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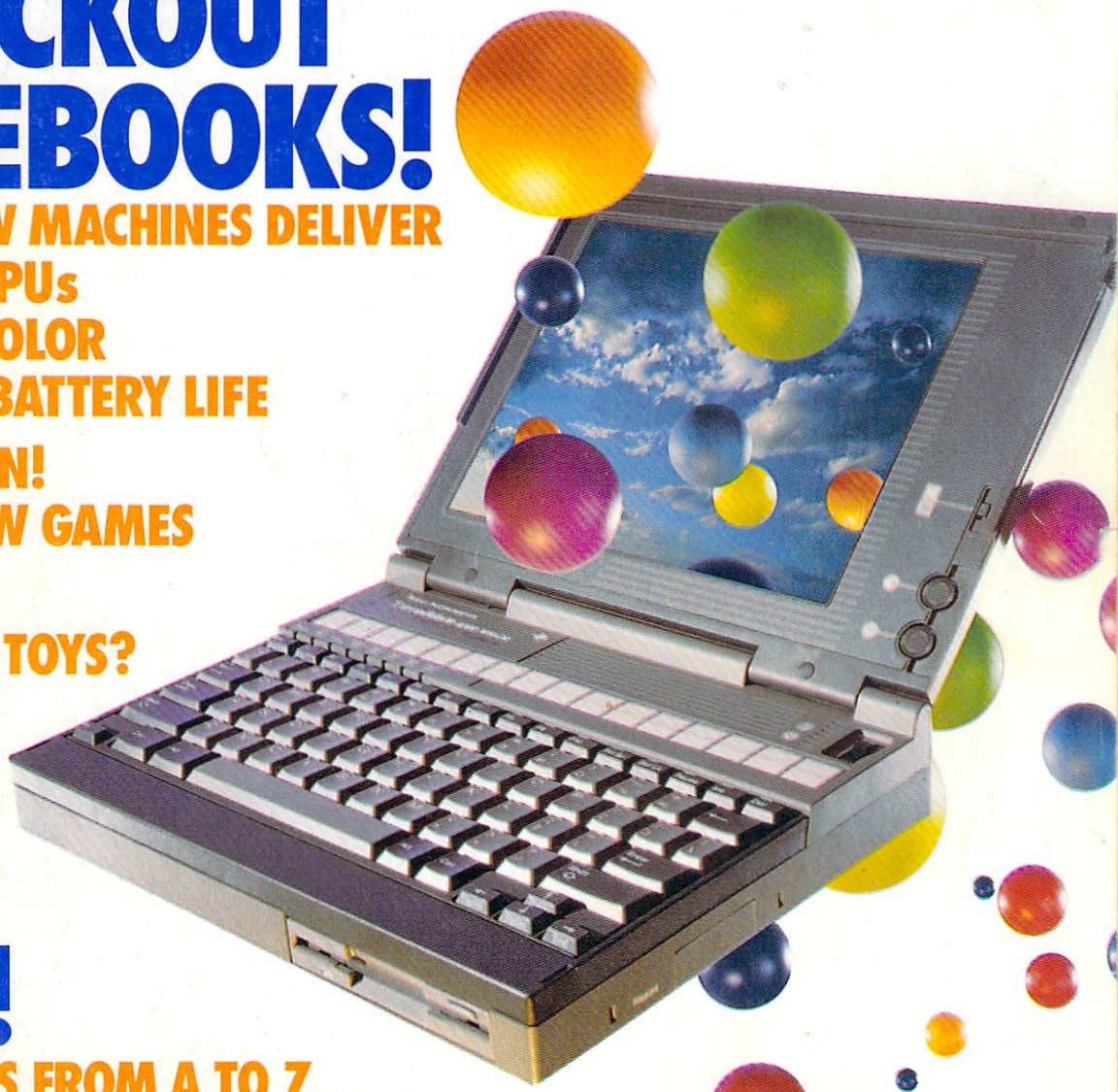

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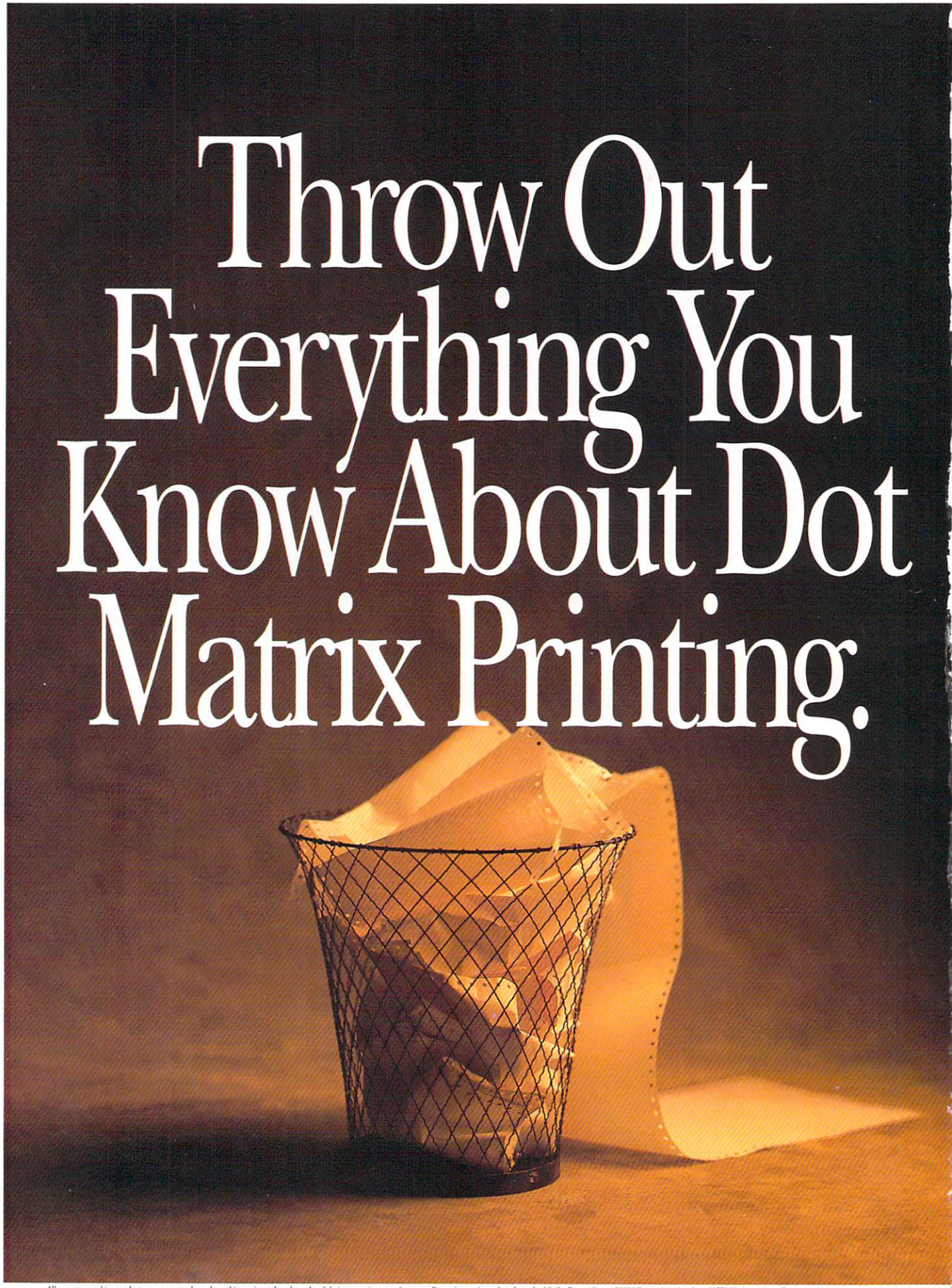

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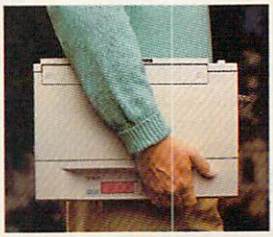

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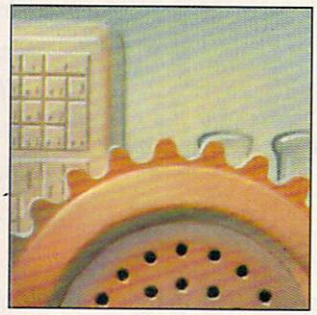

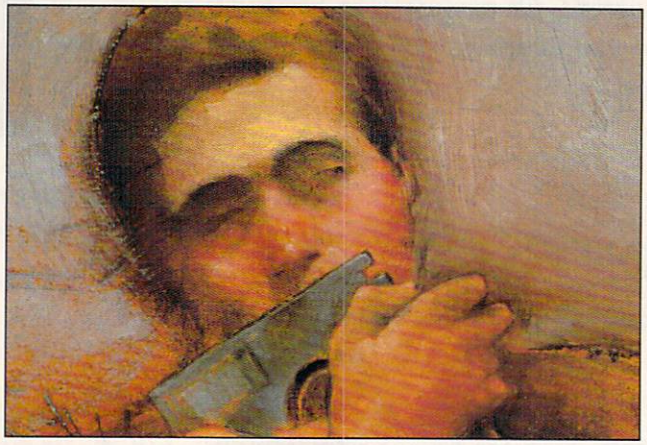

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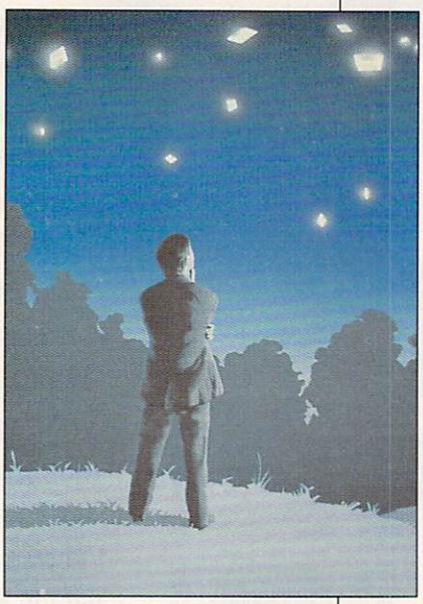
Clifton Karnes

FUD. No, it's not a curse or a new type of missile. As you may know, those three letters stand for *fear, uncertainty,* and *doubt.*

Where do this fear, uncertainty, and doubt come from? First, there's the fear that the hardware and software you're using now won't be useful in the future. The corollary to this is the fear that by buying something now, you'll be making the wrong decision. This fear leads to uncertainty about the future and doubt about the best course to follow.

The famous FUD factor has been with computing for a long time, and it's not likely to go away anytime soon.



FUD has often been used as a selling tool (or more accurately, as an antiselling tool), and some have said that IBM mainframe salesmen invented FUD by telling their clients not to buy competitors' products because "IBM will be coming out with a better product real soon that will blow the competitors' stuff away." Wham! FUD.

When it comes to PCs, FUD has its biggest impact with operating systems. This isn't surprising, since operating systems have the greatest influence on how we interact with our computers and ultimately on how productive we are.

The first big FUD epidemic came when MS-DOS was introduced into a world dominated by CP/M. Here, MS-DOS was clearly superior, and the FUD lasted only about a year.

Microcomputing's next great encounter with FUD came when OS/2 1.0 was released. Whether we wanted it or not, OS/2, it seemed, was our future. All of us asked questions: Should I buy any more MS-DOS software now, since it probably won't be compatible with OS/2? Should I make sure my next computer can run OS/2, even if I'm not running it now?

As we all know, OS/2 didn't take over the world. Or at least, it hasn't taken it over yet.

The next great FUD fight came when Windows 3.0 was introduced. It quickly became apparent that Windows 3.0 was first-rate, and it was a no-lose upgrade because it supported MS-DOS. Windows uncertainty lasted less than a year.

Recently, OS/2 has made a dramatic reentry into the FUD wars with version 2.0, but this release generated little real FUD. There simply aren't enough applications running on OS/2 yet to make someone afraid *not* to upgrade.

The most recent cause for FUD is Windows NT. NT is a FUD arrow aimed at would-be OS/2 buyers in the great tradition started by those IBM mainframe salesmen: "Don't buy their 32-bit operating system now, because we're working on one that'll really knock your socks off."

The side effect of this is that NT has instilled FUD in Windows users. All the old questions are coming back: Should I hold off buying any more Windows software? Should I make sure the next machine I buy can run NT?

With the installed base of Windows users and the repertoire of Windows applications growing dramatically each week, it seems unlikely that NT will knock out 3.1. And Microsoft doesn't seem to want it to. NT is clearly aimed at the workstation-level PC: a 486 or better with 16MB of RAM and a 300MB hard disk.

It doesn't really matter, though. Because the important thing to remember about FUD is that we, the consumers, are the ones in control and collectively making the decisions. We determined that MS-DOS was better than CP/M, that OS/2 1.0 wasn't better than MS-DOS, and that Windows was a great environment to coexist with MS-DOS.

In addition to operating systems, the other traditional source of FUD is hardware. PC prices are at an all-time low, but FUD is still high: Will prices drop even lower? Should I wait? What features are crucial?

Here, COMPUTE can help you with its FUD-fighting Test Labs. If you're looking for a state-of-the-art notebook, check out this issue's installment. We test 11 top notebooks that offer the hottest new technologies: power savings, great color screens, and super 486 power. If you want a multimedia machine, next issue's Test Lab has the scoop on the best, the brightest, and the brassiest. Or if you have your eye on a cost-effective 486SX desktop, January's Test Lab will have all the FUD-dispelling details on the newest entry-level power platform. Stick with COMPUTE. We're anti-FUD. ❐

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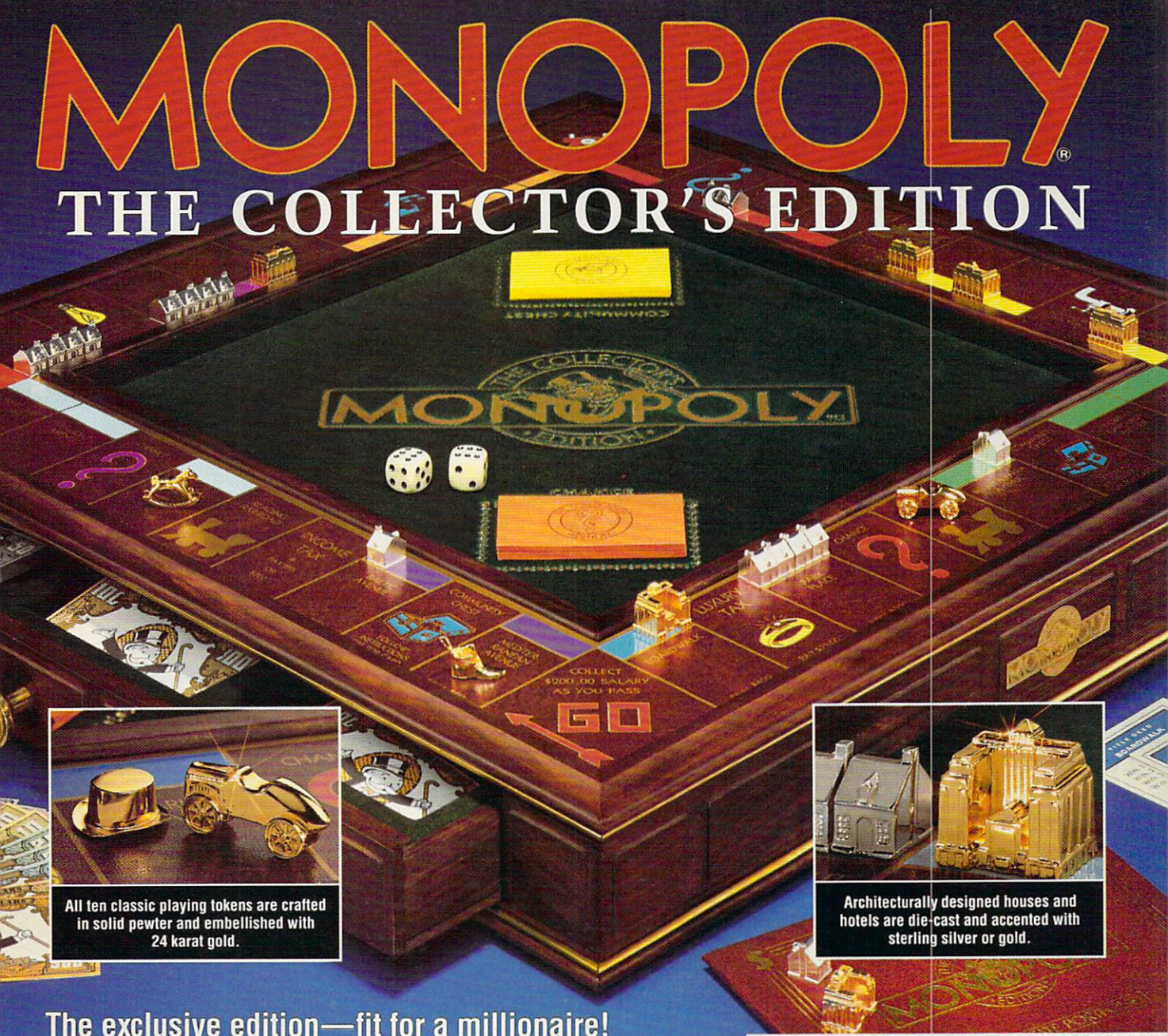

