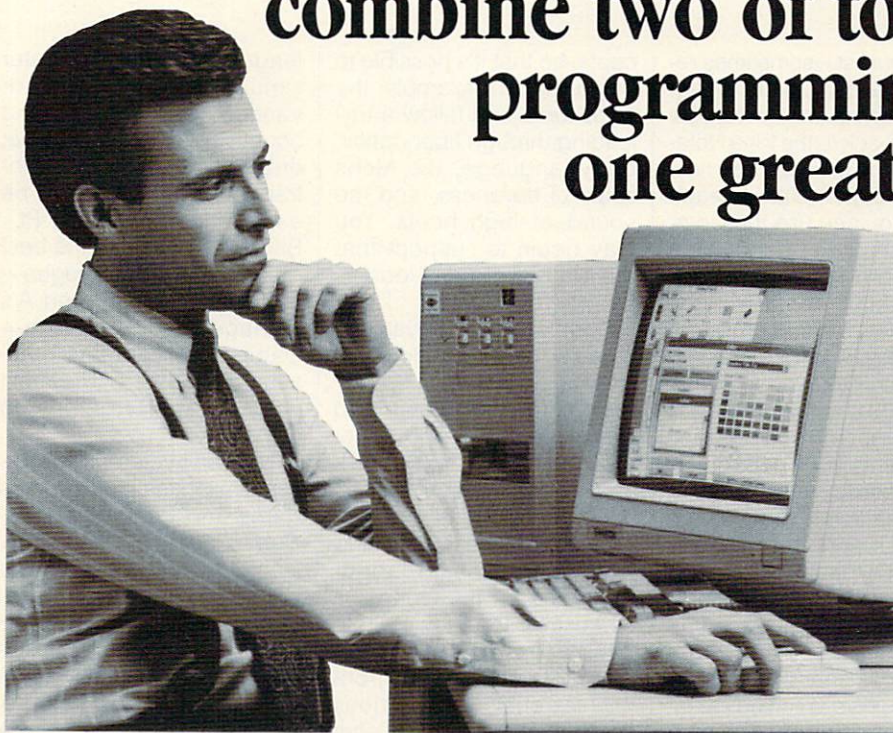
IDEAFISHER

Creative thinking involves not only a goal but also a large amount of healthy mental rambling—a loose, idiosyncratic juggling of words and concepts that you hope will connect to form an actual idea. But the routine of a job doesn't encourage rambling, and if your education has been overly specialized, you may simply not know enough about things even to see the connections. What you need to get creative is a good jolt of lateral thinking—something to question your assumptions, cut through routine thought, and get you back to the fundamental questions about your work. What you may need, in fact, is *IdeaFisher*.

Developed by Marshall Fisher (cofounder of the Century 21 real estate company), *IdeaFisher* is based on the theory that the process of listing and associating ideas helps to stimulate the "Eureka!" or "Aha!" response—the moment of illumination, discovery, creation. To this

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end, *IdeaFisher* has been designed as, essentially, an electronic brainstormer, a 7MB program containing more than 60,000 words, phrases, and concepts that are extensively cross-referenced to form what is, at the very least, one heck of a thesaurus. But *IdeaFisher* also contains about 3,000 questions that cross-examine your project's aims and assumptions, inviting you to think more clearly about what you want to do and how you intend to do it.

Suppose you want to develop a new product or service or to devise an advertising strategy—or even to write a story. The first step is to jot down your ideas on the Idea Notepad, a basic word processor built into *IdeaFisher*. The more specific your ideas, the more *IdeaFisher* will be able to serve you—and its Qbank can help sharpen your concept. Pull down the Qbank menu and select Orient-Clarify. The Qbank will supply a number of basic questions regarding the aims of your project. For instance, it will ask storywriters, "Are you keeping thesis/antithesis/synthesis in mind? Are your characters' motivations clear?" For people in marketing: "Who is your target audience? How will your product appeal to them? How do you know this?" Answer the questions you think appropriate, and then *IdeaFisher* will examine your answers, produce a list of your key words and concepts, and append them to your Idea Notepad.

After returning to the notepad, you can place the cursor beside any of the words or ideas you want to consider in more detail, and *IdeaFisher* will go to its Ideabank to provide further lists of words or ideas relat-

ed to your list—sometimes related in ways you hadn't imagined—any of which may be copied back to the Idea Notepad. If you'd like to see how two concepts relate to each other, you can use the Compare function to produce even more words and ideas to work from. As you work on your project, you can return to the Qbank for further questions that help you to clarify or modify your aims—or you can personalize *IdeaFisher* by adding your own questions, words, and key concepts that relate more directly to your specific project.

Don't expect *IdeaFisher* to assimilate everything, mull it over, and get back to you with the Answer to Your Problem. *IdeaFisher* doesn't pretend to solve anything. What *IdeaFisher* does do is to help you make creative associations far more quickly—and perhaps more extensively—than you might make by yourself. You might not know enough about literature, popular art, religion, and sports to imagine how Dorothy and Toto, the Harlem Globetrotters, Garrison Keillor, Nirvana, and Beaver Cleaver could be conceptually related, but *IdeaFisher* knows and can help you track them down. But the final creative leap—the "Aha!" of recognition or insight—has to be your own, as it should be.

Although the Qbank questions suggest that *IdeaFisher* was chiefly designed with product development and marketing in mind, its range of possible uses is much larger, including story development, speech writing, and general problem solving. *IdeaFisher* also has an engaging fiddle-around factor, luring you to browse through the Ideabank's collection of words, phrases, and key con-

cepts, so that it's possible to begin with, for example, the word *turtle* and follow a trail leading through fiber optics, body language, the Mohs scale of hardness, and the sound of high heels. You may begin to suspect that the Unified Field Theory—Einstein's elusive, long-sought key to the mysteries of the universe—is lurking in there somewhere.

One friend commented that *IdeaFisher*'s biggest drawback is its 7MB of disk space; others might blanch at *IdeaFisher*'s list price of \$595 (the Strategic Planning Module, containing further questions for the Qbank, is \$99 extra). True, few people will purchase *IdeaFisher* as a toy for idle moments, but professionals in various fields might find *IdeaFisher* well worth the investment. And as a partial substitute for or supplement to a liberal education, *IdeaFisher* is certainly inexpensive.

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TONY LARUSSA'S ULTIMATE BASEBALL

SSI pops one over the fence with *Tony LaRussa's Ultimate Baseball*, an impressive rendition of the national pastime that lives up to its lofty billing. The game is the culmination of a 20-year dream for Don Daglow, head designer and cofounder of Beyond Software. In 1971, Daglow created the first full-season major

league baseball computer simulation. Thanks to advanced technology and countless refinements, what originally required a mainframe computer can now be experienced on your PC. Backed by some of the best programmers in the league—not to mention Oakland A's manager Tony LaRussa—Daglow's dream has blossomed into one of the most versatile sports games on the market.

Hardball veterans will notice similarities between this game and Electronic Arts' *Earl Weaver Baseball*. Daglow, who produced that award-winning title with designer Eddie Dombrower, has expanded many of its innovations in his latest work.

Among the most noticeable improvements are the stunning VGA graphics. The action unfolds in a closeup view from behind home plate, affording both the pitcher and batter a clear view of the strike zone. The pitcher's set, windup, and delivery are perfect examples of the entire team's fluid animation. Almost every detail imaginable is here, including runners sliding into base, infielders jumping or diving for the ball, and outfielders making spectacular over-the-shoulder catches. Kudos go to animator David Bunnett (*Typhoon Thompson*) for bringing the game to life.

