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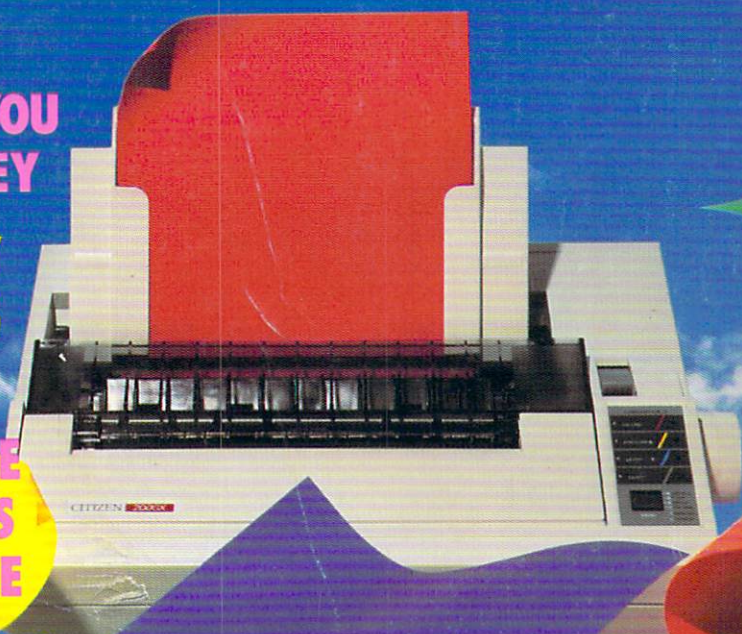
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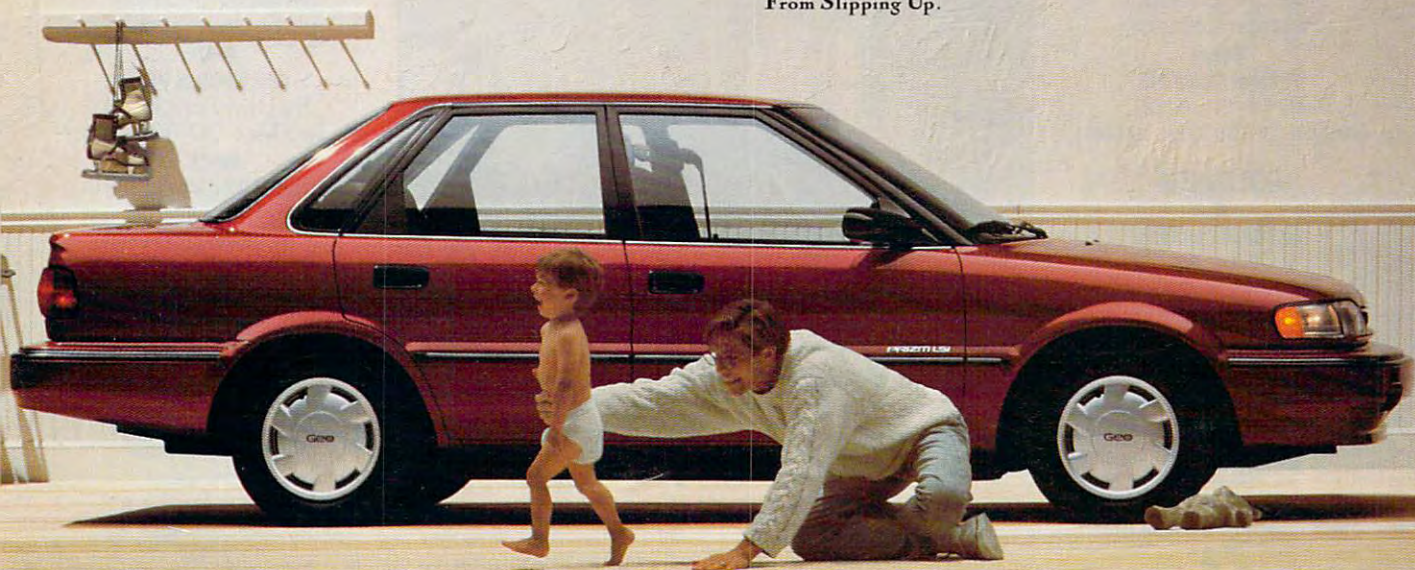
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COMPUTE

VOLUME 14, NO. 2, ISSUE 138 FEBRUARY/MARCH 1992

FEATURES

6

MANAGING YOUR PC'S MEMORY

By Dan Gookin

Three cures for RAM cram.

18

TEST LAB

We examine eight top color printers.

72

WEALTH AND TAXES

By Rosalind Resnick
Beat the tax man.

86

CONTINENTS OF DATA

By Gregg Keizer
Instant information.

104

SPRING TRAINING

By Peter Scisco
Games for the new season.

COLUMNS

4

EDITORIAL LICENSE

By Clifton Karnes
The February/March scoop.

40

NEWS & NOTES

By Peter Scisco
Hot computer news from COMDEX.

48

FEEDBACK

We answer our readers' questions.

52

POINT & CLICK

By Clifton Karnes
Ten new Windows applications.

53

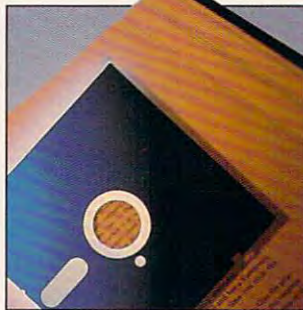
PROGRAMMING POWER

By Tom Campbell
BASIC's DATA statement.

56

TIPS & TOOLS

Timely tips from our readers.



Cover photo by Michel Tcherevkoff

62

INTRODOS

By Tony Roberts
Colorful DOS prompts.

64

HARDWARE CLINIC

By Mark Minasi
How to master HPPCL.

68

COMPUTE/NET

By Richard C. Leinecker
Sierra week online.

70

ON DISK

By Tony Roberts
Five top programs.

80

SHAREPAK

By Richard C. Leinecker
Four top programs.

136

CONVERSATIONS

By Lisa Sarasohn
Synthesizer pioneer Robert Moog speaks out on music.

DEPARTMENTS

82

HOME OFFICE CHOICE

By Tony Roberts
Microsoft Publisher.

84

WORKPLACE

By Daniel Janal
How to manage people you rarely see.

92

ARTS & LETTERS

By Robert Bixby
Publishing with Ensemble.

94

DISCOVERY CHOICE

By Heidi E. H. Aycock
Kid Works.

96

PATHWAYS

By Steven Anzovin
Multimedia education.

98

MULTIMEDIA PC

By David English
Two Mac CD-ROMs.

100

ENTERTAINMENT CHOICE

By Peter Olafson
Gunship 2000.

102

GAMEPLAY

By Orson Scott Card
Build castles in your PC.

REVIEWS

110

Quicken for Windows,
FoxPro 2.0,
Harvard Graphics,
Smith Corona Acer PC
110/286,
The Far Side
Computer Calendar,
Mickey's Jigsaw Puzzles,
Mario Andretti's Racing
Challenge,
Paradox Engine,
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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.

One use, of course...

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

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

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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

PC GAMES

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 fry 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, it's

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EDITORIAL LICENSE

Clifton Karnes

That's right. The issue you hold in your hands *does* say February/March. But don't worry—we're not going bimonthly, and subscribers aren't going to lose an issue. If you signed on to *COMPUTE* for a year, you'll still get 12 issues. For example, if your subscription was due to run out in May 1992, now it will expire in June 1992.

Why the combined issue, then? Here's the story.

As many of you know, *COMPUTE* used to be part of ABC, the network that made the phrase *up close and personal* part of our national culture. Well, in May 1990, *COMPUTE* was purchased from ABC by GMI, a dynamic company that publishes a score of magazines, including the popular *OMNI*.

From the beginning of our relationship with GMI, *COMPUTE* and *OMNI* have been closely related. The readers of the two magazines have much in common, and as a result, we often cover the same topics, though from different points of view. *COMPUTE* has remained a hands-on magazine for PC owners, and *OMNI* is a trailblazer of science

fact, fiction, and opinion.

The close relationship between *COMPUTE* and *OMNI* was further enhanced last year when *COMPUTE*'s senior editor, Keith Ferrell, left *COMPUTE* to take over the position of editor at *OMNI*. Even after he left *COMPUTE*, Keith continued on our masthead as senior editor emeritus, and he always made himself available for advice and encouragement.

With so much in common, it made sense to bring the magazines together in one location. So *OMNI* has moved from its offices in New York City to Greensboro, North Carolina, *COMPUTE*'s home.

This move has two major benefits. First, the two magazines can share physical resources. *COMPUTE* has a leading edge network system with more capacity than we need. And *COMPUTE*'s offices boast more than enough room for an extra staff. The second major benefit of *OMNI*'s move is the day-to-day contact we'll have with each other. We expect the exchange of ideas, technical information, and gossip to be invigorating for both groups.

So, what does all this have to do with the *February/March* on your issue? With *COMPUTE* and *OMNI* working together and sharing production facilities, we needed to move the two magazines' on-sale dates two weeks apart so that both publications wouldn't be requiring the same resources at the same time. After much discussion, it seemed that the best way to do this was to make *COMPUTE*'s February issue our February/March installment and to have our April issue appear on the newsstand two weeks earlier than it would have.

As a result of this change, our *PC Disk* and *Amiga Re-*

source Disk will be changing months. *PC Disk*, which appears every other month, used to accompany issues in even-numbered months: February, April, June, and so on. The disk will accompany the February/March issue (as it normally would), but since the next every-other-month issue is May, the disk will accompany that issue and will correspond with odd-numbered issues from then on.

Similarly, *Amiga Resource Disk*, which used to ship in odd-numbered months, will appear in even-numbered months after the February/March issue.

This may sound complicated, but it isn't really. Whether you subscribed to *PC Disk* or *Amiga Resource Disk*, you'll continue to get your disk every other month, but since we have just one issue for February and March, the name of the month appearing on the magazine will change. That's all there is to it.

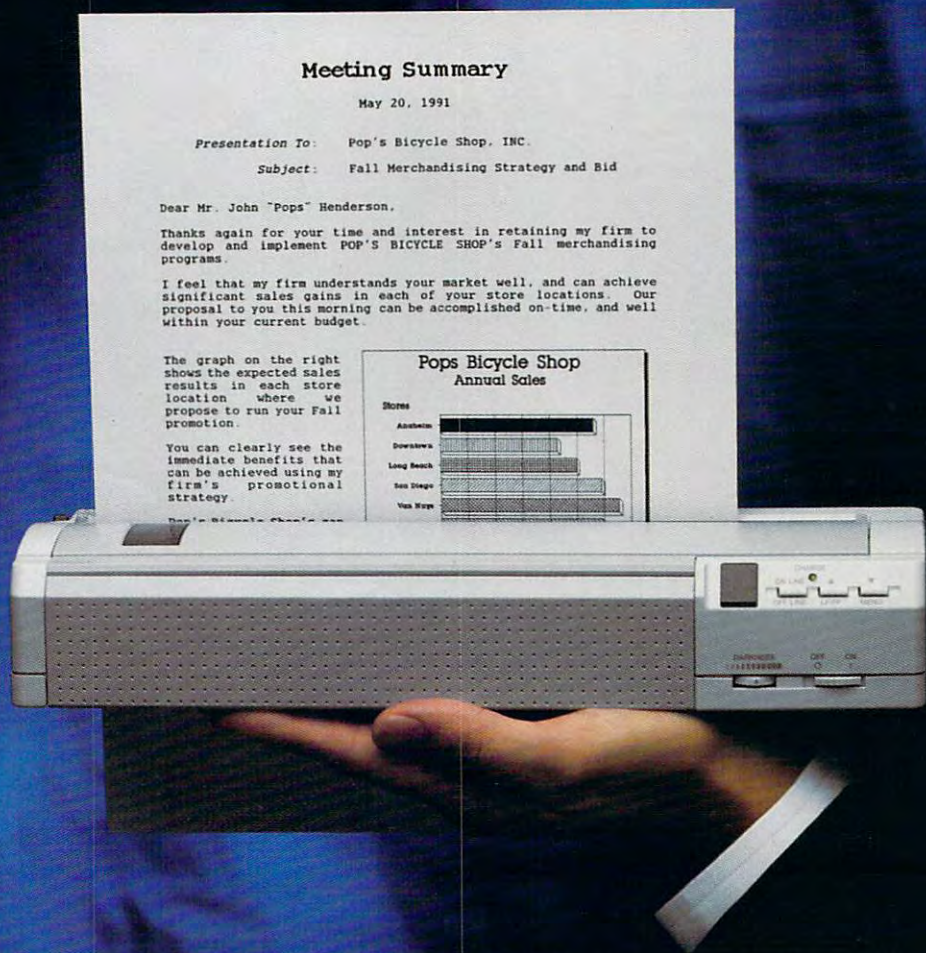
What does this change mean to you? As I said earlier, if you signed up for 12 issues, you'll still get 12. So you won't lose anything. And you'll be getting your issues earlier. From April onward, you'll see *COMPUTE* at least two weeks earlier than you used to.

When you look at the big picture of *OMNI*'s move to Greensboro, there's no downside. Both magazines will continue to serve their audiences with the highest-quality information possible. *COMPUTE* will still focus on the leading edge of PC software and hardware technology, and *OMNI* will still tackle challenging issues in the scientific realm. *COMPUTE* readers will get their magazine two weeks earlier, and everyone—readers, as well as *COMPUTE* and *OMNI* staff—will benefit from the closer relationship. □

It makes sense to bring OMNI and COMPUTE together, so OMNI has moved its offices from New York City to Greensboro, North Carolina.



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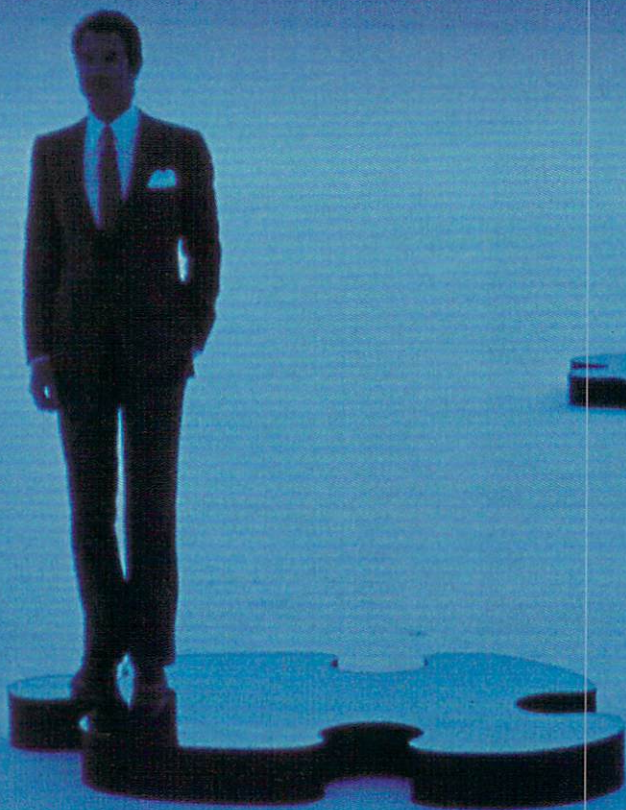
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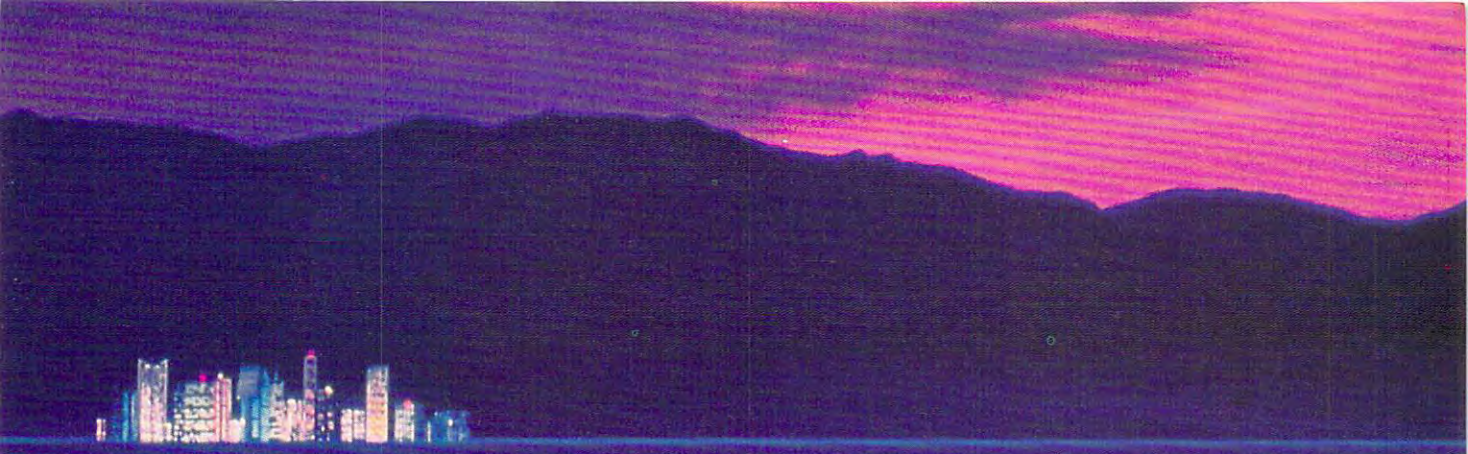
PUT THE MEMORY PUZZLE
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MANAGING YOUR PC'S MEMORY

BY DAN GOOKIN



As technology drags a reluctant DOS into its second decade, one of the issues PC users face is memory management. And thanks to a lack of Darwinian evolution, the procedures for dealing with memory are downright gross. Thankfully, memory managers exist to give you control over the



megabytes of RAM most PCs now contain. DOS legitimized the process when version 5.0 came out. But that doesn't simplify the problem.

In order to understand memory management, you need to know how memory is used in a PC. Further, you need to acquaint yourself with some of the strange terms used to describe memory—primarily the differences between extended and expanded memory and why one is more useful than the other. Then comes learning the memory management techniques that finally help you get your full hardware dollar value under DOS.

Memory in Your PC

Everything starts with the traditional memory map, as shown in figure 1. All PCs, regardless of their microprocessors, have two main areas of memory: conventional memory, which is also called DOS memory, and upper memory, which is sometimes referred to as reserved memory. Together these two areas constitute the basic one megabyte of memory used in all PCs.

Why only one megabyte? Because that was the design of the original PC. Its 8088 microprocessor could only access 1MB of RAM. Further, it could only use that memory in 64K chunks. Therefore, the basic 1MB memory map is divided into 16 banks of 64K each, numbered 0 through 9, then A through F (see figure 1).

IBM designed the bottom ten banks of memory—10 × 64K or 640K of memory—for use by DOS and for running

programs. That was ten times the amount available in competing CP/M computers of the early 1980s—a truly massive amount for a personal computer. The rest of the memory, the 384K that makes up the upper memory area, was devoted to future expansion: ROM BIOSs, video systems, network adapters, and so on.

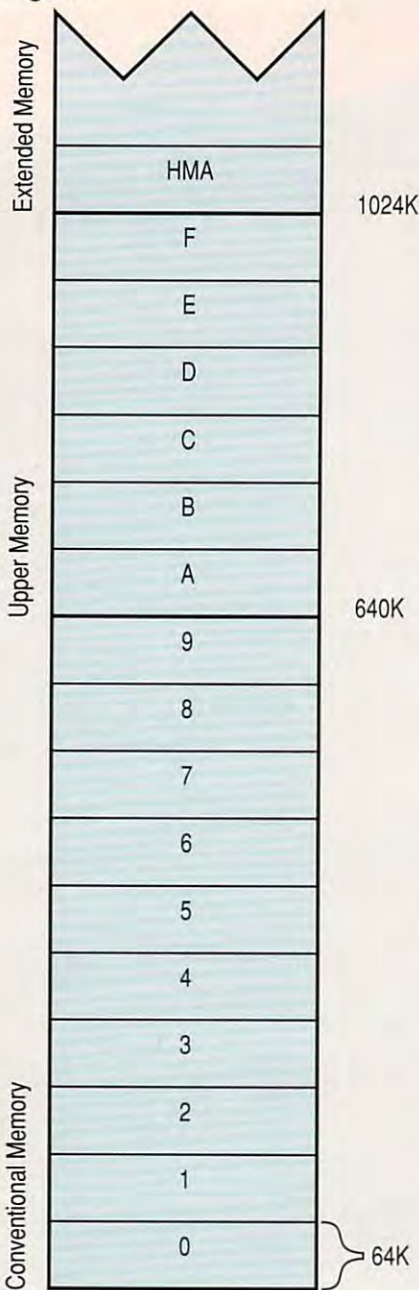
This would all work great, and everyone would be happy save for two things: People wanted their PCs to do more, so programs got bigger, and new PC microprocessors appeared that could access more than the 8088's paltry 1MB.

Extra Memory in Your PC

For a program to do more, it requires more memory. After a short time, PC applications grew in size, quickly reaching the 640K "brick wall." There is no way around that problem; 640K was and is the max for all DOS programs, period. Several work-around solutions were developed, such as memory resident programs, also called TSRs (for Terminate and Stay Resident), that allow software to pop up at the press of a key. But the only lasting and practical way to give DOS applications more memory was expanded memory. (Keep that thought warm for a second.)

The other problem with the 640K limit surfaced with the new, powerful microprocessors hardware manufacturers began tossing into PCs. First the 80286 could access up to 16MB of RAM, 16 times the original PC's limit, and later the 80386

Figure 1



for DOS programs that need extra memory. Extended memory is useful, but under DOS it's merely a name given to any extra memory (above the 1MB mark) in an 80286 or later PC. Table 1 lists the differences, but up front you should remember that for DOS programs, it's expanded memory you want.

Expanded Memory

Expanded memory is basically an extra hunk of memory in your computer—something like another hard drive, only it's memory. To put this memory into an 8088 or 80286 computer, you need to add an expanded memory adapter card, such as the AST RAMPage! or Intel AboveBoard. For 386 PCs, you create expanded memory by using a device driver to convert your extended memory into the more useful expanded memory. (That trick can also be done with some 80286 systems, specifically those with the NEAT or AT/386 CHIPSet from Chips and Technologies.)

On the software side, expanded memory is controlled using the Expanded Memory Specification, or EMS. Since expanded memory was developed by Lotus, Intel, and Microsoft, the

spreadsheet, you have no way of knowing that it's really using some 4MB of expanded memory for storage. All the technowizardry is handled by the 1-2-3 software working with the EMS device driver.

The page frame sounds rather inefficient and inelegant. After all, looking at 32MB of memory via a 16K page is limited. However, your hard drive is accessed only 512 bytes at a time. And working with memory is much quicker than working with a mechanical hard drive, so expanded memory can really be quite zippy. To augment the process, LIM 4.0 EMS also gives you a giant 384K page frame in conventional memory. This allows for major movement of data to and from expanded memory, and it's how task swappers like *Software Carousel* and *DESQview* move programs into and out of memory at the touch of a key.

Expanded memory is the true solution for extra memory under DOS and with DOS applications. All PCs can have expanded memory, and most programs that could use a few kilobytes of extra memory will support expanded memory. Fortunately, there are only a

Table 1

	Expanded memory	Extended memory
Extra memory in a PC	Yes	Yes
Memory above 1MB	No	Yes
8088PC	Yes	No
80286 or later PC	Yes	Yes
DOS programs	Yes	No
OS/2, UNIX, and so on	No	Yes
Data storage	Yes	Yes
Standard	EMS	XMS

raised the roof to 4096MB, or four gigabytes, of RAM. All that extra memory is referred to as extended memory.

Extended memory sounds like a dream come true: acres of ready RAM. The problem is that DOS cannot use extended memory to run programs; all PCs—regardless of their microprocessors—are stuck with the same 640K limit as the old 8088 when they run DOS. Therein lies the rub: To be compatible with DOS and its volumes of programs, you have to all but ignore your PC's extended memory.

Welcome to the first hurdle to understanding memory management. There are two types of extra memory in a PC, expanded and extended. Of the two, expanded memory is the best solution

standard is referred to as LIM 4.0 EMS. The 4.0 refers to the version, which presently allows for up to 32MB of expanded memory in a PC.

Since expanded memory isn't a part of the PC's basic memory layout, it must be accessed through a special area of memory called the page frame. That's a 64K chunk of upper memory that contains four 16K pages. Each page contains memory that can be copied to expanded memory or that was read from expanded memory (see figure 2).

The page frame and all of expanded memory are controlled by the EMS device driver. That's how your software accesses the extra memory. So when you're working on that massive 1-2-3

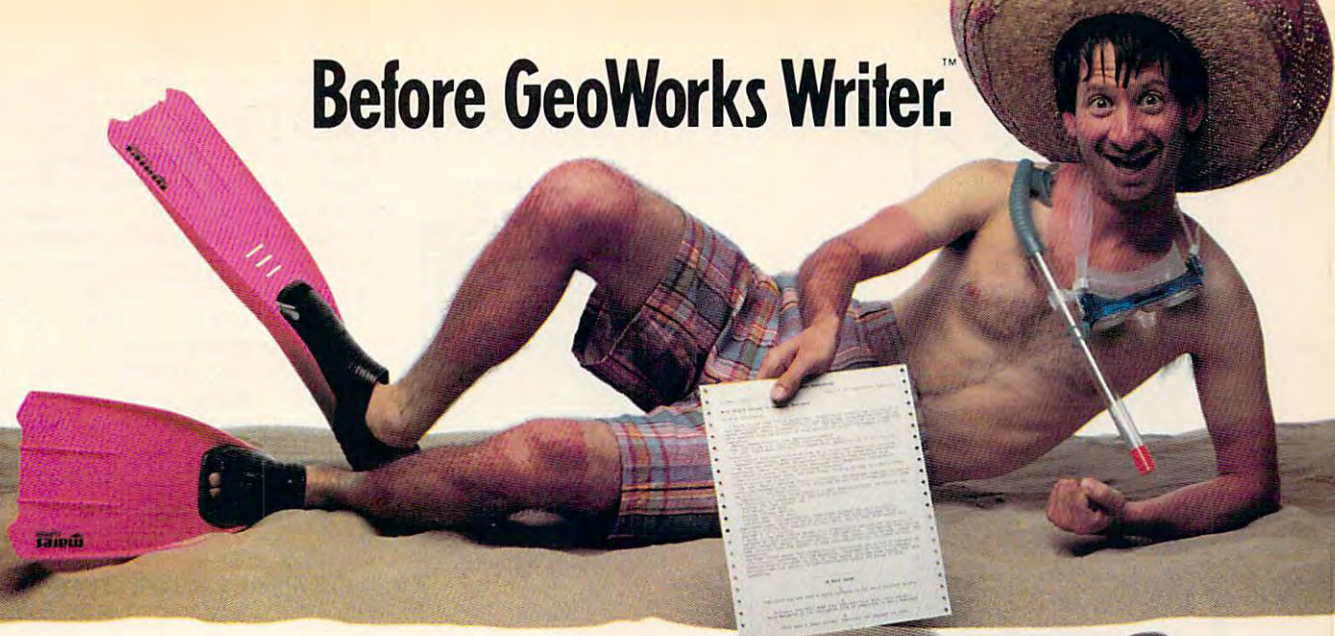
few acronyms and silly terms to learn: *EMS*, *LIM*, and *page frame*. But unfortunately, memory management doesn't end here.

Extended Memory

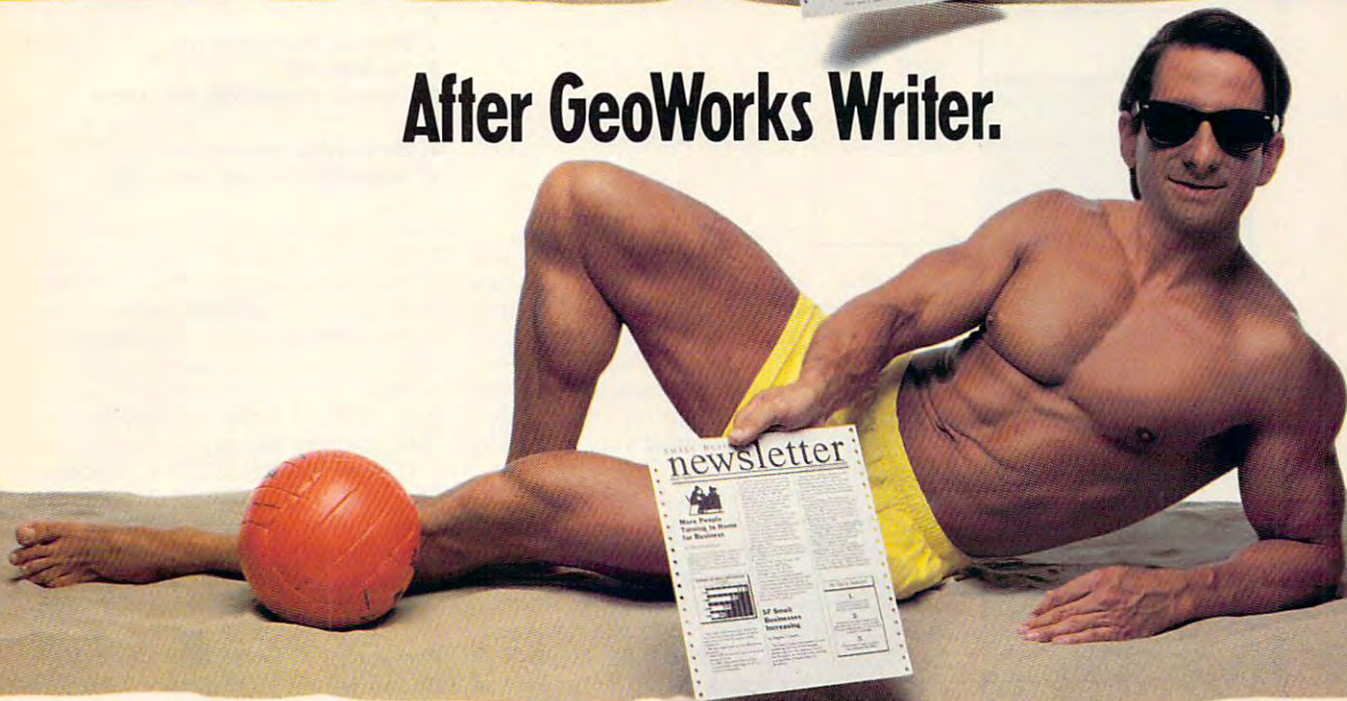
Extended memory is an often cursed at and confusing element of memory management. Basically, extended memory is extra memory above the 1MB mark on 80286 or later PCs. Whenever you add memory to those systems, you're adding extended memory. (On an 80286, you add expanded memory via an expansion card.)

The unfortunate part is that DOS can't run programs in extended memory. To use extended memory, your PC must run in its protected mode. DOS is

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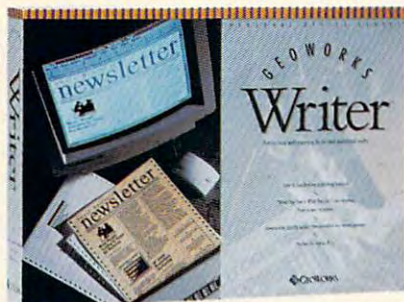
lishing features like multi-column layouts, easy importing of graphics (it comes with clip art!) ... even its own award-winning graphical environment* that makes using it as easy as clicking a mouse. And if you think it's amazing alone, just wait until you see it working with the rest of the Personal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

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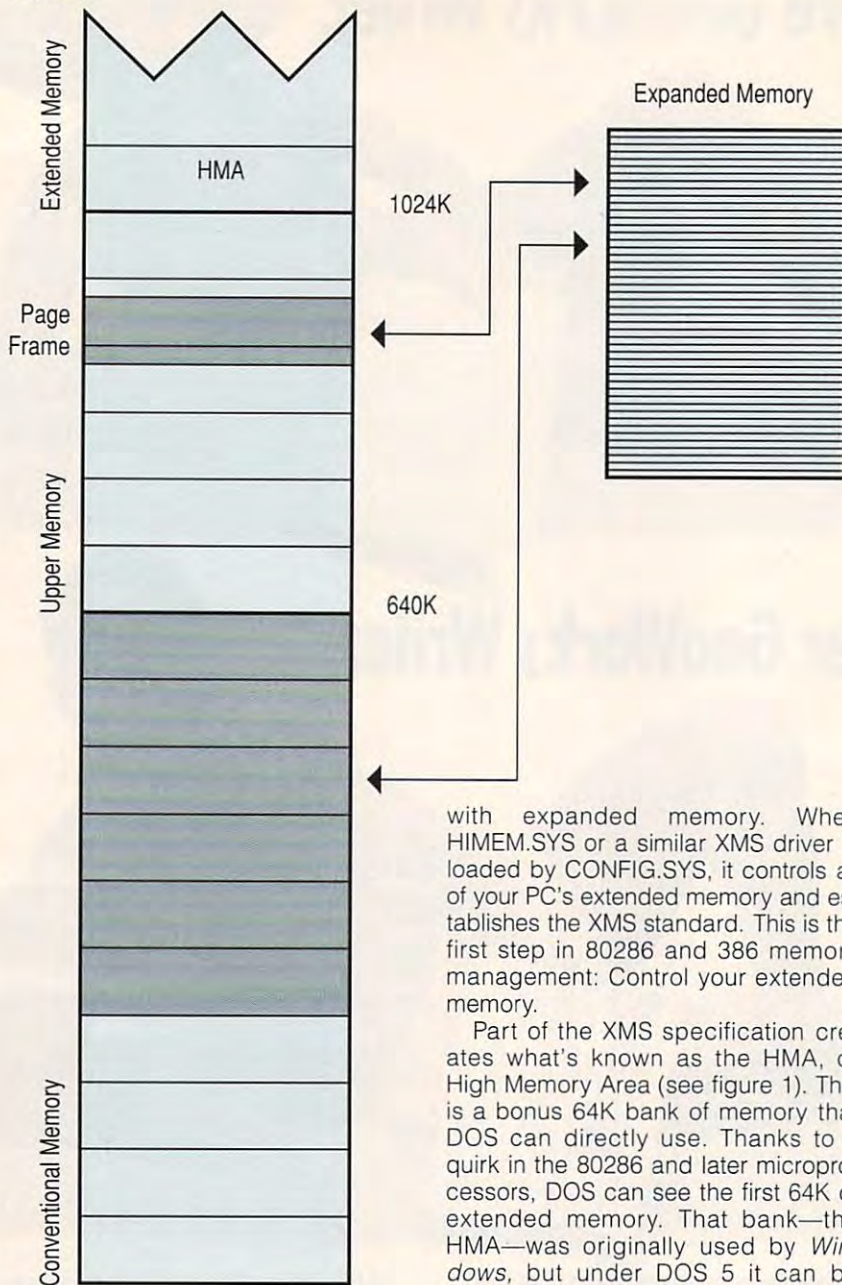
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Figure 2



an 8088 or real mode operating system. If you have OS/2, UNIX, or Xenix, which are protected mode operating systems, then extended memory is required. But under DOS, extended memory is a white elephant.