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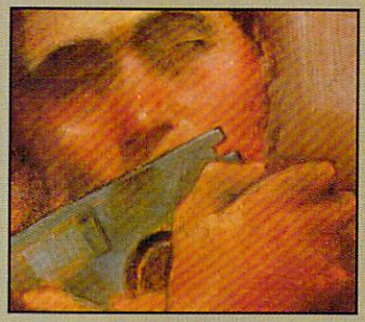
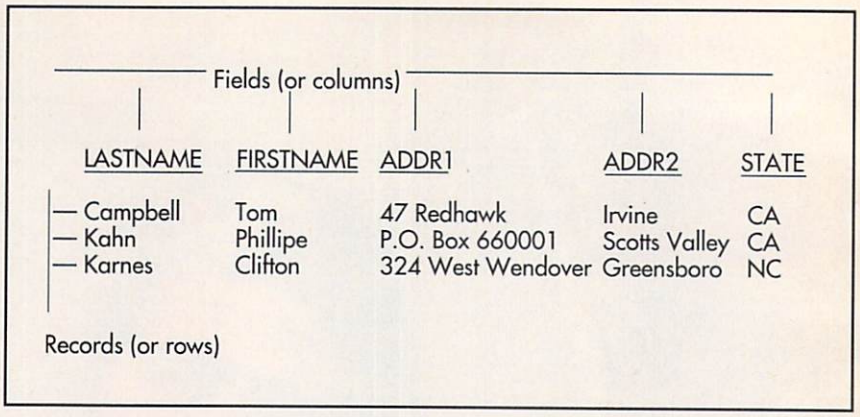


DATABASES

Drowning in data? A database can manage the thousands of details that swamp your desk day after day.

BY TOM CAMPBELL

Every day, we're engulfed with important details to sort and file away. Phone numbers, appointments, seminars, records, and new ideas flood us. It doesn't matter whether we're small business owners, PTA leaders, club and co-op members, or coin collectors; the Information Age has touched us all. There's so much to keep up with that it can turn the most energetic, organized, dedicated newcomer into a tired, frustrated cynic in no time—that is, unless you have a database management system (DBMS) looking after things for you.



No Reason for Fear

Don't let the word database scare you away. Database managers are easier to use than ever, and if you can draw a picture onscreen, you can use just about any of the popular DBMSs on the market today. In fact, some of them are downright fun to play with. True, a few years ago database managers were forbidding and dull, but now they're one of the most competitive arenas in the software world. Software developers have learned that it takes more than horsepower to bring new users into the fold.

In fact, you may be using a DBMS already. If you run Windows and use Cardfile as a phone book/dialer, you're using a simple DBMS. Consider the list of BBS phone numbers and modem settings in your communications program—that's a DBMS. Spreadsheet jockeys who know their way around @HLOOKUP and @VLOOKUP are using the database portion of their spreadsheets (remember that Lotus 1-2-3 originally was advertised as a combination plate: spreadsheet, database, graphics, Coke, and fries). And if you've ever battled with your word processor's mail merge, you've been dealing with a DBMS, too. (Do you end a secondary merge field with {END MERGE} or <ENDMERGE> or...?)

Database Details

Broadly speaking, a DBMS is any program that stores information by category and lets you get at that information in an orderly manner. Parts inventories, mailing lists, accounting systems, and order retrieval systems are all databases and require a DBMS. The categories are normally called fields or columns. The group of fields (for example, last name, first name, street address, ZIP code, and so on) is called a database or a table, as illustrated in the accompanying figure.

Ever notice how Microsoft registration cards are divided into boxes, one per letter, like this?

Last name:ICIAIMIPIEILILI | | | | | |

Microsoft asks you to print and to employ a couple of odd conventions (the tail of the Q points up instead of down) for its optical character recognition system, which automatically translates your printing into computer-readable format. In fact, systems like this can also link directly to a database manager. You're limited to a certain number of character boxes because of the limitations of database managers; most of them restrict the amount of information that can be stored in records or fields. Each customer record is given only 200 bytes (or 2000), and the fields within are also stored in fixed sizes (30 characters for the last name, 25 for the city name, and so on). Of course, the person designing the database determines those sizes.

The reason a DBMS imposes this rather severe limitation is speed—a recurrent theme in database management systems. Without being able to assume that records are of equal size, a DBMS would have no choice but to search through each record until it

DATABASES AS PROGRAMMING LANGUAGES

Lotus 1-2-3 and dBASE shared a common trait from their earliest incarnations: They did certain things better than any other minicomputer or mainframe software could hope to do, and they sported programming languages. (Lotus macros are a programming language? You bet!) But microcomputer users were so cowed by their mainframe counterparts that, for years, dBASE wasn't recognized as a language. Today, no one disputes that point, and database languages may be the most popular computer languages in use.

So why program in BASIC at all? Conversely, why don't database languages look like other languages? Because different jobs call for different tools. Your Swiss Army Knife might be useful, but no one wants to use it to carve a roast. And dBASE may have over 500 built-in statements, but no sane person would use it to write a word processor or an operating system. Compiled languages such as C, Pascal, and QuickBASIC can always run faster than database programs, but they won't be nearly as flexible or as easy to maintain.

Most database languages are reasonably easy to understand, even to the uninitiated user. The examples below use dBASE, but languages such as Clarion and R:BASE are equally simple to learn.

It's easy to see that this line prints a message at the bottom of the screen: &24, 1 SAY "Please press Enter to continue".

You can display the contents of a database with a single keyword, LIST. This command has many options. This line prints all the last names and first names in your database: LIST LASTNAME, FIRSTNAME TO PRINT.

Trying to do either of these things in C, Pascal, BASIC, or any other traditional programming language would require literally thousands of lines of code to open, close, and view database files; and it could never be as clear to the user because there are no database-handling keywords in these languages. To program well in any traditional language requires months of study, but database languages are unique in that even a novice can create significant applications with only a few hours' perusal of the manual.

Is dBASE better than C? The answer, as always, is yes and no. Yes if your application relies heavily on database features, no if it's not a database program or if execution speed is most important.

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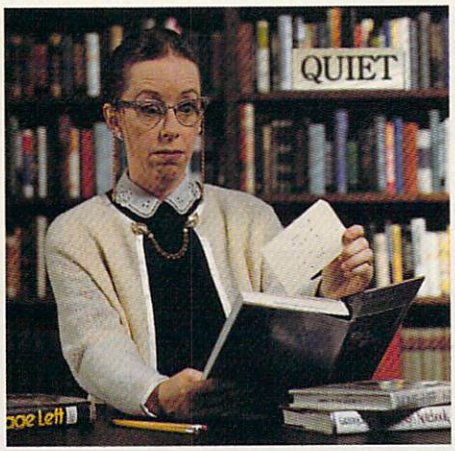

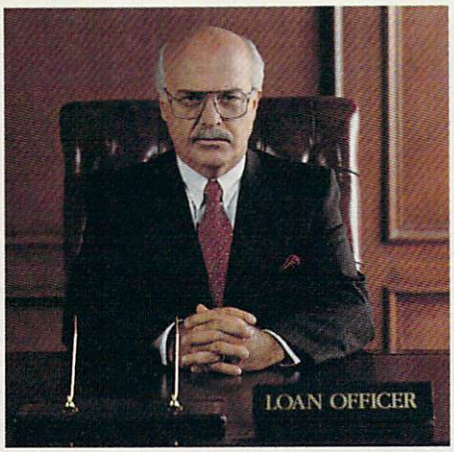

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found the one it was looking for. It's much, much faster for a DBMS to know that, in a database with 120-byte records, record 100 is at position 12000 in the file. Both hard and floppy drives are programmed to be able to position anywhere on the disk in a very short time.

This speed obviously comes at the cost of disk space. Most American surnames fit into 10 or 15 characters, but foreign and hyphenated names can be much longer. Do you want to alienate your customers by starting letters to Mrs. Adamkiewicz-Stanislaw with "Dear Mrs. Adamkiewic" because you can't afford the 50-percent slack such generosity would cost with your 20MB database, or do you want to eat the disk space and shell out $600 for a new drive? Most databases for small businesses, clubs, or home use turn out to be of an easily manageable size. If you have 100 people in your community band and each record uses 200 bytes, the database will be less than 20K in size—easily small enough to fit on even the humblest floppy disk. If you run a stationery store with 6000 customers on your mailing list for offices in the surrounding urban areas and each customer record fits in 220 bytes, your database will weigh in at only 1.3 megs and will still back up to a single high-density 31/2-inch disk.

Many DBMSs that use fixed-length records store only one record in RAM at a time, leaving the rest on disk, so the database capacity is limited by disk space instead of RAM. This contrasts to word processors, which are often limited to available RAM or, worse, the 64K-segment limitation of the 15-year-old 8088 microprocessor that came with the original IBM PC.

Most database managers allow the information they store to be restricted. For example, a numeric field allows for storage only of digits, plus signs, minus signs, and decimal points. A character field can store any information that can be printed—letters, numbers, punctuation marks, whatever. A

IF IT'S TUESDAY, THIS MUST BE REDMOND

Borland needed to expand its product line, and a database manager was the obvious acquisition. The best candidate was a comprehensive relational database with advanced QBE and a popular programming language, so in a much-publicized move, it bought Paradox. That was in 1987, and Borland's purchase of Ansa, developer and then-owner of Paradox, put that product on the map.

Borland spent years doing head-to-head comparisons of Paradox and dBASE, with the former always winning decisively. At the same time Borland vigorously denied the persistent rumor, now known to be accurate, that it was putting its considerable expertise in languages to work developing a clone of dBASE for Windows.

Borland now has two relational database management systems with totally different file formats, languages, and user interfaces. That's not counting Reflex, a flat-file database manager with its own file format and user interface. Borland assures developers that the two products are moving toward common goals, with compatibility being a major issue. That's a little like saying the European Common Market will move to make English compatible with French.

Microsoft needed to expand its product line, and a database manager was the obvious acquisition. The best candidate was a comprehensive relational database suitable for its flagship operating environment, OS/2. So in a much-publicized move, it acquired a controlling interest in Sybase. That was in 1987.

Microsoft spent years developing a powerful database manager that was also easy to use, and in 1992 it debuted plans to buy...Fox Software. It claims its internally developed product, Cirrus, will use BASIC as its lingua franca. But FoxPro uses the dBASE language.

Microsoft also has a number of other BASIC dialects: Visual Basic, Word BASIC, GW-BASIC, QuickBASIC, BASIC 7.1, Test, and QBASIC, to name a few. Visual Basic looks a lot like Word BASIC and Test, but it isn't really compatible with either. QBASIC looks a lot like QuickBASIC and BASIC 7.1, but it bears only the slightest resemblance to Visual Basic, Word BASIC, and Test. And GW-BASIC...well, let's just say that necessary evil would be a more than diplomatic description of its status at Microsoft. Luckily, an ANSI standard for BASIC finally appeared in the late 1980s, and Microsoft was quick to ignore it.

Microsoft is working on a systemwide macro language that will look sort of like Visual Basic but won't be quite compatible. Taking any bets on Cirrus?

Computer Associates needed to expand its product line, and a dBASE-compatible database manager was the obvious acquisition. The best candidate was a comprehensive relational database that extended the dBASE language in nonstandard fashion but ruled its niche of the market. So, in a much-publicized move, it bought...dbFast for Windows. That was in 1991.

In 1992, it swallowed Nantucket whole and burped up Clipper 5.01 for the DOS market. CA now has two dBASE compilers with incompatible language extensions and totally different user interfaces. (Actually, Clipper doesn't have a user interface.)

If an old-fashioned bedroom farce is your idea of a good pick at Blockbuster Video, you'll enjoy the last act of this one. In 1990 and 1991 a number of dBASE developers and power users banded together in the hope of forming an ANSI committee to standardize the dBASE language, working on the assumption that the dBASE language description was not subject to copyright protection. Ashton-Tate, then the owner of dBASE, not only wouldn't cooperate but threatened lawsuits. Borland, with only a nudge or two from the FTC, has since agreed that the language standard would be A Good Thing. If an xBASE (as the common-dBASE notion is called) standard arises, at the most one vendor's version of the language will survive, most likely Borland's. But even that's too close to call; ANSI standards have been known to take years to implement and to come out like a horse designed by a committee. The FORTRAN standard, begun in the 1970s, was known informally as FORTRAN 8X because the standards committee was foresighted enough to know that it would take a while to reach a consensus. The 8X means "nineteen eighty-something." The committee finally did reach a standard...in 1990.

Not only can a standard take years to form, but it can mean wholesale changes to the language. All the major C vendors were on the ANSI XJ312 committee to standardize C, and compatibility was stated as a top priority from day one. When the dust settled, no one's C compiler was compatible with the standard until about 18 months after the standard was ratified. If the xBASE standard ends up looking nothing like dBASE IV, everybody loses until someone comes out with xBASE compilers, which probably won't be compatible with the existing languages.

If Borland's version wins, it means that Microsoft, the second largest software developer in the world and currently an enthusiastic supporter of the xBASE standard, will have to take yet a new direction in databases from its number one competitor. If Microsoft's version wins, it means that Borland, the cradle of xBASE, will no longer own an xBASE-compatible language. If one of CA's versions somehow wins, it will mean that the company with the weakest product line will instantly control a nascent standard.

Oh, did anyone mention that CA is even bigger than Microsoft? It made its fortune in mainframe software and is doing what Microsoft did in the word processor and spreadsheet markets: throwing money at the problem until some of it sticks.

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THE PLAYERS

You can't tell the players without a scorecard. Here it is, with the players listed in alphabetical order.

Clipper 5.01
$795
Computer Associates
12555 W. Jefferson Blvd.
Los Angeles, CA 90066
(310) 390-7923
Unique among the programs listed here, Clipper is a compiler. When you write a Clipper program, it runs as a stand-alone exe file, and you're allowed to distribute it to other users without paying a fee and without their having to own Clipper. It's based on dBASE III Plus with a number of extensions that aren't compatible with dBASE IV. The documentation assumes you know the dBASE language and doesn't have much in the way of tutorial information. Its report writer is good, but you have to be a programmer to use it. Clipper is more suited to traditional programmers than the other products here, but what it does, it does quite well. And what it doesn't do can still be done, because you can use C to add to the Clipper language (and make use of Clipper's internal routines).

dBASE IV 1.5
$795
Borland International
P.O. Box 660001
Scotts Valley, CA 95067-0001
(800) 331-0877
Still the market leader, dBASE is always a good choice. FoxPro is currently more state-of-the-art, but dBASE is, of course, the only product listed here that's completely dBASE compatible. There's a huge market of third-party books and training materials for dBASE, and it runs on every computer known to humankind. Its user interface was given a face-lift for version 1.5, but it doesn't come close to FoxPro's. It has great documentation, an excellent report writer, and a very good programming language. It uses memory efficiently, runs well on 286s, and will soon be doing Windows.

dbFast for Windows 1.7c
$550 (competitor upgrade—$179)
Computer Associates
1 Computer Associates Plaza
Islandia, NY 11788-7000
(800) 225-5224
Purchased by Computer Associates before it purchased Clipper (thus leaving CA in the uncomfortable position of supporting two incompatible dBASE dialects), dbFast for Windows is much more suited to the novice programmer than Clipper is. Again, the documentation on its programming language leaves something to be desired, and the release as of this writing is known to be buggy. Still, it allows you to create stand-alone Windows programs using the dBASE language—a unique benefit no other product could offer at press time.