Other terrific features include a split-second delay after a hit, allowing the defense to get its bearings. The designers also fashioned an ingenious 3-D method of tracking fly balls; fielders converge on a circular white shadow, its size a reflection of how high the ball is in the air. Unlike previous efforts in the genre, this game makes the ball's flight path appear to be genuinely random, af-

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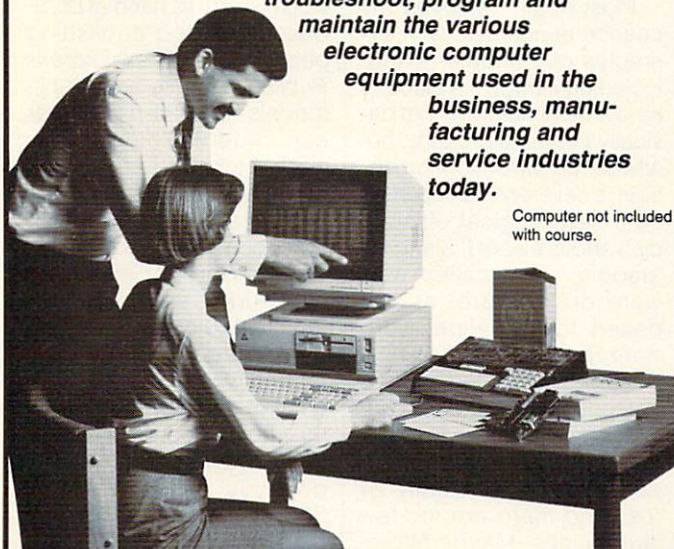
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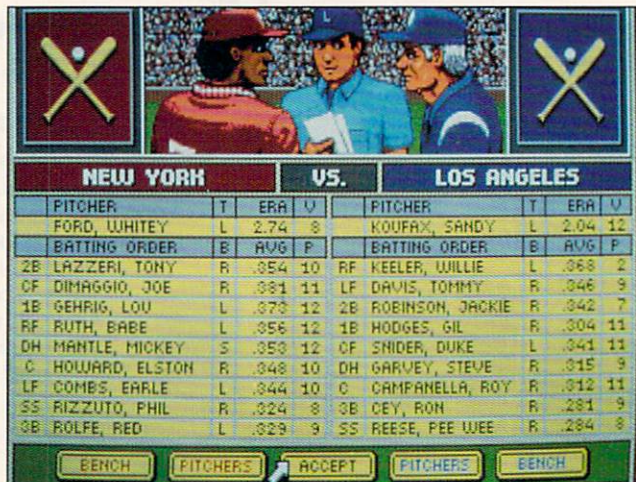
Managers command total control of their teams, including defensive assignments, pitching rotations, batting lineup, and on-field signal calling. In addition, injuries, fatigue, and cold streaks bring substitutions into play. Decisions are made quickly via pop-up menus and bullpen screens.

The Exhibition mode is a blast, but it's only the icing on a very large cake. In league play, the program's complex statistical database can simulate an entire 162-game season in a matter of hours. For the ultimate in realism, however, players invoke what amounts to major league multitasking. In this mode, you can participate in feature games—or merely view the highlights—while the rest of the teams slug it out in the background. From the day-to-day grind to the race for the World Series, this unique environment gives players a taste of the bigger picture.

Baseball number-crunchers will revel in the game's seemingly endless statistical reports, including 14 categories for fielding, 49 for batting, and 44 for pitching. A mammoth Statistical Leaders database analyzes, sorts, and displays both real-life and simulated player stats in more than a dozen different categories. The program encourages multiplayer leagues by offering drafts, trades, and comprehensive team editing.

Extensively detailed yet instantly accessible, *Tony LaRussa's Ultimate Baseball* represents a major achievement in sports simulations that no true baseball fan should be without.

SCOTT MAY



No minor league entertainment, Tony LaRussa's *Ultimate Baseball* knocks other simulators out of the park.

IBM PC and compatibles (AT or compatible running at 10 MHz recommended); 640K RAM; EGA, MCGA, or VGA; hard disk; joystick and mouse optional; supports Ad Lib, Sound Blaster, and Roland—\$49.95

STRATEGIC SIMULATIONS
Distributed by Electronic Arts
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San Mateo, CA 94404
(800) 245-4525

Circle Reader Service Number 367

MICROSOFT PRESS COMPUTER DICTIONARY

When Microsoft publishes a 400-page computer dictionary, you expect it to be better than good. Just as an academic dictionary that includes the name of Oxford or Harvard in its title is likely to be an authoritative resource, a computer dictionary with Microsoft's name creates certain expectations.

Fortunately for all concerned, Microsoft has produced the definitive computer dictionary. Compared to other computer dictionaries and glossaries, *Microsoft Press Computer Dictionary*

(*MPCD*) is much more thorough and readable. It is so readable, in fact, that I enjoyed casually browsing its pages, stopping on unfamiliar terms such as *burst speed*, *ping pong buffer*, and *session layer*. I was also impressed by the distinction made between *baud rate* and *bits per second* (they're not always the same) and the multiple definitions for such words as *path*, *address*, and *format*.

Most of all, I enjoyed my chance encounters with examples of computer slang, including *kludge* ("a piece of hardware or software that basically operates properly, but whose construction or design is severely lacking in elegance or logical efficiency") and *liveware* ("Slang for 'people.' Also called *wetware* or *jellyware*, as opposed to *hardware*, *software*, and *firmware*").

As good as *MPCD* is, it's not perfect. Under *animation*, the definition lists the frame rate of film animation as 28 fps—it's actually 24 fps. And there are too few illustrations. Maybe Microsoft could go in with Time-

Life for the definitive computer encyclopedia in 12 monthly volumes. Until then we'll have to settle for what is clearly a must-have computer resource.

DAVID ENGLISH

400 pages—\$19.95

MICROSOFT PRESS
One Microsoft Way
Redmond, WA 98052-6399

Circle Reader Service Number 368

TANDY DMP 202

Ever wonder if we'll see the end of the dot-matrix printers? Tandy seems intent on continuing tradition, and with the DMP 202 the company delivers a machine that closely resembles some of its early ancestors.

With two buttons to handle simple printer functions, a very plastic—but low-profile—look, and a compact footprint, this unit projects an attitude of low-end, can-do printing.

Emulating an IBM X24 printer, the Tandy DMP 202 handles both graphics and text from the *Windows* environment without complaint and does more than a fair job when you try its hand at DOS-based desktop publishing packages such as *Express Publisher*. Unlike early 8-pin models, this 24-pin printer can produce high-quality work, including near letter quality text. Print speeds clock in at 180 cps in the superspeed mode, bottom out at 33 cps for near letter quality work, and stabilize around 120 cps in standard draft mode.

As always, it's relatively easy to run paper through the tractor feed; it's the more than occasional jams that give you the headaches. Still, unlike some high-end dot-matrix printers, this Tandy printer never attempted to

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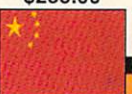
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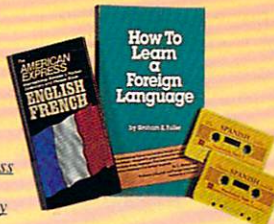
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route paper incorrectly through its insides in a spiteful ploy to cause trouble. The single-sheet paper rack allows for trouble-free printing on either typing paper or stationery.

Not the fastest printer around but one of the lighter ones at 7.3 pounds, the Tandy DMP 202 could make an ideal companion for college-bound students worried about dragging their possessions up four flights to the dorm room. In the home office, on the other hand, the DMP 202 could see some action printing multipart forms.

The noise-sensitive, however, must stand clear. Like its forerunners, the DMP 202 becomes an irritating noise monster when it prints.

Aside from this failing, users who need only a moderate amount of printing done could find the DMP 202 a tolerable balance of quality output, print speed, and price. If this unit turns up in the Radio Shack sale catalog, you might consider picking one up.

DAVID SEARS

Tandy DMP 202—\$399.95

RADIO SHACK
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1800 One Tandy Ctr.
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(817) 390-3011

Circle Reader Service Number 369

I HATE ALGEBRA

A spreadsheet for people who don't understand spreadsheets? Can there be such a thing?

If the name *I Hate Algebra* appeals to you, this product could add up to be just what you need to replace your confusing, algebraically driven spreadsheet.

How does *I Hate Algebra*

outmaneuver the tried-and-true construct-a-formula method so familiar to spreadsheet users? The program attempts to automate the paper-and-pencil approach to arithmetic that we all learned way back in grade school.



It looks plastic and makes a racket, but the Tandy DMP 202 gets basic printing jobs done.

You place symbols such as + and - next to empty cells, with = before the cell where you wish a total to appear. These symbols make up calculations (as opposed to formulas) and remain independent of the cells that contain numbers, so you can apply them to different rows—a nice feature not found in most spreadsheets.

This straightforward approach will please users that need small spreadsheets to manage their finances—a small business or a household budget, for instance. Financial analysts, on the other hand, won't find much use for *I Hate Algebra* because of the algebra-intensive nature of their work.

A *Windows* program, *I Hate Algebra* comes on both sizes of floppy disk, and it stores its files in a simple ASCII format. The manu-

al is quite usable, thankfully, since *I Hate Algebra* offers no online help. You cannot import files from other spreadsheets (a feature handy for those of you who want to make use of spreadsheet code that's in

the public domain).