Don't write off extended memory just yet! It can still be used under DOS for data storage, RAM drives, and disk caches. And on 386-level systems, extended memory can be converted into expanded memory. This all starts with an extended memory driver, such as HIMEM.SYS, which comes with DOS 5.

HIMEM.SYS controls extended memory via the Extended Memory Specification, or XMS. That's a set of rules for accessing extended memory just as the EMS is a set of rules for working

with expanded memory. When HIMEM.SYS or a similar XMS driver is loaded by CONFIG.SYS, it controls all of your PC's extended memory and establishes the XMS standard. This is the first step in 80286 and 386 memory management: Control your extended memory.

Part of the XMS specification creates what's known as the HMA, or High Memory Area (see figure 1). This is a bonus 64K bank of memory that DOS can directly use. Thanks to a quirk in the 80286 and later microprocessors, DOS can see the first 64K of extended memory. That bank—the HMA—was originally used by *Windows*, but under DOS 5 it can be shared between DOS and *Windows* and help save conventional memory.

HMA is the last of the acronyms you need to learn to understand memory on a PC. The others are EMS and XMS. And the different types of memory are conventional, upper, expanded, and extended memory. Between expanded and extended memory, expanded is more useful for DOS. And the bottom line for everything, technical terms aside, is that a system with an 80386-level microprocessor opens more doors for you than any other type of PC. This becomes apparent when you start managing all that memory.

Managing Memory with DOS 5

There are three steps to memory management under DOS 5: The first is to

establish control over extended memory, creating the HMA with HIMEM.SYS and loading DOS into that area. Next comes creating upper memory blocks, or UMBs, and optionally converting over any expanded memory. Finally, there's loading high, which is the process of moving device drivers and memory resident programs (TSRs) into upper memory blocks.

This is important, but it can be confusing. The object of DOS memory management is to free up as much conventional memory as possible, giving your applications more breathing room. Follow along closely, and refer to the sample CONFIG.SYS file in figure 3.

Figure 3

- 1: REM This is a typical DOS 5 CONFIG.SYS file.
- 2:
- 3: device=c:\dos\himem.sys
- 4: dos=high,umb
- 5: device=c:\dos\emm386.exe noems
- 6:
- 7: devicehigh=c:\dos\ansi.sys
- 8: devicehigh=c:\mouse\mouse.sys

The first memory manager in your DOS 5 CONFIG.SYS file is HIMEM.SYS (refer to figure 3, line 3). HIMEM.SYS controls extended memory, sets up the XMS standard, and creates the HMA. In order to do all that, you need to have an 80286 or later PC with at least 350K of extended memory (any 1MB machine will do).

Given that HIMEM.SYS is in control, your next step is to load DOS into the HMA. This frees up 40K to 50K of conventional memory, making that much room available to your applications. The command DOS=HIGH in CONFIG.SYS does the job (figure 3, line 4).

If you have an 80286-level system, this is where DOS 5 stops. You've freed up some 50K of conventional memory, but that's all DOS 5 can do for your machine. If you have an expanded memory card in your system, your next step would be to load your EMS driver (EMM.SYS or something similar), followed by a third-party memory manager, if you have one. Otherwise, the 80286 choo-choo stops here.

On a 386 system, the next step is to create upper memory blocks, or UMBs. These are unused areas of upper memory—that 386K of reserved future expansion memory in all PCs (see figure 1). IBM was quite liberal in giving the PC 384K; in most systems, half of that space is empty. To use it under DOS 5, you can install the EMM386.EXE device driver. (Yes, it ends in EXE even though it's a device driver.)

EMM386.EXE will fill in the cracks of upper memory, putting useful RAM in-

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OPTIMIZING WITH QEMM OR 386MAX

Third-party memory managers offer a whole gang of optional switches to customize the way they control your PC's memory. For example, the following command in CONFIG.SYS sets up *QEMM*.

```
DEVICE=C:\Q\QEMM386.SYS R:2 RAM ST:M
```

QEMM installs both the XMS and EMS drivers for your system's extended memory, as well as creating upper memory blocks. Therefore, one command in your CONFIG.SYS file serves the same functions as HIMEM.SYS and EMM386.EXE under DOS.

The R:2 option is what loads *QEMM* into high memory, saving you some 12K; RAM works like EMM386's similar switch to create UMBs; and ST:M turns on *QEMM*'s Stealth option. That compacts and relocates ROM and BIOS areas of upper memory, giving you more UMBs. It doesn't really free up space under DOS, but the memory savings are enormous under *DESQview* and *Windows*.

386MAX is a heavy-duty memory manager competing toe-to-toe with *QEMM*. The following line sets up *386MAX* in CONFIG.SYS.

```
DEVICE=C:\MAX\386MAX.SYS  
PRO=C:\MAX\386MAX.PRO
```

The file 386MAX.PRO is the memory manager's profile; it contains a list of command line options for *386MAX* that keep your CONFIG.SYS file from getting junky.

Both *QEMM* and *386MAX* have video memory-stealing options. For *QEMM* the option is VIDRAMEGA. That preserves EGA and VGA memory. Then you use the memory resident VIDRAM utility to turn that extra memory on or off. *386MAX* uses the option CGA to hand over an extra 96K of EGA or VGA memory to DOS. Either way, you up the limit of DOS from 640K to 736K.

to the unused spaces. Those areas of memory then become the upper memory blocks. This is done by installing the EMM386.EXE device driver into your CONFIG.SYS file, along with its NOEMS option (figure 3, line 5). Note that EMM386.EXE must come after HIMEM.SYS is installed.

In addition to installing EMM386.EXE, you also need to tell DOS that there will be UMBs. The command DOS=UMB does that in your CONFIG.SYS file. Since DOS is already equal to HIGH, you can simply stick a comma at the end of the command and then add UMB (see figure 3, line 4).

Once the UMBs are created, you can load device drivers and memory resident programs into them. This frees up conventional memory dramatically; with all your 4K, 10K, and 25K de-

vice drivers in the upper memory area, you'll have that much more conventional memory available to your programs.

The command to load device drivers high is DEVICEHIGH. It's used in CONFIG.SYS exactly like the DEVICE command. (See figure 3, lines 7 and 8.) The LOADHIGH command is used at the DOS prompt, or more likely in AUTOEXEC.BAT, to load memory resident programs into UMBs. Just put LOADHIGH, or its abbreviated form LH, in front of any memory resident program you want to load high. Here's an example.

LH DOSKEY /INSERT

In the example above, the LOADHIGH command will put the DOSKEY keyboard macro program into a UMB. Note that any options that would normally follow the TSR in AUTOEXEC.BAT or at the DOS prompt are still specified; the only addition is LH or LOADHIGH inserted before the program's name.

You can load high all you want. Consider bringing out older TSRs and device drivers you didn't think you had the RAM for and using them once

again. (Hello, *Sidekick!*) DOS will load each of them high until there are no more UMBs. When you run out, DOS will load the program low as it did before. You can use the MEM command with the /C switch to see which programs are loaded into UMBs and which are loaded low. (Note that HIMEM.SYS and EMM386.EXE cannot be loaded high.)

Together, all these commands carry out DOS's memory management to the fullest—provided you're a *Windows* user. *Windows* wants and needs extended memory to run. If it sees one byte of expanded memory, *Windows* blanches and won't run in its powerful 386-enhanced mode.

If you don't use *Windows* or if you'd like some expanded memory for the DOS applications on your 386, then you can use the EMM386.EXE device driver to convert some or all of your extended memory into expanded memory.

Figure 4

1: REM This is another DOS 5 CONFIG.SYS file.

2:

3: device=c:\dos\himem.sys

MEMORY TERMS TO DRIVE YOU INSANE

Here's a rundown of common memory terms and some of the jargon you'll see over and over as you work with DOS 5 or a third-party memory manager.

A20. The microprocessor address control line that provides access to the HMA.

BIOS. Basic Input/Output System. The primary ROM instructions for a PC, hard drive, video card, and so on.

conventional memory. The basic 640K of memory available for running DOS programs. Also called DOS memory or low DOS memory.

8088. Any PC that has an 8088, 8086, or similar microprocessor.

80386. Any PC that has a 386-family microprocessor: 386DX, 386SX, i486, 486SX, or similar chips.

80286. Any PC that has a 286 or similar microprocessor.

EMS. Expanded Memory Specification. The rules for working with expanded memory, both hardware and software.

expanded memory. Extra memory for all PCs, which is directly usable by DOS and DOS applications.

extended memory. Memory above the 1MB mark in 80286- and 386-level PCs. Used in *Windows* and other protected-mode operating systems.

G. Abbreviation for *gigabyte*; 1 billion bytes.

HMA. The High Memory Area. An extra bank of memory for DOS created in extended memory by an XMS driver (like HIMEM.SYS).

K. Abbreviation for *kilobyte*. Although *kilo* means 1000, 1K is actually 1024 bytes.

LIM 4.0. Lotus-Intel-Microsoft. The foun-

ders of the Expanded Memory Specification. The 4.0 refers to the version number.

MB. Abbreviation for *megabyte*; 1 million bytes.

RAM. Random access memory. The memory in a PC where the microprocessor can store and manipulate information. This is the area where the work gets done by your applications.

ROM. Read only memory. Usually a chip with instructions for the computer. It's accessed just like RAM, but it cannot be written to or altered.

shadow RAM. A way of speeding up upper memory by copying it to special high-speed RAM. This option is best left turned off when you have a memory manager installed; you'll have more memory available that way.

TSR. A memory resident program. An acronym for *Terminate and Stay Resident*, a DOS programming function.

UMBs. Upper memory blocks. Unused portions of upper memory where device drivers and TSRs can be loaded high.

upper memory. The top 384K in the first megabyte of all PCs. It may also be called reserved memory or high DOS memory. It's often abbreviated *UMA*.

V86. The Virtual-86 mode of the 386 microprocessor. Using this mode, a single 386 chip can be made to emulate several 8086-level computers. This is how environments such as *DESQview* and *Windows* can run several programs at a time.

XMS. The Extended Memory Specification. It consists of rules for accessing and controlling extended memory, as well as creating the HMA.

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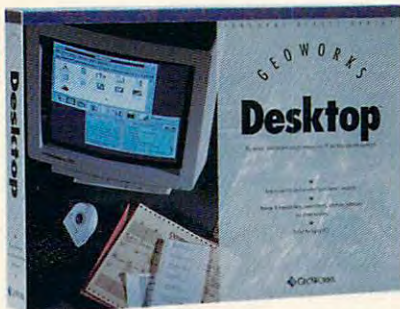
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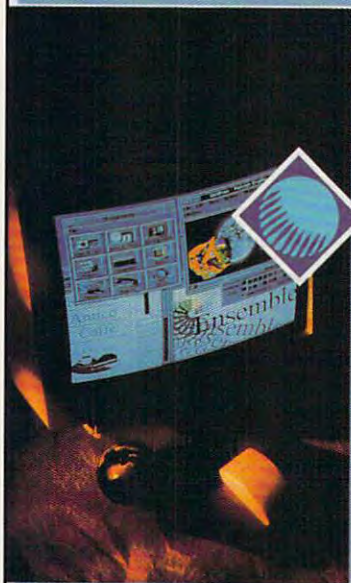


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4: dos=high,umb
5: device=c:\dos\emm386.exe 1024 ram
6:
7: devicehigh=c:\dos\ansi.sys
8: devicehigh=c:\mouse\mouse.sys

Figure 4 is almost identical to the CONFIG.SYS file in figure 3. The EMM386.EXE device driver line is a bit different, however (line 5). First, the value 1024 is specified, and second, the RAM switch is used instead of NOEMS. Otherwise, everything is identical.

The value 1024 after EMM386.EXE indicates that 1MB, or 1024K, of extended memory is to be converted into expanded memory. By default, EMM386.EXE wants to convert 256K of extended memory into expanded. It can convert any value you specify, from 16 on up to 32768 for 16K through 32MB, but usually is limited by the amount of extended memory you have to begin with. Any memory you don't convert remains as extended memory for programs that need it.

The RAM option is basically the same option as NOEMS; both cause EMM386.EXE to create UMBs. The difference is that RAM is used when expanded memory is created. NOEMS directs EMM386.EXE not to create any expanded memory. (Therefore, NOEMS is only used in situations where only extended memory is required, such as when running *Windows*.)

This wraps up what DOS can do with its memory management abilities. It's not bad considering how much more conventional memory you'll have. But it does require a lot of work on your part, editing CONFIG.SYS and AUTOEXEC.BAT to set everything up and load your programs high. If that bothers you, then you should consider the blessings that third-party memory managers offer.

Third-Party Memory Managers

DOS 5 provides a lot of solutions that already existed out in third-party products. Memory management is one of them. While DOS 5 now does memory management, and not too badly, third-party memory managers have been around much longer and do things much more neatly—and automatically. If the bottom line excites you, then know that third-party memory managers often give you an extra 20K to 30K of conventional memory over what DOS provides.

Up front, third-party memory management setup is automatic. Your system is analyzed and customized by a series of tests and self-resets. There's no need to toil with editing CONFIG.SYS or AUTOEXEC.BAT ever. When you make changes to the system, you simply rerun the op-

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timization utility that came with the memory manager. Everything is set up for you. It's really painless.

If you want to go beyond the basics, the third-party memory managers also give you greater control over your memory. Special options let you customize how memory is used beyond what the automatic installation programs can do. These include options to control shadow memory, include or exclude certain parts of upper memory to work around special expansion cards, or really give you a memory boost by taking advantage of unused video memory.

Stealing video memory is one sure-fire way to break through the 640K barrier. For example, if you have an EGA or VGA graphics adapter, you can surrender its high-resolution graphics memory to DOS, adding an extra 64K or 96K to conventional memory. That ups the ceiling from 640K to 704K or even 736K. Wow! Most programs immediately recognize and greedily gobble up the extra memory—more than they would ever have otherwise. But this trick isn't without cost: Any graphics programs or applications that use a graphic screen (such as *WordPerfect's* Print Preview) won't work; you'll just get plain CGA color text.

Presently, two powerhouse memory management packages are available

for 386 systems: *386MAX* (Qualitas, Suite 1386, 7101 Wisconsin Avenue, Bethesda, Maryland 20814; 301-907-6700; \$99.95) and *QEMM* (Quarterdeck, 1901 Main Street, Santa Monica, California 90405; 213-392-9851; \$99.95). Both offer automatic installation and optimization, extensive options for customizing memory on your system, and 100-percent compatibility with DOS 5, *Windows*, and *DESQview*.

Bottom Line

Memory management is going to be a major DOS theme for quite some time to come. The problem has been around since the first spreadsheet users hit their heads on the 640K barrier, and it will be with us until DOS (or its successor) offers a smooth method of accessing extra memory without headaches. Until all these problems are solved, there will be terms to learn, acronyms to identify, and various interesting things to work out in *CONFIG.SYS* and *AUTOEXEC.BAT*.

But the best part about memory management is that once you've set up your PC, you can forget about it. With the proper memory managers installed and the system tested, you can get on with your work and enjoy all the hardware and memory you've paid for. Soon you'll be swimming in RAM. □

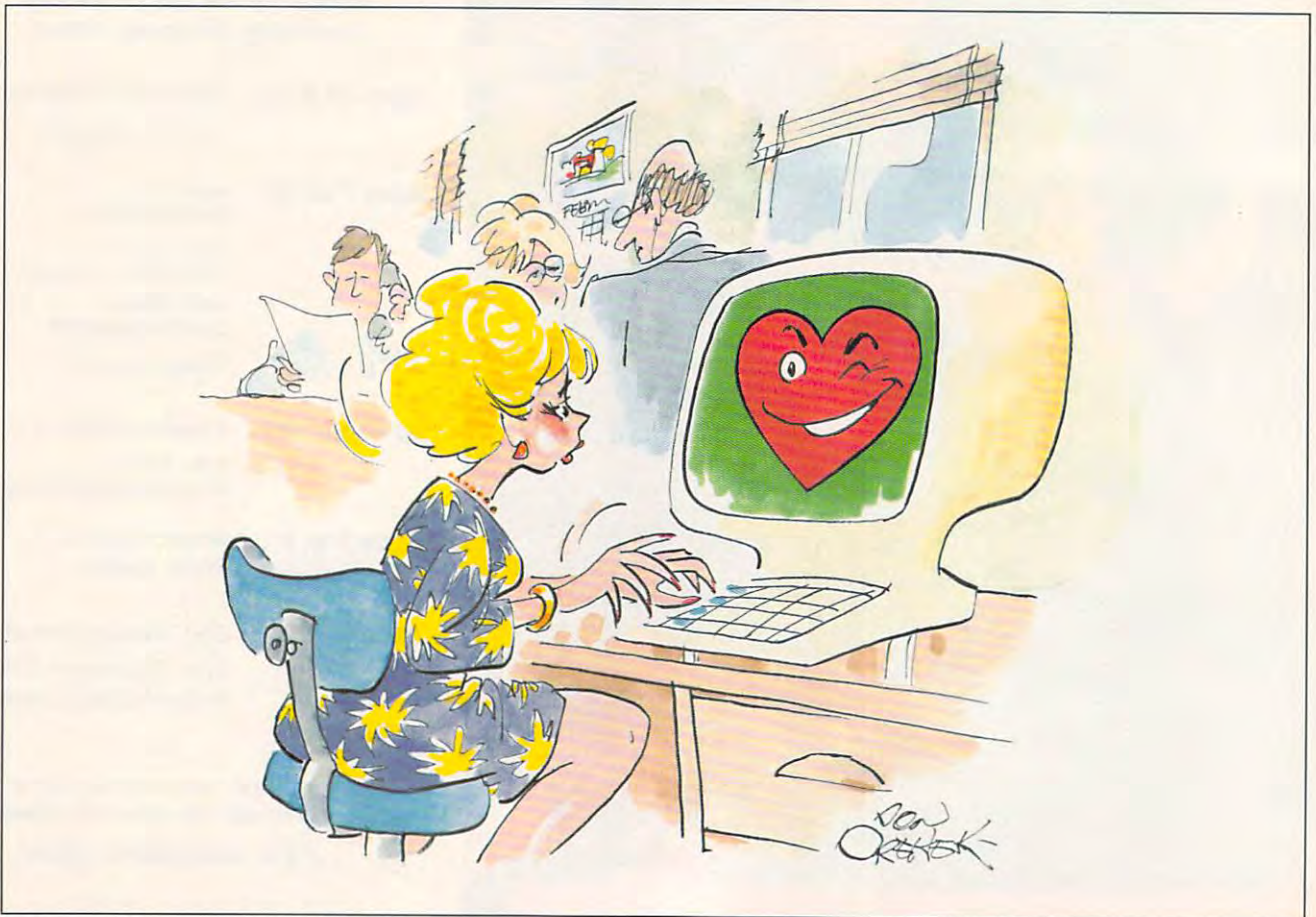
WORKING WITH AN 80286

The DOS 5 memory management solution—like all memory management solutions—works best with 386 systems. If you have an 8088 or 80286 system, however, all hope is not lost. There are solutions, but only with the aid of third-party hardware and software.

Your first step is to install a LIM 4.0 hardware-compatible EMS expansion card. Pack it full of RAM, maybe 2MB worth. Next, you'll need to purchase a third-party memory manager. My recommendation is *QRAM* from Quarterdeck. Under DOS 5, you can then set up your *CONFIG.SYS* file as follows.