FoxPro 2.0
$795
Fox Software
134 W. South Boundary
Perrysburg, OH 43551
(800) 837-3692
Illustrating just how hard it is to write a good database, Microsoft threw in the towel after years of in-house development and bought the best dBASE-compatible DBMS money could buy. Well worth the $170 million in stock Fox cost Microsoft, FoxPro is at the crest of a new wave of databases. It's by far the easiest relational database to learn in this group, yet it's also among the most powerful. Most DOS database managers are woefully behind in the user interface department, but the developers at Fox clearly put their Mac programming experience to work in FoxPro 2.0. Arguably a better dBASE than dBASE, FoxPro is at once fairly compatible with the dBASE IV language and well beyond it in such critical areas as user interface features and lightning-fast indexing. If you need total dBASE compatibility and portability to other machines, go with dBASE. But if you want to give your programs a modern look and demand a red-hot development environment, FoxPro remains unchallenged.

HyperPad 2.2
$229
Brightbill-Roberts
P.O. Box 2476
Syracuse, NY 13220-2476
(800) 444-3490
HyperPad could've been a big hit in the DOS market, and I'm still not sure why it wasn't. Its visual approach to database design makes the creation of most databases a cakewalk, and its English-like command language is child's play to learn, especially if you know HyperTalk. HyperPad is not a clone of the seminal Macintosh program called HyperCard, but the influence is unmistakable. As with ToolBook, you attach program code to onscreen objects such as buttons and fields. This has a hidden trap: You can't make major changes to the program without somehow copying the database records to a new database, and there's no provision for doing so.

ObjectVision 2.0
$149.95
Borland International
P.O. Box 660001
Scotts Valley, CA 95067-0001
(800) 331-0877
Borland's ObjectVision, a Windows program, is a wildly uneven product in terms of where its power lies, although it's rock solid and does everything it's advertised to do and more (Borland doesn't do a good job of explaining it). It's every bit as simple to create a database in ObjectVision as it is in ToolBook, but OV is relational and uses Paradox, dBASE, ASCII, and BTrieve as native file formats. You create a database by "drawing" it onscreen, much as you do with ToolBook. There is no traditional programming language, but ObjectVision lets you attach 1-2-3– and Quattro Pro–style functions to such Windows objects as buttons and data entry fields. Amazingly, Borland lets you distribute stand-alone applications by including a runtime version of ObjectVision with your programs. There's no faster, cheaper, or more effective way at the moment to create Windows databases of simple to medium complexity that you can distribute. Its programmability is limited compared to dBASE's or ToolBook's, but you can still do quite a lot.

Paradox 3.5
$795
Borland International
P.O. Box 660001
Scotts Valley, CA 95067-0001
(800) 331-0877
Borland acquired a database manager called Paradox some years ago because the product lived up to its name: It had a simple-to-learn user interface but came with a language every bit as powerful as dBASE. PAL, the Paradox programming language, is not dBASE compatible, so Borland is now faced with the unenviable task of somehow reconciling two completely incompatible programming languages in the same market segment. Paradox is no longer the technology leader in the realm of high-end relational databases (FoxPro snatched the crown a couple of years ago), but it remains an excellent product with thorough documentation, a much-imitated visual query mechanism, and high-performance database management.

ToolBook 1.5
$395
Asymetrix
110 110th Ave. NE, Ste. 700
Bellevue, WA 98004
(800) 448-6543
ToolBook makes better use of the Windows environment than any other database product available. It's sluggish on even medium databases and on anything but a high-end system (fast 386 on up), but its advantages are many: a programming language that looks like HyperTalk with the bad parts left out, the best sample applications of any product listed here, a solid interface to Windows, an optional multimedia extension package, and some of the most elegant documentation ever written. It's a class act, if limited in some ways, but as a whole it's a seductive development environment.

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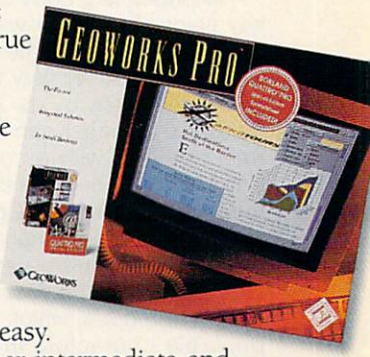

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date field contains only allowable numbers for months (1–12), days (1–31), and years (typically 1900 and up). A logical field can only store T for True and F for False (or sometimes Y for Yes and N for No).

Restricting the kind of information that can be entered into a field confers several advantages to the DBMS user. First, most databases automatically force the user to input only that type of data, so an absent-minded data entry person won't be able to enter ZIP code (numeric) into the state field (character). Second, it speeds indexing.

An index is a copy of one or more key fields (fields you want to sort by, for example, last name or ZIP code) that's designed for very fast access. If you index a file by its ZIP code, the database manager can create a separate index file with a copy of the ZIP code for each record stored in a quick-access format. Computers can sort numbers faster than letters, so the indexing mechanism can take advantage of that trait and convert its copy of the ZIP codes, which are stored as printable characters in your record, into binary values for the index file. That way, printing your customer list by ZIP code will be sped up enormously, perhaps a hundred or a thousand times.

The designers of dBASE III Plus recognized that some databases would do well with the ability to store free-form information, at the cost of limiting how that information could be searched. For example, if you want to store a log of a client's dealings with your customer service department, you'll quickly realize that most records leave this field empty, but the ones for which it is used can easily spill over your database's maximum record size of 4000 characters. The answer to this problem is memo fields, pioneered by dBASE.

Memo fields take up ten bytes per record no matter what. That's the bad news. The good news is that those ten bytes are used to refer to a location in a separate memo file that can store up to 64K of information per memo field. (FoxPro and some other dBASE-compatible databases manage to allot even larger memo fields.) Memos can't be sorted or used in indexes, because indexes copy the contents of each indexed field and they can't be searched easily—but when you need 'em, you need 'em bad. Many database managers that claim to be dBASE compatible don't support memo fields, whereas others, such as FoxPro and Clipper, go dBASE one better by offering beefed-up support for memo fields. Fox for the Mac, for example, uses memo fields to store MacPaint images!

Family Relations

There are two kinds of fixed-length DBMSs (that term includes database managers that use memo fields): flat-file and relational. A relational DBMS is one that lets you use several databases at once, connected by common fields. An example is a customer list that's related to accounts receivable by customer ID. Scroll through the customer list, and you'll see how much each customer owes you because the DBMS knows to look up each account as you scroll. (The inventor of relational database design theory, Edward F. Codd, rightly disputes this simplified example and wrote an entire book explaining what relational databases really are, but we're using the popular definition here for the sake of discussion.) Database managers without this ability are known as flat-file managers, because they use only one database at a time.

GOOD DATABASES CREATE ORDER OUT OF CHAOS

In general, relational database managers are much more capable than flat-file managers and by definition can do everything flat-file managers can, but they're usually more expensive and more difficult to learn.

Indy Car or Family Sedan?

A DBMS that uses fixed-length records isn't the only game in town, of course. You might think of it as the family sedan of databases, which can do just about any task you can throw at it with varying degrees of success—big capacity, reasonably fast sorting and indexing, pretty flexible, and nicely paired with the performance characteristics of a disk drive. Three other varieties of DBMSs exist—network, hierarchical, and object-oriented, but they aren't popular on PCs. A fifth variety, free-form databases, has been around for some time and occupies a small but solid niche in the PC world. Lotus Agenda and AskSam are well-known examples of free-form databases.

While you can make free-form databases look like traditional row-and-column database managers, why bother? Their true power is precisely in not forcing you to such a narrow organizational paradigm. Instead, you're encouraged to make up freestyle associations; Agenda knows that the phrase next Wednesday is the same as December 9 and can spot other such connections without your explicitly asking. Free-form DBMSs usually store all information in RAM, so they can be sharply limited in the amount of information they store.

Two hybrid DBMSs are HyperPad, a sort of character-mode HyperCard for DOS, and ToolBook, a Windows application that also looks like HyperCard. Fields aren't typed, essentially doing the job of both character and memo fields, and they may contain up to 32,000 characters. But nonetheless, they can be sorted and searched, and they don't waste disk space. Each comes with a wonderfully rich programming language and terrific sample applications that you're encouraged to modify for your own use. HyperPad boasts much snappier operation and works well even on the lowliest 8088 DOS machine. ToolBook is unpleasant on anything less than a 386 with four megs running at 33 MHz. If you plan to sort a 10,000-name mailing list in ToolBook, plan to leave your computer running overnight, but that's not really what ToolBook is for. If you want to prototype a Windows application or put together a visual database fast, ToolBook is without peer. Both HyperPad and ToolBook are stable, mature products.

Gone Fishing

With all the options available, you're sure to find a DBMS that suits your style and needs. The most difficult challenge database managers pose may well be choosing the best one for your needs. If you find this to be the case, consider setting up an appointment with a computer consultant, who will evaluate your habits and system capabilities. But don't delay. Information keeps pouring into your life; the sooner you get it managed, the sooner you can take that vacation you've been putting off. ❑

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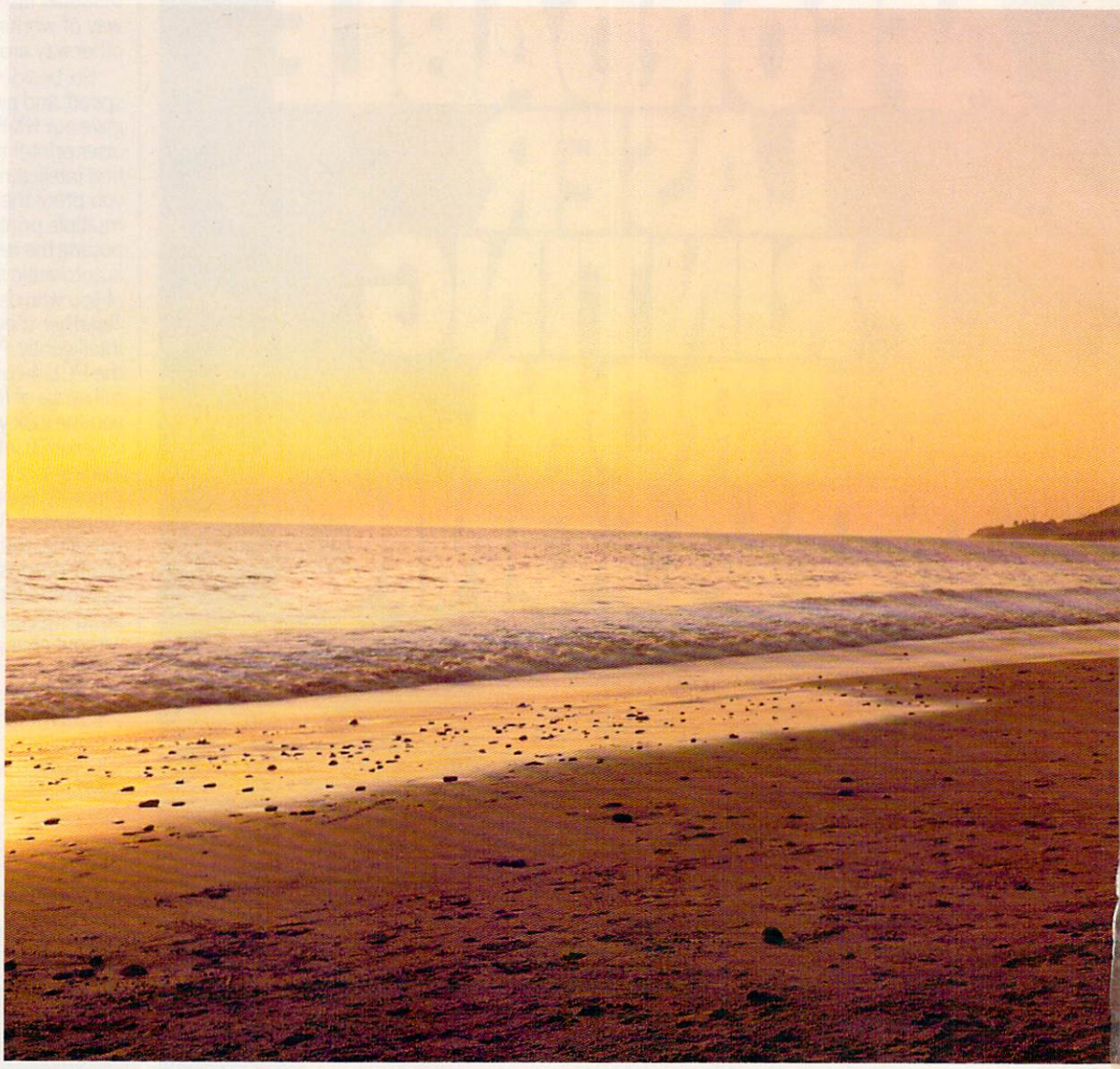

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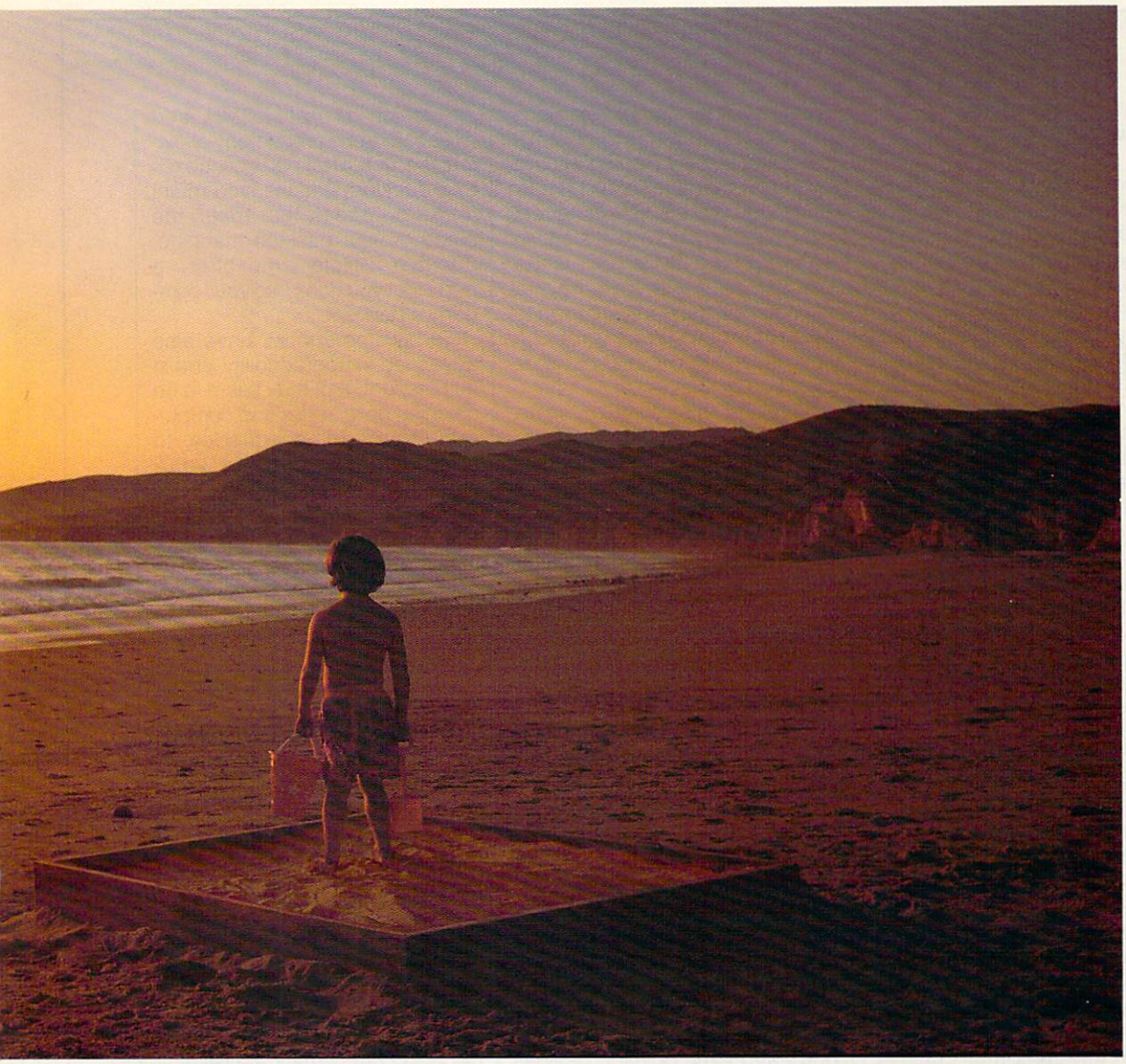

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TEST LAB

Edited by Mike Hudnall
Reviews by Tom Benford

Notebook computers have come of age. At one time, laptop and notebook users were beset by limitations, having to to put up with limited mass storage, processing power, display opportunities, battery life, and expansion capabilities. Overcoming any of these limitations meant investing very large sums of money.