Are the standard spreadsheets *I Hate Algebra* aims to replace really so difficult to learn, however? Considering that a good 10 million of them have been sold—the vast majority to nonprogrammers—probably not.

We even credit spreadsheets with virtually creating the PC industry by bringing micros to the desktops of bean counters everywhere, and because of this I think *I Hate Algebra* might be a solution in search of a problem—or perhaps just a solution with a limited audience.

TOM CAMPBELL

IBM PC and compatibles, *Windows* 3.0 or later—\$79.95

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structs you to do your normal backswing. If the weight rises or if the string touches the ground, you aren't staying level during your backswing.

After working through all the suggestions, descriptions, and drills, you can print out a summary of the advice you've received. A sample checklist for a duffer addressed three main faults, six added points of emphasis, and two additional items. Even with all this advice in hand, you may still have trouble visualizing the problem and its correction. The animated diagrams take over here.

Although the rest of the graphics are simple, the developers have animated actual photos of a golfer making the errors you need to avoid along with corrected swings. The animation—and indeed the whole program—requires some effort on your part, though. Intended for serious golfers, *Personal Pro's* advice helps only when implemented.

You may need to take this a step at a time. Trying to keep your back upright, chin up, neck unbent, and knees flexed with weight evenly on the insides of your feet while turning your right shoulder more to the right, maintaining a constant spine angle, clearing your left hip to the left, fully uncocking your wrists at impact, and keeping your chest down . . . well, it's hard to do it all at once.

Let's apply a little rule-based artificial intelligence of our own here. Are you serious about golf? Do you have swing problems you'd like to cure? Are you willing to work for the cure? If your answer is yes to one or more, enlist *Personal Pro* as your personal trainer.

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another environment, such as *GeoWorks Ensemble*, you'll also be pleased with the notebook's performance.

The system I reviewed shipped with DOS 5.0, which, when combined with *Windows*, formed the basis



The high-powered, aptly named *Kris Master* makes it easy for you to take your office on the road.

KRIS MASTER

Sleek, fast, powerful, responsive—all suitable adjectives for this 7.1-pound 386SX notebook from Kris Technologies. From the sharp charcoal-gray housing to the agile keyboard to the powerful and functional 20-MHz processor, this machine is everything you might want or need when you take your office on the road.

Underscoring this conclusion is the *Kris Master's* inclusion of *Windows 3.0* and a Logitech serial mouse. This notebook certainly has the muscle to run *Windows*, if that's the environment you've chosen for your applications. It goes without saying that it's suitable for straight DOS applications. If you've chosen

for a powerful mobile office. I added *Ami Pro* and several DOS-based applications, including *XyWrite*, a contact manager called *Maximizer Lite*, *GrandView*, *Quicken*, *The Norton Utilities*, and a few others. All my applications performed as well as or even better than they do on my home office system, a 16-MHz 386SX.

Other system specifications include a backlit VGA-compatible display with 640 × 480 resolution in 16-shade gray scale, a high-density 3½-inch floppy disk drive, a socket for a 387SX math coprocessor, a hard disk (20, 30, 40, or 60 megabytes), two serial ports and one parallel port, and a PC-compatible keyboard with embedded keypad. I found the

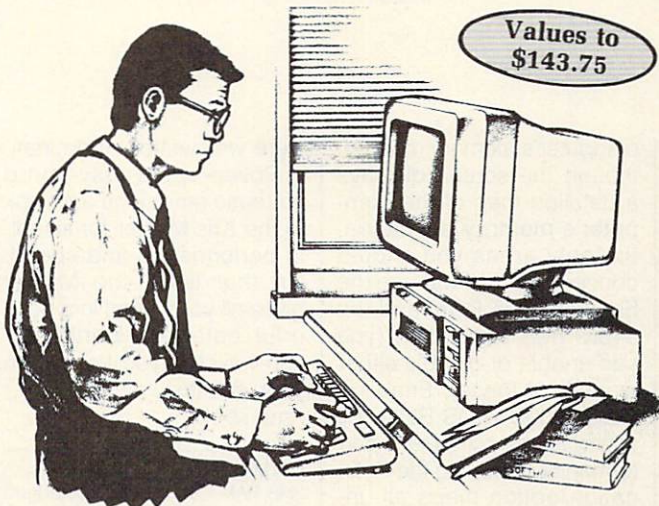
display quite clear and the keyboard comfortable and responsive. I did wish for a trackball or similar pointing device—I swapped the Logitech serial mouse for a MousePen Pro from Appoint because it's much more portable. Topping off the system is a nylon carrying case—a nice touch, even though the bag isn't large enough to hold the Master and the AC adapter unit at the same time.

Installation of a fax/modem card took five minutes and couldn't have been easier. With the extraction of one screw and the removal of a cover, the receptacle was in view. The small 4 × 4 inch card eased snugly into the socket, and the provided screw held it in place. After replacing the cover, I was in business.

The 2400-baud modem worked like a charm. I did have to run the setup program to turn it on, but that illustrates one of its strong points—you can turn it off to save power. A fax/modem card works wonders while on the road to keep you in close touch with your office and help you communicate with associates.

The purpose of a notebook, of course, is to take all of this technology on the road. The *Kris Master* draws portable power from a rechargeable ni-cad battery rated at 2½ hours of operation, depending on the power-saving features you've enabled. When the battery is fully discharged, a fast-charge feature allows you to charge the battery pack in 2½ to 3 hours, also depending on the power-saving features you've enabled. I found that the system lived up to both of these claims. Note, however, that the battery charges only when the computer is

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turned off—it doesn't charge while you're using the computer from an AC power source. The battery-charging indicator lights are located on the AC power adapter unit rather than the computer itself.

As previously mentioned, you can extend the Master's battery operation by enabling a host of power-saving features. While enabling these features makes power management an automatic function, there's also a manual power-management technique that makes use of the suspend-resume switch located just above the keyboard on the right, next to the on-off switch. By pressing this button, you can suspend all computer operations—disk access, screen display, and so on. While in the suspend mode, your work is maintained in memory. Pressing the button again awakens the notebook and returns you to where you left off. The power LED below the screen blinks green when you place the system in suspend mode. I used the suspend-resume feature anytime I paused my work while running off battery power, and it added noticeably to the unit's battery life.

You can access the automatic power-saving features through the Setup screen by pressing the Ctrl-Alt-S key combination. The setup program consists of three screens, which you page through by pressing Fn-PgDn. The first page displays basic CMOS data such as time, date, disk type, memory setup, CPU speed (fast or slow, but there's no reason to set it at slow unless your application requires it), and the initial state of the video display.

The second page of the setup program contains the

computer's memory map. Although the screen displays a detailed map of the computer's memory allocation, the only areas you should concern yourself with are the Shadow BIOS ROM and the 640K-1MB Relocation (you can enable or disable either or both of these). Enabling the Shadow BIOS ROM will speed up the computer's performance. Enabling the Relocation option maps all unused memory found between 640K and 1MB as extended memory. The Kris Master ships with 2 MB of memory in its standard configurations; enabling this feature will give you even more extended memory for your applications.

The third page of the setup program lets you set the computer's power-saving features to the most effective setting for your travel use. The hard disk, LCD display, and suspend mode features can all be set to take effect in 1-minute increments up to 15 minutes (you can disable the hard disk-saving feature by setting the time increment to 0). Doze mode, which controls the main CPU, can be set to take effect in as little as 1/8 second. Sleep mode, which controls the peripherals, can be set for between 1 and 15 minutes.

Despite the flexibility and power of this notebook, there are some curious oversights. For example, neither of the small manuals lists a technical support number or even a main company number. I had to call directory assistance to track down Kris Technologies. My call was precipitated by another omission from the documentation—there was no explanation of how to access the setup program, though the explanation of the program and tips on optimum use

were well written and clear.

Power users may shrug off these omissions and look to the Kris Master for its solid performance and speed. On that level, the Master gives all you'll need in a powerful notebook configuration—even if you keep it on your desktop.

PETER SCISCO

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GRANDVIEW 2.0

From its inception as an outliner and personal information manager, Symantec's *GrandView* 2.0 has successfully garnered faithful followers who use its tools for tasks ranging from personnel management to brainstorming. Count me among those who have found the program's unique blend of outlining, categorizing, and printing to be a worthwhile addition to the desktop—even if these same tools can now be found in spreadsheets, word processors, and other productivity applications.

In its latest incarnation, *GrandView* emerges as a full-blown project management tool, minus the Gantt charts and other features that many managers find too complex or rigid to use in managing day-to-day affairs at the office.