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\EMM.SYS AT 258
DEVICE=C:\Q\QRAM.SYS R:1
DOS=HIGH,UMB
```

HIMEM.SYS is loaded first, followed by the expanded memory manager for your EMS expansion card. Next, *QRAM* is loaded to control expanded memory. Finally, you can load DOS high and create UMBs with the DOS configuration command. From that point forward, the DOS commands *DEVICE-HIGH* and *LOADHIGH* will work on your system just as they would on a 386. The overall conventional memory savings won't be as great, but this is the best that can be done with an 80286.



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drivers had to do was generate an acceptable dither pattern for 16 shades of gray. But now color seems to be coming from everywhere. Just take a look at the number of color printer drivers available in new software applications. Meanwhile, the price and performance of color printers tantalize general computer users because of technological advances and increased competition.

This month's Test Lab focuses on eight printers with color capabilities—from a 9-pin dot-matrix to a sophisticated thermal printer—and helps you decide which printer best fits your needs. Here you'll find benchmarks, output samples, and eight penetrating

by giving home-based computer users exceptional dot-matrix color output, along with a number of other attractive features, at a reasonable price.

The GSX-140 PLUS employs a 24-pin printhead for well-defined text printing. If you're looking for solid color graphics output, as we are in this month's Test Lab, the optional color kit reviewed here fits the bill nicely. With the color kit and a color ribbon installed, you should select the Color Ribbon option from the installation menu—even if you only print in black.

Anyone working in color will most likely be working within the *Microsoft Windows* environment.

Although Citizen doesn't ship a *Windows* driver with the printer, one is available from Citizen's electronic bulletin board. After installing that driver, I found that the color printing worked flawlessly with a variety of applications—from low-end graphics packages like *Paintbrush* to high-end packages like *CorelDRAW!* and *PageMaker*. The productivity packages I used, *Ami Pro* and *Excel*, also printed in color without a hitch.

According to the documentation for this Citizen, you should be able to use the printer driver for the Epson LQ-2500 (a printer with color capability); however, I wasn't able to get color printing from *Windows* using that driver. The manual does provide instructions for configuring the printer to work with several leading DOS applications, including *Harvard Graphics*, *Lotus 1-2-3* (version 2.2), *Microsoft Word*, *The New Print Shop*, *WordPerfect*, and *WordStar* (version 6.0 and *Professional*).

Configuration of these and other DOS applications may require that you write a macro to control how the software interfaces with the printer. Fortunately, Citizen makes this work a little easier for you. With the GSX-140 PLUS, you can create macros by using the utility and reference disk which comes with the unit. It took me only a couple of minutes to create a macro for printing color output from *Harvard Graphics* 3.0. Alternatively, you can load macros through the Command-Vue menu system on the printer's panel.

Almost all of the color output I produced was acceptable for the majority of small business presentation and graphics needs. Charts and colored text were quite bright and well defined. A detailed image from *CorelDRAW!* also reproduced well, including several subtle shadings of color. A *Harvard Graphics* image with a dark background revealed the printer's propensity to create



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bands across the page. However, such banding is to be expected from a dot-matrix printer. Overall, I thought the brighter colors fared better and the printer's ability to mix colors and shadings was exceptional. Graphics printing took some time to emerge from the printer; I would recommend using a print spooler or upgrading the printer's memory from the standard 8K to 40K with the optional memory expansion chip.

In other categories, the GSX-140 PLUS also performed well. I found text very readable and sharp using the printer's built-in fonts or fonts created with *Adobe Type Manager*. In addition, I appreciated the printer's low noise level. At no point during testing did I feel that I had to abandon my small home office while running a print job.

More and more printer manufacturers are using color capability as a means of differentiating their products from their competitors' products. If your job requires the production of presentation materials, if you're looking for a way to enhance the educational uses of your home computer, or if you're interested in exploring the world of color graphics on your PC, this Citizen provides a low-cost, functional means of doing so.

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CITIZEN 200GX

If you're in the market for a good 9-pin dot-matrix printer that can also output in color, then read on: The Citizen 200GX may be just the ticket, especially if you're on a budget.

A compact unit with a small footprint, the 200GX weighs only 11 pounds and measures a demure 17 inches wide x 12.6 inches deep x 5 inches tall. While I found the output sound level to be tolerable, the 200GX is a bit on the noisy side (a characteristic of dot-matrix printers). Thanks to its light weight, however, you can easily move the printer farther away if the noise proves to be bothersome.

The printer comes standard as a black-and-white model, but it can also output color on command with the optional color kit. The color kit consists of a wider printhead and a four-band color ribbon. Installing the color kit is a snap—literally. The color printhead snaps into place, as does the color ribbon cartridge. Installation of the kit takes less than three minutes and doesn't require any technical prowess whatsoever.

The 200GX can churn out copy in high-speed draft mode at the rate of 240 characters per second and in near letter quality (NLQ) mode at 40 cps. Select character widths in sizes of 10,

12, 13.3, 15, 17.1, and 20 characters per inch. Two fonts (draft and high-speed draft) are available in data-processing (utility) mode while three fonts (roman, sans serif, and Courier) serve your needs in NLQ mode.

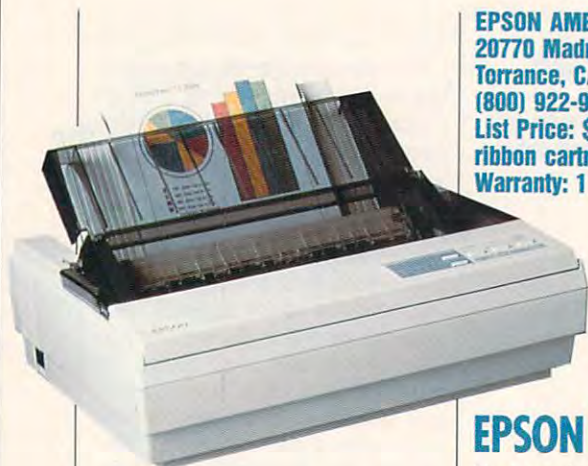
Single-sheet and continuous-form (tractor-feed) paper can be accommodated in widths up to ten inches and in weights ranging from 14 to 27 pounds. You can mount the included tractor-feed unit in the push mode for rear feed with paper parking or in pull mode for bottom feed or rear feed without paper parking. Single sheets are friction-fed from the top of the unit.

It's easy to select or change all features and settings via Citizen's Command-View II control panel. You can access any of 25 functions in three seconds or less through the four menus that comprise this control panel. Effective overall layout and design of the menus and control mechanism make this printer easy to use.

The well-written user's manual provides comprehensive coverage of the black-and-white features and functions of the printer. I would've liked to see more attention given to using the color kit option, especially since I didn't come across any software packages with dedicated drivers for the 200GX. More coverage of how to access and implement the color features would be a welcome addition to this otherwise fine document.

Available emulations allow the 200GX to perform and behave like an Epson FX-850 or an IBM Proprinter III. If you use the color kit and want to output in color, software should be configured to emulate an Epson EX-800 or Epson JX-80 printer. As I stated earlier, the manual should go into more detail for color-kit users. Only a brief, single mention of these Epson color printer driver emulations was made on page 194 of the manual, and it isn't referenced in the index.

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EPSON LQ-860

If you intend to use the 200GX in color mode with *GEM Artline 2.0* or *Presentation Team*, you'll need Digital Research's optional *Printer Driver Pack #7* for the Epson JX-80 driver (this is available free to registered GEM users by contacting Digital Research directly). The print resolution of the Citizen 200GX is 120 x 144 dots per inch with this driver.

Being accustomed to color output from much higher-end printers, I was pleasantly surprised that the 200GX did such a nice job using the Epson JX-80 driver. The printer can create seven pure colors (magenta, yellow, cyan, blue, green, red, and black) from its four-band ribbon, which is adequate for most spot color tasks. Since it can't dither (combine various color dots in sequence to produce additional colors), it isn't capable of outputting sophisticated color files which use color palettes composed of more than these seven solid shades.

If you need sophisticated color palette capabilities and high-resolution output, the 200GX is probably not for you. On the other hand, if you're on a tight budget and you need a good 9-pin dot-matrix workhorse that also has color capability, this Citizen may fit the bill nicely.

TOM BENFORD

Circle Reader Service Number 302

No fuss. No bother. No conflicts. Industry standard. When a printer manufacturer wants to convince you that it's selling a recognizably superior printer, it almost always stresses that the printer's Epson compatible. Well, you don't get much more Epson compatible than with an Epson, and the new Epson LQ-860 will give you more than compatibility—it provides smooth operation and brilliant color output for all of your small business needs.

Printers are often difficult to set up, but setup of this Epson is relatively simple, and the excellent Epson documentation makes understanding and operating the printer much easier. Maintenance should prove simple, and you shouldn't have to service the printer frequently.

I tested the LQ-860 with both DOS and *Windows* programs. Within each of these environments, I used the Epson LQ-2500 driver, which allowed me to take full advantage of the LQ-860's color capabilities. My printouts of a *Windows* bitmap, a *CorelDRAW!* sample, and a *Harvard Graphics 3.0* sample all proceeded without any complications.

As this is a 24-pin printer, you can expect some banding in your printouts. There was more of this than I would've liked, but I found the overall mix of colors and shading quite good. The results are certainly acceptable for

printing graphs in your spreadsheets and for making drafts of presentations. The banding seemed most noticeable with dark colors. If you're producing charts and graphs, put those graphics against a light background or against no background at all. The banding should be much less noticeable. You'll want to steer away from dark backgrounds anyway, as dynamic presentations incorporate lighter, brighter colors.

One frequently overlooked feature of color printers is the way they handle black text. In this area, the LQ-860 truly excels. Even when you're using the color ribbon cartridge, black characters appear sharply defined. With some dot-matrix color printers, the black ink tends to look washed out. Needless to say, when equipped with a black ribbon, the LQ-860 prints even better.

The paper-handling features of the LQ-860 are the standard ones that you'd expect in a printer of this caliber. Loading single sheets and continuous paper is simple. Paper parking also works well. The front panel allows for the selection of fonts and pitch, but I didn't find it as intuitive as front-panel displays on other printers. It doesn't, for example, provide much visual feedback on the status of your document or on the status of print operations.

Noise levels from the printer are quite bearable. The straightforward, complete documentation includes a well-organized troubleshooting section that will help solve any problem you're likely to face when using the printer.

The Epson LQ-860 is designed for the serious business professional who needs good-quality color output at a competitive price. It's not expressly designed for home use, although a home-based worker with serious graphics needs would do well to consider it.

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FUJITSU DL3600

Exceptionally compact, quiet, and picture perfect in its output, Fujitsu's workhorse DL3600 offers versatility and respectable color at a dot-matrix price.

The DL3600 works perfectly well as a basic text printer. After installation of its enclosed color kit, the machine can also render text or graphic images using seven colors, provided you have software capable of creating color text or graphics.

Setting up the machine proved neither time-consuming nor difficult, and within minutes I was generating routine printouts. The DL3600 user's manual, with its clear illustrations and straightforward organization, helped in that regard. I would have liked a troubleshooting section, though, and I found the index to be on the skimpy side. Despite those minor flaws, the user's manual also proved vital in explaining the DL3600's different mode and font settings, which are easy to use after you take a little time to read about them.

Text printouts using the varying settings were of uniformly good quality, even if some of the draft printouts were a little dotted. Color printouts of both text and graphics yielded similarly satisfactory results, with the color images somewhat banded but very impressive otherwise. The optional Fujitsu *Creative Faces* software, which works only within *Microsoft Windows*, offers both PostScript-compatible fonts and color-saturation control for the DL3600. Four emulations are standard on

this printer: the Fujitsu DPL24C PLUS, the Epson LQ-2500 and LQ-2550, and the IBM Proprinter XL24.

Weighing in at a sturdy 26.5 pounds and occupying a space that's 4.7 x 22.8 x 13.6 inches, the DL3600 requires a fair amount of operating room. With dimensions like that, you get desk-commanding bulk but also the capability of handling paper as wide as 16.5 inches. Whether pulling in tractor-feed paper or loose single sheets, the rear-loading DL3600 usually prints quickly and flawlessly. I did run into a couple of jams, though, using both loose sheets and tractor-feed paper. And while the vertical single-sheet paper-feed mechanism didn't always take hold on the first try, it works significantly better than the more complicated, horizontal-feeding setup more common to dot-matrix printers. Soundwise, the DL3600 makes about

as much noise as the next model, operating neither especially loudly nor quietly. The solidly built machine comes with a two-year warranty.

If you're in the market for a printer that performs well with a variety of paper sizes, fonts, and color printing jobs, Fujitsu's DL3600 just may be the one for you.

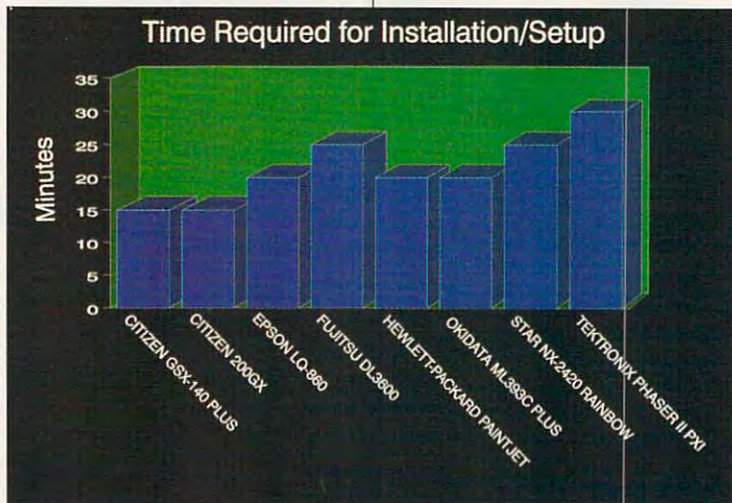
EDDIE HUFFMAN

Circle Reader Service Number 304

HEWLETT-PACKARD PAINTJET

I like computer products that are easy to install, reliable, and versatile. And it is precisely for those reasons that I like the Hewlett-Packard PaintJet color graphics printer.

With the experience and reputation HP has for developing and producing high-quality printers and plotters, I naturally expect excellence in any product bearing the HP logo, and the HP PaintJet lives up to these expectations. This color printer measures approximately 12 inches front to back by 17½ inches wide by 4 inches tall. I found the PaintJet easy to set up, and thanks to its relatively light weight—only 11 pounds—this compact unit moves easily from one location in





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your office to another.

The PaintJet delivers ink to the paper or transparency film via jets of colored ink sprayed precisely through pinhole-size nozzles. Since black ink is used for both regular and color printing, it runs out faster than the colored inks, and the HP folks have wisely adopted a two-cartridge system in the PaintJet. One ink cartridge contains black ink only; the second cartridge contains three compartments, one each for yellow, magenta, and cyan inks. From these four basic ink colors seven "pure" tones are created (black, yellow, magenta, cyan, red, green, and blue). You can produce all other possible colors by dithering (printing small dots of the basic colors side by side). This scheme permits a color palette of several thousand shades at a resolution of 180 dots per inch.

A black ink cartridge will yield about 1100 text pages (using PaintJet paper), while a color cartridge will be spent after about 180 pages on the average. The process of inserting and replacing ink cartridges simply requires removing the cartridge from its container, putting it into the appropriate cartridge well (black or color), and snapping the retainer clip over it. The whole process takes less than 15 seconds and is a "white glove clean" operation.

The PaintJet used for this review came equipped with a parallel interface, although both HP-

IB (IEEE-488) and RS-232C interfaces are also available for this printer.

The printer can accommodate single (cut) sheets of paper, Z-fold tractor-feed paper, or single-sheet transparency film in 8½ x 11 inch size. HP PaintJet paper works best and produces the most vibrant colors thanks to its fine grain; ordinary bond paper has a tendency to let the inks bleed, making the color reproduction muddy, so the slight extra cost for the HP PaintJet paper is a wise investment.

In addition to printing in color, the PaintJet is also quite serviceable as a black-and-white printer for normal uses. Standard fonts include Courier in 10 pitch and Letter Gothic in 12 and 18 pitch, along with boldface and underline enhancement capabilities. Line spacing, perforation skip, page length, top of form, and other adjustable settings normally found on line printers come standard on the PaintJet as well.

Because of the nature of the nonimpact ink-jet technology, the printer is almost totally silent in operation with only the paper-advance mechanism producing a sound as it prints. Maintenance of this printer is simple and you shouldn't need to service it often.

Hewlett-Packard's user's manual is excellent from cover to cover and very thorough. And thanks to HP's leadership in the area of printer and plotter technology, most popular software packages that support color include HP PaintJet drivers.

If you're looking for versatile color-output capability and strong software support in a durable, well-made printer that's moderately priced, the PaintJet certainly merits a closer look.

TOM BENFORD

Circle Reader Service Number 305

OKIDATA MICROLINE 393C PLUS

The original Okidata 393C 24-pin color dot-matrix printer was a heavy-duty, high-speed workhorse that earned the loyalty and fondness of PC users around the world. It's hard to believe that this venerable old printer could be improved, but that's exactly what Okidata did with the Microline 393C Plus—took a very good thing and made it even better.

Physically, the 393C Plus looks virtually identical to its predecessor, since most of the changes are internal, affecting performance, rather than cosmetic improvements. All of the great features of the original model remain—parallel and serial interface ports; rear and bottom paper feed; paper-handling capabilities for cut sheets, tractor-feed paper, and envelopes; the ability to print on transparency film, card stock, thick multipart forms, and labels; and more. All are here in the 393C Plus, along with some new features.

The 393C Plus uses a wide four-color ribbon as the imaging medium, driven by a high-speed 24-pin dot-matrix printhead. *High-speed* is an appropriate term here, since the 393C Plus boogies along at a blistering 517 cps (characters per second) in high-speed draft mode and about 185 cps in near letter quality mode. Draft and letter quality modes are also available, as are pitches of 10, 12, 15, 17.1, 18, and 20 characters per inch.

An able contender for color printing chores, the 393C Plus proves a sterling performer for

black-and-white tasks as well, especially for printing multipart forms or peel-and-stick labels. Changing the ribbon cartridge is easy, so alternating between black and color ribbons for different tasks makes sense. Black ribbons come in either fabric or film versions; the color ribbon is available in fabric only.

The 393C is a large unit. Measuring about 7 inches high by 22½ inches long by 16½ inches deep and weighing in at 37 pounds, it's not a printer you'd want to move around the office unless you nestle it on a roll-around printer stand. Its mass can be attributed to the heavy-duty components and solid construction, which endow it with a high reliability factor and a long life expectancy.

Available emulations include Epson LQ, IBM Proprinter X24/XL24, and IBM X24 AGM. For color work, you'll want to use the Epson LQ emulation and an Epson LQ2550 driver.

Seven solid "pure" colors are produced either by single passes of the ribbon (black, magenta, cyan, and yellow) or by two passes that overprint a second color on top of the first (red, blue, and green). Thousands of other colors and shades are produced by dithering. Virtually any software package capable of color output using the Epson LQ2500 or LQ2550 driver can be used with the 393C Plus, as well as packages which support the IBM Proprinter XL/XL24 and X24 AGM printers (black-and-white only). The output resolution is 180 x 180 dpi.

A quick setup guide will get you operational in just a few minutes. The comprehensive, clearly written, well-organized reference guide simplifies the use of this multifunctional printer.

Noise is a fact of life with dot-matrix printers, and the 393C Plus is no exception. Excellent design and internal sound dampening, however, keep the noise down to a tolerable level.

OKIDATA
532 Fellowship Rd.
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(800) OKIDATA
List Price: \$1,499
Warranty: 1 year parts and labor

If your computing requires the versatile paper handling that a dot-matrix printer offers and you also need high-quality color output at 180 dpi, the Okidata Microline 393C Plus is a good choice. While it's not an inexpensive color dot-matrix printer, without a doubt it's one of the best-engineered and most rugged units available.

TOM BENFORD

Circle Reader Service Number 306

STAR MICRONICS NX-2420 RAINBOW

The Star Micronics NX-2420 RAINBOW is a color printer that doubles as a professional-quality monochrome printer. With support for IBM and Epson printer commands and character sets, this versatile printer can print just about anything your computer can generate.

Installation and setup of this printer are simple, as is maintenance. Because the ribbon comes in a cartridge, moving from regular black-and-white printing to color printing is a simple matter of changing cartridges and using a color driver.

As with all Star printers, the NX-2420 RAINBOW can handle single-sheet or fanfold paper, switching easily between the two with Star's paper-parking feature. You can load fanfold paper from the rear or the bottom. There's even a special mode that lets you print multipart forms with up to five copies, plus an original.

Instead of using a bank of internal DIP switches to set print functions, the NX-2420 RAINBOW uses electronic DIP switches on the printer panel. These let users

select from 25 different functions as power-up defaults.

While the NX-2420 RAINBOW's color mode sets it apart from most printers, its ability to produce quality black-and-white print has not been compromised. It can print in regular and high-speed draft modes and in any of five letter-quality fonts. It can print condensed, bold, double-size, and quadruple-size characters. Speeds range from 55 to 222 cps. Fonts and printing modes can be selected at the printer or from embedded software commands. Print quality is excellent. I wouldn't hesitate to use the NX-2420 RAINBOW to print any business document.

For extra zest in printing, the RAINBOW model offers a splash of color. In addition to black, the NX-2420 RAINBOW can print red, blue, violet, yellow, orange, and green. Colors can be selected easily by pressing buttons on the printer panel, but I wondered if they could be accessed via software. Most word processors do not support color.

The Star manual provides a list of embedded printer commands that permit users to change fonts, size, and color from within most documents. I tried switching fonts, colors, and print size from within several word processors, and the NX-2420 RAINBOW worked flawlessly. Commands are easy to use, consisting of a capital letter enclosed in double parentheses, followed by a digit.

Producing type in a single color is no problem. I discovered that the NX-2420 RAINBOW han-



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dles multicolored graphics just as well when I ran a program that prints cards and posters with colorful cartoon characters. Since the NX-2420 RAINBOW is fairly new, there was no printer driver for it in the software's setup menu, but that wasn't a problem. If you use the printer in standard mode, the Star manual suggests a half dozen alternate drivers as substitutes. I selected one of the Epson drivers and soon had pages of colorful characters rolling off the printer. It was just as easy as that. Depending on the graphics mode selected, the NX-2420 RAINBOW can print between 60 and 360 dots per inch.

Color may not be a required feature on every home or office printer yet, but it does offer another avenue of creativity. If you need a quality monochrome printer for letters and other documents but would like the option of using color, don't overlook the Star Micronics NX-2420 RAINBOW.

TOM NETSEL

Circle Reader Service Number 307

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.

TEKTRONIX PHASER II PXI

It's virtually impossible not to use superlatives in describing the Phaser II PXI color printer from Tektronix. Everything about this high-end PostScript thermal-wax printer is truly "top drawer."

Weighing in at approximately 75 pounds when loaded and ready for use, the printer is physically large, measuring about 17 inches deep by 17.5 inches wide by about 14.75 inches high. The II PXI comes outfitted with serial, parallel, SCSI, and Appletalk (Macintosh) interface ports as standard equipment; and, since the printer can automatically switch between interfaces, you can connect all ports simultaneously. This feature makes the II PXI particularly attractive in environments where multiple PC platforms (even Macintoshes) are present, as in some graphic arts studios, advertising agencies, and office networks.

The features and capabilities of this machine are indeed out-

standing, but with a suggested list price of almost \$8,000, it isn't for everyone. If you're interested in printing out an occasional greeting card or banner via *The Print Shop* or you'd like to output your latest artistic creation in *DeluxePaint II Enhanced*, the Phaser II PXI is not the printer for you, even if your pockets are deep enough to afford it; neither of these popular software programs provides color PostScript drivers to support it. In truth, however, using the II PXI for such normal consumer-level software is analogous to using an Uzi to kill a fly; there's much more power than required.

If, on the other hand, you're using high-end/high-capability software packages like *Gem Artline 2.0*, *CorelDRAW! 2.0*, or *Tempra Pro* (all of which have color PS drivers), you'll really appreciate the amazingly vibrant colors and absolute fidelity that the II PXI delivers on a fast and consistent basis. It's a serious printer designed to handle serious applications without a whimper. And it succeeds marvelously.

The print mechanism is hot thermal-wax transfer with a resolution of 300 dots per inch. Rather than using ink, ribbon, or toner, a thermal-wax printer uses a roll of film coated with yellow, magenta, cyan, and black wax sections; the image is transferred to paper or transparency film using a thermal (heat) transfer process in three passes (one for each of the pri-



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GEM Artline 2.0

mary colors). By layering and combining the three primary colors, you can produce virtually any color (black is used as a shading medium to vary the color hue).

As with the initial cost of this

printer, output materials are also more expensive. For example, a transfer roll will yield about 275 full-color prints or about 1100 black-and-white prints. A four-color transfer roll sells for \$150,

and a monochrome transfer roll sells for \$160. In addition to the transfer roll, you'll also need special paper for your output to look really spiffy. A 1000-sheet package of letter-size paper will set you back an additional \$58. Using these figures, the costs translate to about \$0.60 per color copy and approximately \$0.20 per black-and-white output sheet. Then, too, you might want to purchase additional RAM (\$995 per 4MB upgrade), extra paper trays, or other accessories, which will add to the overall expense. Is it worth it? The answer is undoubtedly yes—if you require this much color-output power. The Phaser II PXi implements Adobe PostScript Level 2 and takes full advantage of this feature-rich page-description language. There are 39 PostScript fonts resident, and the SCSI external port permits storing and downloading additional fonts.



Corel Draw 2.0

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Info Select allows you to: add columns of numbers; store data in EMS; use template or free-form windows; import and export files, screens, and databases; move, join, and duplicate windows and much more.

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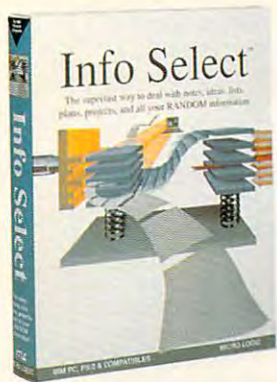
The new LAN version allows integrated E-mail, sharing company rolodexes and distributing company policies. You can share any kind of information. It's your first step into the exciting new world of groupware! Ask about the five node LAN starter pack.

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Info Select is easy to use yet offers the power you need with infobases up to 10 megabytes; text searches up to 700kb/sec; up to 32,000 characters per window; and up to 64,000 windows per infobase. Even better, Info Select can swap down to as little as 7K memory!

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Phone notes



Client info



Decisions



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TEST LAB

The Phaser also runs under Hewlett-Packard HP-GL 7475A (color plotter) emulation for additional versatility and usefulness.

The II PXi is certified by Pantone as compliant with the Pantone Color Matching System and also offers CIE and TekColor-based color matching. Pantone certification is particularly important for any graphic arts or pre-print design applications, since Pantone is a universally accepted and used color-matching system. The possible color palette exceeds 8 million shades using default halftones, and the maximum printable area is 8.1 x 11.6 inches on legal-size sheets.

In addition to the exceptionally quiet operation of the II PXi, I was also very impressed with how fast this printer is—especially

TEST METHODOLOGY

Our Test Lab printer tests were engineered primarily to gauge the output quality of these color printers rather than output speed. Since this month's lineup consists of 9- and 24-pin dot-matrix printers, as well as an ink-jet printer and a thermal-wax printer, speed comparisons are less important across such a broad range of color printer technologies. So although you'll find bar graphs indicating times required to output graphics, pay particular attention to the output samples on pages 32-33.

To determine print output quality, we included in our test suites four graphics files created with *GEM Artline*. Two of these files used black ink only, one used "spot" color, and one used four colors to fill areas within black outlines.

A special color-palette file was also created using the seven solid primary colors (magenta, yellow, cyan, blue, green, red, and black) available on all of our dot-matrix models.

Both the ink-jet and the thermal-wax printers are capable of shading these solid primary colors by adding black to the colors, so a special color-palette file was generated to showcase these capabilities.

While speed is certainly important, the quality of output should be your primary criterion as you select a color printer. As is often the case, quality generally improves, along with speed and capabilities, as the price increases.

—TOM BENFORD, PRESIDENT
COMPUTER PRODUCT TESTING SERVICES

PRINTER GLOSSARY

band. A portion of a graphic sent to the printer. The term **banding** describes the horizontal lines in dot-matrix graphics output.

dpi (dots per inch). A standard for printer resolution that measures the number of dots a printer can place along a linear inch. Laser printers are typically rated at 300 dpi. You should realize, however, that this resolution is not necessarily an indication of print quality, as 300-dpi laser output looks better than 360-dpi dot-matrix output.

draft quality. The lowest print-quality setting of a printer. Because the printer puts less ink on the page, this is usually the fastest print mode. Most often associated with dot-matrix printers.

emulation. The ability of a printer to mimic the functions of a similar, but incompatible, printer. Many printers contain the code to emulate one or more standard printers, such as an Epson FX-80, a Hewlett-Packard LaserJet, or an Apple LaserWriter Plus.

font. A typeface or family of typefaces. Each font has a particular

design but may include different styles and sizes. Most higher-resolution printers allow a choice of font. When shopping for a printer, you'll want to pay attention to how many fonts come standard and how many you can add.

ink-jet printer. A type of printer that uses a mechanism to spray ink onto paper.

jaggies. The saw-blade (or stairstep) appearance of slanted or curved lines. Jaggies occur because you're trying to print a line that is not perfectly straight and either perfectly horizontal or perfectly vertical—the only kind of lines a raster device can create.