While notebook computers still aren't exactly inexpensive, they do offer you far more for your money than previous generations of portable computers did. Perhaps you've been tempted by the freedom notebooks offer you to compute when and where you want or enticed by the promise of increased personal productivity. Perhaps you've resisted that temptation because you didn't want to give up the power and economy of a desktop system. Or maybe you've decided to wait because you're not sure which technology best fits your needs.

Wait no more. This month's Test Lab lineup includes 11 notebooks that in one way or another offer cutting-edge technologies: color displays, advanced power management, raw computing power. And if you've followed the news in the computer industry, you know that computer prices, including notebook prices, are dropping rapidly. You should, for example, manage to find a hard drive–equipped 386SX notebook with features galore and plenty of software for a street price of under $2,000. Whether your portable computing needs are modest or demanding, you'll probably find unexpected bargains wherever you look.

Three of this month's evaluation units offer color displays. Those from NEC and Toshiba boast active matrix color, and AST's notebook gives you a lower-cost passive matrix color display. While gray-scale approximations of color have improved significantly, these color displays are mighty nice.

You want power? Two of this month's evaluation units boast Intel 486 microprocessors: one a DX (TI's TravelMate 4000) and one an SX (Toshiba's T4400 SXC). Two of the notebooks, the Wyse DecisionMate and the PC Brand 486SLC, use the Cyrix 486SLC chip.

Not too long ago, using Windows on a notebook presented a real challenge because of memory limitations, smaller hard drives, and less capable microprocessors. Now many companies bundle their notebooks with Windows and even pointing devices that let you do Windows on the run. In fact, you may find that your Windows apps are more responsive on the new notebook than on the old desktop back at the office. With massive hard drives (up to 200MB), memory expansion of up to 20MB, and expansion-bus technology allowing the use of expansion boxes and docking stations, you might find a notebook that takes the place of your desktop machine. Zenith's Z-Note even offers a port to let you hook into your company's network.

Today's notebooks have also advanced in upgradability, and in this respect, too, they seem to be catching up with desktop computers. From adding a modem to upgrading a hard drive, you'll find more upgrades and options than ever. Samsung's notebook lets you remove the hard drive, and Zenith's promises you can exchange your monochrome display for a color display later. Some of these upgrades still must be performed by the manufacturer, and, in general, upgrading a desktop system is still easier than upgrading a notebook; however, great strides have been made in notebook upgradability.

With the increasing power of today's notebooks, power management ranks high on many people's list of priorities. And several of the units tested this month employ innovative power management technologies. As you ponder future cross-country trips, consider these technologies, and pay careful attention to the battery depletion benchmark statistics.

Should you buy a 486? A 386? A DX, SX, or SL? Should your notebook have an Intel processor, an AMD processor, or a Cyrix processor? This month's Test Lab helps you sort out what each of these microprocessors has to offer; pay particular attention to our benchmark test results. In part, the processor you choose will depend on the applications you use, how much you'll depend on your battery, and how much money you have to spend. This month, as always, Test Lab gives you the information you need to assess your own needs and make a more informed buying decision.

MIKE HUDNALL

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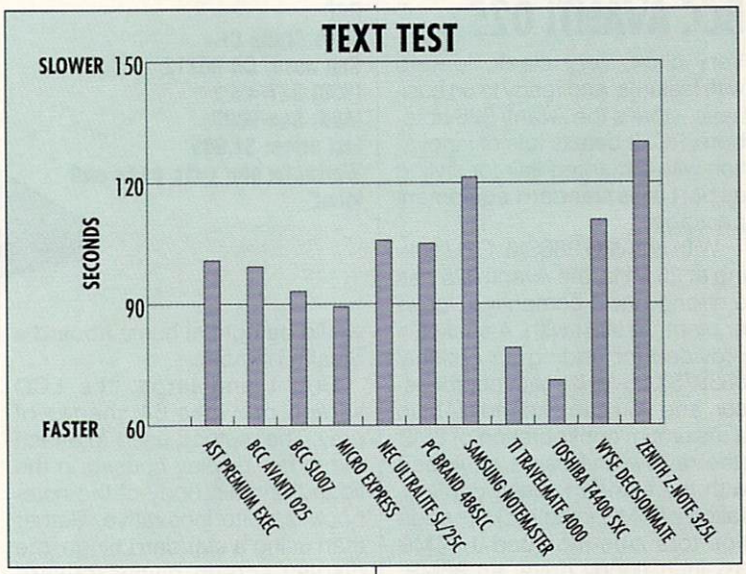
AST PREMIUM EXEC 386SX/25C

Compact and smartly styled, the briefcase-totable AST Premium Exec 386SX/25C color notebook computer uses the Intel 80386SX chip running at a respectable 25-MHz speed. It's the only notebook PC in this roundup that features a passive matrix color display.

The color display is the most distinctive feature of this computer, and I found it to be an acceptable compromise between black-and-white LCDs and the more expensive active matrix color LCDs offered on other notebook models. While the passive matrix technology is less expensive to produce, resulting in a lower overall price for the consumer, there are some video tradeoffs that you should consider. The passive matrix video display, while good, lacks the color vibrancy, the richness and depth, of the active matrix display. Additionally, I noticed in the passive matrix display a marked propensity toward moiré patterns and some blotchiness on the screen. It is color, however, and it adds an entirely new dimension to notebook computing when compared to the mundane appearance of even the best black-and-white LCDs.

The Premium Exec's high-density 3½-inch floppy drive is mounted on the front, and I found this to be a much more convenient and accessible site for the drive than the side of the machine, where other manufacturers usually place the floppy drive. In addition to the floppy drive, the Premium Exec also comes outfitted with a hard drive; the standard configuration is a 60MB drive, but you can optionally order an 80MB drive or a 120MB drive (the review unit came equipped with the 80MB drive and 4MB of RAM installed).

You can expand this notebook's memory to a maximum of 8MB by using single in-line memory modules (SIMMs) in either 1MB or 4MB capacities to populate the two SIMM sockets provided. Adding more RAM is accomplished by removing a sliding cover, which provides access to the interior parts of the machine.



You can also install an optional second serial port adapter when you remove this panel cover, since installation of this option is a snap-in procedure. No technical prowess is required for either of these upgrades, thanks to good overall design. The Premium Exec can also accommodate a 387SX/25-MHz math coprocessor for those chores which are math intensive, so there's good expandability with this machine if and when your needs require more computing oomph.

All of the I/O ports are located at the left rear of the machine and protected by a flip-down door when they aren't in use. A single serial port, a parallel port, a 15-pin Super VGA video port, and dedicated mini-DIN ports for an external keypad and the AC power adapter and battery charger are all grouped together here. You'll find the battery compartment located on the right side of the Premium Exec near the rear of the machine. A snap-off cover on the left side of the notebook provides access to the optional second serial port.

The on/off switch and the brightness and contrast controls are located directly beneath the video display screen on the body of the computer itself. To the left, also at the top, you'll find a bank of six LED indicators which signify power, floppy drive, hard drive, Num Lock, Caps Lock, and Scroll Lock activity.

I found the keyboard quite comfortable, offering good key placement along with a positive, snappy action with an audible click. I really liked the feel of this notebook keyboard, since it closely mimics the feel and sound of my desktop PC keyboard. AST also offers an optional adapter for connecting a desktop keyboard to the Premium Exec if you prefer to use one.

Weighing in at 7.5 pounds, the Premium Exec 386SX/25C is quite totable and, with a charge life of over 1.5 hours under heavy use, serviceable, too. If you're looking for good 386 performance with a color display in a notebook PC at an affordable price, the AST Premium Exec 386SX/25C merits a close look.

Circle Reader Service Number 304

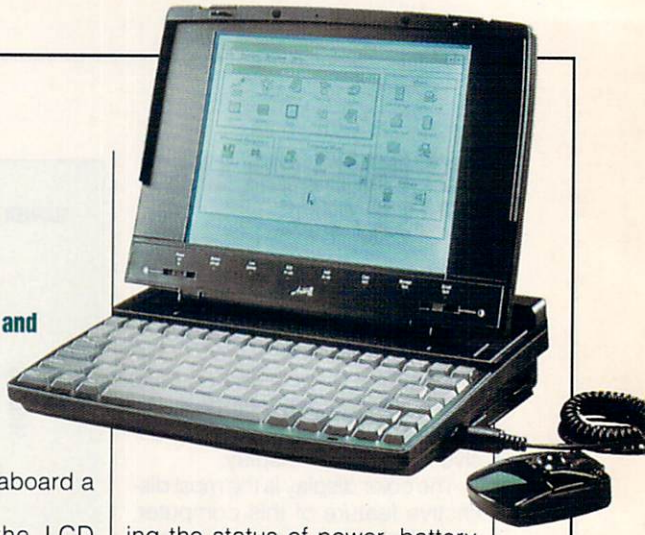
BCC AVANTI 025

Very slick, very sleek, loaded with features, and ready to do business—that's the Avanti 025 notebook PC. It boasts lots of innovation with a marked flair for styling as part of its standard equipment package.

With an AMD 386SXL CPU ticking at 25 MHz, the Avanti 025 has a strong basic computing "power plant" to start with. A socket is provided for adding an optional 80387SX/25-MHz math coprocessor, and you can expand RAM to a maximum configuration of 8MB (the review unit came equipped with the standard base configuration of 4MB installed). In addition to a side-mounted 1.44MB 3½-inch floppy drive, an 85MB, 19-ms hard drive is also standard equipment.

The shape of the Avanti 025 is its most distinctive feature. Rather than taking the traditional notebook approach with a squared-edge rectangular shape, BCC softened the sharp edges of the case with rounded corners and sculpted curves, which makes the case resemble a clamshell when closed. Molded in a semigloss black plastic, the Avanti 025 looks like a notebook PC that would be right at home aboard a Stealth bomber.

BCC
1610 Crane Ct.
San Jose, CA 95112
(800) 827-4222
(408) 944-9000
List price: $1,995
Warranty: one year, parts and labor



Bright and large, the LCD screen provides 64 shades of gray. The method used to attach the video display housed in the lid to the main body of the notebook is quite innovative. Rather than using a standard hinge, the display screen pivots forward from a closed position, making it possible to use this notebook in very cramped spaces (such as the tray on the back of an airplane seat).

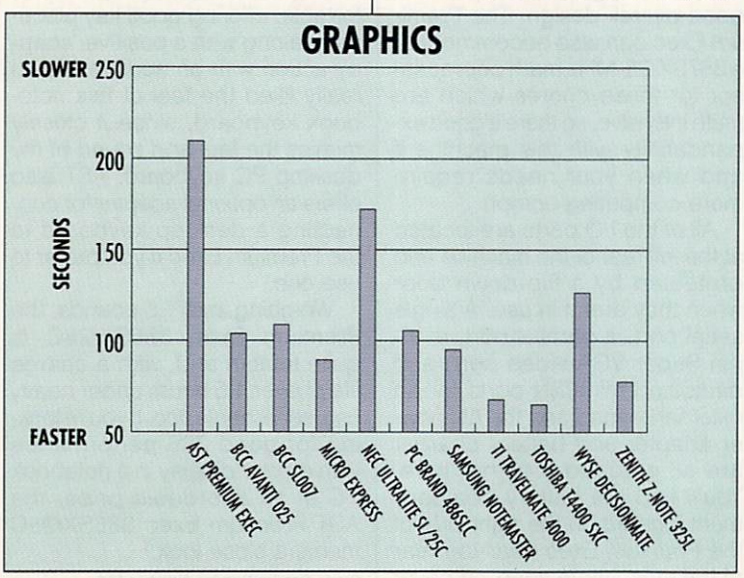
You'll find controls for adjusting the brightness and contrast of the LCD conveniently located just below the display itself—a good place for them, since black-and-white LCDs frequently require adjustment for optimal viewing from one application to another. Illuminated indicators displaying the status of power, battery charge, low battery, floppy use, hard disk use, Caps Lock, Num Lock, and Scroll Lock are also located across the bottom span of the LCD screen.

Advanced Power Management (APM) circuitry built into the Avanti 025 extends battery life, and I had no problem using the computer for 2½ hours or longer per charge, depending on how heavy my usage was. This is particularly significant, since the Avanti 025 also comes equipped with a built-in 9600-bps send/receive fax and 2400-bps data modem which also draws power from the notebook's ni-cads.

Behind a flip-down panel door on the left side of the machine beneath the keyboard, you'll find a 15-pin VGA port for connecting an external color monitor, a parallel port, and a single 9-pin serial port. A PS/2 mouse port and the flush-mounted power switch are mounted on the right side, along with the floppy drive. The AC power connector jack is located at the right rear of the machine, while the dual telephone jacks (for line and phone) are mounted at the left rear corner.

The keyboard features a soft yet sure touch with very short key travel. While this takes a little getting used to if you're accustomed to a full-travel desktop keyboard, I found typing on the Avanti 025 very fast and almost effortless after using it for a short while.

MS-DOS 5.0, Windows 3.1, and WinFAX software all come



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Apprentice can be purchased at these retailers: Bizmart, CompuAdd, CompUSA, Computer City, Egghead, Fry's Electronics, Microcenter or Waldensoftware.

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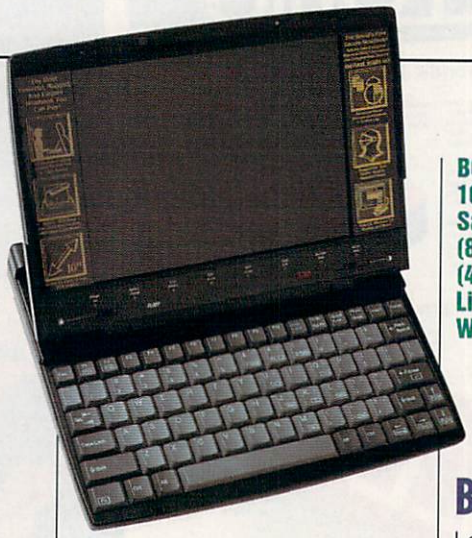


with the Avanti 025, as does a handsome carrying case with ample room for cables, manuals, and more. All this adds up to a 25-MHz 386 machine with the muscle and equipment needed to do serious business right out of the box. And if that's not enough for you, consider this: The Avanti 025 is designed and manufactured right here in the U.S.A.