The program's many new features could easily fill a book. (Actually they fill two—a Reference Guide and a User's Manual—and a couple of topic-sensitive booklets:

one detailing *GrandView*'s use as a presentation tool and the other a well-designed guide to using the program's most effective features.)

The latter booklet is an excellent introduction to the program, and I recommend it highly to all users—no matter how familiar they are with the program's earlier version. By presenting the program's features as a step-by-step guide to productivity, Symantec effectively conveys the power that lies in this tool.

Whether you're managing a to-do list or a complex project, *GrandView* gives you just what you need to track important tasks, assign responsibilities, make reports, and present ideas. Tasks, ideas, people, and dates can be linked in a variety of ways to give you the flexibility and the insight necessary for effective management.

One particularly striking feature about this version of *GrandView* is its expanded presentation and display. With version 1.0, users could view tasks by category, by people, and by date. But the design of the software didn't capitalize on those links—you had to do a lot of the connections by yourself. In 2.0, *GrandView* makes better use of the computer's ability to balance disparate bits of information and then presents that information in ways that make more sense or that provide a new perspective.

As an example of how *GrandView* juggles all of this information, look at how you can use the program to manage a project. First, use *GrandView*'s excellent outlining features to define the separate tasks that go into the project. Then, group tasks together by common features—some may be the re-

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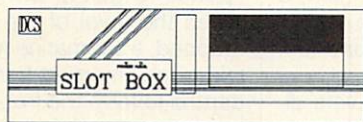
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sponsibility of the marketing department, for example, or some might be consigned to customer service.

You can rearrange the tasks and the rest of the outline material quickly and effectively with the program's various editing commands. Once you've completed your outline, you can proceed to assigning each of these tasks to a person, giving each task a priority and a due date.

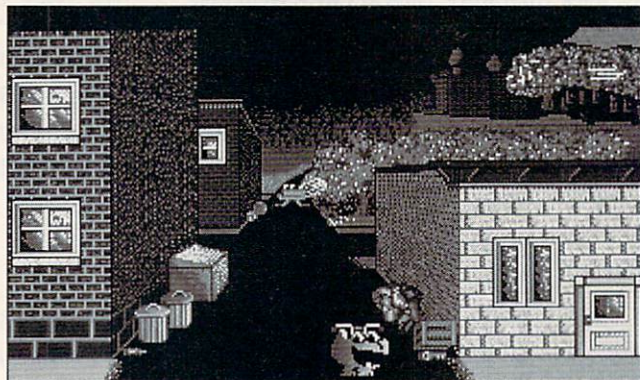
From here on, you can check the status of the project and communicate necessary information about it from within *GrandView*, using separate views to investigate your assignments and writing summary reports using the program's templates.

The templates are a fine addition to this already excellent program. New users can get immediate results from using them; experienced users will find that the template designs suggest different ways of using information.

GrandView isn't without its faults, however, and chief among them is the interface design. Rather than adopt the now-almost-standard DOS-specific technique of granting access to the menu bar through an Alt-key combination (such as Alt-F for the file menu), Symantec insists on using the F10 or backslash keys to activate menus. Few programs use this interface anymore, although those few are well known (*Lotus 1-2-3* and older versions of *The Norton Utilities*, for example). In this GUI world, when it seems that the entire software industry is racing away from DOS applications, it makes better sense to design a consistent interface so that users who haven't opted for *Windows* will at least not have to re-educate

their fingers when it comes to using a keyboard.

Effective project management, no matter what the scale or variety, is key to effective and creative work.



This happy Muncher—one of many to be found in Super Munchers—must know its facts and avoid the Troggles.

With its emphasis on outlining and its support structure of categories, priorities, and responsibilities, *GrandView* can manage the information you need to get the job done right.

PETER SCISCO

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SUPER MUNCHERS

Super Munchers offers fast-paced, arcade-style family entertainment in the classic *Pac-Man* tradition—but with a brain-teasing twist. You move a friendly animated character known as a Muncher around an electronic game board, gobbling up words that match a target rule. You earn points for each correct item munched, but you lose a

Muncher if you chomp down on an object that doesn't fit the rule. The game ends when no reserve Munchers are left for board duty. High scorers earn a place of honor

in the *Super Munchers* Hall of Heroes.

Five types of Troggles, or Muncher-gobbling meanies, make life difficult for morsel-masticating Munchers. Troggles pop up onscreen at random locations and devour unsuspecting Munchers on contact. The higher the level of gameplay, the greater the Troggle menace. Munchers find temporary relief in Troggle-repelling Safe Zones, which Troggles can't enter.

To spice up the action, a special transformation cell appears whenever Munchers chow down on 20 correct items in a row. If players direct their Munchers to this cell, their game pieces change into Super Munchers! Super Munchers have 20 seconds to earn bonus points by trouncing every Troggle in sight. They earn extra super time if they chomp down on correct items as they navigate the board. As an added treat, after every three levels of play, players get to help Super Munchers on a special problem-solving mission.

Super Munchers is a terrific computer game because success requires more than just hand-eye coordination. Players also have to think. How well you do depends upon your ability to identify, classify, and categorize. The package features six major subject areas: Animals, Famous Americans, Food and Health, Geography, Music, plus Odds 'n' Ends. Each topic, in turn, has several target rules for a total of 150 categories (twice that many if you include negotiations). If you're looking for the ultimate in mind-building challenges, *Super Munchers* is a gaming enthusiast's dream come true.

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While you're on patrol, the evil General Masters and his personal army begins to occupy the southeastern tip of your island. His troops push north and west to occupy the mines that bring the heat of the earth's magma to the surface and make life possible on the frigid planet.

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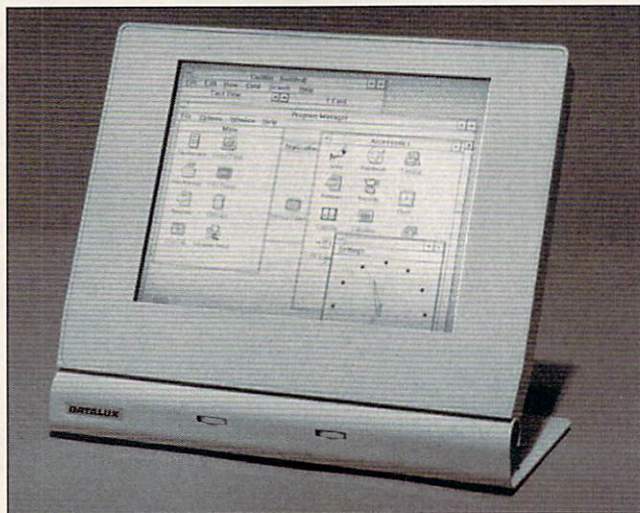
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must find allies and recruit them to your cause. Place good skiers in snow vehicles in a defensive line across the southeastern part of the island. If that line holds, you'll have a slim chance of reclaiming the island by destroying the invading forces.

Much in *Midwinter* depends upon chance. Chance determines both your position and that of the enemy at the beginning of the game. Should you begin play in a very remote area, you'll have little chance of winning the game. Should you fail to quickly establish a strong defensive line of snowmobiles, or if they don't hold off the advancing army, again, you'll fail.

Roam the fractal-generated, 160,000-square-mile, 3-D polygon-filled landscape and enjoy a variety of heads-up winter sports. You can hang glide, ski, snowmobile, or travel by cable car. You can blow up buildings or practice your marksmanship. It makes you wonder if the designer—Mike Singleton of the United Kingdom and Rainbird—decided in midproject to move a Winter Olympics game closer to role-playing territory.

The interface allows for joystick, mouse, or keyboard control. Only the mouse lacked the precision to control the various icon-driven features of the game. A heads-up display with the center of the screen cut to resemble the view through snow goggles or the windshield of your vehicle adds somewhat to the feeling of being there. While you're skiing or hang gliding, the body-heat icon is the most important, since you can freeze to death in the -25-degree temperature. When you're traveling by snowmobile, the most important icons are the gas gauge and the angle of the



What's that "Star Trek" prop doing here? Oh, it's the DATALUX MX LCD monitor, with 16 shades of gray and no eyestrain.

slope. Snowmobiles turn over when the slope is too steep.

Here, as in a role-playing game, each of the 32 nonplayer characters has attributes that determine performance, proficiency, and speed at a number of crucial tasks. The attributes don't appear to change through the course of the all-too-quick game.