laser printer. A type of printer that uses the electrophotographic method used in copy machines. Laser printers print an entire page at a time and offer very high quality.

near letter quality. Print quality that approaches the quality of a standard office typewriter. Abbreviated NLQ.

near typeset quality. Print quality that approaches the quality of a typesetting printer.

pin. One of a series of pins located in the printhead of a dot-matrix printer. Each pin produces a dot at a specified location on a printed line of text. See also **dot-matrix printer**.

print driver. A device driver that converts a program's generic printer output into the codes required by a specific printer.

printer buffer. A hardware- or software-based memory device that accepts printer data from a computer and holds it until the printer is ready for it—thus freeing the computer for other use. The process of using a print buffer is often referred to as print spooling.

sheet feed. A mechanism that uses friction to move single sheets of paper through a printer. See also **tractor feed**.

tractor feed. A mechanism that moves continuous, or fanfold, paper through a printer. The paper must have prepunched sprocket holes on both the left and right sides. Also known as **pin feed**. See also **sheet feed**.

—DAVID ENGLISH



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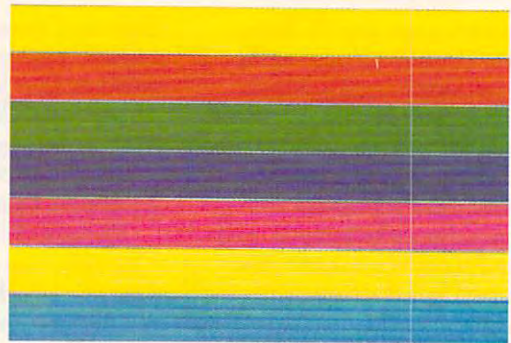
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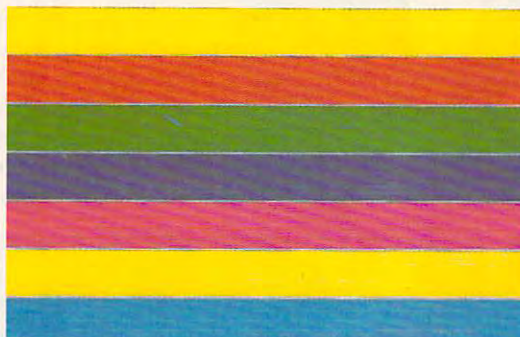
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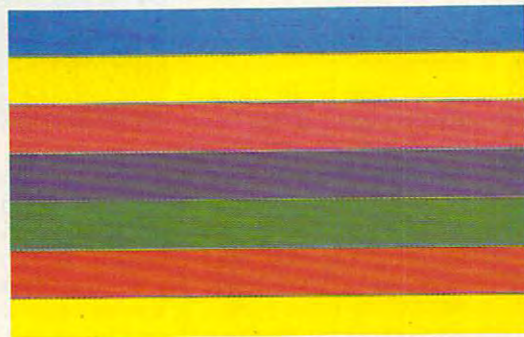
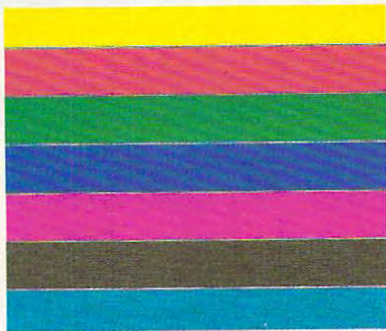
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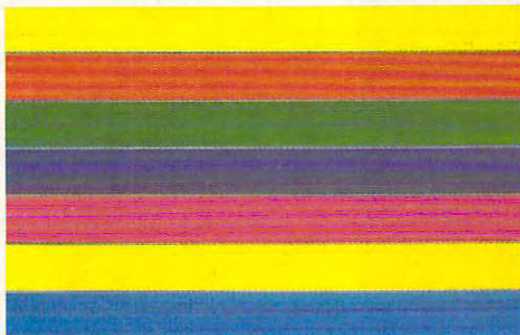


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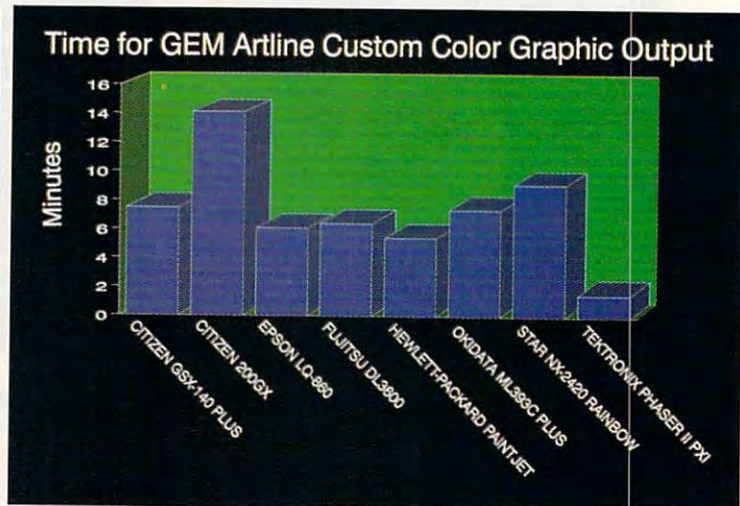
Tektronix Phaser II PXI

TEST LAB

since it outputs in full color. On the average it only took about 45 seconds to output a color page and less than 25 seconds for a black-and-white page. The printer uses a 24-MHz RISC-based processor and comes with 6MB of RAM standard (expandable to 18MB in 4MB increments), which accounts for its remarkably swift color output. Since the image is transferred using heat, operational noise is very low. (The unit's cooling fan and paper-movement mechanisms are the only components that make noise, and even that is minimal.)

A special fine-grain pure-white paper is used in the II PXi, which affords the best adhesion for the heat-transferred wax. I experimented with normal bond paper and achieved poor results, so the special Tektronix paper is a must for the highest-quality output. In addition to paper, the II PXi will also output on transparency film or fabric transfer media (to make iron-on transfers for T-shirts); all output materials are available from Tektronix directly. Tray capacity is 100 sheets of paper or 50 sheets of transparency film.

The documentation supplied with the II PXi is excellent, as are the support materials and software disks containing utilities and



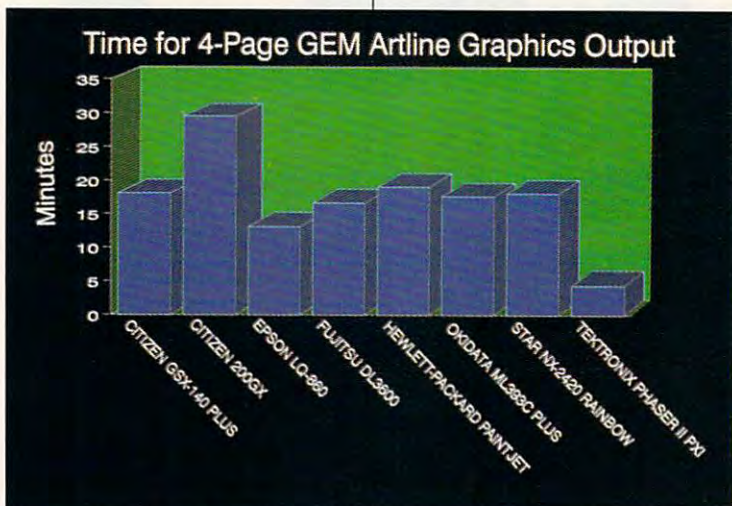
drivers for numerous applications. Using the printer is as simple as connecting it to your PC's parallel (or serial) port, running your favorite application (with an appropriate color PostScript print driver installed), and sending the file to print as normal. Once the file data is sent, the multipass imaging process begins. First the yellow color component is transferred to the paper, which is then drawn back into the printer. Next the magenta color is transferred, and again the paper disappears into the printer. The cyan areas are transferred next with the paper again receding into the print-

er for the black pass, after which it is ejected into the output tray. The output quality is absolutely breathtaking, rivaling a high-gloss color-printed magazine page.

Make no mistake: The Tektronix Phaser II PXi is not a color printer for the average PC user with limited color-output requirements. It is the printer of choice for virtually unlimited color-output capabilities and for serious graphic art applications that require uncompromising Pantone color matching and high-resolution output.

TOM BENFORD

Circle Reader Service Number 308



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.

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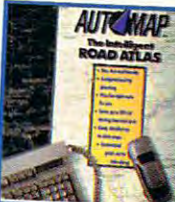
4D Boxing.....	33
688 Attack Sub Combo.....	24
ABC Sports Winter Games.....	34

Geo Jigsaw.....	37
Genghis Khan.....	37
Gettysburg: The Turning Point.....	39
Gold of the Aztec.....	33
Gunship 2000 VGA.....	42

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Ante-Up.....	27
Anarchophobia w/ Sound Source.....	22
Are We There Yet?.....	33
Armada 2525.....	33
Arroyo Alley.....	29
B.A.T.....	33
Bandit Kings of Ancient China.....	37
Bane of the Cosmic Forge.....	37
Bard's Tale Construction Set.....	34
Bard's Tale III.....	31
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Battle Chess II.....	32
Battle Command.....	27
Battle Isle.....	34
BattleHawks 1942/Finest Hour.....	40
Bill Elliot's NASCAR Challenge.....	32
Blitzkrieg.....	32
Blue Max.....	17
Bo Jackson Baseball.....	32
Breach 2.....	22
Bridge 6.0.....	26
Bush Buck Adventures.....	37
California Games II.....	27
Captain Comic II.....	17
Castles.....	37
Champions of Kyrin.....	33
Chuck Yeager's Air Combat.....	40
Command HQ.....	37
Conan the Cimmerian.....	32
Conflict: Middle East.....	37
Corporation.....	32
Countdown.....	36
Covert Action.....	37
Crime Does Not Pay.....	32
Crime Wave.....	36
D-Generation.....	34
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Death Knights of Kyrin.....	33
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No Greater Glory.....	37
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Railroad Tycoon.....	34
Red Baron EGA or VGA.....	37

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Stunts.....	32
Super Jeopardy.....	27
Swap.....	32
Team Yankee.....	37
Terminator.....	34



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Test Drive 3.....	35
Tetris.....	24
Theme Park Mystery.....	32
TimeQuest.....	37
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Tony La Russa AL Stadium.....	18
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Tracoon 2: Air Traffic Controller.....	43
Trump Castle 2.....	32
Twilight 2000 VGA.....	37
Ultima 6.....	40
Ultima Trilogy.....	37
UMS II Planet Editor.....	32
UMS II: Nations at War.....	37
Vaxine.....	28
Vengeance of Excalibur.....	32
Vette.....	27
Volphed.....	29
Warlords.....	29
Wayne Gretzky Hockey 2.....	34
Wayne Gretzky 2: Canada's Cup.....	35
Western Front.....	37
Wheel of Fortune w/ Vanna.....	27
Where America's Past Carmen.....	37
Where in Europe is Carmen.....	32
Where in Time is Carmen.....	32
Where in USA is Carmen.....	32
Where in World is Carmen.....	32
Where in World is Carmen VGA.....	48



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Crusaders of the Dark Savant.....	42
Demoniac.....	32
Dick Tracy w/ Sound Source.....	37
Dusk of the gods.....	37
Elvira II: Jaws of Cerberus.....	43
Falcon 3.0.....	43
Free D.C.....	37
The Godfather.....	CALL
Hoyles Book of Games 3.....	32
Jack Nicklaus: Signature Edition.....	43
Jimmy Connors Pro Tennis.....	33
Laffer Utilities.....	25
Light Corridor.....	32
Lord of the Rings II.....	37
Lost in L.A.....	37



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PRODUCTIVITY

Writing/Publishing Center.....	42
Advanced Mail List.....	32
Animation Studio.....	79
AutoMap.....	59
Bannermania.....	25
BodyWorks.....	47
Dream House Professional.....	48
Dvorak on Typing.....	32
Dvorak's Top 30.....	37



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Floor Plan.....	32
FloorPlan Plus.....	47
Estimator Plus.....	49
GeoWorks Designer.....	49
GeoWorks Desktop.....	49
GeoWorks Writer.....	49
J. K. Lasser's Income Tax.....	47
Lottery Gold.....	32
Mavis Beacon 2 Windows.....	40
Mavis Beacon Typing 2.....	34
Orbits.....	37
Pacioli 2000.....	29
PrintShop New.....	38
Speed Reader for Windows.....	32
U.S. Atlas.....	39
U.S. Atlas for Windows.....	54

CD ROMS

Access's 5 Game Bundle.....	79
Wing Commander/Ultima 6.....	79
Game Pack 1.....	59
Game Pack 2.....	79
Jones in the Fast Lane.....	37
C.I.A. Fact Book.....	79
Stellar 7.....	37
World & US Atlas.....	84
US Atlas w/ Automap.....	94

SOUNDCARDS

Ad Lib Card (Micro Channel).....	139
Ad Lib Gold 1000.....	199
Media Music.....	75
Sound Blaster.....	129
Sound Blaster Pro.....	209
Sound Commander.....	99
Sound Source.....	25
Soundmaster II.....	199
Speakers for Soundcards.....	20
Thunder Board.....	99

ACCESSORIES

Joystick/Gamecard/Mouse Pk.....	49
Gameport Auto CH Products.....	34
Gameport (MicroChannel) by CH.....	48
Hi Res Serial mouse w/software.....	32
2400 baud Internal Modem.....	69
2400 baud External Modem.....	79
IController for PC.....	49
IController for Laptops.....	69
Computer Vacuum Kit.....	25
Computer Cleaning & Vacuum.....	35

JOYSTICKS

Analogue Plus.....	27
Analogue Edge by Suncom.....	20
ErgoStick.....	27
Maximum Flight Yoke.....	70
Pedals for Max Yoke.....	49
Road Pedals by Max Yoke.....	49
Flight Stick by CH Products.....	42
Flight Stick w/ Falcon.....	49
Gravis Joystick for PC.....	39
Mach III by CH Products.....	33
Warrior V by Bondwell.....	20
Weapons Control System.....	89

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Dick Tracy Print Kit.....	17
Dog Eat Dog World.....	32
Dog Eat Dog/Sound Source.....	43
Dragon Wars.....	43
Dragon's Lair: Singe's Castle.....	37
Dragon's Lair II: Time Warp.....	43
Drakkhen.....	37
Dream Team.....	32
Duck Tales-Quest for Gold.....	22
E. Thorp's Real BlackJack.....	32
Eagle's Rider.....	32
Elite Plus.....	29
Enira.....	29
Eye of the Beholder 2.....	40
F-15 II Scenario Disk.....	20
F-15 Strike Eagle II.....	34
F-19 Stealth Fighter.....	43
F-29 Retaliator.....	33
Flight of the Intruder.....	37
Future Wars.....	32
The Games/Winter Challenge.....	35
Games People Play.....	29
Gateway to Savage Frontier.....	33
Life & Death II: The Brain.....	33
LightQuest.....	34
Links: Bayhill Course Disk.....	18
Links:Bountiful Course Disk.....	18
Links:Firestone Course Disk.....	18
Links:Dorado Beach Course.....	18
Links:The Challenge of Golf.....	23
Loom.....	37
Lord of the Rings.....	34
Lost Admiral.....	37
Lost Patrol.....	33
Mac Arthur's War.....	32
Magic Candle 2.....	39
Manager's Challenge Baseball.....	31
Matrix Cubed.....	34
Medieval Lords.....	39
MegaFortress: Flight of Old Dog.....	40
MegaFortress:Mission Disk 2.....	27
MegaTraveller II.....	37
Mickey & Minnie's Print Kit.....	17
Mickey's Crossword Puzzle.....	22
Mickey's Jigsaw Puzzle.....	32

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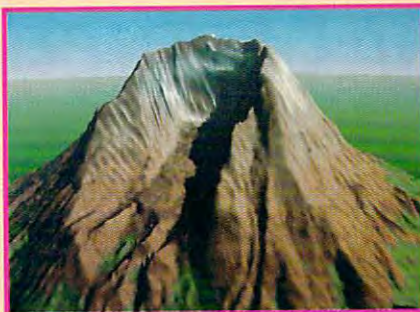
	Citizen GSX-140 PLUS	Citizen 200GX	Epson LQ-860	Fujitsu DL3600	Hewlett- Packard PaintJet	Okidata ML393C Plus	Star Micronics NX-2420 RAINBOW	Tektronix Phaser II PXi
DIMENSIONS								
Height	5.10"	5.10"	15.70"	4.70"	3.86"	7.09"	6.10"	14.75"
Width	16.90"	16.90"	18.50"	22.80"	17.40"	16.42"	18.20"	17.50"
Depth	12.60"	12.60"	7.60"	13.60"	11.89"	22.44"	14.00"	17.10"
Weight (in pounds)	12.1	11.0	22.0	26.5	11.0	37.0	14.6	75.0
PRINT MECHANISM								
Matrix	■	■	■	■	□	■	■	□
Ink-Jet	□	□	□	□	■	□	□	□
Thermal	□	□	□	□	□	□	□	■
HIGHEST PRINT SPEED (in cps)								
Draft	220	160	295	324	300	517	250	N/A
Quality	72	40	82	108	167	230	100	N/A
INTERFACE								
Parallel	S	S	S	S	S	S	S	S
Serial	O	O	S	S	O	O	N/A	S
SCSI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S
AppleTalk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S
EMULATIONS								
IBM ProPrinter	■	■	■	■	□	■	■	□
HP II	□	□	□	□	■	□	□	□
Epson	■	■	■	■	□	■	■	□
HP Plotter	□	□	□	□	□	□	□	■
PS Level 2	□	□	□	□	□	□	□	■
PS Level 3	□	□	□	□	■	□	□	□
RAM/BUFFER								
Standard	8K	8K	6K	24K	8K	23K	30K	6MB
Maximum	40K	40K	38K	24K	8K	32K	N/A	18MB
RESOLUTION (in dpi)								
	360	240	360	360	180	180	360	300
 FONTS								
Internal	8	5	3	8	2	4	7	39
Optional	9	0	0	27	0	N/A	20	Unlimited
PAPER FEED								
Tractor	■	■	■	■	■	■	■	□
Friction Sheets	■	■	■	■	■	■	■	□
Labels	□	□	■	■	□	□	■	□
Transparencies	□	□	□	□	■	■	□	■
Legal	□	□	□	□	□	□	□	■
Envelopes	□	■	□	□	□	■	□	□
OPTIONS								
Sheet Feeder	■	■	■	■	□	■	■	□
Labels	■	■	□	□	□	■	□	□

■—Yes □—No N/A—Not Applicable or (information) Not Available S—Standard O—Optional

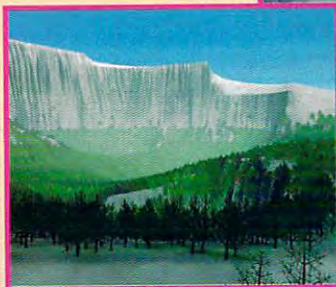
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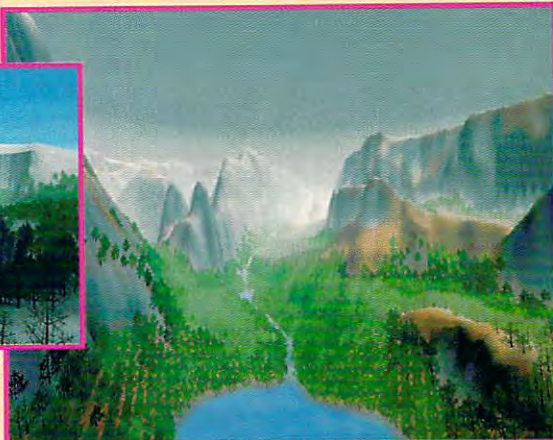
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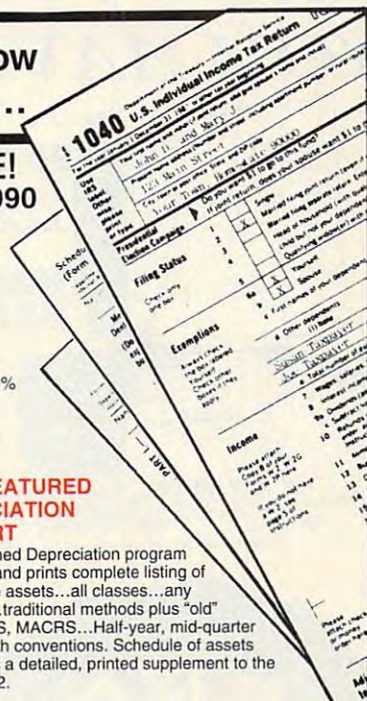
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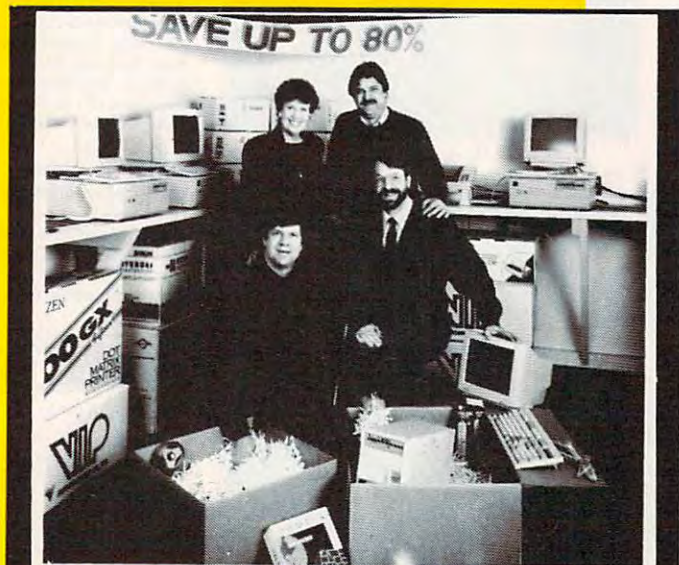
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NEWS & NOTES

Peter Scisco

Soundings

Ad Lib has officially declared that the long wait for its new generation of sound cards is over. The company announced at COMDEX that the Gold Series would begin appearing on store shelves in mid December. A new Yamaha synthesizer chip—the YM262—provides exceptional performance improvement over the previous Ad Lib music card. Chief among the advances are four-operator FM voices and eight FM waveforms for true stereophonic quality, a 12-bit stereo DAC (digital-to-analog converter), and sampling rates up to 44.1 kHz, making for true CD-quality sound. In addition, the Ad Lib Gold Stereo Sound Adapters can be accessorized with

64K of on-card memory. Scheduled for release in 1992 for under \$200. For more information, contact Advanced Gravis, 1602 Carolina Street, Unit D12, Bellingham, Washington 98226; (800) 663-8558.

ATI Technologies, which introduced its sound cards at last summer's PC Expo in New York, began shipping the VGASTEREO-F/X (\$449) and the STEREO-F/X (\$199) cards during COMDEX. Both boast 8-bit DAC and ADC (analog-to-digital converter), compatibility with the Ad Lib and Sound Blaster sound cards, and drivers for DOS and Windows applications. The VGA version also sports ATI's VGA Wonder XL controller, with support for 1024 x 768 resolution graphics and a 16-bit graph-

boasts a CD-ROM mixer so that materials from a CD-ROM drive can be mixed in with digital audio and MIDI tracks. A sound-editing package, *Wave for Windows* (\$149), gives users professional control over the creation of audio presentations. For further information, contact Turtle Beach Systems, CyberCenter, Unit 33, 1600 Pennsylvania Avenue, York, Pennsylvania 17404; (717) 843-6916.

Apple's Polishing Up

Since its disappointing Macintosh Portable, computer users have been waiting to see how Apple would answer the call for a true notebook computer. At this past fall's COMDEX (a conference and exposition held by computer dealers in Las Vegas), Apple answered with a line of laptop computers called the PowerBook series. The series includes the low-end 16-MHz 68000-driven PowerBook 100 (\$2,299 with 20MB hard disk and 2MB RAM or \$2,499 with optional external floppy disk drive), the midline 16-MHz 68030-driven PowerBook 140 (\$2,899 with the same hard disk and RAM, but a longer list of options), and the high-end PowerBook 170 (\$4,599 including 2400-bps modem and 4MB RAM). All models include a trackball, full-size keyboard, and System 7 software. Options include memory upgrades, battery rechargers, power adapter, SCSI adapter and cable, and modem. All of the systems are available now. For more information about these portables for the rest of us, contact Apple Computer, Customer Relations, 20525 Mariani Avenue, Cupertino, California 95014; (800) 776-2333.

Ink Jet to the Stars

Star Micronics entered the field of ink-jet technology in a

Ad Lib introduces a new generation of sound cards with the YM262 synthesizer chip.



several add-on modules, including a PC telephone-answering system, a surround sound module, and a SCSI adapter kit for CD-ROM interfaces. For more information, contact Ad Lib, 220 Grande-Allee East, Suite 850, Québec, Québec, Canada G1R2J1; (800) 463-2686.

Also making noise at COMDEX was Advanced Gravis. New in its product lineup is UltraSound, a PC-compatible sound card. The UltraSound has a built-in stereo amplifier, 16-bit digital audio, 8-bit digital sampling capability, MIDI support, joystick port, and

ics data path for speeding graphic-intensive applications. An optional MIDI interface option for either card sells for \$79. For more information, contact ATI, 3761 Victoria Park Avenue, Scarborough, Ontario, Canada M1W3S2; (416) 756-0718.

Another high-end sound solution comes from Turtle Beach Systems. The Multi-Sound card retails for \$995 and is aimed at users who want to create professional multimedia applications. The card includes 126 CD-quality sampled instruments that are stored in 4MB of ROM. It also

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Star Micronics enters the ink-jet market with a versatile, up-endable four-pound ink jet.

big way at COMDEX by releasing the StarJet SJ-48, a total four-pound printer based on the Canon BJ-10ex printer technology but with significant enhancements, including 13 scalable Bitstream fonts for use with *Windows*, NEC graphics emulation for 360-dpi graphics, and a quarter-size mode for compressed spreadsheet printing. The printer lists for \$499. For more information about the StarJet, contact Star Micronics, 420 Lexington Avenue, Suite 2702, New York, New York 10170-2702; (800) 447-4700.



Windows Calling

If your local telephone company offers a Caller ID service and you're running *Windows* on your home computer, then *WindowPhone* from AG Communication Systems could be the calling manager you've been looking for. As designed, the program will identify the caller by number and associate that number with a name (if that name is contained in your personal phone book), maintain a log of all calls (incoming and outgoing), record phone activity even when the PC is turned

off, support DDE for seamless use with other *Windows* applications, and support speed dialing for up to 20 numbers. The program is scheduled to ship in the spring of 1992, but its price wasn't available at press time. For more information, contact AG Communication Systems, 2500 West Utopia Road, Phoenix, Arizona 85027; (800) 424-8559.

Just the Fax

Fax technology moved away from the simple office fax machine a couple of years ago, but the flood of PC fax products hasn't abated.

At fall COMDEX, Cardiff Software showed *Teleform*, a *Windows*-based software program that links computers equipped with fax cards to stand-alone Group III fax machines. The purpose of this connection is to collect and transport information from forms into data files that can be used by a PC. The program sells for \$995. If you have further questions about *Teleform*, contact Cardiff Software, 531 Stevens Avenue, Building B, Solana Beach, California 92075; (619)

481-2255.

If a big system isn't for you, perhaps you'd be interested in the FM 9642ecc fax/modem card from Osmos. This card is truly a card—its actual size is hardly larger than a credit card (3 x 2 x 3 inches). It offers Hayes compatibility, requires no external power source, has autodial and autoanswer, and sends fax transmissions to Group III fax machines at 9600 bps. The modem part of the card is rated at 2400 bps. The fax/modem is listed at \$300. If you have further questions, contact Osmos, 4151 Business Center Drive, Fremont, California 94538; (415) 623-1000.

Multimedia Does Windows

The showroom of the Bally's Hotel in Las Vegas was bursting with multimedia products, especially those that support the multimedia extensions of *Windows*. Among the most notable were a new edition of the pioneer *Microsoft Bookshelf*; *Macmillan Dictionary for Children*, based on the well-known bound edition and aimed at children ages 8 to 12; and a version of *Links* from Access Software, which boasts detailed graphics and fly-by shots of golf courses.

Low-End Toolbox

Asymetrix announced three products in a new Pocket-Book series designed to appeal to *Windows* users on a budget. *Instant Database* (\$59.95) lets users with little knowledge of database programming develop graphical databases. *Make Your Point* (\$59.95) is a presentation builder. The third product, *Day-Book Plus* (\$49.95), is a personal calendar. If you have any questions, contact Asymetrix, 110 110th Avenue NE, Suite 717, Bellevue, Washington 98004; (206) 462-0501.

Rabbit Grows Up

Not only did The Learning Company show its new *Reader Rabbit 2* at COMDEX, but it also showed an updated version of the original *Reader Rabbit*. This new version is called *Reader Rabbit 1* and includes 256-color VGA graphics, animation, and sound board support. *Reader Rabbit 2* is designed for kids 5-8, while *Reader Rabbit 1* is for kids ages 3-6. Owners of the original *Reader Rabbit* can upgrade to the new version for just \$10. For more information, contact The Learning Company, 6493 Kaiser Drive, Fremont, California 94555; (800) 852-2255.

continued on page 47

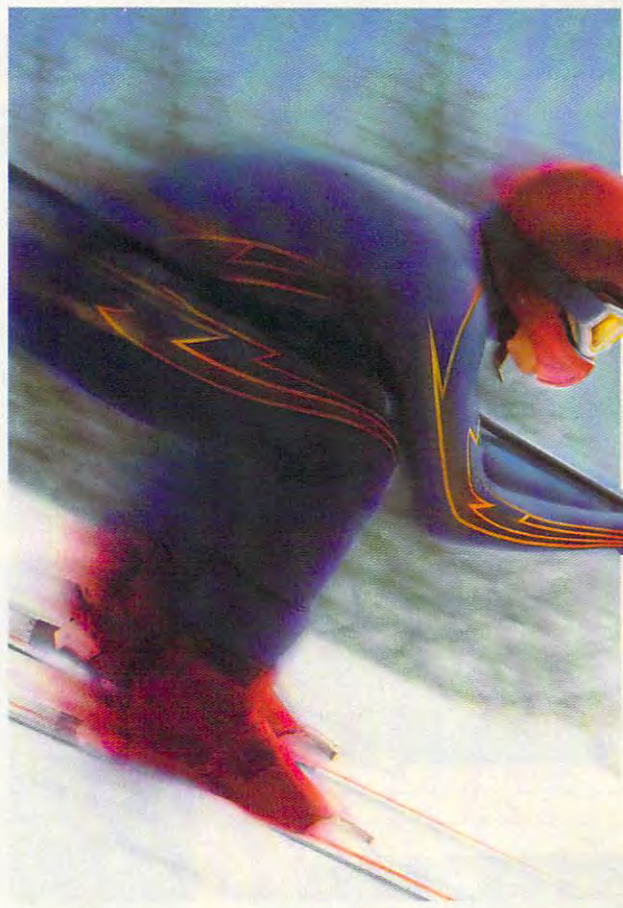
The Games:
Winter Challenge

"HE HATED THE AUSTRILIANS.

THEY WERE FEARLESS, CUNNING AND FAST. FIVE GOLD MEDALS WERE ALREADY GOING BACK TO KITZBÜHEL. BUT HE VOWED TO DENY THEM A SIXTH. ON THE TRAM, HE TOLD THE REPORTERS. HE WOULD BE THE FASTEST MAN DOWN THE MOUNTAIN THIS DAY." INTENSE RIVALRY. GRUELING COMPETITION. WORLD CLASS SPEED. ALL PART OF THE GAMES: WINTER CHALLENGE™ GO FOR THE BRONZE, SILVER OR GOLD AS YOU EXPERIENCE THE



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The Games: Winter Challenge is a trademark of Accolade, Inc. © 1991 Accolade Inc. All Rights Reserved. Actual Game screens from IBM PC VGA version of the game. All other product and corporate names are properties of their respective owners. Neither Accolade nor this product is associated with, or authorized by, the International Olympic Committee, The United States Olympic Committee or any similar organization for any other country.

Circle Reader Service Number 200

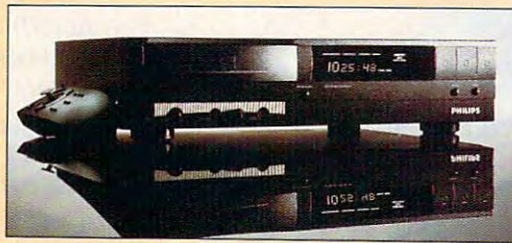
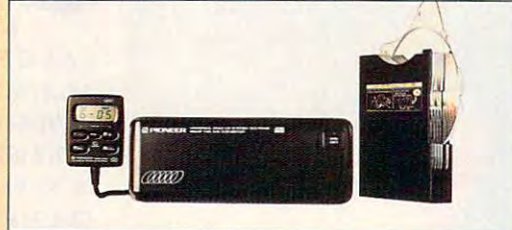
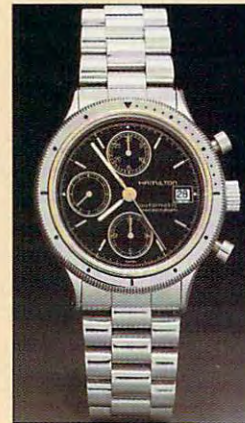
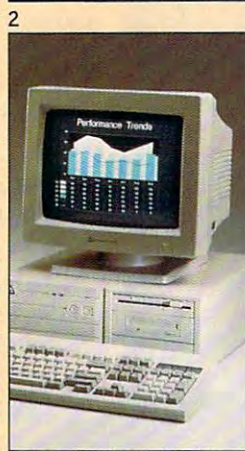
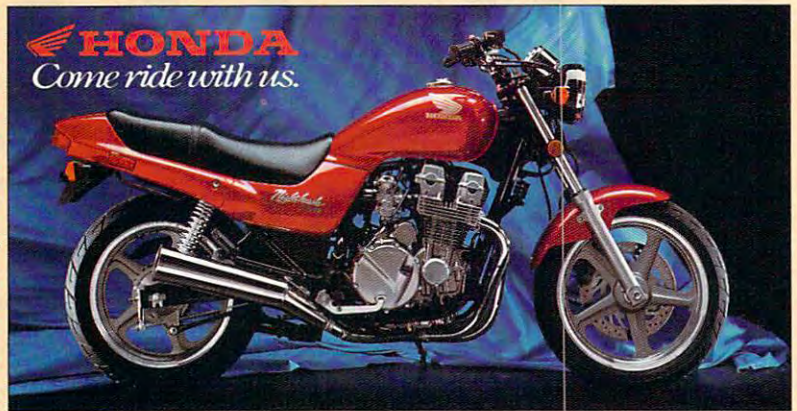
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THE GREAT TR

The following descriptions and values in the 1992 Great Treasure Hunt correspond to the numbered photos on these pages.

1)GEO Tracker LSi 4x4 Convertible, including sporty aluminum wheels option. Value: \$12,935; 2)Honda Nighthawk 750 Motorcycle. Value: \$4,199; 3)Leading Edge Computer package including color VGA monitor, 100MB hard drive and built-in Send/Receive Fax modem. Value: \$2,359; 4)Philips CD-I + Discs. A whole new way of looking at TV: The Imagination Machine (TM). It's CD-Interactive instruction and fun. Value: \$2,300; 5)Creative Labs Multimedia Upgrade Kit consists of the Sound Blaster Pro card, an internal CD-ROM drive, 5 CD and 13 exciting Multimedia software titles. Value \$2,142; 6)Pioneer CDX-FM 45 Universal CD Changer and PCC-700 Compact Cellular Phone for the car. The cellular phone weighs only 10.1 ounces and the CD player has multi-play capability. Value:\$2,100; 7)American Airlines round trip air fare for two to Paris, France from any U.S. gateway city. Value: \$2,000; 8)RCA 35 inch Home Theatre TV, with Pix-in-Pix capability, zoom and pan feature, and sound Retrieval System. Value: \$2,000; 9)Lifecycle Model 5500R The Recumbent Lifecycle Aerobic Trainer makes exercise easier, with a semi-reclining position that helps burn more calories with less exertion. Value:\$1,995; 10)Sansui Mini Stereo. Full-featured mini component surround sound A/V shelf system, which includes three Karaoke modes, allowing users to replace the vocal on their favorite music and sing along. Value: \$1,699; 11)NEC CD Gallery A complete CD-ROM system that adds exciting new capabilities to a PC or Macintosh. Display pictures and illustrations, listen to live audio and experience motion graphics. Includes 7 popular interactive CD-ROM software programs. Value: \$1,500; 12)Schwinn Paramount Series 70 bicycle, with Tange Ultra-Lite 38mm rake fork for smoother, more stable handling on any terrain.

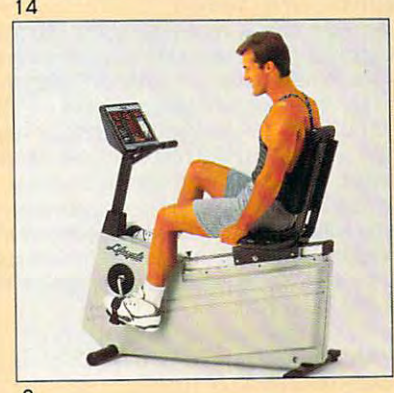
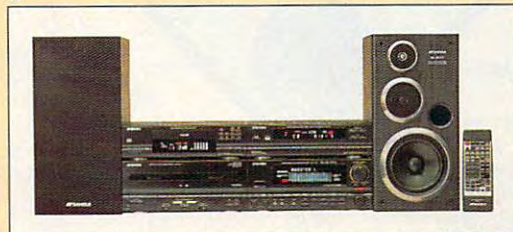
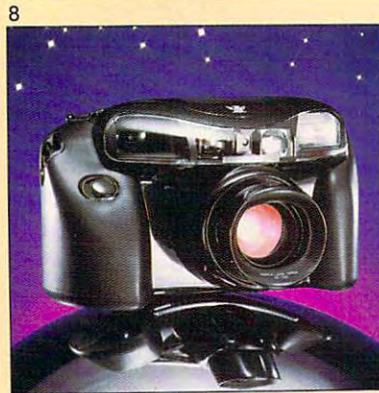
Value: \$1,274; 13)(2) Konica Aiborg 35mm Cameras. A his and hers pair, featuring the world's first moving frame auto focusing system, plus 30 rolls of Konica Super SR Color Print Film. Total Value: \$1,182; 14)(2)CITIZEN PN-48 Notebook Printers the world's smallest laser-quality printer at 2lbs, and packed with accessories such as a NiCad battery, AC adapter/charger and carrying case. The perfect tool for the portable computer user. Total Value: \$1098; 15)Hamilton Deluxe Chronomatic III watch (\$750) with 17 jewel, self-winding mechanical movement, and a Hamilton Wilshire watch with a slim, trim case and unusual hinged lugs that make it one of the most comfortable watches ever designed (\$295). Total Value: \$1,045; 16) Fujitsu DEX-80 FAX Machine features an automatic cutter, built-in answering machine interface, and a full featured handset. Value: \$999.



MEASURE HUNT

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GEO
AT YOUR CHEVROLET GEO DEALERS

Geo Tracker 4x4 Convertible.



13

11

9

The 1992 Great Treasure Hunt is on, and it's easy to enter. When you find the solution, simply mail it to the address shown below, or using a touchtone phone, call 1-900-976-HUNT (\$1.50 for the first minute, \$1.00 for each additional minute). Your solution will be recorded automatically. Here's how to find the correct answer:

Each of the dozen picture discs displayed inside the perimeter of the diamond shown on this page is a portion of a photo or illustration in an ad in this issue. To solve the "Treasure Hunt", find the ads from which discs were taken, and note the page number for each. If an ad appears on the inside or outside of the front or back cover, count that page number as zero. If there is no page number, turn to the next numbered page, and use that page number. If there is no numbered page between the ad and the end of the magazine, stop at the inside back cover, and use zero as your page number. Then add up all twelve page numbers. That is the solution to the "Treasure Hunt" in this issue.

No purchase or phone call required. To enter automatically on a touch-tone phone from 9:00 A.M. EST on 2/1/92 through midnight EDT 5/31/92, call 1-900-976-HUNT to give your name, address, telephone number, and the solution to the "Treasure Hunt" as it appears in the February/March 1992 issue of *COMPUTE* Magazine. The cost for the call is \$1.50 for the first minute and \$1.00 per minute thereafter; average call length is estimated to be 2-3 minutes. Call-in entrants will receive a \$5.00 discount certificate valid toward the purchase of any two books currently available in the *COMPUTE* Library. Charges for calls to the above numbers will appear on your telephone bill. Callers must be 18 or older or have a parent's or guardian's permission to place the call. Call as often as you wish; each call is a separate entry. Call-in entry option is void in LA, MN, and where prohibited.

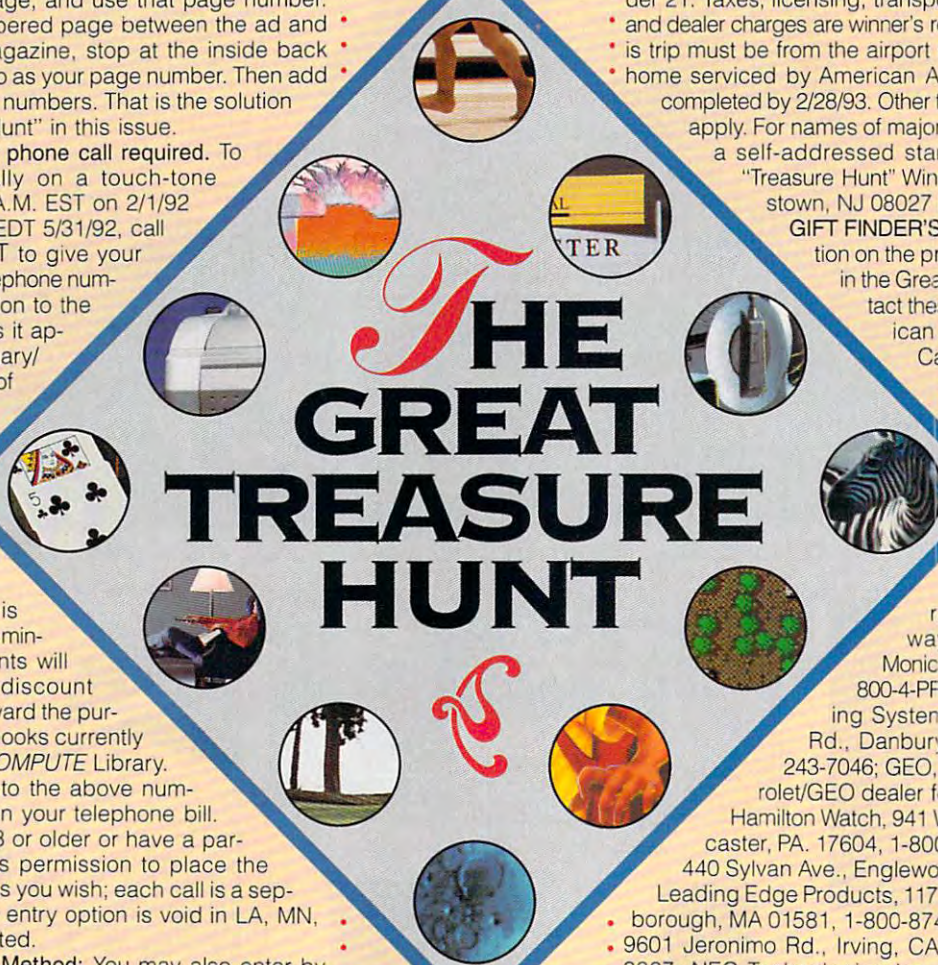
Alternate Entry Method: You may also enter by printing your name, address, phone number, and the solution to the "Treasure Hunt" as it appears in February/March 1992 issue of *COMPUTE* Magazine on a 3" x 5" piece of paper, mail your entry to: "Treasure Hunt", Box 664, Gibbstown, NJ 08027. All entries must be received by 5/31/92. Enter as often as you wish; each entry must be mailed separately.

You may request the solution and complete Official Rules by sending a self-addressed stamped envelope to "Treasure Hunt" Solution, Box 728, Gibbstown, NJ 08027 by 4/30/92; no return postage required for residents of VT and WA.

The 1992 "Treasure Hunt" is sponsored jointly by *OMNI* Magazine and *COMPUTE* Magazine, 1965 Broadway, New York, NY 10023, (212)496-6100. Winners will be selected by 6/30/92 in random drawings from all qualifying entries received. Drawings

Now
**THAT YOU'VE
 SEEN
 THE PRIZES, FIND
 OUT
 HOW TO ENTER.**

THE GREAT TREASURE HUNT



**SEE
 INSTRUCTIONS
 ON
 THIS PAGE.**

will be conducted by POWER GROUP, INC, an independent judging organization whose decisions are final. Odds determined by number of entries received. Major prize winner will be required to execute and return an affidavit of eligibility and release within 21 days of date on notification letter. Limit one winner per household. Open only to U.S. residents except employees and their families of *OMNI* Publications International, Ltd., *COMPUTE* Publishing, Ltd., POWER GROUP, INC., their respective subsidiaries or affiliates and advertising agencies. Total prize value, \$40,827. Prizes are not transferable or redeemable for cash. No substitution of prizes except as necessary due to availability. Some prizes will be awarded to winner's parent or guardian if the winner is under 21. Taxes, licensing, transportation, registration, and dealer charges are winner's responsibility. The Paris trip must be from the airport nearest the winner's home serviced by American Airlines and must be completed by 2/28/93. Other travel restrictions may apply. For names of major prize winners, send a self-addressed stamped envelope to: "Treasure Hunt" Winners, Box 813, Gibbstown, NJ 08027 by 6/30/92.

GIFT FINDER'S GUIDE: For information on the products and services in the Great Treasure Hunt, contact these companies: American Airlines, 4333 Amon Carter Blvd., Mail Drop 5375, Fort Worth, TX 76155; American Honda Motorcycle, 1919 Torrance Blvd., Torrance, CA 90501-2746; Citizen America Corporation, 2450 Broadway, Suite 600, Santa Monica, CA 90404-1003, 1-800-4-PRINTERS; Fujitsu Imaging Systems, 36 Apple Ridge Rd., Danbury, CT 06810, 1-800-243-7046; GEO, See your local Chevrolet/GEO dealer for more information.

Hamilton Watch, 941 Wheatland Ave., Lancaster, PA. 17604, 1-800-234-8463; Konica, 440 Sylvan Ave., Englewood Cliffs, NJ 07632; Leading Edge Products, 117 Flanders Rd., Westborough, MA 01581, 1-800-874-3340; Life Fitness, 9601 Jeronimo Rd., Irving, CA 92718, 1-800-735-3867; NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; Philips Consumer Electronics Company, One Philips Dr., Knoxville, TN 37914, 1-800-223-7772; Pioneer Electronics, 2265 East 220th St., Long Beach, CA 90810, 1-800-421-1603; RCA Corporation, 600 N. Sherman Dr., Indianapolis, IN 46201; Sansui Electronics Corporation, 1290 Wall St. W., Lyndhurst, NJ 07071; Schwinn Bicycle Company, 217 N. Jefferson, Chicago, IL 60661-1111; Creative Labs, Inc., 2050 Duane Ave., Santa Clara, CA 95054, 408-986-1461. **CONTRIBUTORS TO THE CREATIVE MULTIMEDIA UPGRADE KIT:** Broderbund Software, 1-800-521-6263; Davidson & Associates, 1-800-545-7677; Dr. T's Music Software, 617-455-1454; HSC Software, 310-392-8441; ICOM Simulations, 1-800-877-ICOM; Interplay Productions, 1-800-969-GAME; Origin, 1-800-999-4939; Passport Design, 1-800-443-3210.

NEWS & NOTES

Reglazing

Microsoft Windows might make it easier to run computers, but things can get complicated when your Windows installation isn't working right. Gordon Kraft, president of DiagSoft, explained that when Windows users get in trouble, it's often nearly impossible to determine whether the problem is hardware-, software-, or configuration-related.

Kraft's company has a possible answer. DiagSoft's new software package, *QAPlus/WIN*, lets you check your entire system and identify the problem.

QAPlus/WIN provides extensive Windows-related configuration and setup information and allows you to edit specific files. If you use it every day, you can actually use the software to fine-tune your system so Windows will deliver peak performance. *QAPlus/WIN* is available through computer and software dealers for a suggested retail price of \$159.95.

If you have questions, contact DiagSoft, 5615 Scotts Valley Drive, #140, Scotts Valley, California 95066; (800) 342-4763.

ALAN R. BECHTOLD

A Higher Low End

Micrografx has introduced *Windows Draw*, a drawing package that will raise the stakes in the competition for the low end of the PC graphics market. Selling for a suggested retail price of less than \$200, *Windows Draw* was designed to provide everything entry-level Windows graphics users need.

Micrografx is so sure about its ease of use that *Windows Draw* is backed by "the 60-minute challenge," which promises a full refund to anyone who isn't drawing up a storm after the first hour of running the program.

Micrografx compares its new low-cost drawing program to similar packages retailing for \$600 or more. *Windows Draw* includes Bézier-curve editing, outline fonts, and special effects such as text on a curve and blending—features usually found only in more expensive drawing programs.

Micrografx has established a hard-won reputation for inexpensive, easy-to-use drawing programs. The company established its name with *PC-Draw*, the first drawing program ever developed for the PC. *Windows Draw* is available for a retail price of \$149.95.

If you have further questions about *Windows Draw*, please contact Micrografx, 1303 Arapaho, Richardson, Texas 75081; (800) 733-3729.

ALAN R. BECHTOLD

PROTECT YOURSELF!



NEW SCREAM-ALARM HELPS PROTECT YOU OR A LOVED ONE FROM ASSAULT, BURGLARY, FIRE!

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Acct. # _____ Exp. date _____

Signature _____

Florida residents: Please add extra 6 1/2% sales tax.

High Scorer

Is there a short routine in BASIC I could add to my games that would allow a high-scorers list, including the player's name, his or her score, and the date? I've experimented with sequential files and random access files, but I can never get them to work very well.

DAVID SKRDLA
MEDFORD, OK

The following routine creates an ASCII file that contains a list of the top ten scorers. When you enter the routine, you should have a variable called name\$ that contains the contestant's name and a variable called score that contains the contestant's score. This example program contains a short routine at the beginning that creates a name and a score so that each time it runs it updates the high-scorers list. You should delete these lines when you use the routine with your program. This program is written in Microsoft QuickBASIC but should be usable with most BASICS, since it doesn't do anything fancy.