Circle Reader Service Number 305

BCC
1610 Crane Ct.
San Jose, CA 95112
(800) 827-4222
(408) 944-9000
List price: $3,495
Warranty: one year, parts and labor

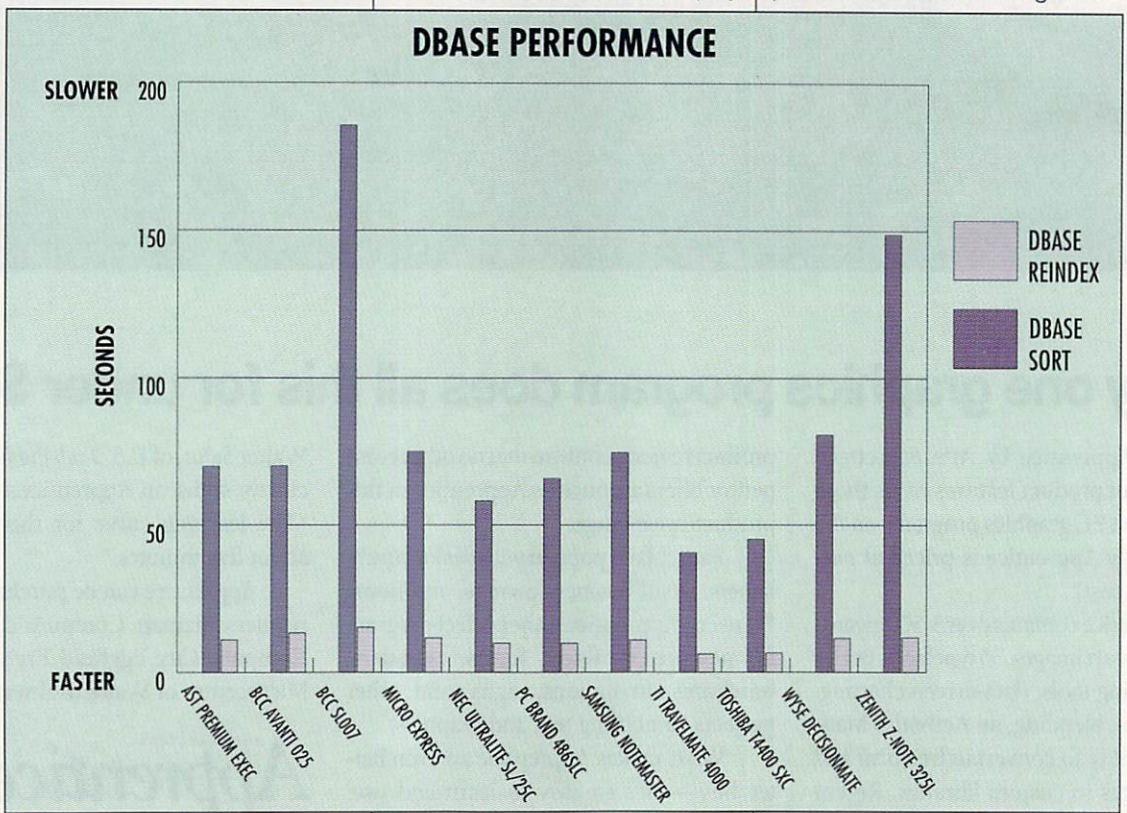
BCC SL007

Looking virtually identical to the BCC Avanti 025 notebook also covered in this roundup, the BCC SL007 notebook boasts many of the same features as the Avanti model but adds a couple of innovations of its own.

The SL007's video display is the same as the one found on the Avanti, featuring a ten-inch diagonal viewing area—one of the largest and brightest available on any of today's notebooks. The display screen is built into the lid of the notebook, and like the other BCC model, uses a unique pivoting arrangement to erect the screen in much less space than other notebooks require. By pivoting the screen forward when it's open, you can use the notebook comfortably on your lap or on the tray mounted on the back of an airplane seat. This feature will find favor with frequent flyers who need (or want) to compute on the go.

The APM (Advanced Power Management) features of the SL007 will also find favor with commuting computerists, since its average charge life extends well past 1½ hours even with high-demand usage. Normal charge life under average use was typically 2½–3 hours during the review.

A "soft touch" mar-resistant semiflat black sculpted case contains the notebook PC, and its curved lines and clamshell-like appearance when closed give it a



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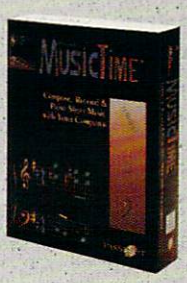

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Circle Reader Service Number 211

very nineties look, indeed.

Standard equipment for the SL007 consists of 4MB of RAM (expandable to 8MB) and a very fast 85MB IDE hard drive. A side-mounted 3½-inch high-density floppy drive, a parallel port, a serial port, and a 15-pin VGA port are also part of the basic complement of features, as is a PS/2-style mouse port. BCC also provides a socket for adding a math coprocessor if you think you might need one.

Unlike the Avanti model, which uses an AMD CPU, the SL007 uses an Intel 80386SL chip running at 20 MHz. While performance on the SL007 was quite good, it didn't have the snappy performance evident in its sibling, the Avanti.

The SL007 also features a built-in 9600-bps send/receive fax and 2400-bps data modem. Software that comes with the notebook includes WinFAX, MS-DOS 5.0, and Windows 3.0, so this machine is factory equipped and configured to do meaningful work as soon as you turn it on.

The most innovative feature of the SL007 is its built-in security. BCC claims that the SL007 is the "world's first secure notebook," incorporating a DES (Data Encryption Standard) coprocessor so that only authorized personnel can use it. This security feature permits you to assign a special five-character password to the notebook via a utility in the machine's setup section. This is a particularly attractive feature if you have sensitive information on the machine that you'd like to protect from unauthorized eyes when the machine is left otherwise unguarded (as during a lunch break).

A pleasant and unexpected plus is the inclusion of a miniature trackball, which plugs directly into the PS/2-style mouse port of the SL007. The mini trackball, only about half the size and thickness of a standard desktop mouse, is quite serviceable and a handy device to have if you're a traveler using today's GUI-based software, especially since you don't need a flat surface to use it. The thumbball unit is a nice touch that both looks good and works well.

The combination of built-in features, good performance, and encrypted security makes the SL007 a machine worthy of serious consideration.

Circle Reader Service Number 306

MICRO EXPRESS
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Santa Ana, CA 92705
(800) 989-9900
(714) 852-1400
List price: $2,695
Warranty: 15 months, parts and labor; 30-day money-back guarantee

MICRO EXPRESS NB2500

The Micro Express NB2500 is chock-full of features that will appeal to just about any user. Molded in a black, wrinkle-texture finish that doesn't show fingerprints, the notebook has rugged good looks and is a bit larger than most of the other notebooks reviewed here.

The NB2500 uses the AM386DXL CPU running at 25 MHz. This low-power microprocessor includes an internal 128K RAM cache for high performance, coupled with low current requirements to extend battery life. The extraordinarily flexible power management on this machine permits adjustable sleep modes and other energy-conserving features that contribute to battery charge life of between 2½ and 3 hours under ordinary use and more than 1½ hours under continuous, heavy use.

Standard equipment on the NB2500 includes a high-density floppy drive, an 80MB hard drive, and a built-in send/receive fax/modem. The notebook comes with 4MB of RAM, but you can expand the memory to a maximum of 8MB with an optional 4MB SIMM upgrade ($240).

The display measures nine inches diagonally and delivers 640 × 480 VGA resolution represented in 64 levels of gray. Slider controls just above the keyboard let you adjust brightness and contrast, and a 15-pin jack at the rear of the machine lets you use an external monitor.

Along with the external VGA jack, you get an external keyboard/mouse port, a parallel port, a 9-pin serial port, a telephone jack (for connecting the fax/modem), a proprietary expansion bus, and a scanner port, all located at the rear of the machine beneath a flip-down panel door. The scanner port supports a Marstek handheld scanner (either the 400-dpi or 800-dpi model), and it's certainly a unique and useful idea.

An optional expansion chassis ($499) adds two full-length 16-bit slots and an additional power supply, and it mates with the NB2500 via the expansion bus connector.

I found the keyboard of this machine really terrific, mimicking exactly the feel, key spacing, and action of my favorite desktop keyboard. All function keys are grouped together at the top, while dedicated cursor control keys occupy the bottom right of the keyboard. As far as notebook keyboards go, I'd rate this one a solid 10 on a 1–10 scale.

The front mounting of the floppy drive on this machine appeals to me. However, I don't like the placement of the green LED power indicator and amber hard

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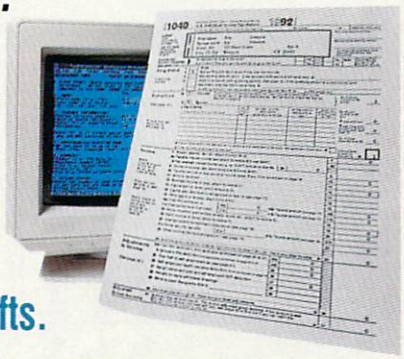

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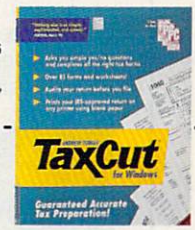
System Requirements

DOS: IBM PC/Compatible, 640k RAM, Hard Drive.
Windows: IBM PC/Compatible, 286 or higher, Hard Drive, Windows 3.1.
Mac: Mac Plus or better, 2MB RAM, Hard Drive.



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Circle Reader Service Number 105

THE SONERA VIDEO SCORES

To test the performance of displays in this month's notebooks, we used DisplayMate from Sonera Technology. The Sonera video scores represent our lab's subjective analysis of display performance in DisplayMate's Video Obstacle Course, a series of 33 test patterns designed to uncover video anomalies or substandard performance. Common video irregularities, including blooming, defocusing, geometric linearity, moiré patterns, flicker, streaking, ghosting, and other conditions, are diagnosed using the test patterns displayed. A "jury" of three CPTS staff members scrutinized each monitor for each test and voted either 1, signifying the monitor passed the test, or 0, designating failure. The votes of these three testers were compiled for all of the tests, and the results were totaled. A perfect score for the Video Obstacle Course is 33.

—TOM BENFORD, PRESIDENT
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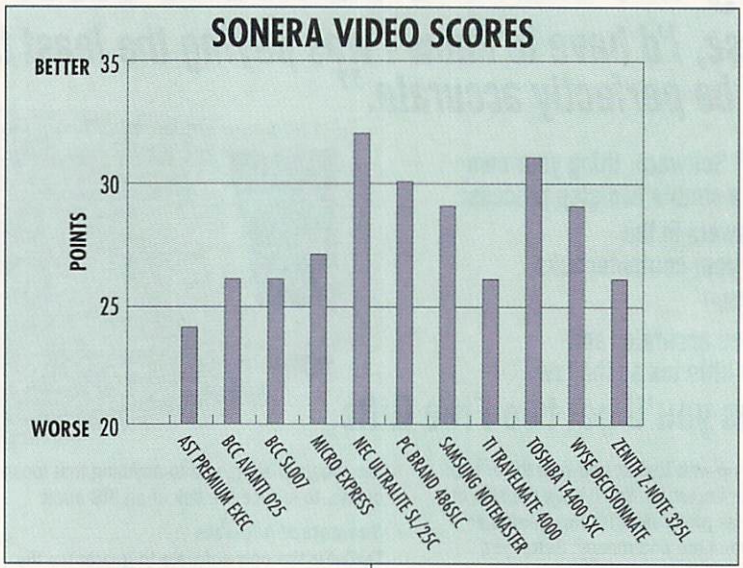
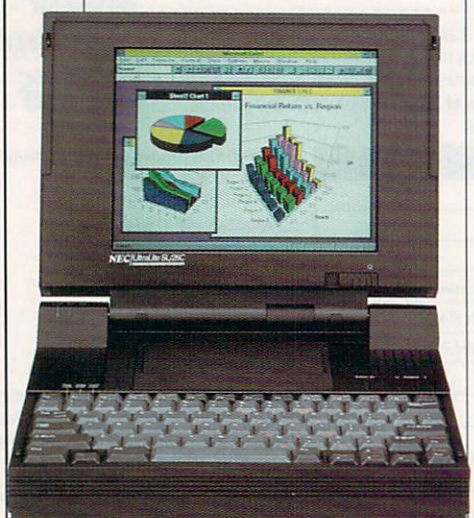


drive activity indicator next to the floppy drive. The problem is that when you're typing, your hands obscure the view of these two LEDs. My feeling is that if you're going to put status indicator lights on a notebook, you might as well put them where the user can see them while working. A minor gripe, perhaps, but one I feel is valid.

The notebook proved itself to be a reasonably quick and consistent machine for all of the DOS and Windows applications I ran on it during the reviewing process. MD-DOS 5.0 comes with the NB2500, along with several utility and setup disks. The documentation for the machine is thorough, well written, and logically organized. If you're considering a 386-based notebook, you should consider the Micro Express NB2500.

Circle Reader Service Number 307



NEC ULTRALITE SL/25C

The impressive power and features of the NEC UltraLite SL/25C should raise the eyebrows of even the most stoic and jaded computerist. This is a wish-list machine.

NEC TECHNOLOGIES
1414 Massachusetts Ave.
Boxborough, MA 01719
(508) 264-8000
List price: $4,599 with 2MB RAM; $4,868 with 4MB RAM
Warranty: two years, parts and labor

The SL/25C's remarkable TFT (Thin Film Transistor) active matrix color liquid crystal display is an absolute pleasure to view, even for the most extended periods. I found the images on this display absolutely stable and the colors strikingly crisp. In the Video Obstacle Course of the DisplayMate Video Utilities, the UltraLite scored an unparalleled 32 out of a possible perfect score of 33; no other color notebook or laptop display I've seen to date surpasses that of the UltraLite SL/25C.

Standard equipment on this notebook includes a built-in high-density 3½-inch floppy drive for transient file work and a fast 80MB hard drive for mass storage. Two mini-DIN ports, one for a PS/2-style mouse and one for an external keyboard, are located next to a 15-pin external Super VGA connector and a single 9-pin serial port, all concealed from view when not in use by a flip-down panel door. Adjacent to this panel you'll find another flip-down door, which houses the parallel printer port and a proprietary connector for an external floppy drive.

Snap-off covers on the right side of the UltraLite conceal an external numeric keypad port

Close the Windows. Lock the DOS.

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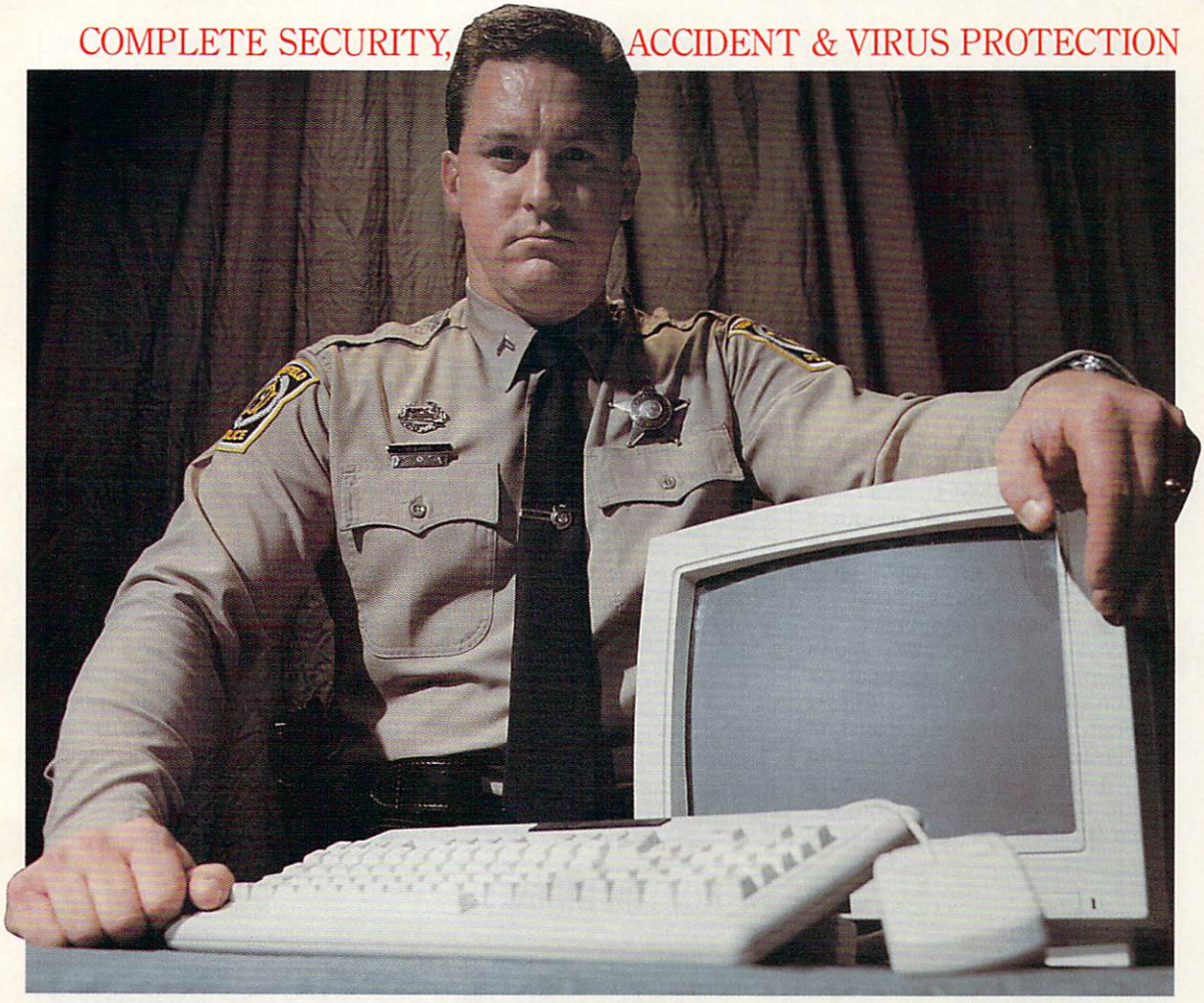

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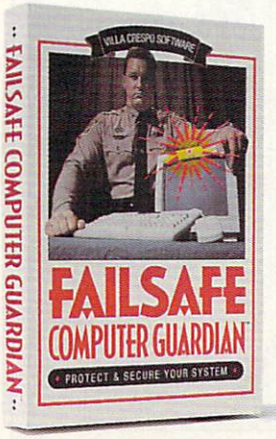

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and an expansion port. The expansion port connects the SL/25C with its accessory docking station, an optional item which endows the SL/25C with two 16-bit expansion slots and a 5¼-inch drive bay to accommodate an extra device, such as a CD-ROM drive.