Ultimately, *Midwinter* proves perhaps a bit too challenging. The characters don't seem to work well together, and success depends upon chance rather than strategy or good gameplay. When I finally called the MicroProse support line for help with the game, I was told that *Midwinter* was a UK product and I would have to call them for support.

While I enjoyed skiing, snowmobiling, and hang gliding, I recommend *Midwinter* only to the most skilled gamers. After a time, the difficulty will overpower the value of the game's realism and leave you cold.

ALFRED C. GIOVETTI

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DATALUX ML LCD MONITOR

At first glance it looks like one of the flat-screen desktop computers from "Star Trek: The Next Generation." It's much thinner than a regular computer monitor—sort of a notebook computer without the computer. This sleek little screen is actually a stand-alone LCD monitor that comes with its own VGA card; it replaces a standard VGA monitor. You can also buy a model with a built-in compact keyboard: the MKL PC Terminal (\$1,175).

Why use a DATALUX instead of a standard cathode-ray monitor? Three reasons come to mind. First, this screen takes much less space than a standard monitor, making it a good pick for

close areas. The model with the keyboard is especially space-conservative, and you can even hang the screen-only model on the wall. Second, some people are concerned that the low levels of radiation that emanate from standard monitors could be harmful. LCD screens—in both DATALUX monitors and laptop computers—give off virtually no radiation. Third, some people are sensitive to the slight pulsing of standard computer monitors and become overly tired when they look at these monitors for more than an hour or two at a time (especially monitors with short-persistence phosphors). LCD screens switch their pixels on and off much more slowly than conventional monitors, so people with this problem can work with LCD screens all day without becoming tired.

I've used a DATALUX for about four months and found only one real drawback. The current models support just 16 gray shades, even though most laptop and notebook LCD screens now support either 32 or 64 shades of gray. On the other hand, a DATALUX screen is noticeably brighter than the other passive-matrix LCD screens I've seen.

If you're unable to use a conventional computer monitor because of space or health considerations—and you don't require color—the DATALUX ML LCD Monitor may be just what you're looking for.

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VENGEANCE OF EXCALIBUR

The spirit of Excalibur lives again! You can even bring *Spirit of Excalibur* characters back to life in Virgin Software's *Vengeance of Excalibur*. If you weren't around to defeat the evil sorceress Morgan Le Fay in *Spirit of Excalibur*, there are plenty of new knights to accompany you through medieval Spain and its surroundings in *Vengeance*.

The 256-color *Vengeance* opens with a pan shot of a breathtaking castle, but a large logo with dripping blood foretells the dangers that lie ahead as you pursue the demon lord, fight off mercenaries, and try to lead your knights to victory. You really need a mouse to navigate the program with any speed, since you choose tools from icons at the side of the screen and then apply the tool to a character, object, or list of choices.

The Crystal Ball icon gives the status of characters; the Map icon leads to your map of Iberia. The Hourglass icon offers slow, medium, and fast movement at the map level, while the Magnifying Glass icon zooms to the scene level, where you'll examine and acquire objects, get information from locals, and make key decisions. The Rider icon moves characters at the map level, as long as they are loyal to your cause—enemies, for example, aren't forces you can control. The Scroll icon saves and loads games so you don't have to start from the first scene every time you boot or die, while the Gauntlet icon brings up actions like Pick Up, Search, Seize, Drop, Trade, Give, Talk, Request, Bribe, Use, and Attack.

Vengeance explains the situation you and your knights are in, as well as how to navigate the game and handle combat and magic. There are descriptions of each episode, hints, a historical background, and an advisory on the roles of faith and nobility. Knights will refuse to do many evil deeds, like attacking friendly characters. If you make them do too many unethical acts, the knights can die.

The game also allows you to snoop around the map and zoom into scenes without bringing characters to that point in the game, but you won't be able to spoil surprises, since doors are most often locked to voyeurs. You'll be forced to rely on brawn or brain to gain entrance to exotic scenes and reap the rewards hidden there. To gain entrance to the game at all, you'll have to supply a word from somewhere in the handbook—a very mild form of copy protection. But there's no red plastic decoder required as in *Loom*, nor any complicat-

ed code to decipher. You just find a word that's *x* words past a given sub-heading.

I enjoyed the graphics in *Vengeance* and asked a couple of unsurpassed experts from the local BBS what they thought. The two teenage boys agreed. However, neither of them seemed interested in finishing the game and abandoned it in about an hour. We all felt that our characters were killed too often to sustain a sense of involvement, and had I not been reviewing *Vengeance*, I would've abandoned it myself. But if you enjoy games that catch you off guard and challenge your life at many turns, then you've got the right stuff to lead your knights to victory in *Vengeance*.

REBECCA ROHAN

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PFS: WINDOWWORKS

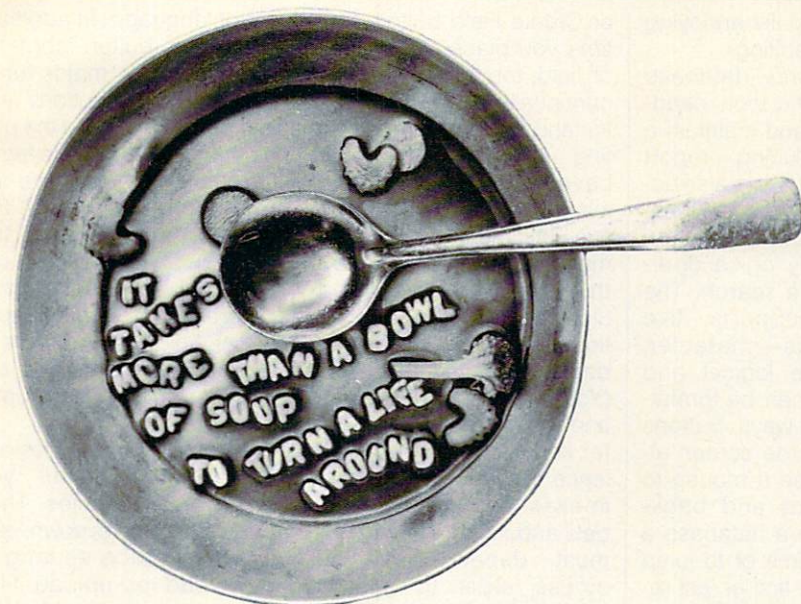
PFS: WindowWorks is an integrated software package for *Windows 3.0* that can do quite a lot. In a package like this, with such a variety of programs, it's important to determine what it can do well and where it falls short.

The package includes a word processor, spreadsheet, chart generator, database, telecommunications program, label maker, and address book. When loaded, *WindowWorks* sets up its own desktop, opening a document window and displaying an icon for each program module at the bottom of the screen. To switch to a module, you simply double-click on the appropriate icon. While *WindowWorks'* screens are not as attractive as most *Windows* applications (for example, in the word processor, buttons are little more than white squares with letters in them), they do provide most of the functions *Windows* users expect.

When it comes to features, the fully implemented word processor is loaded, sporting a WYSIWYG display, toolbar, ruler, spelling checker, thesaurus, and outline generator. The word processor can even produce a table of contents or an index. As with most *Windows* word processors, *WindowWorks'* toolbar provides buttons and list boxes for changing fonts, font sizes, text attributes, paragraph justification, and text styles. The ruler allows you to manipu-

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late tabs and indents by dragging and clicking with your mouse.

The word processor can easily handle graphics as well as text. To import a graphic, you first copy it into Windows' Clipboard and paste it anywhere in your document. If you place the graphic amid text, the text automatically flows around the graphic.

Like most integrated packages, *WindowWorks* can share data between its tools. You can, for example, link data from the spreadsheet to a word processor document. However, *WindowWorks* doesn't support Windows' DDE (Dynamic Data Exchange), opting instead for its own type of object and data linking.

Unfortunately, the word processor is infuriatingly sluggish. If you're a fast typist, you'll spend much time waiting for the display to catch up with you. This sluggish-

ness is especially annoying when you're editing.

WindowWorks' database provides all the tools needed to create and maintain a database, including a report generator that offers a selection of built-in numerical functions and a query function that can apply logical operators during a search. The database supports five types of fields—character, numeric, date, logical, and memo—that can be formatted in several ways. Buttons at the top of the screen allow you to use a mouse to move forward and backward through a database a record at a time or to jump quickly to the first or last record. Although *WindowWorks* cannot directly import or export other database formats, it can import or export delimited ASCII files.