```
DIM a(9)
leftmargin = 20
REM Take out this part. It's for
REM demonstration purposes only,
REM to generate names and
REM scores.
RANDOMIZE (VAL(MID$(TIMES$, 7,
2)))
name$ = ""
FOR i = 0 TO 8: name$ = name$ +
CHR$(RND * 25) + 65): NEXT
score = INT(RND * 5000)
REM End of demonstration lines.
score = 99999 - score
score$ = STR$(score)
score$ = RIGHT$(score$,
LEN(score$) - 1)
score$ = RIGHT$("00000" +
score$, 5)
IF LEN(name$) > 8 THEN name$ =
LEFT$(name$, 8)
OPEN "highscor.txt" FOR APPEND
```

```
AS #1
PRINT #1, score$, name$, DATES$
FOR i = 0 TO 9
PRINT #1, "99999"
NEXT
CLOSE #1
RESET
SHELL "type highscor.txt >
tempscor.txt sort"
SHELL "del highscor.txt"
OPEN "highscor.txt" FOR OUTPUT
AS #2
OPEN "tempscor.txt" FOR INPUT
AS #1
FOR i = 0 TO 9
LINE INPUT #1, a$
PRINT #2, a$
NEXT
CLOSE #1
CLOSE #2
SHELL "del tempscor.txt"
OPEN "highscor.txt" FOR INPUT
AS #1
FOR i = 0 TO 9
LINE INPUT #1, a$(i)
NEXT
CLOSE #1
CLS
PRINT SPC(leftmargin);
PRINT "-----HIGH SCORES
-----"
FOR i = 0 TO 9
IF LEFT$(a$(i), 5) <>
"99999" THEN
PRINT TAB(leftmargin); "":
PRINT USING ("#####"); 99999-
VAL(LEFT$(a$(i), 5));
PRINT RIGHT$(a$(i), LEN(a$(i))-
5);
PRINT " "
END IF
NEXT
PRINT SPC(leftmargin);
PRINT "-----
-----"
```

The Numbers

I would like to have a program that would turn on the Num Lock key in my Tandy 1000TL/2 during power-up.

JERRY G. JOHNSON
SUGAR CREEK, OH

Enter this program using GW-BASIC or any compiled BASIC at your disposal.