If you prefer using an internal modem, you can install an NEC modem in the internal slot. Expand RAM to a maximum configuration of 10MB via 2-, 4-, 6-, or 8MB memory modules.

The heart of the UltraLite SL/25C is the Intel i386SL CPU, which runs at 25 MHz. This gives the SL/25C more than adequate performance while keeping the power requirements reasonably modest through the SL chip's power management functions.

While NEC claims that you can get up to 5 hours of operation on a charge with light use and about 1½ hours under constant operation, I found the SL/25C to be a bit on the power-hungry side with average continuous-use sessions lasting only slightly more than an hour between charges. With all of the power management options enabled, I averaged 2–2½ hours per charge, which is a workable charge life in real-world terms.

Thanks to excellent layout and design, using the machine is a joy. Illuminated power, battery, and disk usage LEDs grace the upper left of the unit by the lid hinge, while illuminated Num Lock, Caps Lock, and Scroll Lock indicators appear just above the excellent 88-key keyboard, which features a dedicated cursor keypad and an embedded numeric keypad.

You can adjust screen brightness via a slider control mounted at the lower right of the display, and the standby and power switches are flush mounted at the upper right just above the keyboard. Overall ergonomics of the 7½-pound notebook are excellent, and its black nongloss case gives it a distinguished, business-like appearance.

Windows and DOS-based applications all run at a respectable clip on the SL/25C equipped the way I reviewed it, but adding an optional 80387SX math coprocessor along with some additional RAM would improve its performance even more for those real power-user applications. If you're like most users, however, you'll find that the SL/25C fills your wish list just fine the way it is.

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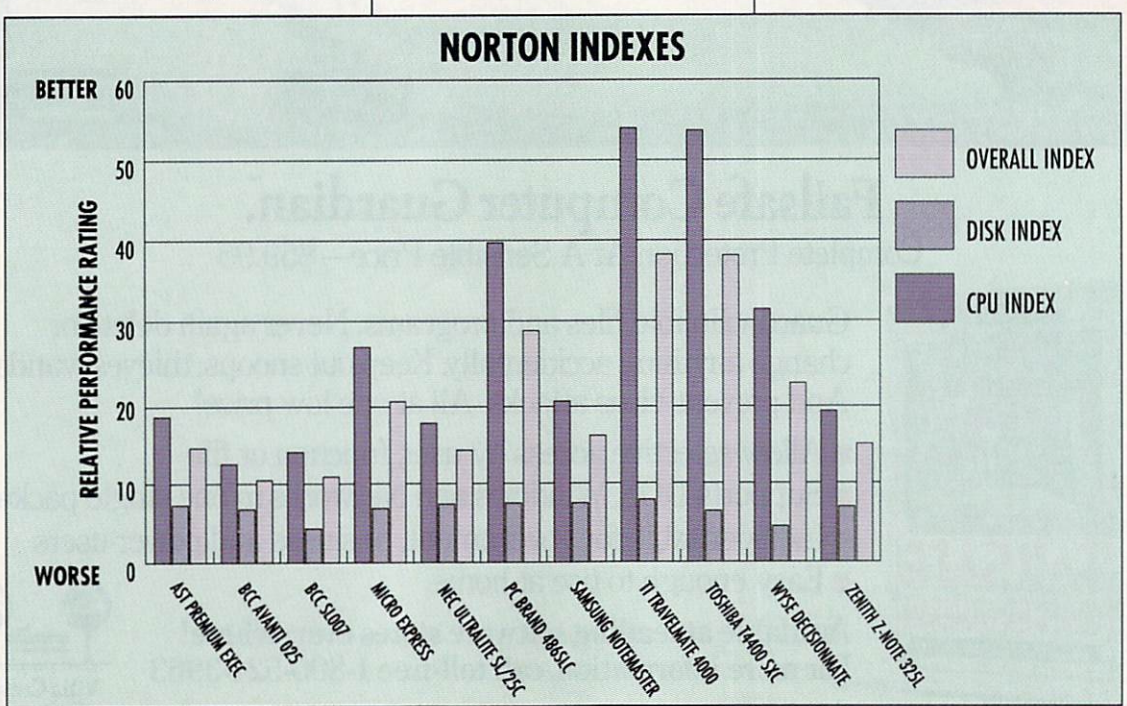
THE NORTON INDEXES

The Norton computing, disk, and overall indexes show you how well a computer performs when compared to a 4.77-MHz IBM XT. In the Norton index, the XT has a value of 1.0. If a computer is twice as fast, it will have a value of 2.0. The greater the index value, the faster the computer—and the faster your applications will run.

The computing index rates the computer's microprocessor performance. The disk index rates the performance of the hard drive. The overall index factors in the microprocessor and disk performance, among other things.

—RICHARD C. LEINECKER



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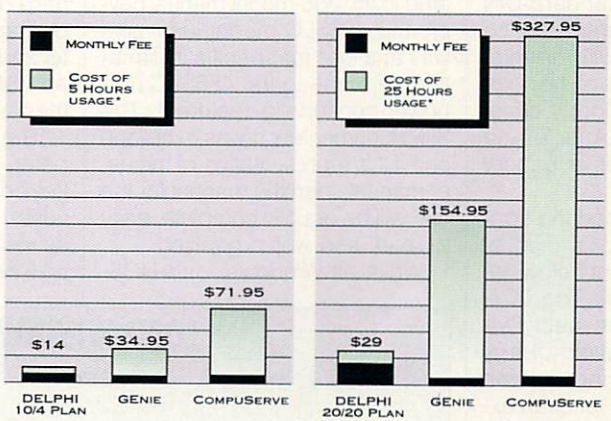

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PC BRAND 486SLC

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Weighing in at just a tad under seven pounds, the PC Brand 486SLC notebook computer packs the power and functionality of Cyrix's new microprocessor (486SLC) into the convenient and easy-to-carry notebook form factor.

An abundance of good features make this notebook an attractive choice for many users. For example, the 486SLC comes equipped with two serial ports rather than the single COM port usually found on notebooks. These dual ports, as well as a single parallel port, reside behind a drop-down panel door at the right rear of the notebook. An adjacent panel houses the PC Brand proprietary expansion connector used for attaching peripherals.

On the left side of the machine, you'll find a jack for an external keyboard; a mini-to-standard-DIN keyboard cable adapter is also thoughtfully provided with the notebook. On the right side of the notebook, you'll find the floppy drive, a 15-pin external VGA jack, and an AC power adapter or battery charger jack.

PC Brand has placed the controls for the notebook's display within easy reach, right below the display screen itself. The LCD screen is one of the best I've seen, completely devoid of any moirés and flickering, which makes it easy to view for even extended periods. I did notice some streaking and image persistence, although these weren't major concerns.

Compared to keyboards on other notebook PCs, this one is slightly stiff and doesn't produce an audible click, but the action is positive, and most fast typists will like the speed and feel this keyboard offers. I found the key arrangement and spacing quite satisfactory; the dedicated cursor keys and the embedded numeric keypad make it an almost perfect input device. To page up or page down, you must depress the Fn key and the up- or down-arrow key, but the absence of dedicated Page Up and Page Down keys was the only real feature I missed on this keyboard.

Unfortunately, the user's manual for the 486SLC wasn't ready in time for the review, but a manual for the PC Brand NB/386SX was supplied as a substitute. While most of the information covered in the 386-model manual covers the 486SLC model, as well, I was at a loss for specific information germane to the 486SLC (like power-conserving features). The 386 documentation was excellent, and if it is representative of the user manual, then the manual for the 486 will be equally complete, easy to read, and well organized.

While all Windows- and DOS-based applications ran without a hitch during the review, the performance of the 486SLC (using the Cyrix 486SLC microprocessor) wasn't as good as I expected it to be, based on my experience with i486-based notebooks. Even running it with all of the power-saving options turned off (CPU timeout disabled, display and hard drive timeouts disabled), its performance overall was lackluster and more in keeping with a faster 386-based machine rather than a 486 notebook.

The 486SLC comes with a zippered carrying case, the external-keyboard adapter cable mentioned earlier, and MS-DOS 5.0, as well as setup and utility disks.

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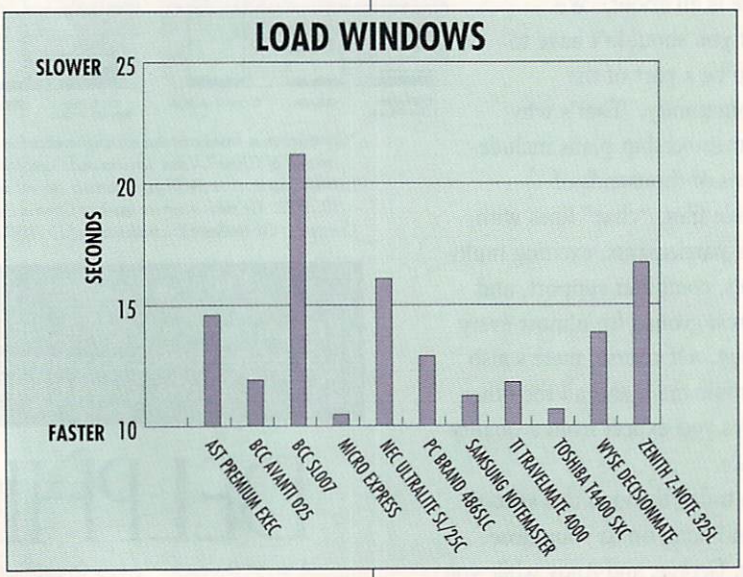

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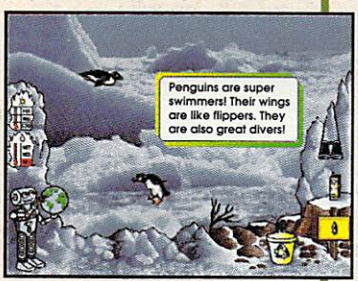

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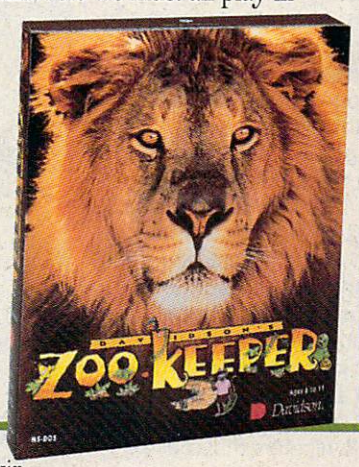

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SAMSUNG NOTEMASTER 386S/25

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List price: $2,199 with 2MB RAM and 60MB drive; $2,548 with 4MB RAM and 60MB drive
Warranty: one year, parts and labor

Samsung's 5.8-pound NoteMaster 386S/25 is one of the lightest and best-looking notebooks around, and its removable hard drive and battery features are sure to appeal to business travelers.

The attractiveness of the NoteMaster is immediately apparent in its molded case, which uses a nonglossy, semitextured, gunmetal gray plastic with a black inset panel on the lid for contrast. Opening the lid reveals that the clean, uncluttered lines are carried through here, too. The hinge that serves to keep the display screen joined to the main body of the notebook does double duty as an indicator panel.

Rather than the traditional rectangular LED indicators usually found, Samsung has shaped its indicators on the NoteMaster in the form of icons representative of their status. For example, the power indicator LED is an illuminated light bulb icon, the floppy drive indicator is a disk icon, and so forth. While not a major feature, it's one of the little niceties that make this such an attractive notebook.

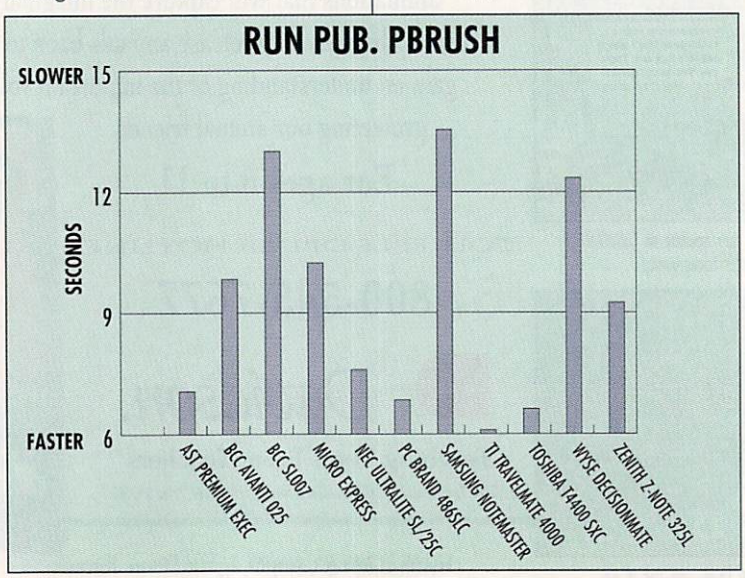
The NoteMaster uses the AMD 80386SXL as its central processing unit, and its clock ticks along at a pace of 25 MHz. Two megabytes of RAM come standard with the notebook, along with a 40MB hard drive. You can expand RAM up to 8MB using a memory card, and if you want a larger hard drive, you can order a 60MB or 80MB model. For extra number-crunching power, you can also order an 80387SX math coprocessor. Samsung has provided convenient access to the coprocessor socket via a door on the underside of the notebook; you don't have to disassemble the notebook to insert the chip.

A unique feature of the NoteMaster is its ability to use alkaline batteries instead of its own rechargeable ni-cads. This feature can really come in handy if you run low on power and you don't have access to an AC power source. Just pop in the optional ($69) alkaline pack, which uses standard AA alkaline batteries, and you're good for another hour of computing. Additionally, you can change batteries while the NoteMaster is in operation without losing power.

Without a doubt the most innovative feature of the NoteMaster 386S/25 is its removable hard drive. Yes, you read that correctly; the hard drive can be removed from the NoteMaster, since it's mounted in a convenient handheld caddy. Samsung decided on this unique removable hard drive approach as a feature that would appeal to business users who'd like to be able to transfer data conveniently from their NoteMasters to their office desktop PCs.

Samsung is also offering an internal hard drive receptacle as an accessory item ($249) that allows a desktop PC to accept the hard drive from the NoteMaster. The removable drive caddy also makes it easy to upgrade or switch hard drives in the NoteMaster. Now that's innovative!