The database's major weakness is its clumsy design. For example, you must select the Create Text

or Create Field button each time you place a new label or field, forcing you to jump continually between the button and the display when setting up a new form. It would have made more sense to leave the selected mode active until you turn it off. Also, many dialog boxes (and this is true in all the modules) don't allow the selection of options with the standard Alt-plus-letter hot keys. (You can tab to any option and then select it with the Enter key.) Another inconvenience is the inability to type in exact coordinates for labels and fields. Instead, you must depend on your mouse skills to position screen objects correctly.

The terminal program offers a few options missing from *Windows' Terminal*, including a dial directory, Y-batch file-transfer protocol (it omits Kermit, however, which is included with *Windows' Terminal*), and simple

script language. In addition, it provides button icons for the program's major functions. Using the buttons, you can select or change the program configuration, the terminal emulation, the active duplex, the dial directory, the hang-up function, and the send-file and receive-file operations. While the terminal program's "look-back" buffer can hold only 400 lines of text, you can capture an entire session to disk for later perusal.

All in all, online sessions run smoothly—until you want to transfer files. Then the program bogs down, easily taking twice as long to download or upload files when compared with *Windows' Terminal* program (XMODEM transfers). This defect is serious enough to avoid using the terminal program for anything other than leaving quick messages or capturing E-mail.

In addition, I couldn't get

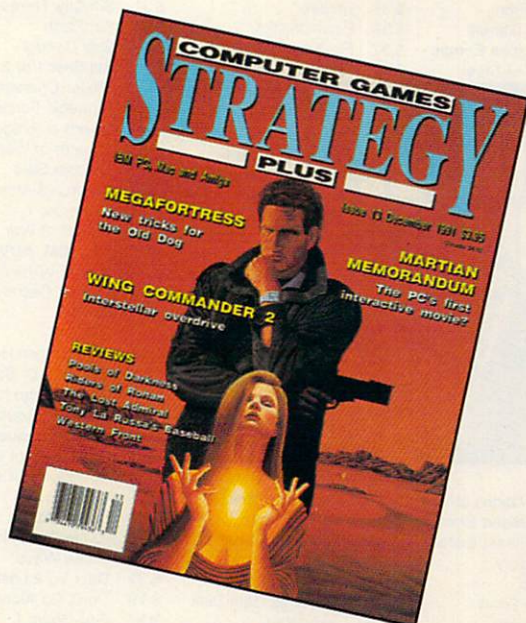
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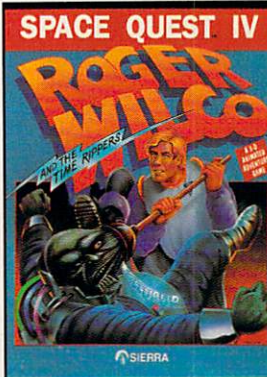
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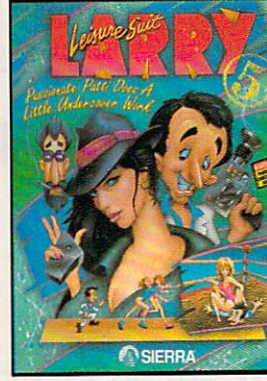
'CARRIERS AT WAR' from SSG's WW2 carrier warfare. Explore Pearl Harbor, Santa Cruz, Coral Sea, Midway, Eastern Solomons, & Marianas Turkey Shoot. Great graphics and simulation. You must seek out the enemy carriers, fleets and aircraft before they find you. Hundreds of ships & aircraft are individually modeled. With point & click interface. 256 color VGA & sound board support. **\$37**

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'SPACE QUEST IV' from SIERRA is a 3D animated adventure game. Roger Wilco embarks on a trip through space and time to keep the universe safe for fair play, and bad jokes in this fourth chapter in the Space Quest series. Features include 256 color hand painted graphics, scrolling screens, realistic sound effects, and a rock and roll soundtrack with sound board support. **\$34**

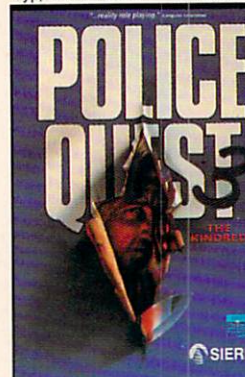
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'LEISURE SUIT LARRY 5' from SIERRA is a 3D animated adventure game. Help Larry and Passionate Patty take on organized crime, the FBI, and the Citizens Against Nearly Everything in their spiciest computer caper yet. Features include hand painted digitized 256 color graphics, original score by Hollywood composer Craig Safan, a no typing interface, and sound board support. **\$34**

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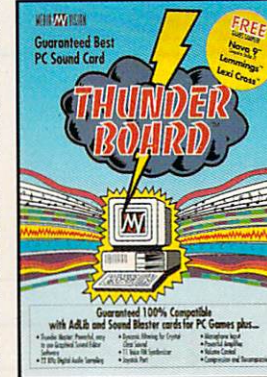
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'POLICE QUEST 3' from SIERRA is an accurate simulation of police action in an adventure game setting. Follow a dangerous and puzzling trail of brutal cult killings and on the way make sure you 'do it by the book' to keep the criminals behind bars. Features include video-captured human actors with life-like action, 256 color hand painted digitized graphics, and sound board support. **\$34**

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'THUNDER BOARD' from MEDIAVISION is a sound board that is 100% compatible with Soundblaster and Adlib cards for PC Games. It reproduces all digitized sounds using an 8 bit Digital to Audio Converter (DAC). Features include dynamic filtering, 11 Voice FM music synthesizer, sampling rate up to 22 KHz, microphone input, joystick port, and a 2 watt power amp. **\$84**

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IBM SIMULATION

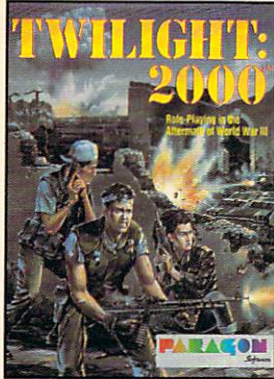
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IBM SIMULATION

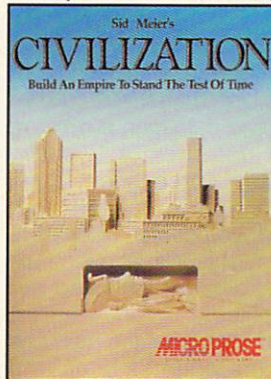
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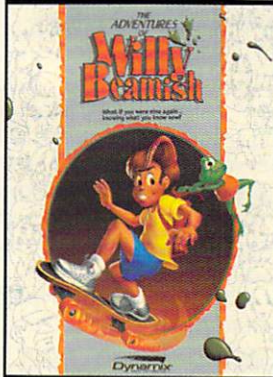


'TWILIGHT 2000' from MICROPROSE is a roleplaying game set in the aftermath of WW3. Test your leadership skills by commanding a squad of 20. Features individual motivations, values & moral code, 50 attributes/skills, 60 careers, overhead 3D outdoor views, detailed 3D military vehicle simulators, masses of vehicles, weapons, & explosives to kill & maim with. 256 color VGA, adlib support. **\$34**



'CIVILIZATION' from MICROPROSE "is a competitive multi-opponent strategy game with a great deal of replayability" CGW. You explore cities, continents, and the world in an EMPIRE like way. You make economic decisions prioritizing technological growth in order to advance your civilization more rapidly than the other players. The best of both SIMCITY & EMPIRE. **\$39**

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'ADVENTURES OF WILLY BEAMISH' from DYNAMIX is an animated adventure game. As Willy Beamish you'll face neurotic parents, a ghostly grandfather, teachers pushed over the edge, the babysitter from hell, a pet frog on steroids, and a plot to blow up the city's sewer system. Features traditional cell animation, 256 color hand painted scenes, and sound board support. **\$34**



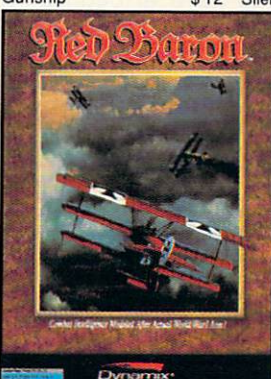
'ELVIRA 2: THE JAWS OF CERBERUS' from ACCOLADE is a horror fans' role playing game. Find and rescue Elvira from among 3 different worlds, a graveyard, a haunted house and catacombs, then fight a final battle against an entity of awesome power. Features include nearly 4000 locations, fully animated battles, 256 color VGA graphics, over 700 separate items, and sound board support. **\$39**