```
10 DEF SEG = (0)
```

20 POKE 1047, (PEEK(1047) OR 32) 30 SYSTEM

The last line should only be used with interpreted BASIC. Save the program as NUMON.BAS (or compile it as NUMON.EXE) and run it from the command line by typing GWBASIC NUMON (or just NUMON, if you've compiled it) or put this command in your AUTOEXEC.BAT file. This will turn on Num Lock. If you would like a program that toggles the Num Lock condition on or off, change the name to NUMTOG.BAS and change line 20 to POKE 1047, (PEEK(1047) XOR 32). If you want to turn Num Lock off, change the name to NUMKILL.BAS and line 20 to POKE 1047, (PEEK(1047) AND 223) which is 255-32. That's not the end of it, though. The Caps Lock key is operated by using OR 64, XOR 64, or AND 191. Here's a diagram that tells you all the values you can use and the keys they affect.

	OR	AND
Right Shift	1	254
Left Shift	2	253
Ctrl	4	251
Alt	8	247
Scroll Lock	16	239
Num Lock	32	223
Caps Lock	64	191
Insert	128	127

Short Story

The normal size of your magazine is 10³/₄ inches tall. However, the height of my September 1991 issue was 1/4 inch shorter. Why is this? Is it an official size change or just a coincidence?

MIKE WILSON
AUBURN, CA

It was intentional. We cut 1/4 inch off the magazine to save money. You probably would not think that the 25 inches of slick-finish paper we saved

How to score with your computer, locking your Num, the long and short of COMPUTE's new trim size, an ANSI correction, and more

"Aliens approaching... fightercraft launched."



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Hyperspeed is a dramatic enhancement of MicroProse's interstellar action epic, *Lightspeed*, featuring 4 giant star clusters, an all-new animated opening, more aliens and more role-playing adventure.

We're so sure you'll consider *Hyperspeed* the best space game you've ever played that we'll pay you to find out. Just send in your *Hyperspeed* proof-of-purchase along with the original disks of any space game you own, and MicroProse will send you \$10.

For IBM-PC/Tandy/compatibles. For the latest information on release dates and availabilities, call MicroProse Customer Service at 410-771-1151, 9 am to 5 pm EST, weekdays. © 1991 MicroProse, Inc., 180 Lakefront Drive, Hunt Valley, MD 21030-2245.

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per magazine would amount to much, but in publishing, you have to multiply everything by hundreds of thousands (it comes to almost 150 miles of paper, enough to stretch from Kalamazoo to Detroit). Besides, it allowed us to make use of a different printing process. COMPUTE has been a consistent size over the years, and perhaps, in retrospect, some sort of statement should've been made. Although the magazine is a slightly smaller "trim size," we've made absolutely sure that exactly the same number of words are used, so you shouldn't feel cheated. Next time you see a tree, you can be proud that you did your part to save it.

Another GeoWorks Fan

I've noticed that much of your focus has been on Windows. You've completely ignored a much better alternative. *GeoWorks Ensemble* does the same job Windows does, but it does it more easily and far better than Windows.

Right now, I'm writing this letter using *GeoWrite* while downloading a file from America Online and printing yet another file, all at the same time, on a wimpy XT. This is to say nothing of laser-quality printouts on 9-pin printers, 32-character filenames, and the abundance of other goodies *Ensemble* offers.

I hope you'll pay more attention to the real miracle GUI on the market.

MIKE SHAW
LAFAYETTE, IN

We thought we had paid enough attention to Ensemble, but we're all so impressed with its capabilities that we're willing to mention it again. As of this writing, it has been as newsworthy for its potential as for its accomplishments, and for those of us who spent years waiting for Microsoft to make Windows a

viable operating system shell, our impatience with *GeoWorks* may be unwarranted. The truth is that *GeoWorks Ensemble* is an incomparable bargain and worth serious consideration, particularly if upgrading to the newest version of Windows also means having to upgrade your hardware.

Hard Luck

I purchased a Seagate 157A hard drive, and about ten months later it just quit. The dealer looked it over for a week and then agreed to replace it. I asked if a new receipt could be sent so I could continue my warranty. I was told that the new drive would be covered under the old warranty—in other words, with ten months chopped off, resulting in a two-month warranty on a brand-new drive. I called several more manufacturers and discovered that this is the industry standard. I thought your readers would like to know.

DERK HATCHER
LAKE TOXAWAY, NC

Street Legal

The following address and telephone number should have appeared with the November review of *By Design: STREETWISE* Software, 1227 18th Street, Suite B, Santa Monica, California 90404; (310) 829-7827.

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. □

EDITORIAL

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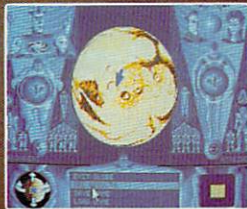
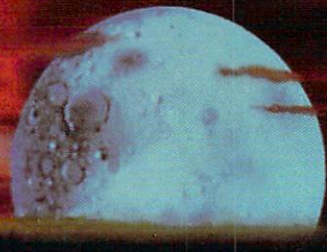
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POINT & CLICK

Clifton Karnes

TOP TEN NEW WINDOWS APPS

COMDEX/Fall, the most exciting computer show on earth, was held this past October in Las Vegas, Nevada. This year, there were more than 1500 exhibitors, and *Windows* applications were everywhere. Here's a look at the ten best new *Windows* products I saw at COMDEX.

For productivity, the big news was *Microsoft Word for Windows 2.0* (\$495). It's been more than a year since *Win-Word* had an upgrade, and 2.0 is well worth the wait. New features include a redesigned ribbon and ruler, with a customi-

DTPers will be delighted with *Micrografx Windows Draw*, a beautifully designed draw program that lists for just \$149.95.



zable toolbar. Grammar checking is now available on board as is a graph editor. For desktop publishing, the program sports a draw program, and layout can now be frame based, which means you can move text and graphic elements around on the page by dragging and dropping them.

The second biggest COMDEX productivity package also comes from Microsoft—*Microsoft Works for Windows* (\$149.95). This program is like the DOS version of *Works*, except for the fact that the telecommunications module has been dropped and a draw program has been added. *Works* looks great under *Windows*. For a home office,

this integrated combination of a word processor, spreadsheet, database, and draw program may be just the ticket.

Although Microsoft has released its own *Windows*-based money-management tool, the biggest news at COMDEX in this popular category was Intuit's *Quicken for Windows* (\$69.95). This product has everything found in version 5.0 of *Quicken* for DOS, except for loan amortization, and the interface is excellent.

Desktop publishers will be excited about Bitstream's new type design tool, *Makeup* (\$149.00). With *Makeup*, you can stretch and bend type to create almost any effect you want. And *Makeup* works with PostScript Type 1 (the fonts used with *ATM*), TrueType (which will be bundled with *Windows 3.1*), and Bitstream's own Speedo fonts.

DTPers will also be delighted with Micrografx *Windows Draw*, a beautifully designed draw program that lists for just

\$149.95. It has about 95 percent of *Micrografx Designer's* power at a fraction of its \$795.00 price.

For entry-level DTP, the most interesting new *Windows* program was *Microsoft Publisher* (\$149). The program has everything you need to get going with page design and layout, including a boatload of on-board fonts.

For desktop publishing professionals, there's LaserMaster's *WinPrinter* (\$1,995). This is a 400 x 400 dpi PostScript-compatible printer designed especially for the *Windows* environment. Its output is beautiful, and it's fast.

Windows utilities at COMDEX were led by *Diagsoft*

QAPlus/Win (\$159.95), a tremendously powerful diagnostic tool for the *Windows* environment. If you've heard of *Check-It*, the popular DOS diagnostic utility, you may be interested to learn that the QA people also wrote that. But this is more than just *Check-It* for *Windows*. It offers powerful features you're not likely to find in any other diagnostic program.

Although not strictly a *Windows* product, *Stacker AT/16* (\$249) is almost a must for every *Windows* user. It's a software or software-and-hardware combination that can double the size of your hard disk. As most of us are painfully aware, *Windows* programs eat up hard disk real estate like nobody's business—as a case in point, *Word for Windows 2.0* gobbles up a breathtaking 15MB. *Stacker AT/16* can make living with *Windows* much easier.

In the last year, *Windows* programmers have been treated to a raft of programs that make it easy to create *Windows* apps. The earliest group to appear were *HyperCard*-like products—*Asymetrix ToolBook* and Spinnaker's *Plus*. Then came what are now being called visual programs—*Visual Basic* and *Realizer* are the two best examples. The problem is that up until now there haven't been any programs that make traditional C-and-SDK-style development easier. Well, now there's *Microsoft QuickC for Windows* (\$199). To program with this tool, you'll have to know C, and you'll have to learn the *Windows* API, but you'll have an integrated environment that's hard to beat.

Also included in the package is *QuickCASE:W*, a special version of *CASE:W* that makes it possible to create interfaces by drawing them, *Visual Basic* style. Make no mistake, this one's a winner. □

PROGRAMMING POWER

Tom Campbell

WARP FACTOR 8, MR. DATA

While you take it for granted now, BASIC didn't always have the ability to read files. Hard to imagine BASIC without this crucial aspect of the language, but the first versions of Microsoft BASIC had to be squeezed into 4K. That's right—less than the *minimum* disk space required for any file on some high-capacity hard drives.

DATA statements were added as a sop. For reasons we'll examine shortly, I rarely employ them in BASIC programs anymore, but my first excursion into a higher-level language—and in 1984, *Turbo Pascal* was undeniably a higher-level language than GW-BASIC—left me amazed that there was no way to include data in a program. You can now use *Turbo*'s strangely named typed constants to do roughly the same thing as DATA statements, but they were added years later as a response to C's initialized variables. I was depressed to realize that my only recourse was either to declare a bunch of variables at the top of a routine and initialize them manually at a later time or to use files.

Make My DATA

A DATA statement is just a list of one or more values of a type recognized by BASIC. The READ statement automatically assigns one of the values in the DATA statement to a variable, magically keeping track of both the line of the DATA statement and the datum being read. Then it moves efficiently on to the next datum the next time it's called, using an internal placeholder called the DATA pointer.

The program PLAY1.BAS offers an example of DATA at work, as well as DATA's assis-

tant, RESTORE. Run it, and you'll hear a passable rendition of reveille, the familiar bugle call played by a lone, shivering enlisted man at dawn in countless war movies.

```
' PLAY1.BAS—tested with  
' PowerBASIC and QuickBASIC.  
' Illustrates DATA and RESTORE  
' statements by playing reveille.  
' THE FIRST PART.
```

```
' Each call to PlayVerse will read  
' each NextLine$ string and play  
' it until a "" occurs.
```

```
CALL PlayVerse  
CALL PlayVerse
```

```
' THE SECOND PART.  
' Go back to the first DATA  
' statement. Play up to a "".
```

```
RESTORE  
CALL PlayVerse  
' Skip down to the Part 2 DATA  
' statement, and play up to a "".
```

```
RESTORE Part2  
CALL PlayVerse  
' THE THIRD PART.
```

```
' Simply continue playing Part 3.  
CALL PlayVerse
```

```
' This loop fetches the value of  
' each DATA statement, copies it  
' into the string variable  
' NextLine$, and plays it. When  
' the variable is a null string,  
' the subroutine exits.
```

```
SUB PlayVerse  
DO  
  READ NextLine$  
  PLAY NextLine$  
  LOOP UNTIL NextLine$ = ""
```

```
END SUB  
' Refrain—this is used several  
' times by reveille.
```

```
DATA "P8 C32 P32 P16 F32 P16  
L16 A F C32"  
DATA "P16 C32 P32 P16 F32 P16  
L16 A F C16"  
DATA "P16 C32 P32 P16 F32 P16  
L16 A F C16"  
DATA ""
```

```
' Part 1—this is used the first  
' time through.  
DATA "P16 L16 F P16 L4 A F8 P8"  
DATA ""
```

```
' Part 2—used the second time  
' through.  
Part2: DATA "P16 C16 P16 L4 F"  
DATA ""
```

```
' Part 3—used as the third and  
' last part of reveille.  
DATA "MS P8 L8 A A A A L4 O5  
C"  
DATA "L8 O4 A F A F A F"  
DATA "L8 A A A A L4 O5 C"  
DATA "L8 O4 A F A F C C L4 F"  
DATA ""
```

At the heart of PLAY1.BAS is the PlayVerse subroutine. It fetches each string found in a DATA statement (BASIC knows to start the DATA pointer at the first DATA statement in your program), copies that string into the variable NextLine\$, and then uses PLAY on that string variable. It stops when an empty string is encountered. The empty string as used here, by the way, is referred to in the literature as a sentinel value. A sentinel value is a user-defined value that cannot possibly occur in a valid list of data and can therefore be used to stop a sequence of actions (normally data entry, as in this example). You'll often see -1, 0, or a large number such as 9999 used for the same purpose in DATA statements that use numeric values.

The first two calls to PlayVerse together play the first of reveille's three parts. The first call plays the section labeled Refrain, a section used by all three parts of the bugle call. At this point, the DATA pointer points to the DATA comment as Part 1, and that's what gets played on the second call to PlayVerse, right up to its null (sentinel) string.

As we get ready to play Part 2 of reveille, the utility of the DATA and RESTORE statements becomes clear. The second part of reveille reprises the first section, which is labeled Refrain. We could take the easy way out and just copy the DATA statements, but BASIC was originally designed with 4K or 8K free system memory in mind, not

The READ statement automatically assigns one of the values in the DATA statement to a variable.

The data in sequential files is used in a continuous stream from top to bottom.

640K. The RESTORE statement allowed you to reset the DATA pointer back to the first DATA statement. We'll quickly see that this wouldn't really do the job for this program, but luckily RESTORE was later supplemented to allow you to restore to a particular line number, meaning that the DATA pointer would now point at the DATA statement on the given line. Later, an alphanumeric label (like Refrain in this example) could also be used.

So to play the second part, RESTORE moves the DATA pointer to the first DATA statement. However, this time we want to play the data statements labeled Part 2 after we play Refrain, not Part 1.

After the refrain is played, a RESTORE Part2 allows us to skip over Part 1 and go directly to the Part2 label when a subsequent call to PlayVerse executes its first READ statement.

File Your Data

So far, so good. We've seen how DATA statements let us embed initialized data into a program, which no popular language until C would allow, several years after BASIC's rise to unprecedented popularity. We've also seen how to reorganize the sequence of this data by using the RESTORE statement with a line label (or number, for the Philistines reading this column). Why bother with files?

Because files allow the crucial separation of program and data—that's why. As you can see, the sample program PLAY1.BAS, above, is written for a BASIC compiler. If you decide to change the tune it plays or to give it an option to play more than one tune, you'll be confronted by a morass of DATA statements that could haunt you for the entire life of the project. Every time you want to add or edit a

song, you'll have to recompile. Worse, the people to whom you distribute your program would have no way to add or change tunes themselves, unless they had the source code to your program and a BASIC compiler and they knew how to program.

No, DATA statements are only helpful when the data set is small, does not change, and is only used once. For example, some BASIC programs contain short subprograms in machine language. If they total a page or less of source code, converting them into DATA statements isn't a bad idea. Otherwise, they should reside in separate object modules.

The solution to data that changes while the program doesn't is to use files. First the good news: They're very easy to use once you get the hang of file I/O statements and maintenance. Now the bad news: The data in sequential files (as in this example) is used in a continuous stream from top to bottom, and the only way to change position is to start back at the beginning of the file.

These compromises are well worth the limitations, and you can always use random files for more sophisticated manipulation of the file pointer (eliminating the ability to use ASCII files, though).

Play It Again

Here is the new program, with a data file following it. Save the data file as an ASCII file under the name PLAY.DAT.

Make sure this file ends with a blank line! Otherwise, the loop won't stop because the sentinel will never be found. When you want to add a song, just place it in a different file under a new name and pass that name to the PlayTune subroutine.

DECLARE SUB PlayTune (Filename\$) ' PLAY2.BAS—tested with

' PowerBASIC and QuickBASIC.
' Illustrates separation of program and data by placing the tune to be played in a sequential ASCII file. Read in the file PLAY.DAT and play it. Stop when a blank line is encountered.

CALL PlayTune ("PLAY.DAT")

' PlayTune opens the ASCII data file Filename\$ and reads in the music data to be played, playing each string until a null string (blank line) is hit.
' End your file with a blank line!
' Filename\$ is an ASCII data file.
' Make it usable for reading.
' Loop until the sentinel value (a blank line) is encountered.
' Read in a line. Play it unless it's blank. In that case, quit.
' Return the file resources to DOS.

```
SUB PlayTune(Filename$)
OPEN Filename$ FOR INPUT AS
#1
DO
LINE INPUT #1, NextLine$
PLAY NextLine$
LOOP UNTIL NextLine$ = ""
CLOSE #1
END SUB
```

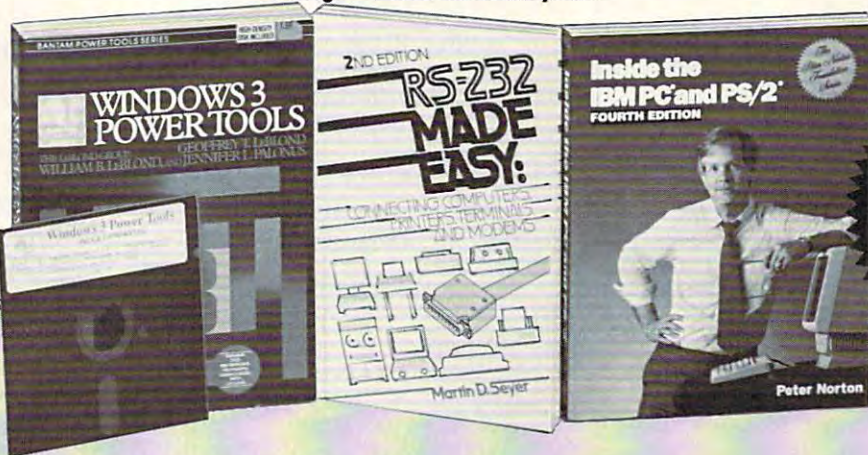
Here is the ASCII file PLAY.DAT. End it with a blank line and save it as an ASCII file.

```
P8 C32 P32 P16 F32 P16 L16 A F
C32
P16 C32 P32 P16 F32 P16 L16 A F
C16
P16 C32 P32 P16 F32 P16 L16 A F
C16
P16 L16 F P16 L4 A F8 P8
P8 C32 P32 P16 F32 P16 L16 A F
C32
P16 C32 P32 P16 F32 P16 L16 A F
C16
P16 C32 P32 P16 F32 P16 L16 A F
C16
P16 C16 P16 L4 F
MS
P8 L8 A A A A L4 O5 C
L8 O4 A F A F A F
L8 A A A A L4 O5 C
L8 O4 A F A F C C L4 MS F □
```


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TIPS & TOOLS

This month's column offers help for those environment-busting long paths and for organizing your PageMaker publication with thumbnails.

Quick Path Changes

My 200MB hard drive has plenty of room for installing software, but its path statement doesn't have plenty of room for the directories.

To solve this problem, I created a batch file that lets me easily change my path statement. That way, when I decide to work on editing text files, I can set the path so my word processor and text editor are available. Then, when I want to compile a program, I set the path so my compiler and all of its directories can be found.

Here's a simple example batch file. To use it, just type NEWPATH and a number. If you don't specify a number or the number you specify is out of range, the available options will be displayed.

ECHO OFF

```
REM Check for a
REM command line argument.
REM You'll need one IF
REM statement for
REM each new path choice.
REM
IF "%1" == "1" GOTO ONE
IF "%1" == "2" GOTO TWO
IF "%1" == "3" GOTO THREE
IF "%1" == "4" GOTO FOUR
IF "%1" == "5" GOTO FIVE
IF "%1" == "6" GOTO SIX
IF "%1" == "7" GOTO SEVEN
IF "%1" == "8" GOTO EIGHT
REM
REM Show choices, since there
REM was no command line
REM argument given or the
REM command line argument did
REM not match any of the above
REM choices.
REM
ECHO 1. PATH=C:\DOS;C:\BRIEF;
ECHO 2. PATH=C:\DOS;C:\WS;
C:\WINDOWS;
ECHO 3. PATH=C:\DOS;C:\WP50;
C:\WINDOWS;
ECHO 4. PATH=C:\DOS;
C:\DPAINT2;C:\PBRUSH;
ECHO 5. PATH=C:\DOS;C:\BRIEF;
C:\EXTRA;
ECHO 6. PATH=C:\DOS;C:\C600;
```

```
C:\QB45;C:\EXTRA;
ECHO 7. PATH=C:\DOS;
C:\ARTFILES;C:\VENTURA;
ECHO 8. PATH=C:\DOS;C:\UTILS;
C:\NORTON;
```

```
ECHO To set the environment to
ECHO one of these paths, just
type
ECHO NEWPATH [number].
```

GOTO END

:ONE

```
REM Set the path to the
REM first choice.
PATH=C:\DOS;C:\BRIEF;
ECHO Path set to
PATH=C:\DOS;
C:\BRIEF;
GOTO END
```

:TWO

```
REM Set the path to the
REM second choice.
PATH=C:\DOS;C:\WS;C\
WINDOWS;
ECHO Path set to
PATH=C:\DOS;
C:\WS;C:\WINDOWS;
GOTO END
```

:THREE

```
REM Set the path to the
REM third choice.
PATH=C:\DOS;C:\WP50;C\
WINDOWS;
ECHO Path set to
PATH=C:\DOS;
C:\WP50;C:\WINDOWS;
GOTO END
```

:FOUR

```
REM Set the path to the
REM fourth choice.
PATH=C:\DOS;C:\DPAINT2;C\
PBRUSH;
ECHO Path set to
PATH=C:\DOS;
C:\DPAINT2;C:\PBRUSH;
GOTO END
```

:FIVE

```
REM Set the path to the
REM fifth choice.
PATH=C:\DOS;C:\BRIEF;C\
EXTRA;
ECHO Path set to
PATH=C:\DOS;
```

```
C:\BRIEF;C:\EXTRA;
GOTO END
```

:SIX

```
REM Set the path to the
REM sixth choice.
PATH=C:\DOS;C\C600;C\QB45;
C:\EXTRA;
ECHO Path set to
PATH=C:\DOS;
C\C600;C\QB45;C\EXTRA;
GOTO END
```

:SEVEN

```
REM Set the path to the
REM seventh choice.
PATH=C:\DOS;C\ARTFILES;C\
VENTURA;
ECHO Path set to
PATH=C:\DOS;
C\ARTFILES;C\VENTURA;
GOTO END
```

:EIGHT

```
REM Set the path to the
REM eighth choice.
PATH=C:\DOS;C\UTILS;C\
NORTON;
ECHO Path set to
PATH=C:\DOS;
C\UTILS;C\NORTON;
```

:END

RICHARD C. LEINECKER
REIDSVILLE, NC

Tom Thumbnails

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I used to take *PageMaker's* thumbnail feature for granted, hardly ever using it, until I once showed thumbnails of a lengthy newsletter to a client. He was very impressed, calling it "the most comprehensive first renderings" he'd ever seen. Since then I have used thumbnails often to preview a presentation, to sell an idea, and to spark ideas.

WILLIAM HARRELL
VENTURA, CA

Easy Zips

If you use *PKZIP* and a lot of switches such as `-r` to allow recursing subdirectories, `-p` to store the pathnames, and `-whs` to include hidden and system files, you can set these as default options.

With a text editor, create a file called `PKZIP.CFG`. In this file you'll specify the defaults. To set recursive subdirectories, add these two lines.

```
paths=recurse
recurse=on
```

To include hidden and system files, add the following line.

```
mask=hidden/system
```

To set the method of compression, add this line.

```
compress=size
```

Save the `PKZIP.CFG` file in the `PKZIP` directory. Then set an environment variable

`PKZIP.CFG=C:\PKZIP` in your `AUTOEXEC.BAT` file. Now you're all set. The program will default to what you've set in the `PKZIP.CFG` file. For more information you can consult the `MANUAL.DOC` file in the *PKZIP* package.

SANDEEP TAMHANKAR
HAZLET, NJ

Mondo Batch

Most people have dozens of batch files on their hard drives that make DOS easier for them. Some may log on to a directory, run an application, clear the screen, and then return to the root directory. Some may even be interactive and display menus. But each of these batch files occupies a cluster of storage space. That can be 2K or 4K, depending on the size of your hard drive. It's a shame to waste so much space for these small files.

There is a solution. Combine many of your batch files into one big file. Here's how.

Run a text editor or word processor in ASCII mode. I called mine `BIGBAT.BAT`. Start the file like this.

```
ECHO OFF
IF "%1"==" " GOTO SYNTAX
SHIFT
GOTO %0
```

The label `SYNTAX` will give instructions for using `BIGBAT` in case no command line argument was given. If there was an argument, then the batch file will go to the label of the same name. For instance, if you typed `BIGBAT WORD`, it would go to the label `WORD`. Here's the rest of `BIGBAT`.

```
REM Run XyWrite word processor.
:WORD
CD \XY
EDITOR
CLS
CD \
```

```
GOTO END
REM Run Brief text editor.
:BRIEF
CLS
CD \BRIEF
B
CLS
GOTO END
REM Run QuickBASIC.
:QB
CLS
CD \QB45
QB
CLS
CD \
GOTO END
REM Delete the contents
REM of disk in drive A
REM without Are you sure?
REM prompt.
:KILLA
ECHO Y DEL A:*. *
GOTO END
REM Delete the contents
REM of disk in drive B
REM without Are you
REM sure? prompt.
:KILLB
ECHO Y DEL B:*. *
GOTO END
REM Read a file on the screen.
:READIT
TYPE %1 MORE
GOTO END
REM
:SYNTAX
ECHO To use BIGBAT, type
BIGBAT [label]
ECHO where label is the label
ECHO within the batch file you
ECHO want to execute.
:END
```

RICHARD C. LEINECKER
REIDSVILLE, NC

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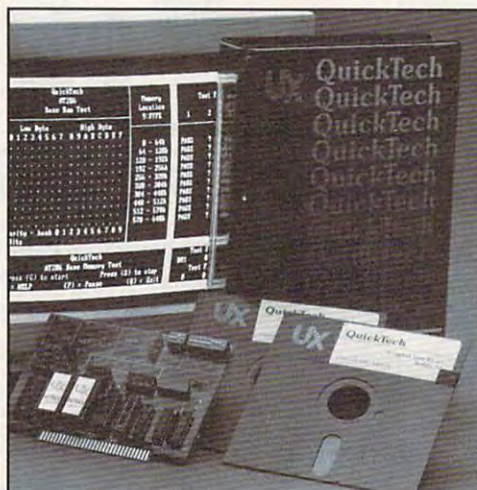
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INTRODOS

Tony Roberts

PROMPTING FOR COLOR

In a recent column, I discussed the PROMPT command and suggested a few ways to customize the DOS prompt so it would provide you with more useful or interesting information.

Perhaps the most common PROMPT command anywhere is PROMPT \$p\$g, which causes the system to display the current PATH on every prompt line. But there's more that can be done with PROMPT, and I invited readers to offer their suggestions.

I heard from several readers, most of whom concentrated on experimenting with color. If you have a color monitor and want to display color on your DOS screens, the PROMPT command is probably the easiest way to do it.

Before you begin experimenting, make sure that ANSI.SYS or an equivalent is installed on your system by checking your CONFIG.SYS file for the line DEVICE=ANSI.SYS.

When installing device drivers such as ANSI.SYS, it's OK to put the driver file in a subdirectory other than the root directory as long as the DEVICE line in the CONFIG.SYS file specifies the complete path.

To refresh your memory on prompt metastrings, refer to table 1. Metastrings are groups of characters (strings) that the program changes into something else. In the case of the PROMPT command, the dollar sign is a special signal that tells the program to apply special treatment to the following character.

On to the prompts: Rob Moses, of Sacramento, California, puts different parts of his prompt in different colors. He prints the path in cyan, a hy-

phen and greater-than symbol (->) in red, and the text in yellow. He describes it as "an interesting effect that emphasizes data and keeps the drive and path in the background."

```
prompt $e[1;36m$P$e[31m
$g$e[33m
```

In this line, you can identify the various metastrings: \$e for escape, \$p for the current path, \$g for the greater-than symbol. Most of the other information—the left brackets and the numbers—is used by ANSI.SYS to control the color of the output.

The combination of an escape character (\$e) and a left bracket ([) is a metastring that alerts ANSI.SYS that it should translate the next few characters. Use tables 2 and 3 to help you interpret the previous PROMPT command.

Following the first \$e[is the number 1, which indicates high intensity, or boldface. Next, the number 36 calls for a foreground color of cyan. The m signals an end to this ANSI color sequence. Further along, 31 changes the color to red, and later 33 changes it to yellow.

If you're getting the hang of understanding these cryptic codes, try this one from Larry Parker of Springfield, Missouri.

```
prompt $e[1;37;44m$P$e[2;37;
40m$ _ $e[1;33;41m$g$e[2;37;40
$e[m
```

This prompt displays the drive and path in bold white type on a blue background and then uses the \$_ metastring to move to a new line, where it displays a prompt arrow (=>) in yellow on red. Finally, normal white text on black is restored.

Bob Smith of Negley, Ohio, sent along a colorful prompt that displays the path in blue text on red, the date in yellow

text on green, and the prompt WHAT NOW? in red text on cyan. The DOS colors are set to white text on magenta.

```
prompt $e[1;34;41m $P$g
$e[1;33;42m $d $e[0;46;31m
WHAT NOW? $e[1;37;45m
```

Our final prompt comes to us from Richard Ericksen, of Orinda, California, who honors us with a prompt that says COMPUTE, spelled out in a rainbow of color.