As one would expect in such a well-appointed and innovative



machine, all of the basic requirements are covered, as well. The NoteMaster comes equipped with a serial port, a parallel port, and external keyboard and 15-pin VGA ports, as well as a proprietary expansion slot. The keyboard offers firm, positive action along with excellent spacing. Performance, I found, was pleasingly quick using applications under DOS and Windows 3.1, and battery charges regularly lasted over two hours, even when the notebook used the battery a great deal.

For styling and features, the NoteMaster is an excellent choice in a 386 notebook.

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TI TravelMate 4000 WINDX/25

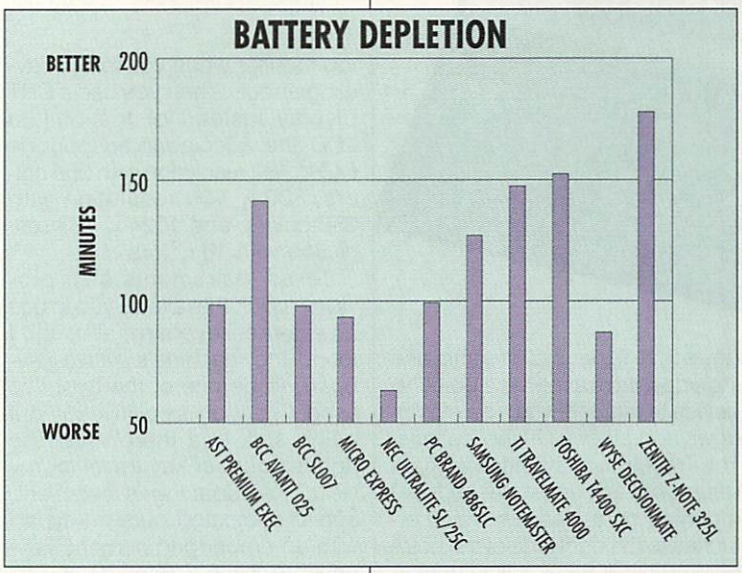
Texas Instruments describes its TravelMate 4000 WinDX/25 notebook as "486 desktop power to go." This is an accurate statement, since this machine is armed to the hilt with heavy computing artillery.

The core of the WinDX/25's power, its 486DX CPU, runs at 25 MHz. The 486DX CPU has a built-in math coprocessor and associative caching, so it's a veritable powerhouse to build upon. And that's exactly what Texas Instruments did. The machine comes with 4MB of RAM as its standard complement, and this can be expanded up to a 20MB maximum.

The WinDX/25's case is remarkably thin (under two inches), and the machine could rightly be described as compact. With a weight of just over 5½ pounds, it's certainly one of the lighter and easier-to-carry notebooks presently available. The case sports handsome two-tone brownish gray plastic with clean lines and flush-mounted controls.

The machine's high-density floppy drive is front mounted, and the jack for connecting an external keypad occupies the right side of the WinDX/25. You access all other ports—serial, parallel, external video, and PS/2-style mouse—behind a flip-down door on the left side. In the rear you'll find a proprietary expansion bus and the AC power adapter or battery charger jack. If you prefer an internal fax/modem, you can order one as an option for this notebook.

The WinDX/25 comes preconfigured to do useful work as soon as you turn it on; its 120MB internal hard drive comes already loaded with MS-DOS 5.0 and Win-



COMPUTE APPLICATION AND BATTERY TESTS

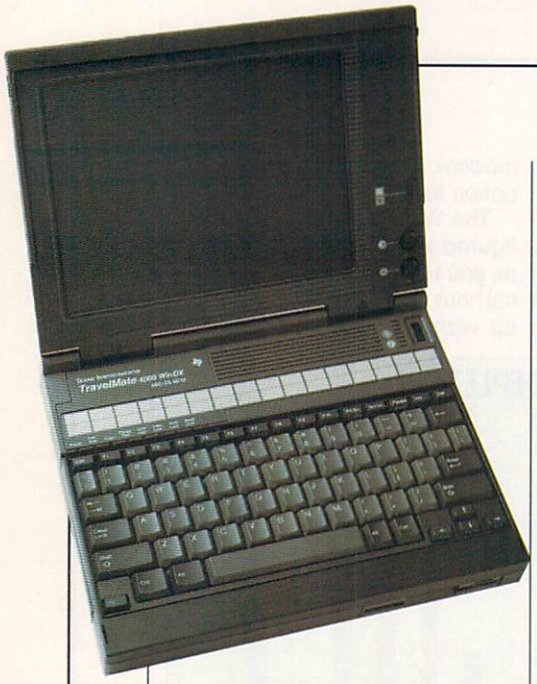
We put this month's notebooks to the test with a series of real-world applications: a word processor, a spreadsheet, a database, a CADD program, and so forth. These are the kinds of apps COMPUTE readers use on a regular basis, so the benchmarks offer a realistic and familiar way of evaluating the performance of our notebooks. The bar graphs indicate how long a particular notebook required to accomplish something, whether sorting a database or doing a search and replace in a word processor. As Microsoft's Windows environment continues to gain acceptance, even on notebooks, we decided to time how long it took each notebook to load Windows. The lower the bar, the better the performance.

The battery depletion test should prove particularly interesting if you'd like to compare the battery performance of a 386SX notebook (such as AST's) to the performance of notebooks sporting new microprocessors like Intel's 386SL, microprocessors that have special power management capabilities built in. For this test, the higher the bar, the better the notebook's performance.

To ensure fair comparisons and to make our data more meaningful, we asked each manufacturer to include 4MB of RAM, even if the base configuration included less RAM; and we asked that no coprocessors be included. The one obvious exception to the coprocessor prohibition is the Texas Instruments TravelMate notebook; its 486DX microprocessor has coprocessing capabilities built in.

These benchmark results should be particularly interesting if you've wondered about the relative performance of chips from Intel, Cyrix, and AMD (identified in the grid of notebook features). Even if you don't understand all of the specific differences among the microprocessors, you can appreciate the differences in performance.

—MIKE HUDNALL



dows 3.1. Texas Instruments also includes its TravelPoint pointing device to facilitate your use of Windows and other GUI applications. The TravelPoint is a little trackball (*thumbball* is a better description) mounted on a platform which attaches to the right side of the notebook. While it takes a little getting used to, I found it a worthwhile and functional device that gives the notebook additional productivity as part of the standard package.

The video capabilities of the WinDX/25 are well taken care of. The ten-inch (diagonally measured) liquid crystal display (LCD) features 640 × 480 resolution with 64 shades of gray. It has 1MB of video RAM and TI's Mouse Quick display technology, which provides instant screen updates of mouse movements without lag. While I found the LCD to be good, it did exhibit some tendency toward moirés, ghosting, and streaking. On the plus side, the machine features a video-reversal switch which instantly changes the screen from dark on light to light on dark. This compensated for less-than-optimal screen patterns and contrast levels with some applications, and it is an attractive feature.

The external VGA capabilities of the WinDX/25 make it a natural for using with a good color desk-

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top monitor when you're not traveling about. When you use a CRT display instead of the built-in LCD, the video adapter supports 640 × 480 resolution with 256 colors, 800 × 600 resolution with 256 colors, and 1024 × 768 resolution with 16 colors.

Texas Instruments also provides a jack that allows you to use an external keyboard, although I found the machine's native keyboard to be one of the best I've used. Its action is positive without being stiff, and there's just the right amount of key travel for my taste. Key spacing is excellent, and a dedicated cursor keypad with an embedded numeric keypad makes this keyboard very utilitarian. All function keys line the top row, and all eight of the machine's LED status indicators are flush mounted just above the function key row.

You'll find the screen controls for brightness and contrast flush mounted and the power switch recessed to prevent your accidentally pressing it.

If you're looking for the power of a 486DX in a well-designed notebook, you'll certainly want to consider the WinDX/25.

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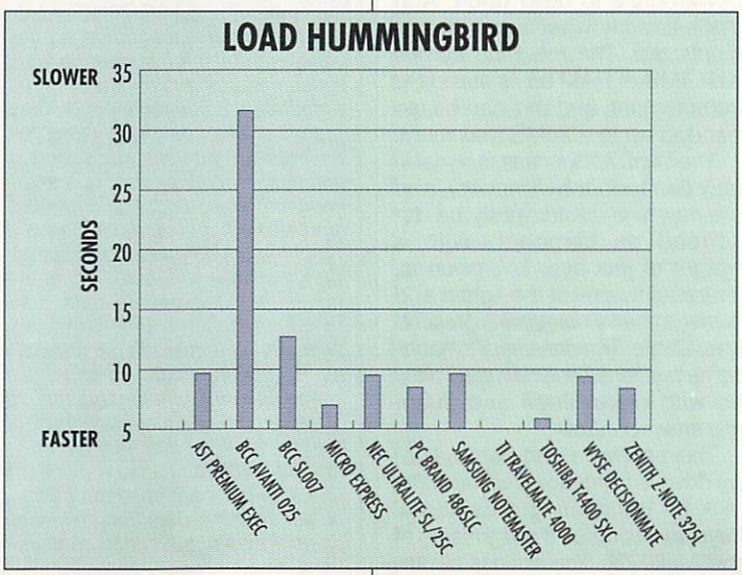
TOSHIBA T4400SXC

Striking, sleek, impressive, fast, expensive, and maybe even *sexy* are all valid descriptors for Toshiba's impressive T4400SXC color notebook computer. So if you're looking for a color notebook that's on the leading edge of technology and your pockets are deep enough, this machine may be just the ticket for you.

If good things come in small packages, then Toshiba has produced a good thing indeed by stuffing a 486-based computer with an active matrix color display, floppy and hard drives, multiple I/O ports, and a full-size keyboard into a demure package that fits easily into a briefcase and weighs only 7¾ pounds with its battery installed.

The heart of the T4400SXC is an Intel 80486SX CPU running at 25 MHz. The i486 chip has its own 8K internal cache, which,



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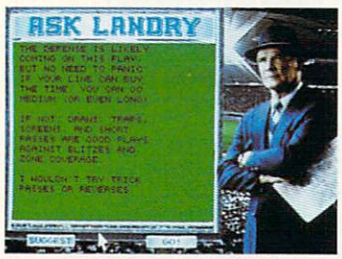

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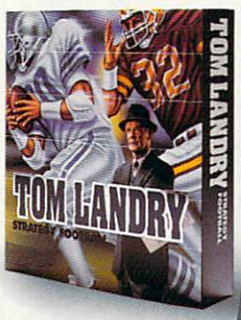

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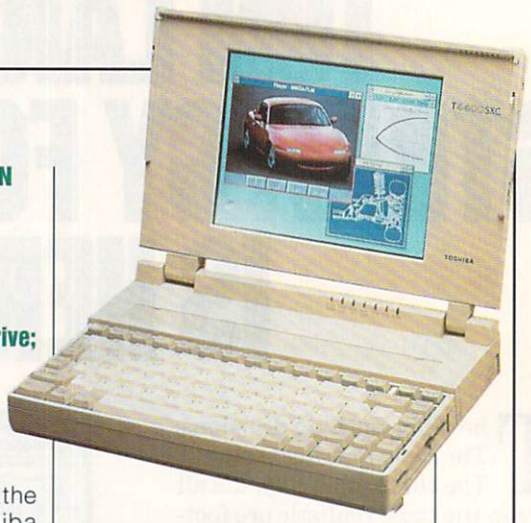

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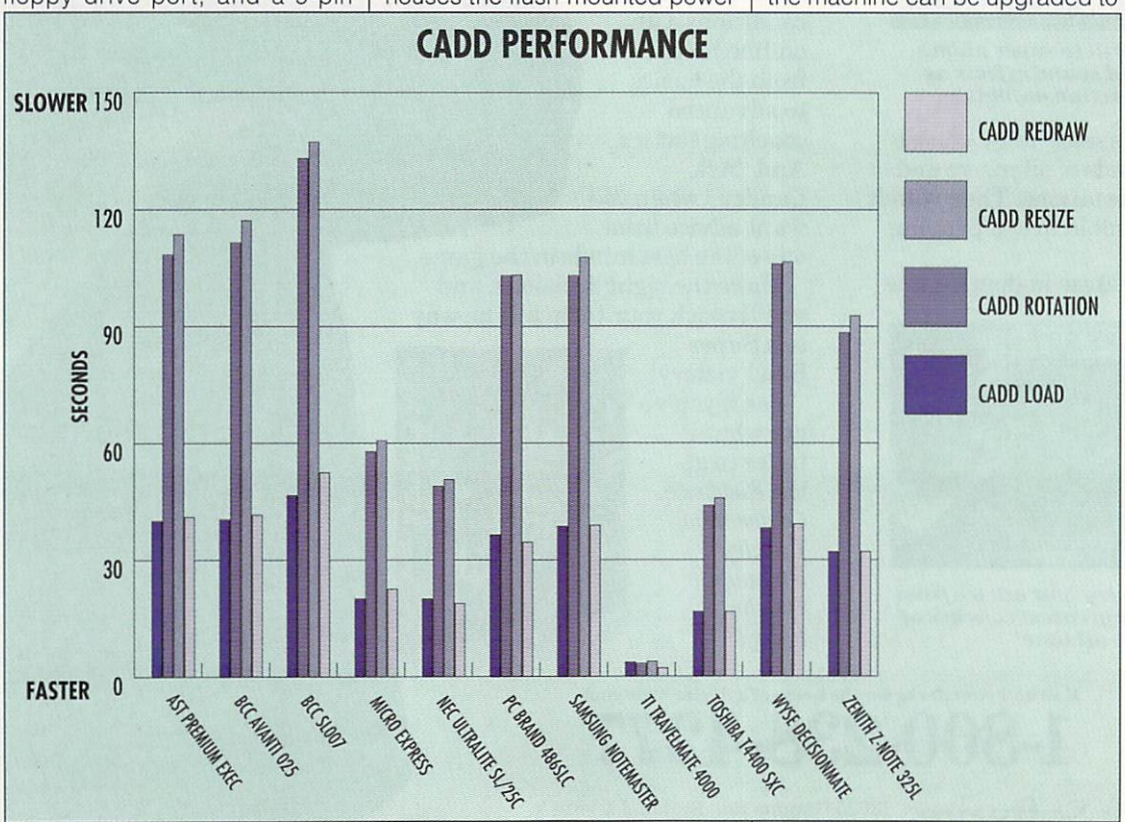
combined with the 25-MHz speed, makes even the most laborious computing task a remarkably speedy operation. Should you require even more computing speed and power than this mini-Titan delivers in its standard configuration, the CPU can be upgraded to a 25-MHz 486*DX* chip.

A high-density 3½-inch drive, located on the right side of the T4400SXC near the front, handles floppy media, while an internal 80MB IDE hard disk takes care of your mass storage. For even more storage, you can order a 120MB hard drive for about $500 more.

The I/O ports are located at the rear of the machine, hidden from view when they're not in use by a flip-down door. This panel also hides a dedicated PS/2-style mouse port, a 15-pin RGB video port, a parallel printer or external floppy drive port, and a 9-pin serial port. Also at the rear of the machine, you'll find a Toshiba proprietary expansion connector, protected by a removable snap-off panel cover. This connector lets you use the T4400SXC with its desktop docking bay, which offers two full-sized industry standard expansion slots, a parallel port, a serial port, a PS/2-style mouse port, a VGA monitor port, a keyboard port, a floppy drive port, and a 5½-inch bay.

The left side of the machine houses the flush-mounted power switch near the rear of the unit and an external keypad port (hidden by a snap-off cover) at the middle of the left side. Near the front, you'll find a modem line port under another snap-off cover. This gives you access to an optional, internally mounted, 9600-bps, cellular-ready fax/modem.