IBM HARDWARE

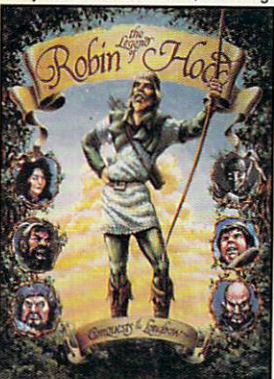
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'RED BARON' from DYNAMIX is the best WWI flight simulator. Take either side, fly 28 aircraft including Albatros D3, Fokker Triplane, DH2 Pusher, Sopwith Camel, Spad 7. Amazing AI, fly against real aces who use historically accurate tactics. Fly multiplane missions vs multiple enemies, single mission or campaign game. VCR with pan & zoom, 256 color VGA, & sound support. **\$34**



'CONQUESTS OF THE LONGBOW: ADVENTURES OF ROBIN HOOD' is an adventure game that gives a feeling for the legend. Richard is being held for ransom by the Austrians. Your goal is to raise money to pay the ransom. You are aided by your marry band and obstructed by Prince John, the Abbot & the Sheriff. Features multiple paths to multiple endings, 256 color VGA & sound support. **\$34**

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the terminal's window to operate properly. When I tried to enlarge the window by dragging its bottom edge down, the horizontal scroll bar was improperly redrawn about a third of the way up from the bottom of the window. Apparently the terminal program can't be run with a full-sized window, which limits the lines of text the program can display.

WindowWorks' spreadsheet module can import and export *Lotus 1-2-3* and delimited ASCII files. And if you own Spinnaker's *Eight-In-One*, you can also import those files to transfer them to any of the other supported formats. The spreadsheet supports standard cell formats, including text, percentage, scientific notation, and several date forms. Numbers can be formatted in various decimal, dollar, and comma formats.

Although cells can be displayed in WYSIWYG fashion, with bold, underlined, and italic text, these attributes must be selected from a dialog box; they are not readily available on the display. Worse, the attributes stay active only for the currently selected cell or cell range, forcing you to bring up the dialog box continually and reselect attributes.

While you can set the width and height of spreadsheet columns and rows, you must do so by entering values into a dialog box (the opposite of the database's mouse-only field positioning; if only they were the other way around). No easy click-and-drag method here. Both relative and fixed cell addressing are supported, however, and many built-in functions (over 40) are included to aid you in setting up formulas.

WindowWorks' chart generator allows you to create

bar, line, pie, area, and high-low-close charts. You can enter chart data manually or import data from a *WindowWorks* spreadsheet file. Once you've started your chart, you can enter chart titles, axis labels, and legends using different fonts and text attributes.

Rounding out the package are the address book and mailing label modules. The former is a stand-alone, dedicated database which, oddly, maintains no connection with the full database module (except through *Windows'* Clipboard). Besides not wanting to create a database from scratch, I can't imagine why anyone would want to bother with the address book at all. Thankfully, the label maker can print mailing labels using both address book or database data.

Despite *WindowWorks'* unfinished, rushed-out-the-door feel, for a while it was the only kid on the block. If you wanted a reasonably priced integrated package for *Windows*, you had to buy *PFS: WindowWorks*. Now that Microsoft has released its impressive *Works for Windows*, Spinnaker's going to have a tough time keeping pace, especially when you consider that both packages flaunt the identical, low price tag. Frankly, I can think of no reason to prefer *PFS: WindowWorks* over *Works for Windows*.

CLAYTON WALNUM

IBM PC and compatibles (80286 or faster required); 1MB RAM (1.5 MB recommended); EGA, VGA, or Hercules; hard disk; 1.2 MB 5¼-inch or 720K 3½-inch floppy drive; mouse; *Microsoft Windows* 3.0; Hayes-compatible modem optional—\$199.

SPINNAKER SOFTWARE
201 Broadway
Cambridge, MA 02139
(617) 494-1200

Circle Reader Service Number 378

WORDTRIS

It all begins so innocently. First one letter block drops into a well; then another, and another. Mildly intoxicating Russian music wafts gently from speakers attached to the computer sound card. You suspect nothing. Welcome to *WordTris*.

Casually, you reposition the falling letter blocks before they land on the water. The goal is to form words with three or more letters. The more words you spell, the more points you accumulate. Soon you notice that some words earn higher scores than others because they contain obscure letters like Z, Q, J, and X rather than common characters like S, T, A, and E. You secretly wish for more of the high-value letters to drop.

"This is easy," you smugly tell yourself. Completed words disappear from the well, leaving you more room to maneuver. Then it happens—you progress to another level. Letter blocks begin to drop more rapidly. Again you rally to the challenge, adjusting your reflexes to accommodate the faster speed at which letter blocks now fall. Your score rises steadily. You're on top of the world!

Suddenly, the computer beeps again—the telltale sign that you've made it to another level. More letters fall. Where are the vowels? Why do you get four Ls in a row? The activity becomes difficult.

Your nerves begin to fray. You're all thumbs. Blocks start to land on top of other blocks, pushing the lower ones underwater. Soon sunken blocks reach the bottom of the well. Columns of blocks stack above the water line.

At first, it's possible to get sunken and stacked letter blocks to disappear. The

game accepts words spelled horizontally or vertically no matter where they lie. At higher levels of play, however, blocks fall so rapidly it's hard to regain control. Mercifully, the game ends when a letter block reaches the top of the well. Peace of mind returns.

Is *WordTris* a last-ditch Soviet attempt to capture the hearts and minds of an unsuspecting American public? Perhaps, but it's also a terrific computer game that builds vocabulary skills as it improves hand-eye coordination. Play alone, against a friend, or cooperatively with another challenger. Match wits against three players in Tournament mode. All four of you play identical games to see who earns the highest score. There's even a Head to Head option allowing challengers to play on separate computers connected via cable, modem, or Novell network. Every game type offers four difficulty modes—Children's, Novice, Advanced, and Expert. Each has ten levels of play.

No matter which game or difficulty mode you choose, *WordTris* has "potato chip" appeal. It's impossible to play just one round. Magic Words, Special Bonus, Eraser, and Mystery Blocks, combined with your unrelenting desire to earn a place of honor on the high-scorer list, will keep you coming back.

CAROL HOLZBERG

IBM PC and compatibles; 640K RAM; CGA, EGA, VGA, Hercules, or Tandy 16-color; 3½-inch or 5¼-inch floppy drive; hard drive recommended; 256-color VGA graphics require a 1.2MB 5¼-inch floppy drive, 3½-inch floppy drive, or hard drive; supports Ad Lib, Sound Blaster, Tandy 1000, and Roland sound; joystick or mouse optional—\$44.95

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END BALDNESS AND THINNING HAIR

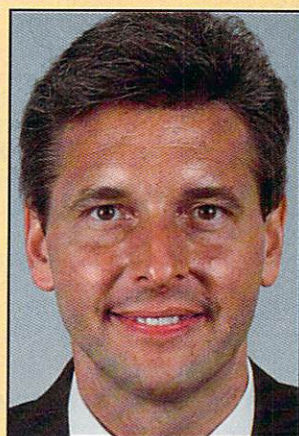


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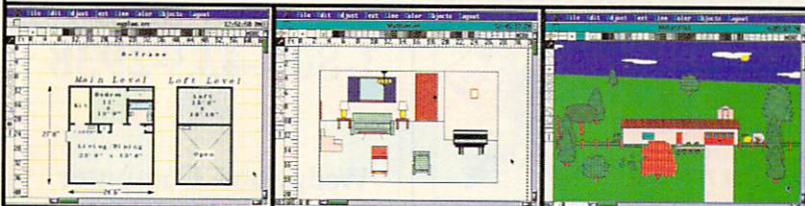
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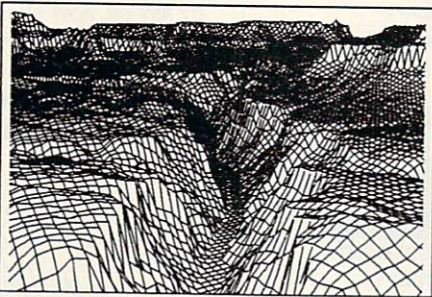
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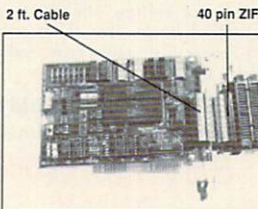
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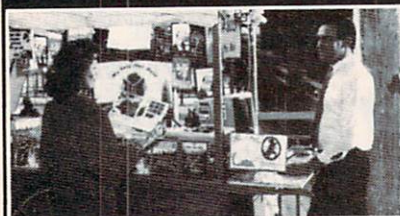
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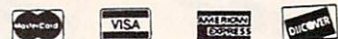
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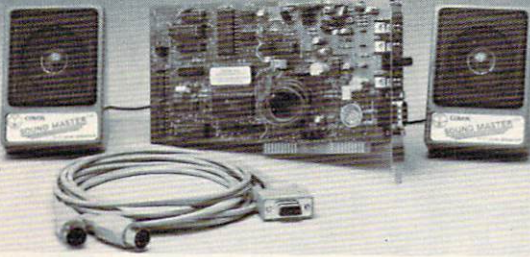
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Insider Radio