```
prompt $e[1m$e[37mC$e[35mO$e
[34mM$e[36mP$e[32mU$e[33mT
$e[31mE$e[37m$g$e[0m
```

Thanks to everyone who sent along prompts. You've brought a little color into our lives.

Table 1: Prompt Metastrings

\$q	= (equal sign)
\$\$	\$ (dollar sign)
\$t	current time
\$d	current date
\$p	current drive and path
\$v	MS-DOS version number
\$n	current drive
\$g	> (greater-than sign)
\$l	< (less-than sign)
\$b	(pipe)
\$h	backspace (erases previous character)
\$e	escape code (ASCII code 27)
\$_	carriage return and linefeed

Table 2: ANSI Color Codes

Color	Background	Foreground
Black	40	30
Red	41	31
Green	42	32
Yellow	43	33
Blue	44	34
Magenta	45	35
Cyan	46	36
White	47	37

Table 3: ANSI Attribute Values

0	white text on black
1	bold
2	low intensity
4	underline (monochrome only)
5	blinking
7	reverse
8	hidden

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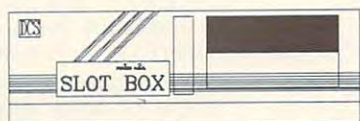
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Mark Minasi

TALK TO YOUR PRINTER

A while back, I played a computer game called *Skyfox II* from Electronic Arts. I don't know if it's still around, but it was an amusing shoot-'em-up in space, in the same genre as Origin's popular *Wing Commander* or, back in 1979, the Atari 400/800 *Star Raiders*. Anyway, it was a fun game, but it desperately needed a map of star bases, asteroid fields, and wormholes—handy little coordinates that could jump you immediately from one point in the galaxy to another.

So I collected the coordinates of all of the interesting objects and set out to write a program that would produce a nice, usable star map on my laser printer. To do that, however, I had to learn the printer's control language. And that's not the last time I've found it useful to know a printer-control language. Just yesterday, I needed to print out the *Windows* configuration file called *SETUP.INF*. Unfortunately, *SETUP.INF* runs 170 characters wide, making it difficult to print out the file on a laser printer. A batch file a couple of lines long, however, did the trick, compressing my printer typeface enough to fit 170 characters on a line. Laser printers have a wealth of nifty features, not all of which are exploited by most application programs. If you know how to write printer-control programs, however, you're no longer at the mercy of your applications.

Each printer's control language is different. The sequence of commands that instruct an Epson dot-matrix printer to draw a circle are completely different from the set of commands used to print a circle on a laser printer. So I'll stick to just one printer's command language: the language used by Hewlett-Packard's

line of laser printers, called HPPCL (Hewlett-Packard Printer-Control Language). There are different versions for different printers, so I'll discuss the most recent version, HPPCL5.

Printer-control languages do such things as select fonts; print graphics; describe the dimensions of the printable area of the page to the printer; and select print effects such as underlining, strikeout, and shadow.

This month, we'll spend a fair amount of space learning how to create printer-control programs. Once we have that out of the way, we'll be able to spend a column or two exploring what PCL can do for you.

Let's start our examination of printer languages by demonstrating how to send printer-control strings to the printer. For our first printer-control program, we'll reset the printer.

Paging Mr. Printer

The easiest way to send commands to your printer is to create a file with those commands and then copy that file to the device PRN. For example, you can make your printer say hello by creating a file that contains the word *Hello*. Call it *GREET.TXT* and just *COPY GREET.TXT PRN*.

You can use any old text editor; EDLIN or DOS 5.0's EDIT will do fine. Don't forget that a laser printer needs an entire page of text before it'll print, so you'll have to take it offline and press the Form Feed button to see your handiwork.

Isn't that form-feeding business annoying? It'll make a good starting point for our first printer batch file: *EJECT.BAT*. The printer command that forces a printer to eject a page is just one character: CTRL-L, the form feed character. Here's how to send a CTRL-L to your printer.

First, we'll create a file called *EJECT.TXT*. It'll contain

the CTRL-L character. I'll use EDLIN and, initially, EDIT for my examples. Since all my printer command programs will be very short, you won't mind using EDLIN, and, besides, everyone has EDLIN. Start the process by typing *EDLIN EJECT.TXT*. You'll see the EDLIN prompt, the asterisk (*). Type I, for *insert line*, and press the Enter key. You'll get a line-numbered prompt.

Now we're going to enter two characters: CTRL-L and CTRL-Z. CTRL-L is the command we want to send to the printer, as I've said. CTRL-Z is the this-is-the-end-of-the-command character. We'll end all our printer programs with CTRL-Z. The reason is simple—when you copy the file to the printer, the printer receives all of the codes in the file, including the carriage return/line-feed at the end of the line. But we don't want to send the CR/LF, as that essentially sends a blank line to the printer.

On the first line, press Ctrl-L and then Ctrl-Z. They'll show up on the display prefixed by circumflexes (that is, $\wedge L \wedge Z$). Press Enter, and EDLIN will offer you a second input line. EDLIN's not too bright—CTRL-Z is the internal character in DOS that signals the end of the file, but EDLIN doesn't seem to notice that you're done until you put a CTRL-Z on a line all by itself. So, at line 2, just press Ctrl-Z and press Enter again. (Think of EDLIN as being hard-of-hearing.) You'll be back to the EDLIN * prompt. You can now save what you've done by pressing E, which signals *save and exit*, and press Enter. EDLIN will save *EJECT.TXT* for you.

If you're using DOS 5.0's EDIT, press Ctrl-P Ctrl-L Ctrl-P Ctrl-Z. Anytime you want to insert a control character in EDIT, you must precede it with a Ctrl-P.

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Circle Reader Service Number 114

Now let's try it out. Just type `COPY EJECT.TXT PRN`. (This works only if there's something waiting to be printed in the printer.) Your page should appear.

It's annoying to have to type that `COPY` command every time, so let's create a batch file that will automate the process. All this batch file will do is copy the file. Use `EDLIN` to create this one, too. Type `EDLIN EJECT.BAT`. We'll call the batch file `EJECT` as well, just to make it descriptive.

When you get the `EDLIN` prompt, type `I` again, and on the first line type `@COPY EJECT.TXT PRN>NUL` and press Enter. There's no `CTRL-Z` at the end of this line. The `@` at the beginning of the line tells DOS not to show us the `COPY` command. The `>NUL` tells DOS to send the screen output from the `COPY` command to the special DOS device called `NUL`. It's a kind of DOS black hole—you put things in it, and they never come out. This way DOS doesn't show us the `1 FILE(S) COPIED` message.

On `EDLIN`'s second line, press `Ctrl-Z` and the Enter key. Type `E` to save the work, and you have an `EJECT` batch file. Now type `EJECT` from the DOS prompt, and voilà! You've forced the laser printer to spit out the page stored in memory.

Here's one side note on this batch file and all the others that we'll build. The `COPY EJECT.TXT PRN` command only works if `COPY` can find `EJECT.TXT`—that is, if `EJECT.TXT` is in the current subdirectory. I generally put all of my printer programs into a subdirectory called `C:\PCODES`. Then I can code the full filename with the subdirectory included. My `EJECT.BAT` looks like `@COPY C:\PCODES\EJECT.TXT PRN>NUL`. That way, `EJECT.TXT`

can be called from any subdirectory.

Now you've built your first printer program. You've seen the following.

(1) You create two files: one that contains the printer command string and another that uses a batch file to copy the command string to the printer.

(2) The printer command string file is a one-liner, and the one line must end with `CTRL-Z`, `ENTER`, `CTRL-Z`, and `ENTER`.

(3) The batch file is also a one-liner, but you end its one line with `ENTER`, `CTRL-Z`, and `ENTER`. (Recall that these instructions are `EDLIN`-specific.)

Calling Room Service

I share a printer—via a print-sharing device—with a few other folks in my office. One thing that constantly annoys me is that most software doesn't clean up after itself. What I mean by that is you'll run a word processor that makes Times Roman the default typeface so it can print your purple prose, and then it prints that purple prose. The problem is what the word processing program does to the printer as the program exits.

Nothing.

The program should reset the printer to its power-up settings, but it doesn't. So I wrote `RESET.BAT`. You reset a printer with just two characters: the `ESCAPE` character and a capital `E`. That's simple enough, but what's an `ESCAPE` character?

You see `ESCAPE` in most printer-control strings. It's also `CTRL-[` (that's a left bracket). But as you'll see, it's a bit tricky to enter it in a text editor. So let's see how we can do it.

You'll notice an `Esc` key on your PC keyboard. That's an `Escape`, all right—but don't try pressing it to insert an `ESCAPE` code into a file.

To build `RESET.BAT`, we'll first need `RESET.TXT`. Type `EDLIN RESET.TXT` and, as before, press `I` to start inserting lines. You insert the `ESCAPE` code by pressing `Ctrl-V` and then `[` (the left bracket). Then press `E`—making sure it's a capital `E`. Don't forget that all printer command strings end with `CTRL-Z`. Then press Enter. Again, `EDLIN` will expect another line, so press another `Ctrl-Z` and press Enter. Save the file with `E`, and test it out by typing `COPY RESET.TXT PRN`. As before, create a `RESET.BAT` batch file. On my system, it contains just one line: `@COPY C:\PCODES\RESET.TXT PRN>NUL`.

When you run `RESET.BAT`, all you'll see will be the printer's Form Feed light flashing briefly. The flashy programs come later.

If you're using `EDIT`—and if you're not, why not? DOS 5.0 is only 39 bucks at Egghead—you'll have to use a slightly different approach to enter the `ESCAPE` code. You can create `RESET.TXT` like this.

First, invoke `EDIT` with `EDIT RESET.TXT`. For the first line, press `Ctrl-P Ctrl-[` (that enters the `ESCAPE` code), then `E`, then `Ctrl-P Ctrl-Z`. The line will look like a capital `E` surrounded by arrows facing in opposite directions.

Save it by pressing `Alt-X` and the Enter key. Creating `RESET.BAT` involves no special instructions.

If you'd like to try your hand at another printer-control program, try this one from last month, a program that produces a solid black page: `<ESC>&10E<ESC>ESC>*p0x0Y<ESC>*c2400a3300B<ESC>*c0P<ESC>E`

The `<ESC>` is shorthand for the `ESCAPE` code. Pay close attention to the upper- and lowercase, and the first two 10s are *one-zero*, not *lowercase L-uppercase O*. □



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MEET THE MOVERS AND SHAKERS

November 11-17, 1991, will go down in history as a special week. That's because it was Sierra week on COMPUTE/NET on GENie. Trivia quizzes with prizes, the latest Sierra demo software for downloading, and realtime conferences with the Sierra folks provided exciting events each and every day.

If you think you're an expert on Sierra software, you can still take the Sierra trivia quiz. It's in the COMPUTE Game section. We're not giving prizes anymore, but you'll still have a good time trying to match wits with the other Sierra trivia mavens. You can, however, win prizes by playing the COMPUTE scavenger hunt. It has questions about the latest issue of COMPUTE magazine. Prizes include magazine subscriptions, disk products, books, and connect time.

During Sierra week we had three realtime conferences: one with Corey and Lori Cole, authors of *Quest for Glory*; another with Al Lowe, author of *Leisure Suit Larry*; and the third with Ken and Roberta Williams, founders of Sierra. The discussions were lively, entertaining, and informative. You can get the transcripts and find out what went on by getting on COMPUTE/NET on GENie, finding COMPUTE's PC Magazine software library, and downloading THECOLES.TXT (the transcript of Corey and Lori Cole's RTC), ALLOWE.TXT (the transcript of Al Lowe's RTC), and KENROB.TXT (the transcript of Ken and Roberta Williams's RTC).

In January we're sponsoring another event. It's going to feature Brøderbund's PlayMaker Football software. You'll be able to download the demo software, play the PlayMaker

Trivia quiz and try for fabulous prizes, and participate in several realtime conferences. It's the perfect time for this to happen, too, right before the 1992 Super Bowl. Hope to see you there.

We've had lots of requests online for our previously published BASIC programs. It seems that the advent of *Visual Basic* and the preponderance of *QuickBASIC* have awakened a sleeping giant. BASIC is back, and plenty of hobbyists want BASIC programs to tinker with and learn from. Since you asked for them, we're more than happy to comply. Just log on to COMPUTE/NET on GENie or America Online, go to COMPUTE's PC Magazine software library, and you'll find tons of BASIC programs.

We uploaded several of our BASIC collections with source code only (those are the BAS files). After getting some feedback, though, we've started to include both the source code and the compiled, executable program so that nonprogrammers can have ready-to-run software without having to fool with BASIC. We're going back now and adding the compiled programs to the source code files we uploaded earlier. When you look through the files, note whether they're EXE files.

As always, COMPUTE/NET has software in its libraries that you'll want to download. To find the files, just log on to COMPUTE/NET and go to the software library section. Here are my recommendations.

This month's featured GIF picture is MOONFOOT.GIF. It's a hi-res, 256-color picture of an astronaut's foot on the moon. It was taken by the astronaut himself, looking down at his foot on the lunar surface. It's not only attractive but also thought provoking.

If you need a utility that gives you keypress shortcuts, try *SuperMAC* (filename SU-

PERMAC.ZIP). It's a keyboard macro utility that was published on COMPUTE's PC Disk. For those of you new to PCs, a keyboard macro program lets you store a sequence of keypresses that can be called with one hot key. For repetitive tasks, a utility of this kind saves you endless time and energy by easily repeating sequences of keypresses. This program isn't shareware, so you won't get requests for a registration fee. You won't have much trouble using it. For a program of this type, it's easy to use and has most of the features of commercial macro utilities.

If you like playing cards, you'll love *Card Shark* (filename CARDSHRK.ZIP). It has all of the casino favorites: poker, blackjack, baccarat, and solitaire. For poker, blackjack, and baccarat you can play up to five hands and sit in any position. That's great for those of you who're practicing for the next junket to Atlantic City or Las Vegas. The program even gives you advice if you don't know what you should do next. The colorful graphics run in CGA, EGA, Tandy 16-color, and VGA graphics modes.

What do you think of COMPUTE magazine? If you have suggestions or comments, there's an easy way to talk to us and get a swift response. Get onto COMPUTE/NET and leave messages to the editors and staff in our message section. It's probably the least formal way to communicate with the COMPUTE staff, and because of that, you'll get friendly and speedy answers to your questions and comments.

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 RLEINECKER on GENie, Rick CL on America Online, or 75300,2104 on CompuServe. □

Rub elbows with the likes of Ken and Roberta Williams, founders of Sierra, on COMPUTE/NET.

INTRODUCING

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COMPUTE/NET on GENie had a terrific grand opening. The comments ranged from "I've never seen a RoundTable open up with so much information" to "This makes my modem and computer system worth their price."

This month we're sponsoring some contests. Do you know your computer trivia? Then try our computer trivia game. And that's only one of the games we have ready. There's a scavenger hunt and a logic game. And if you win, you can get free magazine subscriptions, disks, books, or connect time.

Above all, though, when you visit COMPUTE/NET, stop in at the COMPUTE Bulletin Board and participate in some of the most stimulating conversations online.

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ON DISK

Tony Roberts

SHOP SMART, SEE THE DOCTOR, AND MORE

This issue's *PC Disk* is loaded with fun software. We have programs to fill you in on the day's historical events and to help you make your shopping list.

The disk also includes a utility that lets you in on the inner workings of your PC as well as an outstanding application-switching program for Windows users.

COMPUTE's *PC Disk* is issued every other month and includes a selection of the best shareware and freeware programs we've been able to locate. We scan hundreds of pro-

WinEZ is here. It's the Windows program I've been looking for since the day I cracked open my Windows 3.0 box.



grams and present you with the cream of the crop to save you time and trouble.

The disk is mailed automatically to those who subscribe to the service, but it's also available on a disk-by-disk basis. If something on this month's disk interests you, send in the adjacent coupon and give these programs a test run.

If you find some software you can use and think it's a good value, be sure to send in a registration form and pay any fee requested by the author. If everyone will support shareware authors, they'll continue to produce software we can try before we buy.

The Grocer

Ever since I bought my first computer ten years ago, peo-

ple have asked whether it could be of any help doing a normal household chore such as filling out a grocery list. Up until now, I've said no, but things may be changing.

The Grocer, a creation of Richard Zakas, finally makes computerized grocery list management practical. His program is fast, customizable, and easy to use.

You start with the sample data files and add to them the foods you buy, the product sizes, and the prices. Then to make a grocery list, you simply indicate how many of each item you want to buy.

The program organizes its displays (and printouts if you wish) into food groups—canned goods, condiments, paper products, and so on—making it easier to fill out your shopping list. Once you get to the store, you'll find that the grouping on your list fairly well matches the grouping of products on the shelves.

The Grocer also can help with budgeting. If your database contains up-to-date pricing information, you'll have a close estimate of how much this week's shopping expedition will cost before you ever leave home.

Zakas distributes *The Grocer* as shareware and requests a \$12.50 registration fee, which should be mailed in by anyone who continues using the program after an initial testing period.

Today

With Patrick Kincaid's *Today* running on my system, I really look forward to going to work each day. The program, which runs as the last item in my AUTOEXEC.BAT file, fills my screen with fascinating facts relevant to today's date.

I find out who's celebrating a birthday, I learn what hap-

pened historically on that date, and I read a pithy thought for the day. Although the program comes with its own data files, the user is encouraged to create a data file of his own important dates. On February 22, George Washington's birthday will be reported, but my dad's birthday will be noted there as well.

Today also allows you to create reminders. Perhaps you need a reminder on the first day of each month to pay the rent. I've just entered a 21-day reminder for the three weeks preceding my wife's birthday. Maybe this year I'll do my shopping before the eleventh hour.

People who use *Today* are asked to send in the program's \$15 registration fee. Registered users will receive updated disks which include greatly expanded data files as well as a companion program called *When*, which permits you to search the data files for specific events, rather than specific dates.

PC Doctor

PC Doctor is a shareware program that lets you in on the inner workings of your PC. Among its features is a system analysis, which gives you the lowdown on your PC's configuration, tells you about its memory, and reports on installed ports.

The program also can display a memory map and information about IRQs, TSRs, the environment, and installed device drivers. You can scroll through your system's memory and edit it if necessary.

PC Doctor, which was created by COMPUTE's Rick Leinecker, has a \$19.95 shareware registration fee.

Critter

Dana Cline's *Critter* is a critical error handler that replac-



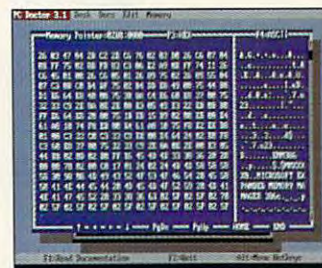
The Grocer



Today



Critter



PC Doctor

es the infamous *Abort, Retry, Fail* message that DOS unceremoniously provides when something goes wrong.

Critical errors are hardware errors, often involving disk drives (no disk or door open, for example) or printers (offline or no paper, for example). When a problem occurs, *Critter* pops up with a bright

and a bright red box that explains the problem. You still press the appropriate key to continue, but it's nice to be notified of the problem in such a pleasant way.

If the system is unattended, however, such as a network hub, a BBS system, or a system running batch files, *Critter* permits an automatic response after a specified timeout. The automatic responses that can be preprogrammed include *Abort, Retry, Fail, Ignore, Warm Reboot, and Cold Reboot*. Critical errors also can be logged to a printer.

Critter is a memory resident utility that can be loaded high under DOS 5.0. If the software you are using has its own critical error routine, *Critter* quietly steps aside and lets it do the work. The program is offered as shareware and has a \$20 registration fee.

WinEZ

Here's the *Windows* program I've been looking for since the day I cracked open my *Windows 3.0* box. *WinEZ* makes it a snap to switch instantly from one application to another.

The program installs two additional buttons on the title bar of the active window. One is the Fast Path Icon, which allows you to quickly start any *Program Manager* application; the other is the Task Switch Icon, which moves you instantly to any currently open application.

WinEZ also includes a Run feature that lets you quickly select and run any executable file on disk. In addition, Run remembers the last five programs initiated through this facility and maintains a list box with their names so they can be found and executed easily.

I haven't seen a faster, friendlier tool for *Windows* navigation. *WinEZ*, from New Generation Software, is shareware with a fee of \$29.95. □

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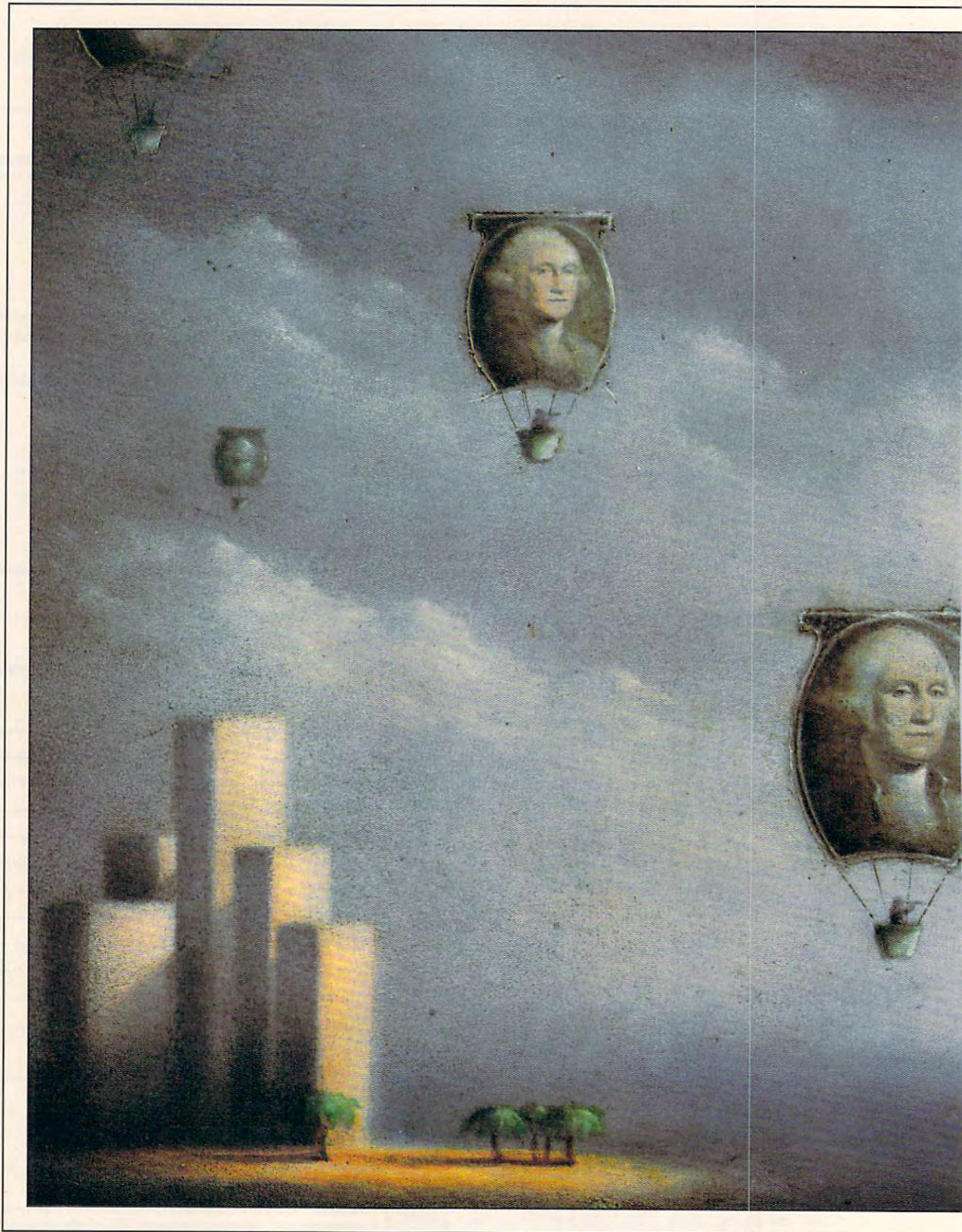
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ONCE YOU GET IT,
HOW WILL YOU MANAGE IT?
NOTHING IS CERTAIN BUT

WEALTH AND TAXES

BY ROSALIND RESNICK

For millions of Americans, April 15—Tax Day—is a day approached with dread. If you're like many last-minute taxpayers, you'll spend one long, sleepless night rummaging through a stack of old receipts, bank statements, and check stubs. Then, scribbling some numbers on your coffee-stained tax return, you'll dash off to the post office just before midnight—offering up a prayer to the patron saint of Lost Taxpayer Causes as you slip the envelope through the slot. Or maybe you'll simply throw up your hands and dump the whole mess on the lap of the nearest C.P.A., paying dearly for your procrastination.

There is a better way, and if you have a computer, you're already way ahead of the game. If you use tax-preparation software, you'll probably end up spending far less than the \$50 an hour charged by many C.P.A.'s, who often use professional versions of the same software that you can go out and buy yourself.

Now that prices are coming down and programs are getting friendlier, you owe it to yourself to give tax-preparation software a try. If you do, you'll be in good company. Dataquest, the San Jose market research firm, estimates that over three-quarters of a million personal tax packages were sold in 1990. Dataquest predicts that figure could double by the end of 1991, and again in 1992.

"It's one of the fastest growing software categories around," says Gladys Francis, a Dataquest information analyst. "If you know how to use a personal computer, you can probably use tax-preparation software."

Once merely glorified spreadsheets, tax-preparation programs now do virtually everything except root through your shoeboxes and sign your name at the bottom of the return. These days just about all of the top-selling programs—*TurboTax*, *TaxCut*, *MacInTax*, *Personal Tax Edge*, and others—feature IRS instructions online, taxpayer interviews, pop-up help, onscreen calculators, almost every IRS form you'll ever need, and the ability to import data files from programs like *Quicken* and *Managing Your Money*. Upgrades for the 1992 tax season have improved on these features to make them better, faster, and even friendlier.

"We have turned from form preparers to tax advisers," says Anne Rawland, director of corporate communications at Parsons Technology, which sells *Personal Tax Edge*. "We're both a form provider and a simplified H&R Block at the same time."

Andrew Tobias, the popular financial writer who lends his name and expertise to MECA Software's *TaxCut*, says he uses the tax-preparation software to do his own taxes, his friends', and even his mother's.

"If you're rich and you hate this kind of thing, you can take everything over to your accountant and pay \$2,000 and not worry about it," Tobias says. Tax software, on the other hand, is inexpensive and "ready when you are, and you don't have to leave messages with the secretary."

Even the U.S. government, often

WEALTH OF INFORMATION

There's probably a money-management program out there that's perfect for you. And, if you're conscientious about using your software, when tax time rolls around, you can hit a few keys and all the information slips neatly into a software program that computes your taxes.

Most money-management software falls into one of two categories: day-to-day cash management and long-term financial planning. A few programs (*Market Base* and *Andrew Tobias' Managing the Market*, for example) even help you track the stock market.

Intuit's *Quicken*, by far the most popular personal finance program, looks and works just like a checkbook and register. *Quicken* helps you pay your bills, track your income and expenses, budget, and keep track of your stock portfolio.

The other leading personal finance program is *Andrew Tobias' Managing Your Money 7.0* (\$219.95) by MECA Software. *Managing Your Money* does everything

Quicken does and packs in plenty of pithy advice from the financial expert and best-selling author whose name is on the product. *Managing Your Money* also has everything you need to run a home business, including an appointment calendar and an electronic card file. The program also links up with MECA's *TaxCut* and *Managing the Market*, which automatically updates stock quotations online by logging on to Dow Jones News/Retrieval. Also watch for forthcoming personal finance software from Parsons.

If your goal is active portfolio management and long-term financial planning, consider programs like *Dollars & Sense* and *Money* magazine's *WealthBuilder*. Introduced in 1989 by Reality Technologies, *WealthBuilder* bills itself as "the program that picks up where *Quicken* leaves off." With Wall Street scandals breaking almost daily and the nation's S&Ls drowning in debt, your computer may be the only investment adviser you can really trust.

maddeningly slow to embrace change, favors the growing trend toward taxpayers using PCs to fill out their own returns. "We don't have any problem with it as long as it results in an accurate return," says an IRS spokesman in Washington, D.C. In the not-too-distant future, he predicts, home computer users will be able to send their returns to the IRS via modem.

Despite the many pluses, however, tax software isn't for everybody. If you don't do your own taxes now and wouldn't know a 1040 if you tripped

over one, you may be better off continuing with your accountant. Likewise, if your taxes involve passive losses, home office deductions, or anything else that's likely to trigger an IRS audit, then a C.P.A. may be your best bet.

Fortunately, when it comes to shopping for tax software, it's hard to go wrong. Since the market is so competitive, once one company unveils a new bell or whistle, it isn't long before everybody else builds in that feature, too. And even though the market for tax software has undergone a good deal of consolidation over the last few years, price competition remains fierce. Most top-selling programs now sell for less than \$100 with upgrades available for under \$50.

Here's how the Big Three of the tax-preparation software field break down:

- *TurboTax* (\$79.95 for the DOS version, \$99.95 for *Windows*) and *MacInTax* (\$99.00): The most popular program by far, ChipSoft's *TurboTax* offers versions not just for Joe Taxpayer but for C.P.A.'s and tax preparers, too. *TurboTax*'s latest version features 11 new forms and work sheets, toll-free technical support, quicker data entry, a smoother interface with *Quicken*, a *Windows* version, and a final review feature that checks over your tax return after you're done. Now that ChipSoft has bought out Softview, the developer of *MacInTax* (the leading Macintosh tax program), *TurboTax for the Mac* has been discontinued, and many of its best features have been grafted onto *MacInTax*.
- *Andrew Tobias' TaxCut 1040* (\$89.95): The up-and-coming num-

TAPPING THE MONEY LINE

If your PC is equipped with a modem, financial help and information are only a phone call away. But be prepared to pay for it. Dow Jones News/Retrieval can run you close to \$200.00 an hour after access fees, surcharges, and per-character charges. On the other hand, DJN/R is the only service with up-to-the-minute stock quotes—and that may be just what you need. If you can wait until the trading day is over, you can get daily stock quotes on GEnie as part of your basic service for an access fee of \$4.95 per month.

For financial novices, Prodigy offers a wealth of financial information for the monthly membership fee of \$12.95. Prodigy's Money section includes advice on financial planning and home business, a Money Talk bulletin board, and more. For \$14.95 more per month, Prodigy members can log on to Strategic Investor, a database with reports on more than 4500 individual stocks and 2500 mutual funds plus market news, charts, and columns from *Investor's Business Daily*.

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<p><i>AM-TAX Personal-1</i> <i>AM-TAX Personal-2</i> <i>AM-TAX Professional</i> AM Software P.O. Box 25010 Kansas City, MO 64119 (816) 426-8361</p>	<p>\$40.00/\$25.00 (<i>Personal-1</i>) \$65.00/\$45.00 (<i>Personal-2</i>) \$125.00/\$95.00 (<i>Professional</i>)</p>	<p>IBM PC or compatible; 320K RAM (<i>Personal-1</i> and <i>Personal-2</i>), 512K and hard disk (<i>Professional</i>)</p>	<p>18 states at \$30.00 each (\$20.00 each for update): AZ, CA, GA, IL, IN, KS, KY, MD, MA, MI, MO, NJ, NY, NC, OH, PA, SC, VA</p>
<p><i>TurboTax</i> (DOS or <i>Windows</i>) ChipSoft 6330 Nancy Ridge Dr., Ste. 103 San Diego, CA 92121 (619) 453-8722</p>	<p>\$79.95/\$44.95 (DOS) \$99.95/\$54.95 (<i>Windows</i>)</p>	<p>IBM PC or compatible, 512K RAM, and hard disk; for <i>Windows</i> version, <i>Windows</i> 3.0</p>	<p>DOS, 44 states at \$49.95 each: AL, AZ, AR, CA, CO, CT, DE, DC, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, TN, UT, VT, VA, WV, and WI <i>Windows</i>, 15 states at \$69.95 each: CA, CT, DC, IL, MD, MA, MI, MN, NJ, NY, NC, OH, OR, PA, and VA, with nonresident NY forms included in NJ and CT</p>
<p><i>RapidTax Professional</i> <i>RapidTax</i> DacEasy 17950 Preston Rd., Ste. 800 Dallas, TX 75252 (800) 877-8088</p>	<p>\$699.95/\$399.00 (<i>RapidTax Professional</i>) \$49.95/\$25.00 (<i>RapidTax</i>)</p>	<p>IBM PC or compatible, 512K RAM, and hard disk; (<i>RapidTax Professional</i> only) laser printer required for Client Organizer/Proforma</p>	<p>24 states at \$25.00 each: AL, AZ, CA, CO, CT, DE, DC, GA, ID, IL, IN, LA, MD, MA, MI, MO, NJ, NY, NC, OH, PA, SC, VA, and WI</p>
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<p><i>Tax Preparer</i> HowardSoft 1224 Prospect St., Ste. 150 La Jolla, CA 92037 (800) 822-4829</p>	<p>\$295.00/\$99.00</p>	<p>IBM PC or compatible, 128K RAM (with IBM BASIC) or 256K (with GW-BASIC)</p>	<p>1 state at \$125.00: CA</p>
<p><i>Andrew Tobias' TaxCut 1040</i> MECA Software 55 Walls Dr. Fairfield, CT 06430 (800) 288-6322</p>	<p>\$89.95/\$49.95</p>	<p>IBM PC or compatible, 512K RAM, and hard drive</p>	<p>13 states at \$39.95 each: CA, CT, DC, GA, IL, MD, MA, MI, NJ, NY, OH, PA, and VA</p>
<p><i>Tax Ease Individual</i> Park Technologies P.O. Box 1317 Clifton Park, NY 12065 (518) 877-5881</p>	<p>\$79.00/\$49.00</p>	<p>IBM PC or compatible, 256K RAM, and <i>Lotus 1-2-3</i> or compatible spreadsheet</p>	<p>25 states included for \$10.00 more (final cost \$89.00): AZ, CA, CO, CT, DC, GA, IL, IN, KS, KY, LA, MD, MA, MI, MN, MO, NJ, NY, NC, OH, OK, OR, PA, VA, and WI</p>
<p><i>Personal Tax Edge</i> Parsons Technology One Parsons Dr., P.O. Box 100 Hiawatha, IA 52233-0100 (800) 223-6925</p>	<p>\$49.00/\$24.50 to upgrade from last year's <i>Personal Tax Preparer</i></p>	<p>IBM PC or compatible, 640K RAM, and hard disk</p>	<p>All states that require a return except HI for an additional \$49.00</p>
<p><i>J. K. Lasser's Your Income Tax Software</i> Simon & Schuster Software 15 Columbus Cir. New York, NY 10023 (800) 825-7638</p>	<p>\$74.95/\$49.95</p>	<p>IBM PC or compatible, 512K RAM, and hard drive</p>	<p>24 states at \$29.95 each: AL, AZ, CA, GA, IL, IN, IA, KS, KY, LA, MD, MA, MI, MN, MO, NJ and NY together, NC, OH, OK, PA, SC, VA, and WI</p>
<p><i>EasyTax</i> (replaces <i>Swiftax</i>) Timeworks 625 Academy Dr. Northbrook, IL 60062 (800) 323-7744</p>	<p>\$79.95/\$39.95</p>	<p>IBM PC or compatible, 512K RAM, one floppy drive or hard drive; for state returns: 640K and hard drive</p>	<p>24 states at \$39.95 each: AL, AZ, CA, GA, IL, IN, IA, KS, KY, LA, MD, MA, MI, MN, MO, NJ, NY, NC, OH, OK, PA, SC, VA, and WI</p>

Forms	Technical Support	Description and Features
<i>Personal-1</i> : 1040, 2106, 2119, 2210, 2441, 3903, 4562, 6251, 8615, 8814, W-2, W-2G, W-2P; schedules A-F, EIC, R, and SE <i>Personal-2</i> and <i>Professional</i> : all forms with <i>Personal-1</i> plus 1040A, 1040ES, 3800, 4136, 4137, 4255, 4684, 4784, 4797, 4835, 4868, 4952, 4972, 5329, 6252, 8283, 8453, 8582, 8606, 8829; schedules 1-4 and D1.	Unlimited support by toll call during business hours, Monday through Friday; extended to 8:00 p.m. on Mondays and Tuesdays January 15 through April 15	Input screens follow tax forms. Supporting forms are called up with the press of a key. Prints approved tax forms on most dot-matrix and laser printers; no special fonts or paper required. <i>AM-TAX Personal-1</i> is designed for simple tax situations and low-end computers. <i>AM-TAX Personal-2</i> is designed to handle virtually any personal tax situation. <i>AM-TAX Professional</i> includes the ability to handle up to 500 returns per directory, and it issues an instruction letter, a client bill, and a 1992 organizer.
1040, 1040A, 1040ES, 1116, 2106, 2119, 2210, 2441, 2555, 2688, 3800, 3903, 3903F, 4137, 4255, 4562, 4684, 4797, 4868, 4952, 4972, 5329, 6198, 6251, 6252, 8283, 8332, 8453, 8582, 8606, 8615, 8814, 8822, and 8824; schedules 1-3, A-F, R, and SE; plus 22 work sheets	Free technical support via toll call, fax, bulletin board, CompuServe, and GEnie	For 1991 <i>TurboTax</i> added 11 new forms and an easier installation process. Another new feature categorizes you according to special situations and leads you through all the proper forms. Its final review feature displays an evaluation of the return once it's completed. <i>TurboTax</i> also offers a short-form program for \$29.95 (DOS) or \$39.95 (Windows).
1040, 1040A, 1040ES, 1040EZ, 1116, 1310, 2106, 2119, 2210, 2210F, 2441, 2688, 3800, 3903, 3903F, 4137, 4255, 4562, 4684, 4797, 4835, 4868, 4952, 5329, 6251, 6252, 8283, 8453, 8582, 8606, 8615, 8814, 8815, 8829, and 9282; schedules 1-3, A-F, R, and SE; plus 21 work sheets; <i>RapidTax Professional</i> includes additional forms 1040X, 3468, 4136, 4469, 4972, 5884, 6198, 8271, 8801, and 8803; <i>RapidTax</i> includes form 2555.	Unlimited telephone and fax support (<i>RapidTax Professional</i>); Unlimited free fax support, unlimited telephone support and priority updates for \$25.00 (<i>RapidTax</i>).	After Sylvia Porter's death, DacEasy dropped her name from the <i>RapidTax</i> program. Both versions of <i>RapidTax</i> support laser and dot-matrix printers. In <i>RapidTax Professional</i> a database manager tracks client data and prints reports or mailing labels. <i>RapidTax Professional</i> also includes a client organizer that carries last year's tax forward including depreciable assets with updates. <i>RapidTax Professional</i> also has higher quality forms than <i>RapidTax</i> , the individual version.
1040, 1040A, 1040X, 1041, 1116, 2106, 2119, 2210, 2439, 2441, 2555, 3468, 3800, 3903, 4136, 4137, 4255, 4562, 4684, 4797, 4835, 4868, 4952, 4972, 5329, 5884, 6198, 6251, 6252, 8283, 8396, 8582, 8586, 8606, 8615, 8803, 8814, 8815, 8828, 8829; schedules 1-3, EIC-A, A-F, K, R, and SE	Unlimited support during normal business hours, Monday through Friday, by toll call	Tracks omissions and potential errors. File preview discloses summary of tax information without loading the file. Tracks line number and form location of all overridden fields. Professional version also prepares a transmittal letter explaining the amount of tax or refund due and provides a customer invoice.
1040, 1040ES, 2106, 2119, 2210, 2441, 3468, 3800, 3903, 4562, 4797, 5329, 6251, 6252, 8582, 8606, 8615, and 8829; schedules A-F, R, SE, and EIC	Free telephone support and a 24-hour fax line	HowardSoft markets <i>Tax Preparer</i> for professionals and individuals with complex returns. It has more than 20,000 users nationwide. It allows them to forecast tax liabilities while planning future tax strategies. It includes a file manager that allows control of multiple accounts, plus cover and billing letters, batch processing, and graphic printing.
1040, 1040A, 1040EZ, 1040ES, 1040X, 1099-R, 1116, 2106, 2119, 2210, 2441, 2688, 3468, 3800, 3903, 4136, 4137, 4255, 4562, 4684, 4797, 4835, 4868, 4952, 4972, 5329, 6198, 6251, 6252, 8271, 8283, 8453, 8582, 8606, 8615, 8801, 8803, 8814, 8815, 8822, 8824, 8829, W-2, W-2-P, and W-2-G; schedules 1-4, A-F, R, SE, and EIC; plus 21 work sheets	Unlimited support via toll call, CompuServe, and fax, plus a special number for installation problems	<i>TaxCut</i> is based on an expert system designed to learn about the user as it prepares the tax forms. It raises red flags at figures that might trigger an audit. MECA guarantees <i>TaxCut's</i> accuracy with a pledge to pay penalties resulting from any miscalculation by the program. A shoebox feature can sort tax records into specific categories from a general file. MECA also offers a short-form version called <i>TaxCut EZ/A</i> for \$29.95. The buyer can upgrade to <i>TaxCut</i> for \$25.00 if the return becomes too complicated for <i>EZ/A</i> .
1040, 1040X, 2106, 2119, 2210, 2210F, 2441, 3800, 3903, 4136, 4255, 4562, 4797, 4952, 4972, 6251, 6262, 8582, 8606, 8615, and 8814; schedules A-F, R, and SE; plus four work sheets	Unlimited support via toll call	<i>Tax Ease</i> combines both federal and state returns on a single program and features line-by-line assistance for complex forms. The program is five years old with 1000 current users. On-disk tutorial and printed instructions.
1040, 1040A, 1040ES, 1040ES WS, 2106, 2119, 2210, 2210WS, 2441, 3903, 4562, 4684, 4797, 4868, 5329, 6251, 8283, 8453, 8606, 8615, 8814, and 8829; schedules A-F, R, and SE; plus seven work sheets	Unlimited support via CompuServe, fax, or toll call	Replaces <i>Personal Tax Preparer</i> . New: state modules, cross-referencing, online help, a glossary, enhanced windowing, pull-down menus and toolbars, plus turbo-speed processing. Includes a depreciation calculator, online questionnaire, and audit warnings. If you have no tax payment due, <i>Personal Tax Edge</i> supports electronic filing (for \$19.00).
1040, 1040A, 1040ES, 1040EZ, 1040X, 1099R, 1116, 2106, 2119, 2210, 2441, 3800, 3903, 4136, 4137, 4255, 4562, 4684, 4797, 4835, 4868, 4952, 4972, 5329, 6198, 6251, 6252, 8283, 8453, 8582, 8606, 8615, 8814, 8815, 8824, W-2, W-2G, W-2P, Schedules 1-3, A-F, K, R, and SE; plus 12 work sheets	Unlimited support via toll call or fax	This program still comes with J. K. Lasser's <i>Your Income Tax 1992</i> and includes an interview feature which walks a user through filling out the necessary forms. This year's version supports electronic filing via modem or disk and includes a tax timesaver that works straight from tax records. It will compare different strategies (for example, a married couple could file jointly or individually) to contrast their impact.
1040, 1040A, 1040EZ, 1099-MISC, 1099-R, 2106, 2119, 2210, 2441, 2688, 3800, 3903, 4137, 4255, 4562, 4684, 4767, 4868, 4952, 4972, 5329, 6251, 6252, 8283, 8453, 8582, 8606, 8615, 8814, 8815, 8822, 8829, W-2, and W-2G; schedules 1-3, EIC-A, A-F, K, R, and SE; plus 19 work sheets	Unlimited free support via toll call (satisfaction guaranteed). Support hours extended after January 2. Toll-free premium support: \$50 annual fee.	Just released in September 1991, <i>EasyTax</i> is an upgrade of Timeworks' <i>Swiftax</i> program. Timeworks describes it as "the only program that replicates IRS-identical forms on laser or dot-matrix printers with no additional software or font cartridge required." It supports electronic filing, includes shoebox-style expense entries, and imports from <i>Quick-en</i> , <i>Lotus 1-2-3</i> , <i>Dollars & Sense</i> , and <i>Managing Your Money</i> .

—GARY TAYLOR

GETTING HELP

While financial software can certainly make your life simpler, it can't make you wealthy unless you yourself are prepared to make some savvy decisions. Let's face it—even the world's most sophisticated software program can't tell you which stock will be a superstar or whether to buy term or whole life insurance.

The secret, say the professionals, is solid tax and financial planning, not betting the farm on a hot new issue or seeking out some shady accountant who promises to save you a bundle.

"Good planning is not going to make you rich," says Harold Evensky, a financial planner at Evensky & Brown in Coral Gables, Florida. "You're going to get rich by doing whatever you do for a living. Good planning is not a way to beat the system. Rather, it's an intelligent way to work with the system."

If your goal is a comfortable nest egg and long-term financial success, here's

what Evensky suggests:

- Cover your assets: Protect yourself against disaster with life, health, and disability insurance.
- Save for a rainy day: Set aside enough cash to cover at least three months' living expenses.
- Don't put all your eggs in one basket: Diversify your portfolio. Don't just buy bonds; for example. Buy government bonds; corporate bonds; short-, intermediate-, and long-term bonds; and taxable, tax-free, and tax-deferred bonds.
- Don't hide from the tax man: Invest your money in whatever you think will yield the highest returns. After all, it's not how little you pay in taxes; it's how much you get to keep after your taxes are paid.
- Plan to die (and to live): Make a will. Let your heirs know how to handle your estate after you're dead or incapacitated.
- Plan to plan: Start early. Be realistic. Get good, qualified, independent advice.

ber 2 of the tax-preparation market, *TaxCut* owes a lot to a program released several years ago called *Ask Dan About Your Taxes*. Massachusetts tax lawyer Daniel Caine continues to refine the software as president of Legal Knowledge Systems, while MECA Software (marketer of Andrew Tobias' other software programs) distributes it. The program's strong points are its ease of use, especially for tax novices, and Caine's expert advice that's sprinkled throughout. This year's program includes a soup-to-nuts taxpayer interview, a *Windows* version to be released in January, and *TaxCut EZ/A*, a "baby *TaxCut*" for short-form users that retails for \$29.95. If you discover along the way that you really need the long form, you can always upgrade to the regular *TaxCut* for only \$25.00 more.

- *Personal Tax Edge* (\$49): The nation's third-ranked program in user popularity, Parsons' tax software has long been a low-price leader. The \$49 package packs in everything the big boys do—depreciation calculator, audit warnings, what-if estimator, taxpayer interview, the works—in addition to free, unlimited technical support by phone. *Tax Edge's* object-oriented capabilities, added in 1990, let you open the Schedule C file, for example, at the same time you're working away on your 1040. Last October, Parsons released an early bird version of its program by mail for only \$29. Rawland, Parsons' director of corporate communications, says this year's *Personal Tax Edge* crunches numbers faster and offers better graphics.

No matter which tax program you decide to buy, make sure it includes these helpful features:

- Taxpayer interview: A series of step-by-step questions can help guide you through the maze of forms and schedules you'll need to file. This year's *TaxCut*, for example, starts out by asking you such questions as "Do you want to file jointly?" and then suggesting some reasons to consider doing that. *TaxCut* even prompts you to enter your name, occupation, and Social Security number.
- Forms and schedules: Besides the basic 1040, most top-selling programs include dozens of approved IRS forms for everything from deductible business expenses to depreciation of rental property. Make sure the program you buy has the forms you need.
- IRS instructions: Unless you get your kicks from wading through a pile of IRS brochures, you'll want a program that has the official IRS instructions online.
- Electronic filing: If you think you're due a refund, get a program that lets you file your return via modem. The reason? You'll get your refund check a lot faster. Many programs let you electronically send your completed form to a third-party service which, in turn, transmits your return to the IRS computers. (There is an additional fee for this.)
- What-if tax planning: You can plot this year's tax strategy and get a head start on 1993 with programs that let you make projections. You can calculate how fast your home business will grow, for example, or whether you can save money if you

and your spouse file separately.

- Onscreen tools: Pop-up calculators and scratch pads mean you don't have to waste time rooting through piles of paper to find your pencil.
- Financial data support: If you've used a program like *Quicken* to track your expenses all year, there's no reason to type everything in again from scratch.
- Technical support: If you're a member of CompuServe or GEnie, you'll welcome the chance to get your questions answered online. Most companies also offer help via phone and fax, though that can get expensive.

What's next for tax-preparation software? In the future, the experts say, tax programs will become even faster, easier to use, and less expensive. They'll hook up not only with personal-finance programs like *Quicken* but with financial-planning software, IRS computers, online information services, and more.

And yet there will always be limits to what your PC can do to help you with your taxes. It won't write that big check to the IRS. And it won't help you explain to the auditor why you deducted that trip with your kids to Disney World as business travel. □

PRODUCT LIST

Managing Your Money—\$219.95

Managing the Market—\$149.95

MECA Software
55 Walls Dr.
Fairfield, CT 06430
(800) 288-6322

Market Base—\$59.00

MP Software
P.O. Box 37
Needham Heights, MA 02194
(800) 735-0700

CashBiz—\$49.95

M-USA Business Systems
15806 Midway
Dallas, TX 75244
(214) 386-6100

Wealth Starter—\$59.95

Wealth Builder—\$149.95
Reality Technologies
3624 Market St.
Philadelphia, PA 19104
(800) 346-2024

Quicken—\$69.95

Intuit
66 Willow Pl.
Menlo Park, CA 94026
(800) 624-8742

Dollars & Sense—\$99.95

The Software Toolworks
60 Leveroni Ct.
Novato, CA 94949
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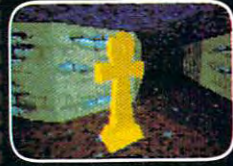
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SHAREPAK

Richard C. Leinecker

SERIOUS STUFF FOR YOUR PC

This month's *SharePak* brings you four value-packed programs that'll put your computer to work and lighten your load. They're solid productivity programs that help tame DOS, copy high-density disks, create TSR help screens, and maintain a register for your credit card accounts. All of these programs are easy to use yet very powerful. That means you won't

February/March brings programs that'll put your PC to working hard so you don't have to.



PC Valet Shell gives you power with a single keypress.



Save a ton of time and grief with EZ-DiskClone Plus.

spend hours learning how to use them; you'll just save hours by using them.

CredCard

In these days of budgets and belt tightening, this program is especially welcome. Its objective is to provide a financial register for your credit card accounts, similar to your bank account register, so that you can effectively manage your credit cards. It won't help you resist the urge to

plunk down the plastic when you see something you just have to have. But it'll give you an honest assessment of your sins when the bill comes in.