"Software/Hardtalk" is a new half-hour public radio program in the works (and hopefully on your public radio airwaves by the time you read this). Western Public Radio is launching the program, which will be hosted by noted computer journalist John C. Dvorak and will feature news, commentary, new product announcements, guest interviews, and question-and-answer sessions with listeners—all on the subject of personal computing. As public-radio

programs *Mickey's ABCs*, *Mickey's 123s*, and *Mickey's Colors and Shapes*. If you currently own the copy-protected version of this software, you can obtain free upgrade replacement disks (with a \$4.50 shipping and handling charge) by calling (800) 688-1520. Any Disney product can be ordered by contacting the same toll-free number.

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Disney Lifts Protection

To make its children's programs a bit more customer-friendly, Walt Disney Computer Software has removed the copy protection from its ever-popular preschool software

itor-in-chief of *Boxing Illustrated* and hosts the TV show "Boxing Illustrated."

Se Habla DeskMate Aquí

Tandy has released a Spanish version of its popular *DeskMate* personal productivity software. *Spanish DeskMate* includes the same collection of applications as *DeskMate* version 3.5 (the most current) and is available for \$99 through Radio Shack stores.

Photo Finish

Specialized electronic services are popping up everywhere, now that the world is going online. From restaurant guides to special online shopping services, if there is a niche, some service seems to be out there filling it. One of the more interesting applications is Donatelli Model Management of Reading, Pennsylvania, which is distributing photographs of its models to desktop publishers through CompuServe. Members can order 35mm slide duplicates or color prints of male and female models photographed in a variety of commercially useful situations. It's your basic online stock-photo book.

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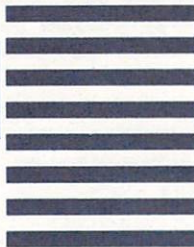
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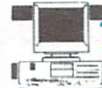
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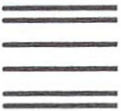
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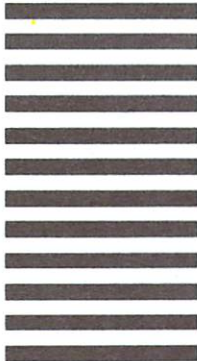
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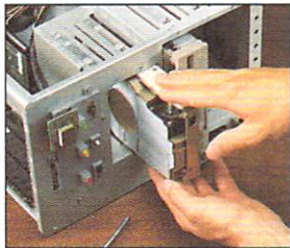
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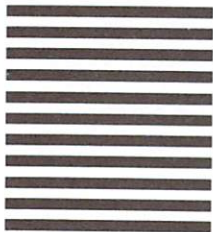
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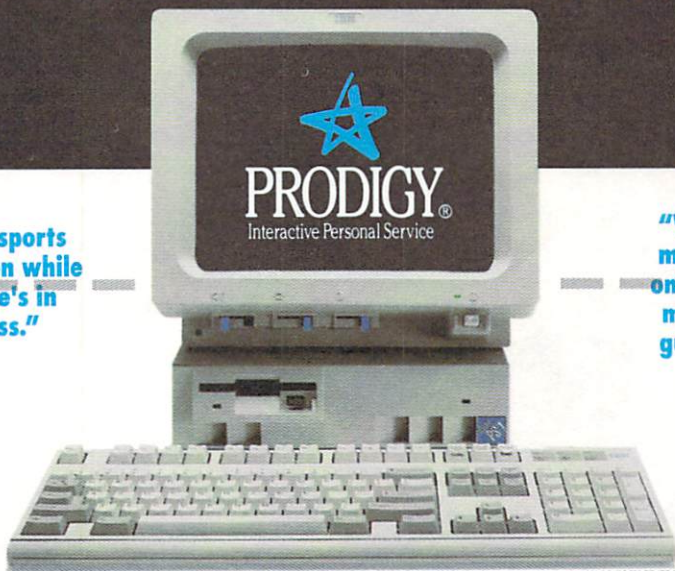


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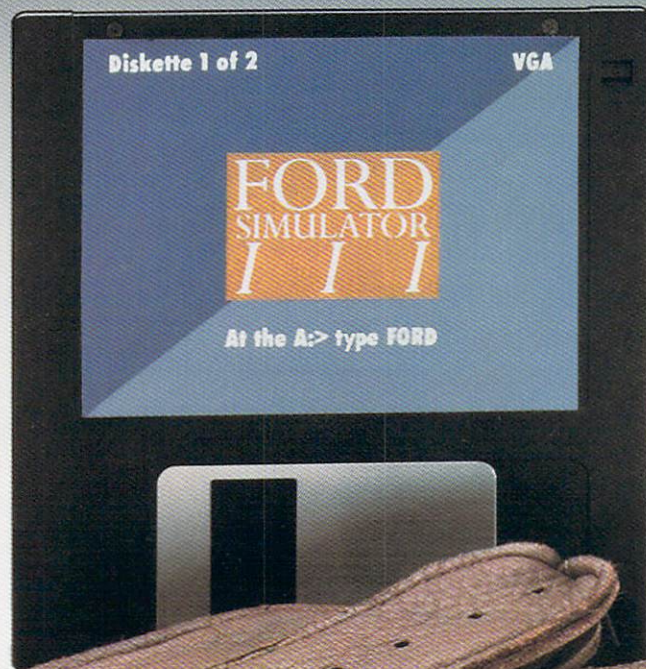
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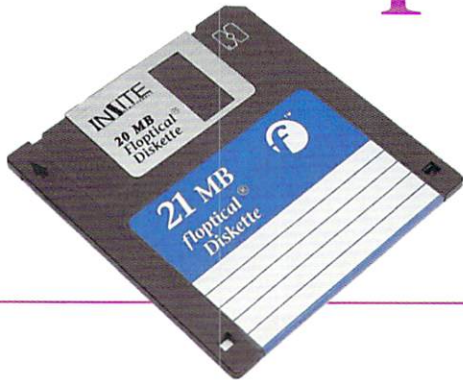
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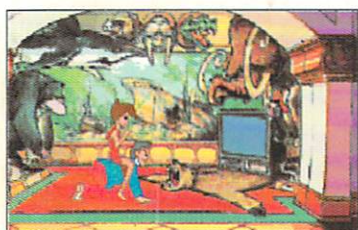
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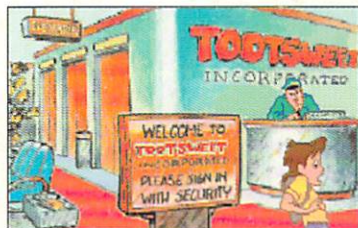
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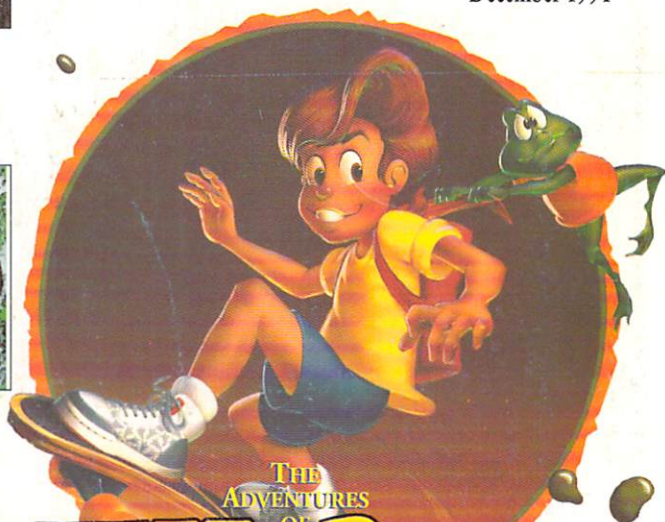
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