The program has a very friendly, consistent interface that makes it easy to learn and use. Online help is as close as the F1 key, so you won't have to fumble with the manual. The program's main function is showing you your day-to-day unpaid balance. You'll see how much money you owe; how much interest you're paying; and thus, how much the account is costing you.

The program runs on any IBM PC or compatible with 256K RAM, any monitor, and at least one floppy drive. The registration price is \$49.

EZ-DiskClone Plus

Disk copying is a pain—that is, until you get *EZ-DiskClone Plus*. This program makes disk copies in a single pass, regardless of the disk's density. You'll get no more of those *Insert Target Disk* instructions from DOS; just run the program with its easy-to-use menu, and your disk is copied.

There are lots of nice options. If you want to make several copies of a disk, you don't have to constantly reinsert the source disk. It remains in memory until you're ready to copy another disk. In addition to copying disks, *EZ-DiskClone Plus* will compare disks, check for bad sectors, list a directory, and let the utilities clean the disk drive.

The program runs on any IBM PC or compatible with 256K RAM, any monitor, and at least one floppy drive. The registration price is \$29.95.

PC Valet Shell

I'm a guy who hates *Windows*, shells, menu programs, and anything else that comes between me and

the DOS prompt. But I've softened my stance after using *PC Valet Shell*. This program does everything that it takes two dozen utility programs in my DOS directory to do. And I don't have to remember the syntax of using each of the utilities or the DOS commands, since the program gives me a single keypress for each one.

It's fast, too. No long delays while it fetches a directory or looks at a file. It's obvious that the programmer went to great lengths toward optimal code. The list of commands is long; you can do everything that DOS does and plenty more.

To run the program, you need an IBM PC or compatible, 256K RAM, any monitor, and at least one floppy drive. The registration price is \$15.

TSRMAKER

You're using a new program. It's great, but you can't remember all the keypresses. What usually happens is that the manual becomes part of your lap for several weeks. And when it drops to the floor for the hundredth time, it looks like it has been through a war. Well, there's a better way. *TSRMAKER* lets you create single text screens that become TSRs and pop up with a single keypress. You can create help and reminder screens for just about anything.

No, you don't have to be a programmer. All you need is a text editor or word processor. Using an editor, you create an ASCII file. Then *TSRMAKER* converts it to a COM file. Anytime you want to load your special help screen, just run the COM file it created. To see the screen, press the hot key that you selected.

The program runs on any IBM PC or compatible with 256K, any monitor, and at least one floppy drive. The registration price is \$20. □

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HOME OFFICE

COMPUTE CHOICE. Here's a breakthrough program that lets nonprofessionals in on the secrets of desktop publishing.

Tony Roberts

MICROSOFT PUBLISHER

Microsoft Publisher is a breakthrough desktop publishing program that will help anyone prepare brochures, newsletters, cards, and other printed materials. And you don't need a degree in picas and points to get results that will please you for most of your personal desktop publishing chores.

The package has many of the amenities of high-end desktop publishing software, but it overflows with features that make it simple to use for those not schooled in the graphic arts. With *Microsoft Publisher*, you'll be able to create birthday cards, party invitations, and newsletters for the canoe club quickly, efficiently, and in a manner that's pleasing to the eye.

Page Wizards are the genius behind this ease of use. Microsoft has bundled a handful of Wizards with the program to help you make quick work of setting up brochures, newsletters, greeting cards, calendars, and business forms. There's a Page Wizard for just about everything—there's even a paper-airplane-making Wizard to help you through those slow Friday afternoons.

The Page Wizard feature asks you a series of questions about the selected project: Do you want a classic or a modern brochure? Do you want a picture on the front page? Large or small?

Once you've completed the questionnaire, *Microsoft Publisher* goes to work and assembles the elements needed for your publication and places them on the page while you watch. An information box keeps you posted on what the program is doing and why.



If you will pay close attention, you'll learn how to build your own similar publications.

But if you're interested only in the final results, that's fine. Go warm up your coffee or put out the trash while the Page Wizard does its work. When you return, you simply replace the Wizard's sample copy and graphics blocks with your information and artwork—that's it. Send your pages to the printer and get on with your life.

Using Page Wizards, I created a birthday card for my brother in about five minutes. Calendars for the whole family took slightly longer only because my daughter wanted to see every possibility for the piece of art that was to adorn the calendar for her room.

Microsoft Publisher is a frame-based program. This means that you create boxes called frames on your pages and then fill the frames with various elements. You can select text frames, word-art frames, and picture frames.

Frames are easy to move and resize, and the program

helps you get the job done correctly by including icons that tell you what function is being performed. Click on a frame handle, and a moving truck icon reading *move* appears, reassuring you that you are about to move the frame. Similarly, if you click on a frame handle to resize the frame, a double-headed arrow reading *resize* lights up.

Another winner in the ease-of-use competition is a *Microsoft Publisher* feature called Word Art. This ingenious concept allows you to create headlines or word illustrations that are curved around a circle, slanted, rotated, shaded, or stretched. *Microsoft Publisher* also provides a battery of specialty fonts for this purpose, so you can make a statement that really fits the tone of your project.

It takes under a minute to make and place a Word Art creation. Developing the same effect with a traditional font-manipulation tool would take much longer. Although its Word Art effects are clearly less sophisticated than what could be produced with dedicated software, *Microsoft Publisher* almost guarantees that anyone, even a complete novice, will get speedy and satisfactory results.

Border art is another fascinating feature that will captivate *Microsoft Publisher* users. You can place a traditional box around one of your frames, or you can spice things up by selecting one of the dozens of border art possibilities provided with the program.

Microsoft Publisher makes it easy to locate and select just the right border art. Simply click on a border art filename in the selection box, and a preview of the art appears onscreen. If you like it, click on OK, and the border will be applied. If the selection isn't what you had in mind, continue browsing until you find the perfect border. The same process also makes selection and placement of clip art quick and easy.

Clip art of various forms can be imported into your publications. If your clip art library is small or nonexistent, you'll find more than 100 black-and-white and color clip art examples packed with the program to get you started.

Microsoft Publisher has the look you'd expect of a *Windows* application, and anyone familiar with that format can press forward with little or no help from the manual. Program options are selected via standard menu options or through a toolbar that provides quick access to the most commonly used options.

This toolbar changes its appearance, too, depending on which type of frame is currently selected. If a text frame is selected, options for changing type sizes, fonts, justification, and line spacing are available. When a picture frame is selected, the options presented include border weight, shading, and shadows.

Microsoft Publisher is a per-

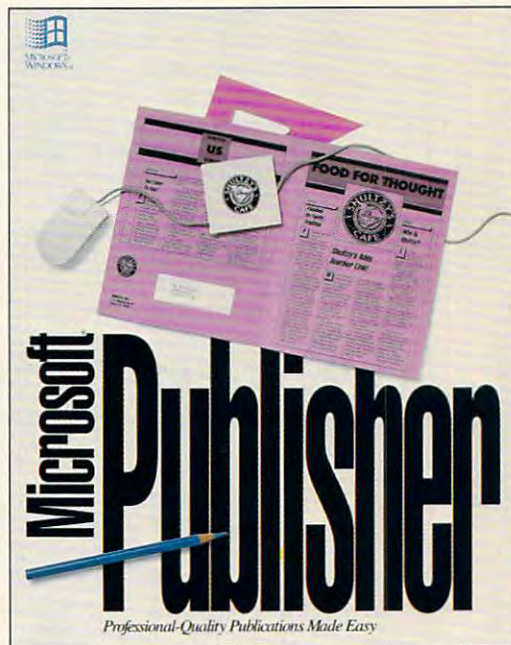
fect program for someone who doesn't plan to do desktop publishing every day. You don't have to study it, practice it, or learn it—you just use it whenever you need it.

Help and guidance are built into every aspect of the program. A status bar at the bottom of the screen helps keep you on track. Place the mouse pointer over a tool on the toolbar, and the status bar identifies the tool and explains how to use it. The program includes a standard *Windows* help program and offers a brief tutorial to show you how *Microsoft Publisher* pages are assembled.

Microsoft Publisher includes a built-in word processor with a spelling checker, so you can create and design your documents without leaving the program. Alternatively, you can create your text outside *Microsoft Publisher* and import it through one of the many text filters provided.

In addition to the clip art and border art that come bundled with *Microsoft Publisher*, the package includes several template files to help you get started with such things as résumés, business cards, labels, or price sheets.

Although not as sophisticated as the top-of-the-line professional desktop publishing packages, *Microsoft Publisher* deserves credit for being an inventive piece of software. Its print routine, for example, automatically rotates the panels of a greeting card so the card folds correctly. Also, you can create a publication in book format. For example, to create an eight-page booklet, *Microsoft Publisher* prints pages 8 and 1 on the first sheet of paper, 2 and 7 on the second sheet, 6 and 3 on the third sheet, and 4 and 5 on the final sheet.



Fold the sheets together, and you have a nice, neat booklet. This type of pagination, or imposition, is something users of high-end desktop publishing software have requested for many years.

Professional desktop publishers may become frustrated by the lack of detailed controls in *Microsoft Publisher*. One example concerns type size: It can only be selected in half-point increments instead of tenth-point increments. Another *Microsoft Publisher* shortcoming that might annoy professionals is that it doesn't use style sheets to facilitate copy formatting.

But if you don't know a thing about desktop publishing, *Microsoft Publisher* will make you happier than any other software package I can imagine. It won't make you an automatic desktop artist, but it will let you quickly and easily turn out clean, crisp desktop published documents. □

IBM AT and higher and compatibles; 1MB RAM (2MB recommended); EGA, VGA, 8514/A, Hercules, or compatible video adapter and monitor; hard disk; Windows 3.0; mouse recommended—\$199

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WORKPLACE

Daniel Janal

LONG-DISTANCE DELEGATION

For the mobile manager, keeping in touch with subordinates can be perplexing. For Terry Kalil, public relations manager for Great Plains Software, who spends about 40 percent of her time on the road, it's a fact of life.

How does a manager go about managing workers she rarely even sees?

"In the past year I've gone from [being the] sole person to heading a staff of three. It has presented incredible challenges," says Kalil. Her full-time staffers are a publicity specialist and two publicity coordinators. She also shares an administrative assistant.

Because of her frequent absences, her staff has matured quickly. "In many ways I think my team is a stronger team because I am not here. They are learning to make day-to-day decisions," she says. "There is a great joy in finding [that] projects get done."

Yet there are special challenges for the mobile manager who manages from different time zones.

"Anytime you are developing a team, the challenge is to

be a teacher via long distance," she says. "It is critical that when I'm in town I spend a lot of time laying out assignments, managing their current work, and providing feedback. One of the things we're implementing is a detailed planning-within-plan process." This means that every task is broken down into a set of steps and procedures, as on a flow chart.

However, she warns other managers that disaster can occur if a manager doesn't set boundaries for authority and decision making by workers. "You need to set policies that empower employees to make decisions within a range that's appropriate [for] their experience," she says. "When you are gone a lot, they need that authority."

She advises managers to make sure that everyone understands the steps to complete the project. "I'm very big on having systems. They are critical to getting things done. They are important to remove redundancy." She's in the process of creating a training and procedures manual for her staff that will include such topics as how to update the database and how to write a press release.

Kalil shares these rules for mobile managers:

- Decide who will make decisions on which subjects.
- Create clear ground rules.
- Set clear limits of authority.
- Encourage communication with your team. Ask them to leave voice mail. Let them come to you. Call them back as soon as possible. Leave a detailed itinerary so they can get in touch.
- Give your people space and independence.

It's important for managers to communicate clearly the purpose of their field trips. "Al-

ways tell people . . . what you got out of [a trip]. If all you talk about is this great party or that great dinner, it creates the wrong impression in people's minds," she says. "If you tell people about the great concert or Broadway play, be sure to tell them about getting stood up for an appointment or delays at the airport. You must be sensitive to what war stories you tell."

Not only does she have to stay in touch with her staff, but she must also report to her managers. She says this is not a problem because the corporate culture accepts the telephone, with its special strengths and weaknesses, as a fact of life.

"A lot depends on corporate culture. The company must be flexible and informal. People are top priority, instead of how many documents [are] processed," she says. Because of this philosophy, her own performance review was conducted via voice mail with her manager. "It was not uncomfortable because our communication skills have adapted. It feels like we are talking face to face."

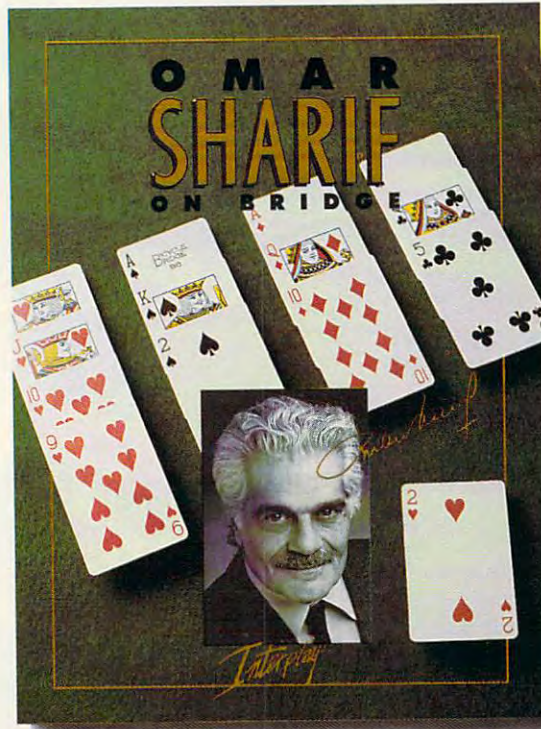
One important dimension of using technology to manage employees is discipline. "Discipline means you check your E-mail and voice mail on a daily—or hourly—basis to stay connected to your employees in a timely manner," she says. "In a nutshell, it means not letting the technology replace the human elements of communication that are the keys to successfully using technology as a management tool."

Kalil's system for combining people, technology, and travel seems to have worked. The amount of media coverage received by the company has doubled in the past year, as has the number of leads generated by publicity. □

Technology is just a tool—a way to establish and maintain relationships. The people are the ones that matter.



PLAY BRIDGE WITH THE MASTER HIMSELF



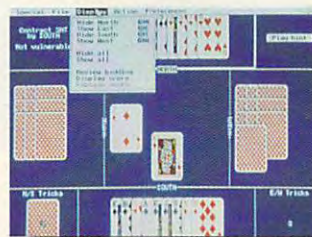
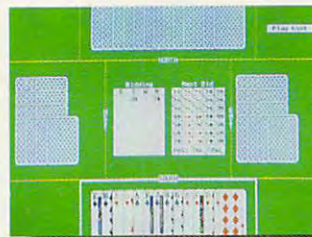
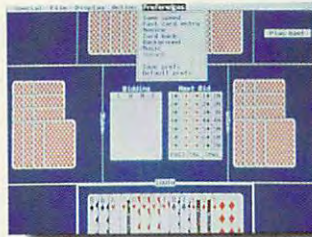
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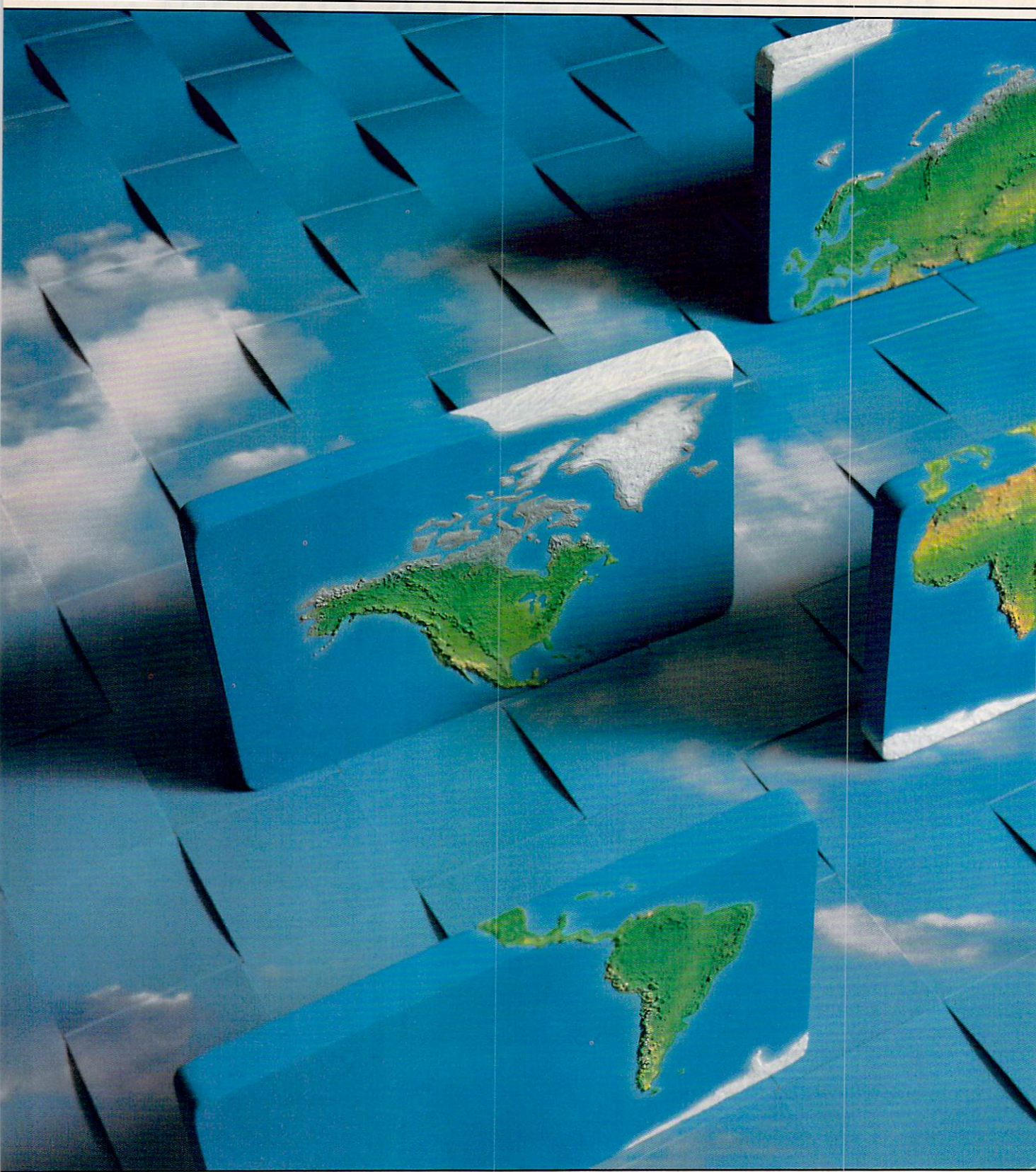
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MS-DOS Screens Pictured.

Circle Reader Service Number 105

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YOU CAN NAIL YOUR
HOME OFFICE DOOR SHUT AND
STILL STAY IN BUSINESS.

CONTINENTS OF DATA

BY GREGG KEIZER

As long as your phone, PC, fax, copier, and other gadgets stay in good repair, you can keep in touch with your clients and customers, order supplies and services, pump out the work, and turn a dollar without leaving your home office or accessing outside sources of information. In fact, the only opening you would need to the outside world is one large enough for delivery people to slide mail and express packages through.

As farfetched (and unhealthy) as that sounds, the day of the virtual home office—where you have everything at your electronic fingertips—has already dawned. You can reach out and touch every resource you need from the comfort and convenience of your home office.

You can even draw from the information well without setting foot inside a library. One way, of course, is to hit the wires and telecommute to any of several excellent commercial databases on online services and bulletin boards.

Another way to get the business information you need, a way that doesn't set the telecomputing meter ticking, one that compresses entire shelves of in-office reference material to a handful of plastic discs, is CD-ROM technology.

CD-ROMs use the same CD technology that has revolutionized the music business. Tiny pits and peaks are set in plastic to represent digital data. A low-powered laser reads these highs and lows and then re-creates the original music, image, or text. A CD-ROM opens up vast expanses of storage space—enough to fill about 1500 floppy disks. You can cram hundreds of books onto one platter slightly smaller than a 45-rpm record.

But CD-ROM development suffered from a computing Catch-22: Without a broad selection of usable discs, few people had reason to buy a drive. But without lots of drives on desktops and in PCs, disc publishers had little reason to produce software. Recently, however, drive prices have fallen from the stratosphere, and producers have seen a ready market for their wares.

Sony, one of the consumer electronics gorillas, slips around this chicken-and-egg problem by bundling a six-pack of CD-ROM titles with its CDU-535 drive. You'll find Sony's Laser Library commonly discounted to just under \$600. Some PC makers who are providing CD-ROM drives in their systems, like Sun Moon Star and Headstart, also seed with software that's sometimes free, sometimes deeply discounted. Aggressive CD-ROM publishers take a risk and price their products for the consumer, not the corporation, hoping to make their profits on volume.

Tandy, though not normally known for breakthrough pricing, sells its CDR-1000 internal drive for less than \$400. The CDR may be slow at accessing data, but it's one of the few drives that meet MPC (Multimedia PC) standards for streaming data—reading it from the disc—once it's found. Sony's CDU-7211 and CDU-541 are faster, more expensive drives that sit outside your PC. Toshiba's XM-3300 series devices (XM-3301B-PCF and TXM-3301P1-PCF) are fast, but they're troublesome if you want to play audio CDs (almost all CD-ROM drives also take straight music discs). And NEC's portable CDR-36 is a go-anywhere drive that provides CD-ROM access on the road.

For the home office, where speed sacrifices must often be made at the altar of price, the Tandy drive and the Sony Laser Library are best buys. Both drives are solid performers; and the Laser Library's bonus software goes a long way toward getting your CD-ROM collection rolling. The Tandy drive does without the bothersome caddy, the protective shell the discs sit in, and has the advantage of hiding inside your PC. By the same token, that means you must install the drive yourself, something some home office workers will shun. The Laser Library, on the other hand, is an external drive that only requires an empty slot.

Indispensable Home Office CD-ROMs

It's not difficult to assemble a working CD-ROM reference library that replaces several feet of space once reserved for dictionary, encyclopedia, atlas, and thesaurus. Even more specific CD-ROMs can turn you into a direct-mail marketer or a telemarketing phenom.

CD-ROMs let you search through volumes of information in less time than it now takes you to grab a book.

Microsoft Bookshelf should be at the front of your home office CD-ROM archives. Available in both DOS and Windows (multimedia) formats, *Bookshelf* is an excellent general reference starter kit. You get *The American Heritage Dictionary*, *Bartlett's Familiar Quotations*, *Concise Columbia Encyclopedia*, *Concise Columbia Dictionary of Quotations*, *Hammond World Atlas* (Windows version only), *Roget's Thesaurus*, and *The World Almanac*.

The multimedia version of *Bookshelf* uses animation, music, and speech to bring these references alive, something that you can forgo if you're using them exclusively for the office. You'll find that others in the family, especially kids, will think the spoken word pronunciations, digitally recorded national anthems, and animated illustrations for articles are great, though.

TEN WAYS TO MAKE CONTINENTS OF DATA PAY

1. Target a direct-marketing campaign—nationwide or local—with the help of *Business Lists-On-Disc's* (\$2,500) 9 million names and addresses.

2. Keep your computer consulting business up-to-date with a year's subscription to *Computer Select*, a database of hundreds of articles from nearly all the nation's PC-related publications.

3. Translate documents with the help of *Languages of the World* (\$950), a collection of 18 dictionaries in a dozen languages from around the world, including English, Japanese, Chinese, Dutch, French, Spanish, German, and Italian.

4. Stay in your office (and stay productive) rather than going to the library—once you have something like *Facts on File World News Digest*, a CD-ROM with thousands of clippings from the last ten years.

5. Feed your business-consulting clients news on the competition when you stick *The Wall Street Journal Ondisc* (\$1,950 per year) into your CD-ROM drive.

6. Split the cost of your home office's basic reference library with the family and forget about buying a paper encyclopedia.

7. Plan a marketing campaign for your client by digging into the volumes of Dun & Bradstreet business information on *MarketPlace Business 1.1* (\$695, Macintosh).

8. Track Weather trends near your farm or outdoor business with the *World Weather Disc*, a collection of 17 databases culled from the National Climate Data Center and the National Center for Atmospheric Research (\$249).

9. Blow the doors off your desktop publishing competition with *Type Gallery PS* (\$399), a CD-ROM that holds the entire Adobe PostScript font library. You can access three of the 470 fonts; after that, you pay only for the ones you want by calling a toll-free number and giving a credit card number. Font families cost \$25 and up.

10. Improve your research-on-demand productivity with *Reader's Guide to Periodical Literature* (\$1,095 per year).

If you're strapped for cash, go for *The Software Toolworks Reference Library*, a collection that costs \$50 less than *Bookshelf*. It, too, includes a dictionary, thesaurus, and quotations, and it tosses in several other useful works—an address and phone directory and *New York Public Library Desk Reference* stand out—but it lacks an atlas and encyclopedia.

No matter what general collection you start with, a full-length encyclopedia should be next on your home office CD-ROM list. *The New Grolier Electronic Encyclopedia*, number one on the Bureau of Electronic Publishing's bestseller chart, is a multimedia production with such minimal hardware requirements—only 512K and a floppy drive—that it's perfect for the low-powered

home office. Sound, speech, and music add to the reference, but it's the text itself—identical to *Academic American Encyclopedia* you find on the online services—and an attractive price (\$395) that makes this worthwhile. Your other pick, *Compton's Multimedia Encyclopedia*, comes from Britannica and is a more thorough reference.

List-O-Mania

Once you have the essential references at your fingertips, you can move on to more specific CD-ROMs that meet the needs of your own business.

The process of finding new clients and then organizing a direct-mail campaign means you'll burn the midnight oil. You can hit the local yellow pages, but that only gives you nearby business-

TRADING TIME FOR MONEY

Isn't paper good enough?

I'd be among the first to vote for paper's long life span. After all, I make my living putting words on paper. But I'd like to draw the line when it comes to looking something up. I can do without paper there.

That's because time is a nonrenewable resource. There's never enough. Anything that lets me use my time more productively puts more money in my checking account and keeps the mortgage wolves from the door.

A simple experiment sufficed to demonstrate the advantage of CD-ROMs over book resources. I needed to find out when the *Brooklyn Bridge* was completed. Using *World Book*, a popular at-home reference, I pulled out the B volume, first looking under the general "Bridges," which then led me to the more specific "Brooklyn Bridge," where I found the

date—1883. Total time for the reference excursion: ten minutes, what with pulling volumes and skimming text.

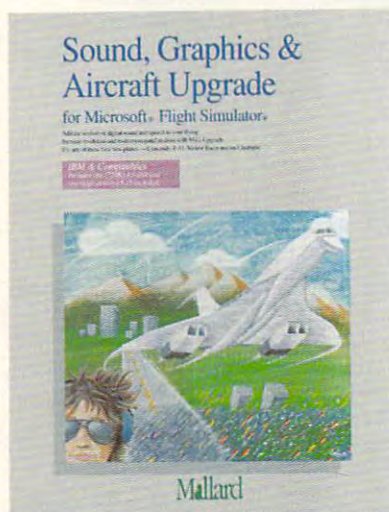
When I slipped *Compton's Multimedia Encyclopedia* in the CD-ROM drive and typed *Brooklyn Bridge*, though, it took about two seconds for dozens of references to appear on the screen. Another ten seconds or so led me to the "Bridges" article, where each instance of the words *Brooklyn Bridge* was highlighted. In less than a minute—and without getting up from the computer—I had my answer.

CD-ROM technology puts more information at your fingertips, and puts it there faster, than any paper-based reference, and without the fumbling. Add the ability to quickly cross-reference information and the ease with which you can integrate information into computer-created work, and CD-ROMs shine even more brightly.

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es. Or you can slip American Business Information's *Business Lists-On-Disc* into your CD-ROM drive. This collection of over 9 million businesses, culled from over 5000 telephone directories, lets you search for clients by everything from city or ZIP code to company size or the type of business.

And you pay only for the names you use. *Business Lists-On-Disc* includes a key counter that you stick into your PC's parallel port. You can download, print, or autodial up to 1000 names before that counter empties; you buy additional lots of 1000 names at 12 cents per name. Obviously, it's most economical when you download lists to your PC—that way you can reuse the list as many times as you want.

If you work in the computer business, you need Ziff-Davis's *Computer Select*, a full-text collection of 50 computer magazines. Hundreds of other publications toss in article abstracts (short summaries), which are less valuable. For computer consultants, freelance writers, and mail-order merchants of software or hardware, *Computer Select* is a paper-free way to keep up with the industry. You can search through the hodgepodge of text by any combination, from company name or product to your own string of words. *Computer Select* isn't inexpensive at nearly \$1,000 per year, but the perks include monthly CD updates.

High-Tech Home Office

CD-ROMs in the home office provide instant access to library-sized chunks of information. It's as if you had a slew of electronic databases in your home.

The home office of the near future will have even more ways to handle information. Sony's Data Discman, a Walkman-sized box that bundles a 3½-inch CD-ROM drive with a 3²/₅-inch screen, sells for around \$550. Discs like *CIA World Fact Book*, *The American Heritage Dictionary*, *USA Today 1990/1991*, and *Compton's Concise Encyclopedia* put text (but no pictures or sound) on the Data Discman. Throw this two-pound machine in your briefcase, add a couple of miniature CDs, pick up your notebook computer, and you can handle business anywhere.

Apple and IBM, meanwhile, hope to mine the same reference mother lode with a portable reference reader or multimedia machine they will coproduce sometime in the next three years.

If the future of working includes working at home, it also includes optical discs, gigabytes of information, and the means to make sense of it all. Continents of data are waiting under the rainbow sheen of the compact disc. It's time to start exploring. □



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ARTS & LETTERS

Robert Bixby

PUBLISHING ON A SHOESTRING

I lay out books as a hobby. One of the simplest forms of books is the chapbook. Chapbooks are usually printed on bond paper with cardstock covers and saddle-stitched. Because chapbook publishing is so simple and inexpensive, it's open to virtually everyone.

I have laid out a 40-page book in an evening using nothing more than *GeoWorks Ensemble's GeoWrite*. There are strong advantages to the *Ensemble* environment—chiefly, the wide variety of fonts that can be printed at laser quality on dot-matrix printers.

Begin by using Page Setup in the File menu to specify landscape orientation, 8½ x 11 inch sheet, and two columns. Make the right and left margins ½ inch and the top and bottom margins 1 inch. Make the gutter (the space between the two columns) 1 inch.

Use Insert from Text File on

the File menu to insert your edited ASCII file (all editing should be finished *before* the book is laid out). The next step is to allow for alternating pages. At the top of the first column of the first page, insert a page break from the Edit menu. Do the same a line above the bottom line in the second column. Insert a page break a line above the bottom of the first column on the second page and another at the top of the second column of the second page. Continue inserting page breaks in this way until you reach the end of the text. Remember that the left column should be blank on odd-numbered pages and the right column should be blank on even-numbered pages and each page containing text should have a page break at its bottom.

You're dealing with four-page signatures—that is, each unit of your publication is a single sheet of paper which contains four book pages, two pages on each side. Therefore, you're going to want to lay out your book so that the middle two book pages will print on an even-numbered page in *GeoWrite*. Go to the approximate middle of your *GeoWrite* document, or perhaps a page or two after the middle. Be sure that it's an even-numbered page in *GeoWrite*. From here on, you'll be cutting and pasting whole pages.

Go to the next page in *GeoWrite*. Click the mouse button on the text five times. This selects the entire page, including the page break. The page breaks at the bottoms of the pages are a potential problem. Place the mouse cursor on the left end of the page break (it appears as a solid line), hold down the Shift key, and click to unselect it. Now use Cut from the Edit menu to cut the page. Go back to the blank side of the middle

page. Click above the page break on that page and paste the text you just cut.

Continue this procedure, cutting successive pages and pasting them on the blank side of pages from the middle to the front of the book. As you can guess, this is the point where organization is most apt to break down.

You can't rely on *GeoWrite's* headers, footers, or page numbers. You'll have to create your own and paste them into the columns. Go back to Page Setup and make the top and bottom margins one-half inch. That will give you an additional inch of space on each page. Go to the first page where you want a header and type the information at the top of the column—*not* in the header area provided by *GeoWrite*. Use the Copy command in the Edit menu to place the header in the clipboard. Then go through the book, page by page, pasting this header in place at the top of each column. Some people like to use alternating headers, and this is very easily done. Just copy one header (usually the book title) to the top of each right column and the other header (chapter name or author name) to the top of each left column. Number the columns at the bottom of the text area (*not* the footer area) following the flow of the text, remembering that odd numbers go with right columns and even numbers with left columns.

Print out a complete set of pages, place them back to back, and fold them in half. Read the pages in page-number order to check continuity.

Find a copy shop that can make two-sided photocopies and let the proprietor set the material up (usually every other page has to be upside down). It's worth the extra money to have the books folded in half, stapled, and trimmed. □

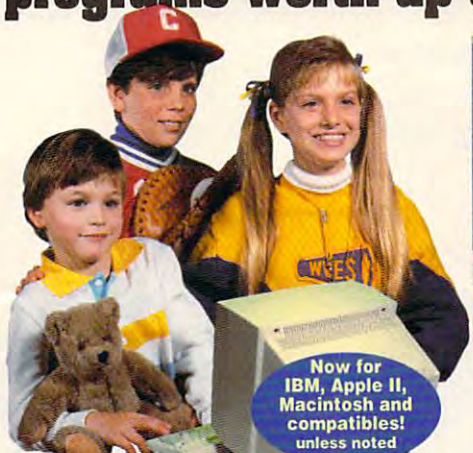
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SOFTWARE SELECTION GUIDE

- ages 3-7
- ages 7-10
- ages 10-13+

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Name _____

Address _____

City _____ State _____ Zip _____

Telephone () _____

Name of Program (Print in box) _____

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

2. Computer you own and disk size required (check one):
 IBM/Tandy & compatibles with 5.25" disk drive
 IBM/Tandy & compatibles with 3.5" disk drive
 Apple II family & compatibles with 5.25" disk drive
 Macintosh & compatibles with 3.5" disk drive

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

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

5. Parent's signature _____

We reserve the right to request additional information or reject any application or cancel any membership. Sales tax will be added in PA. We'll send you details of the club's operation with your enrollment shipment and you have a 15-day no-obligation privilege to decide if you wish to continue as a member.



701B

DISCOVERY

COMPUTE CHOICE. Encourage your child's imagination and give new meaning to the art of storytelling with this fun program.

Heidi E. H. Aycock

KID WORKS

Your child comes home an hour later than you'd expected. You ask where he's been. "What took you so long?" you ask.

"Well, there was this big dinosaur in the school parking lot, and he wouldn't let me get on the bus," your child says. When you hear the tall-tale engine revving up, do you stop the process pronto? Or do you listen carefully, ask for details, and pull out some crayons and paper so your child can draw an artistic rendering of the events in question?

Imagine, if you can, swallowing your anger and encouraging your child to express what's in his imagination. Paper, pencil, and crayons make ideal tools for elaborating on such tales, but so do computers—especially now that Davidson & Associates has released *Kid Works*, a kid-sized writing program with graphics and sound.

There's a big difference between exercising your imagination and lying. Relish your child's fabricated adventure. Turn on the computer, start up *Kid Works*, and say, "Tell me more. Type in what happened."

Your child sits at the computer and sees an electronic sheet of paper that looks just like the specially lined paper he uses in elementary school—lots of space and a dotted guideline running between the lines. Hands poised on the keyboard, your child begins to type an epic tale of stout-hearted courage.

After he's put several well-written lines onscreen, he jumps up from the computer and tells you he's finished. "Read my story," he says.

"Let's make the computer read your story," you say. "Click on the mouth at the top of the screen to hear it."

Your child easily finds the correct icon, and a robotic voice reads back the whole exciting tale.

"Some of these words would make good pictures, wouldn't they?" you say to your child.

"Yeah, like the dinosaur," he says.

"Let's click on the button that turns words into pictures," you say. You have to point this one out because it isn't as obvious as the Mouth icon was. Your child clicks on it, and suddenly several of the words become small pictures. The word *run* changes into a small picture of a child running. The word *eat* changes into a kid eating a slice of pizza; the word *fast*, into a picture of a tortoise racing a hare, with an arrow pointing at the hare. The word *dinosaur* changes into a picture of a green thunder lizard.

"That's not what the dinosaur looked like, though," says your child. "For one thing, it

wasn't green, it was purple."

"Why don't you draw one? Click on the picture of the paintbrush and bucket," you say.

Now he has colors, drawing tools, and funny stamps with which he can draw his dinosaur. When he finishes, he can insert the picture into the story. He can draw other scenes for the story, too.

After he's finished writing and illustrating, he can play the story back. The robotic voice reads his words and icons while his pictures pop up, full size. In effect, your child has written his own electronic storybook.

Kid Works is a treat for children and a godsend for parents who want to encourage creativity. It's a perfect adjunct to reading aloud and adds new meaning to the idea of storytelling.

Besides helping your children write picture books, the program can do many other tricks. It can help them learn to read new words; the electronic voice will read aloud any word they choose. By setting up matching games, parents can reinforce associative skills; the computer can



check the child's work by reading aloud the words as they're matched. Kids can learn about sequencing and comparing by writing whole stories from icons—the program provides loads of icons—but you can make your own, too. *Kid Works* looses a flurry of projects and games for kids. Even before they can type, your children can benefit from this new package if you'll sit with them, typing the words that they say and helping them draw pictures.

The program is large in scope, and the collection of tools is ideal. While it won't replace the time you spend reading aloud and spinning yarns with your children in your lap, *Kid Works* will add a new dimension to the concept of telling stories. Because it emphasizes all of the elements of a good tale, this program will stir up creative juices and reinforce imaginative play. It will encourage such varied behaviors as parent-child cooperation and child independence. You can work together on a project or let your kids produce surprise masterpieces.

The speech portion of the program sets it apart from many other children's word processors and graphics programs. Kids will love to hear their stories read aloud by the computer (though to an adult the voice may sound a little sterile and mechanical). Because you can teach the voice to read words it doesn't already know, you can teach it to say your child's name. Best of all, you don't need to run out and get a sound card to benefit from the speech capabilities. Even on a plain PC speaker, you can hear the voice very well. *Kid Works* also sports some charming sound effects

that punctuate the interface, but to hear these, you'll need an Ad Lib, a Sound Blaster, or another add-on sound board.

Kid Works' only weakness is its interface. The program is so massive and has so many modules to manage that it's easy to get lost. Some icons clearly denote their functions. Others, however, are obscure.

Creating these icons must have been a tough challenge for the program designers. Imagine coming up with an icon for the move function (analogous to cut-and-paste in many word processors). *Kid Works* uses the image of two moving people carrying a crate. Pretty good. But when it comes to the icon for cancel, the designers might have come up with a more obvious choice than a hand with its palm facing out.

In some parts of the program, you have to go through too many steps. If you want to quit, for example, you click on the Stop icon at the top of the screen. If you haven't saved yet, the program makes you go through the save procedure—clicking in a few dialog boxes—before it quits. The program should simply ask you if you want to save before quitting and do it for you. The save process itself requires two clicks too many.

In spite of the interface problems, *Kid Works* is still a great program. Don't let the complexity of the package scare you away from the enormous benefits. Your kids can only grow more creative and more confident in their abilities if they use this program.

Imagine your child has finished writing his story about coming home from school.

He's drawn illustrations of his battle with the dinosaur, his

triumphant exodus from the schoolyard, and his tired journey home. You've replayed the talking picture book six times, sitting together. You've exchanged a few laughs, a few hugs, a few daydreams. Then you say, "OK, that was a great story, but what really happened?"

Your child looks down at his hands, winces a little with the sting of the truth, and then lets you have it: "I traded my watch to Timmy for this cool lizard he caught. Then the lizard ran away, and I had to help look for her. I lost track of time."

"Your new watch! The one Grandma got you for your birthday?" You shudder. "What did the lizard look like?"

It may have taken a long time to uncover what happened, but *Kid Works* made it a fun time. And your child learned the difference between a tall tale and a true tale—and the value of each. □

IBM PC and compatibles 8 MHz or faster; 640K RAM; EGA, MCGA, or VGA; hard disk with at least 2MB free space; mouse; supports internal sound board or speech device, such as Sound Blaster, Speech Thing, Ad Lib, or IBM Speech Adapter—\$49.95

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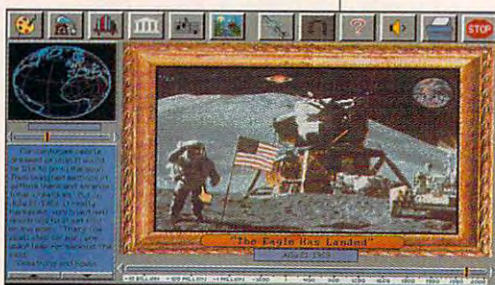
PATHWAYS

Steven Anzovin

ADRIFT IN THE INFORMATION OCEAN

When Christopher Columbus landed on a Caribbean island in the fall of 1492, he was completely lost, though he didn't know it. He'd set off to find the spice islands of the East Indies (and was convinced that he'd found them), but instead, he opened the way to an entirely new world. That kind of serendipitous discovery is the theme behind a new class of educational software that lets kids explore the ocean of information in the hope that they'll make discoveries as significant to themselves as those of Columbus were to the world.

Exploration turns random wandering into knowledge. Can the same feat be accomplished with software?



Most multimedia reference software—like *The New Grolier Electronic Encyclopedia* (\$395.00) and *Xiphias' Timetable of History, Science, and Innovation* (\$129.95), both excellent educational tools for older kids and fun to use—is currently available only on CD-ROM. The usefulness of these packages is thus limited to kids who have access to a CD-ROM player, and the slow pace of CD-ROM makes it hard for children to sustain interest in spontaneous exploration.

A new program called *Knowledge Adventure*, from the company of the same name (4502 Dyer Street, La Crescenta, California 91214; 818-542-4200; \$79.95), is en-

cyclopedic in scope but needs no CD-ROM. It comes on floppies and takes up only a few megabytes on any hard disk, although it contains hundreds of text articles and scores of images and sounds on a wide range of topics. The information in *Knowledge Adventure* stays in compressed form and decompresses on the fly as you access it. The program's interface is slick and friendly, with point-and-click, drag-the-gadget operation. The main panel has windows for text and pictures, and as in any well-behaved hypermedia application, you can click anywhere on the picture or on any word in the text and be transported to related material. The path you take is selected by the program, however, which

sometimes makes random choices among multiple possibilities. There are also two neat navigational gadgets: a timeline slider that lets you pick an era—and a rotating globe of the earth. Not only does the globe spin on command, allowing you to access information about any location covered in the program's database, but you can also zoom in and out from low-earth orbit to a vantage somewhere beyond the smaller Magellanic cloud.

What's interesting about *Knowledge Adventure* is that it's deliberately free-form and aimless. Unlike a book or typical database, *Knowledge Adventure* encourages kids to wander in fields of facts, without dwelling too long on any particular topic. The program offers in-depth information about the high points of history, from the big bang to the

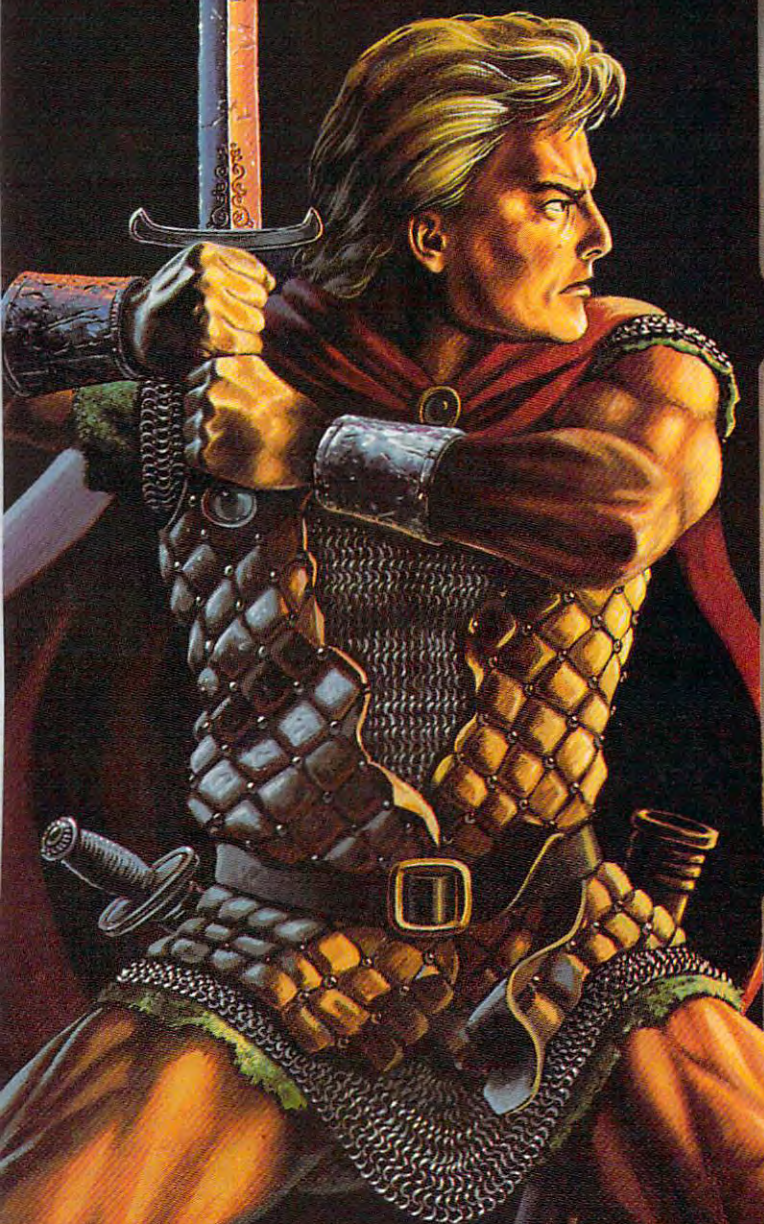
twenty-first century, covering such subject areas as technology, art, biography, music, architecture, and natural science. While to a certain extent purposeful navigation among these topics is possible, kids will find it easiest simply to let the program take them where it will, whether for better or for worse.

Is wandering a good way to learn? Well, it is and it isn't. Exploration behavior is as old as hunger, and it follows a well-known pattern. At first, when the environment is unfamiliar, we explore randomly. Then, as the general shape of the environment becomes known, we focus on a particular goal or set out for a specific destination. Educational programs that present gobs of material to explore need to satisfy both kinds of behavior. I let my six-year-old daughter and ten-year-old son play with *Knowledge Adventure* for a while, and I found that their explorations followed the usual pattern. At first, they were excited to see new things and content not to know where they were going next. But then they began to complain about not being able to go anywhere they wanted or to search for a particular concept by typing it in. To get around efficiently in *Knowledge Adventure*, they had to know how one fact might link up with another—or needed someone who did. With Dad and Mom on hand, *Knowledge Adventure* stayed interesting a lot longer.

What's the best way for kids to learn? Parent- or teacher-guided exploration. Computer software just isn't responsive or interesting enough yet. Otherwise, free-form adventures in learning provide an experience a little too close to Columbus's. After all, that venerable explorer went to his grave without a clue as to what he'd found. □



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MULTIMEDIA PC

David English

KNOCK YOUR SOCKS OFF

If you think of CD-ROM software as boring, you're in for a big surprise. Two new CD-ROM packages explode the old prejudices and point the way to great things to come.

What makes these two CD-ROMs so different? Each was put together by an exceptionally talented group of artists, animators, and musicians—individuals who are clearly excited about the creative potential of this new medium. Their talent also shows through in their ability to mix animation, music, sound effects, and video into a unified whole. If you need proof that multimedia is

identical to their Mac cousins. (Did you ever wonder why Microsoft chose the Mac II's default resolution of 640 x 480 with 256 colors as *Windows with Multimedia's* default resolution?) They should also be two of the first CD-ROMs that make multimedia a must-have component of PC computing.

Verbum Interactive (Verbum, 670 Seventh Avenue, Second Floor, San Diego, California 92101; 619-233-9977; \$49.95) is basically a multimedia version of *Verbum* magazine, a flashy quarterly that explores the cutting edge of computer art and design. It comes on two CD-ROMs (that's right, a single 650-megabyte CD-ROM wasn't big enough) and includes a look at how major ad agencies

use multimedia (with some impressive samples), a hands-on guide that explains how to add special effects to type, a discussion by six industry leaders about the future of multimedia (with three full hours of recorded

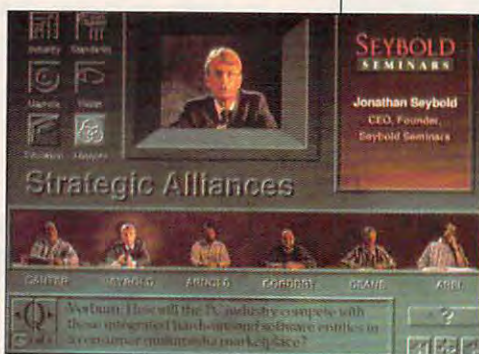
voice and video excerpts), and much, much more. My favorite section is called Gallery, which includes 13 stunning examples of multimedia. "Living Photos" lets you tour an interactive exhibit of photographs by rock musician Graham Nash. The commentary and music—both by Nash—make this more than a simple slide show. "Street Poet Ray" features Marvel Comic's rap poet Ray, whose colorized face moves in sync with his spoken poetry. "Student Work" showcases the multimedia explorations of a group of students at the Art Center College of Design in Pasadena, California. And "Verbum Tunebox" lets you play music selections, with screen graphics, by Todd Rundgren, Graham Nash, Pauline Oliveros, and others. The music plays in stereo through your CD-ROM drive's audio-out.

If *Verbum Interactive* could be described as art school meets multimedia, then *Spaceship Warlock* (Reactor, 3110 North Sheffield, Chicago, Illinois 60657; 800-843-9497 for orders, 312-573-0800 for information; \$95) could be described as Marvel Comics meets NASA simulation. Created by Mike Saenz, a former artist and writer for Marvel Comics, and Joe Sparks, a former aerospace simulation artist for NASA/Ames Research, *Spaceship Warlock* is quite simply the best-looking and -sounding game I've ever played on a computer. The stunning 3-D animation and excellent original score make it the closest thing yet to an interactive movie. (It even feels like a film—black bands at the top and bottom of the screen make it look like a wide-screen movie.)

The transitions from static graphics to animation are smooth as silk, and the digitized music doesn't begin and end abruptly during the animated sequences (unlike almost every other PC game that uses real sounds). But best of all, everything looks great—including the green buglike aliens, the dark city streets with their video-propaganda machines, the Flash Gordon-like luxury spaceliner *Belshazzar*, and the sudden attack of the pirate spaceship *Warlock*.

Verbum Interactive and *Spaceship Warlock* show the real potential for CD-ROM and multimedia technology when creative artists are involved. In upcoming columns, I'll take a look at other knock-your-socks-off CD-ROMs that are currently being developed to run under *Windows with Multimedia*. □

Verbum Interactive includes more than three hours of recorded voice and video excerpts.



something to shout about, look no further than *Verbum Interactive* and *Spaceship Warlock*.

There is *one* catch. At the time of this writing, both are available only for the Macintosh. They were created with *MacroMind Director*, which currently has no equivalent on the PC. But with the recent release of *Windows with Multimedia* and MacroMind about to release a PC program similar to *Director*, you can expect to see comparable CD-ROMs for the PC. In fact, both *Verbum Interactive* and *Spaceship Warlock* are being ported over to *Windows with Multimedia*. They should be virtually