The review unit came outfitted with the standard 4MB of RAM, but the total memory capacity of the machine can be upgraded to



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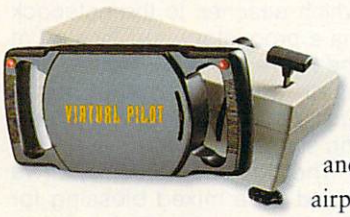

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NOTEBOOK FEATURES	AST Premium Exec 386sx/25c	BCC Avanti 025	BCC SL007	Micro Express NB2500	NEC UltraLite SL/25C	PC Brand 486SLC
Microprocessor	i386SX	AM386SXL	i386SL	AM386DXL	i386SL	Cx486SLC
CPU speed in MHz	25	25	20	25	25	25
Optional math coprocessor support	387SX	87SLC	387SX	387DX	387SX	Cyrix
BIOS	AST	Award	Award	AMI	Phoenix	PC Brand
Width (in inches)	11.4	11	11	11.6	11.5	11
Depth (in inches)	9	8.5	8.5	8.7	9	8.5
Height (in inches)	2.3	1.7	1.7	2.3	2.4	2.25
Weight (in pounds)	7.5	6.38	6.38	7	7.5	6.14
Shades of gray or color technology	passive color	32	32	64	active color	32
Standard/Max RAM in megabytes	4/8	4/8	4/8	4/8	2/10	4/16
Serial ports	1	1	1	1	1	2
Parallel ports	1	1	1	1	1	1
Mouse port	■	■	■	❐	■	❐

■=yes ❐=no

20MB. While the 4MB configuration proved more than adequate for all of the DOS- and Windows-based software I used on the T4400SXC, expanding the RAM and possibly upgrading to the DX CPU would increase the multitasking and overall throughput power you might need if your application demands are extraordinarily heavy.

You can power the Toshiba T4400SXC three ways: through its own internal rechargeable batteries, through its AC power adapter, or through the optional desktop docking bay. One of the big surprises of the T4400SXC was the longevity it enjoyed from a fully charged battery; a charge life of over 2½ hours was routine, with some computing sessions approaching a full 3 hours before the low-battery warnings started. Toshiba claims a 3-hour battery life with a 90-minute recharge, and my experience corroborates this claim.

The 83-key keyboard has a comfortable, positive action with good tactile feedback, although it lacks an audible click. I found key placement and spacing excellent, so if you're a fast touch-typist, you'll really fly when using it.

The active matrix liquid crystal display (LCD) is truly superb, capable of supporting all standard color and VGA modes as well as SVGA color (256 colors at 640 × 480 resolution from a palette of 185,193 colors). If you hook up an external monitor to the RGB port on the T4400SXC, you can see video on the LCD screen as well as on the external monitor, a handy feature for sales, training, or classroom presentations. The colors are absolutely brilliant with excellent hue and saturation; I found the screen easy to view from virtually any angle and under almost any lighting conditions. Since this computer uses an LCD panel rather than a cathode-ray tube, the images are rock steady with pristine definition. To say that viewing on the T4400SXC is a pleasure is an understatement.

There's lots to like with the T4400SXC, even though it will seriously deplete your piggy bank. As of the writing of this review, prices for this notebook are already dropping; competition from other manufacturers will doubtless make this and other leading-edge products more affordable for the masses in the not-too-distant future.

Circle Reader Service Number 312

WYSE DECISION-MATE 486SLC

Just when you think you've seen it all when it comes to making notebook PCs slimmer, Wyse introduces its DecisionMate 486SLC notebook computer, which pushes the thin profile envelope further still. This five-pound notebook measures less than 1½ inches thick.

The DecisionMate's finish, with a handsome wrinkle-texture bronze color, resists fingerprints and presents a most pleasing appearance. The machine is uncluttered without being boring.

Wyse managed to keep the weight and thickness down by opting for a detachable floppy drive, which attaches to the notebook via a proprietary port located at the left rear of the machine, beneath a snap-off panel cover. This same panel also conceals the single serial port.

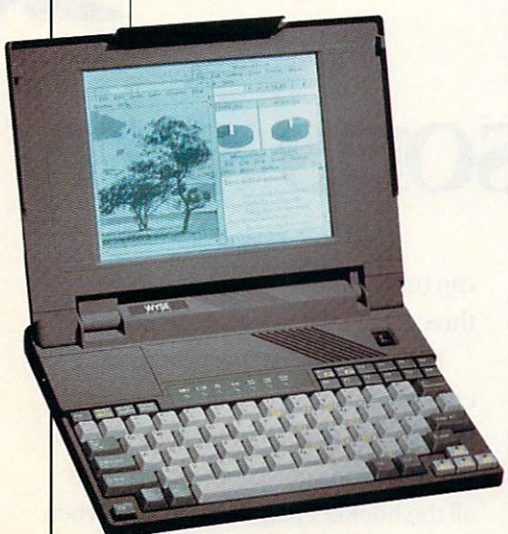
The detachable floppy drive could be a mixed blessing for some users who don't want to plug and unplug the device, although business travelers who ordinarily do their file exchanges via a modem or file transfer cable and rarely or never use floppies while

NOTEBOOK FEATURES	Samsung NoteMaster 386S/25	TI TravelMate 4000 WinDX/25	Toshiba T4400SXC	Wyse DecisionMate 486SLC	Zenith Z-Note 325L
Microprocessor	AM386SXL	i486DX	i486SX	Cx486SLC	i386SL
CPU speed in MHz	25	25	25	25	25
Optional math coprocessor support	387SX	(built in)	(no, but CPU upgradable)	na	387SL
BIOS	Phoenix	Phoenix	Toshiba	Modular	Zenith
Width (in inches)	11	11	11.7	11	11.63
Depth (in inches)	8.5	8.5	8.3	8.6	8.54
Height (in inches)	1.8	1.8	2.3	1.45	1.87
Weight (in pounds)	5.8	5.6	7.75	5	5.92
Shades of gray or color technology	64	64	active color	32	64
Standard/Max RAM in megabytes	2/8	4/20	4/20	4/8	4/12
Serial ports	1	1	1	1	1
Parallel ports	1	1	1	1	1
Mouse port	■	■	■	■	■

■=yes ❐=no na=information not available

on the road will love it (a LapLink cable and file transfer software are provided with the DecisionMate). Of course, you can always pack the floppy drive along in the supplied carrying case, since it weighs only about a pound.

The 486SLC CPU provides performance comparable to that of a 486SX running at the same clock speed of 25 MHz but provides additional power conservation features to extend battery life. During the review I averaged 1½ hours of constant use with all of the power-saving features disabled and 2½- to 3-hour averages with the power management turned on.



The base configuration comes standard with 4MB of RAM, and you can expand this to 8MB. Wyse offers two models of the DecisionMate; the only difference between them is internal hard drive capacity. The Model 80/4 comes with an 80MB drive, while the Model 120/4 comes with a 120MB drive; the latter unit was supplied for the review.

Security is something the folks at Wyse have taken seriously. The computer features password protection that prevents unauthorized eyes from seeing your data or entering the system configuration menus. In addition to the password protection, the DecisionMate also comes with a hardware security kit, which consists of a restraining bracket, cable, and combination lock. This kit tethers the notebook to a desk to make sure it will still be there when you get back from a trip to the water cooler.

I found the VGA liquid crystal display screen bright and easy to read, especially with the special character set Wyse uses. A 15-pin port on the left side of the machine lets you attach an external VGA or SVGA monitor (up to 800 × 600 resolution is supported), and a mini-DIN connector lets you attach a PS/2-style mouse or keyboard. The parallel port and the dial controls for video brightness and contrast are located at the right side; the power connector is located at the rear.

Wyse preinstalls MS-DOS 5.0 on the hard drive, as well as software for menuing, disk caching, expanded memory management, setup, and testing.

The keyboard is excellent, with an inverted-T dedicated cursor pad and an embedded numeric pad. Wyse groups the function keys together in two rows at the upper right corner of the keyboard, and all LED status indica-

WYSE TECHNOLOGY
3471 N. First St.
San Jose, CA 95134-1803
(800) GET-WYSE
(408) 473-1200
List price: $2,299 with 80MB drive; $2,699 with 120MB drive; $2,899 with 200MB drive
Warranty: one year, parts and labor

1. "I just turned it on and started using it. Dynamite!"
Madeline S. Fitzgerald
Woodcraft Supplies

2. "Almost no need for the manual. QuickBooks makes it easy."
Julia Perkins
Photography

3. "A breeze! Does everything I need, quick and easy."
Kenneth P. King
Finance Consultant

4. "Does two employees' work. Simple, quick and efficient."
David L. Wies
Chiropractor

5. "It's so easy, I haven't used the manual since I installed it."
Timothy J. McManus
Campground Operator

6. "Hallelujah! QuickBooks is simple to understand and use."
Cynthia Krol, Accounting

7. "Love it! Reports can be laid out in any conceivable way."
Susan Yeagley Sullivan
Psychiatric Mgmt.

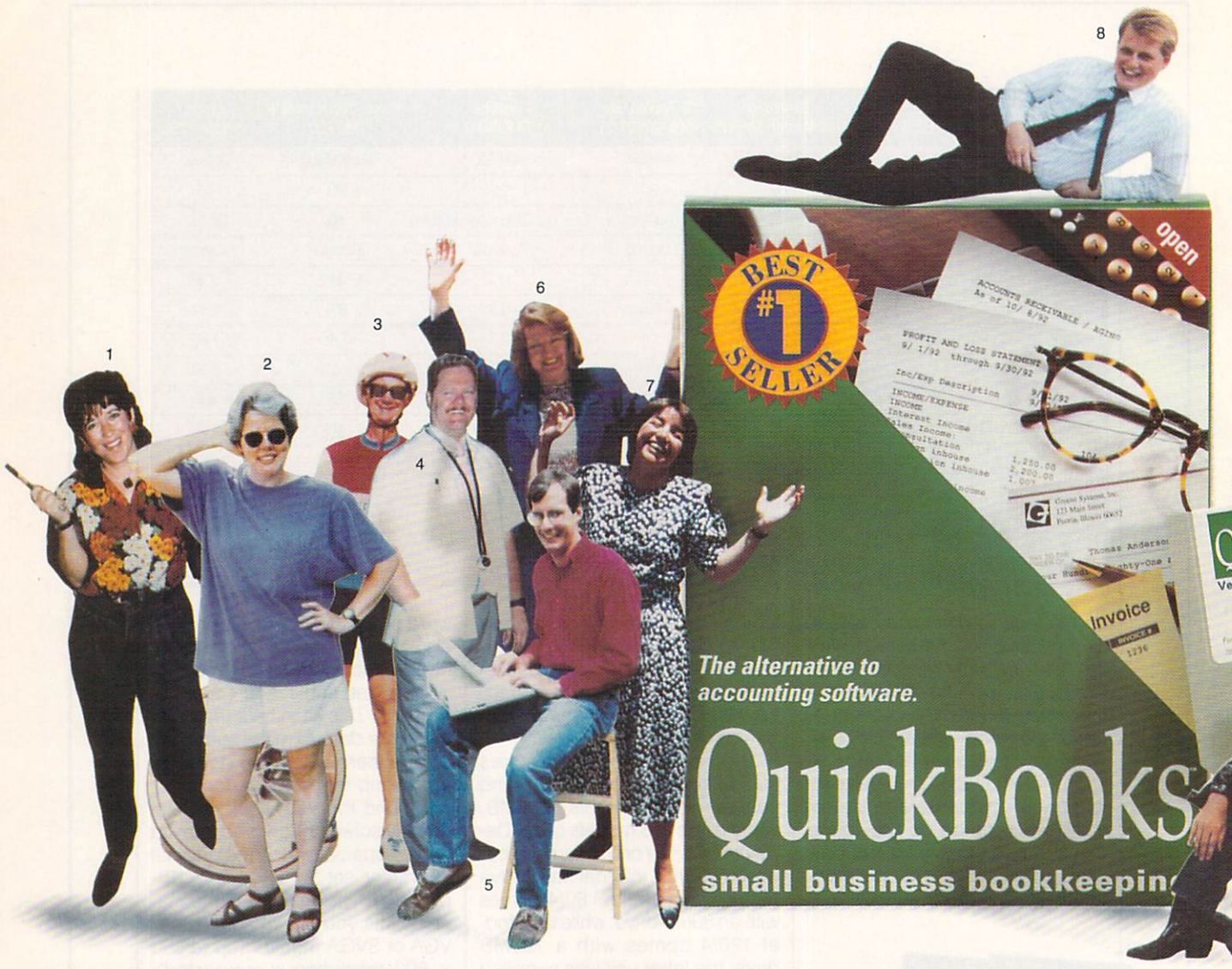
8. "Our clients will never use manual ledgers again."
James Matthews, CPA

9. "You don't have to be a rocket scientist, or even a CPA."
Stephen P. Blanding
Distributor

10. "So thorough and accurate — for such a reasonable price."
Tomm Furch
Photographer

11. "Super! For the first time, I look forward to my accounting."
Jan Cole
Appraiser

12. "The best! (I tried Pacioli, Peachtree,® DacEasy,® etc., etc.)"
Dan Ridgely
General Contractor



A few of the reasons why

"Extraordinarily easy to use, yet provides plenty of accounting power."
PC Magazine

"QuickBooks is the easiest."
New York Times

"A great program if you're more interested in running your small business than becoming an accountant."
PC World

People are so enthusiastic about QuickBooks™ that after just three months on the market it was already outselling all the traditional accounting software. And it's still #1.

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13. "Finally! The first program I feel like I have control of."
Valerie Lindow
Accounting

14. "Saves so much time! Unbelievably easy to use. Thanks."
Gerald Frazier
Real Estate

15. "Un-mindboggling! It's easy. Install and you're on your way."
Kathryn Mary Olsen
Professional Trainer

16. "I've tried 'em all. Nothing else compares. It's awesome."
Scott Roberts
Consultant

17. "Totally logical, human, instinctive, understandable."
Katherine J. Bartz
Consultant

18. "The only remotely comparable programs cost thousands."
Scott McGuirk
Business Consultant

19. "User-obvious, painless invoicing and accounts receivable."
Valon Cross
Programmer

20. "Peace of mind when used by employer or employee."
Donald K. Burden
Dentist

21. "I tested many accounting packages, and none came close."
Samuel Moeller
PC Consultant

22. "Super-quick, butt-kicking program! About time! Amen!"
Robert D. Pinson
TV Production

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Ad Code: CMBRT

tors are flush mounted above the keyboard.

High marks go to the design team at Wyse for producing a functional notebook that's a delight to use and look at.

Circle Reader Service Number 313

ZENITH Z-NOTE 325L

ZENITH DATA SYSTEMS
2150 E. Lake Cook Rd.
Buffalo Grove, IL 60089
(800) 553-0331
List price: $2,949 with 85MB drive; $3,249 with 120MB drive
Warranty: one year, limited; extended-warranty, on-site, and loaner options available

Zenith has taken a different approach in designing its Z-Note 325L notebook. From its striking exterior design to its innovative expansion and power conservation features, Zenith has clearly eschewed the commonplace to claim a place above ordinary notebooks.

This is apparent starting with the almost paper white color of the notebook's plastic case. Clean, squared lines accented by a square-embossed trim give the Z-Note a businesslike appearance.

One of the unique features of the Z-Note is its liquid crystal display (LCD) system status panel. Rather than the usual bank of LED indicators to signify power, drive activity, and lock-key status, Zenith has built in a four-pane LCD window that keeps tabs on these functions by providing status icons in the window panes.

Individual icons show the status of AC power operation, standby mode, battery power operation, hard drive activity, floppy drive activity, port replicator, external CRT, modem, LAN controller, speaker, Num Lock, Caps Lock, Pad Lock, and Scroll Lock. With all these areas to provide user feedback for, Zenith's system status panel makes a great deal of sense.

In fact, the only LED indicator on the machine is a small power LED located in the center of the machine just below the display screen, which changes color according to the current power or battery conditions. This LED is visible with the lid in either the open or closed position, so you'll always know at a glance if the Z-Note is turned on.

The review unit came equipped with an 85MB hard drive and 4MB of RAM, a popular configuration for today's high-demand applications. If that isn't enough, the RAM can be expanded to 12MB using 2MB and 8MB memory expansion modules. The CPU of the Z-Note, an Intel 80386SL microprocessor, runs at 25 MHz, which gives the Z-Note a good balance of performance and power-conserving features. You can install an 80387SL math coprocessor in the available socket if you need the extra processing power.

Most of the ports (15-pin external video, parallel, mouse/keyboard, serial, and proprietary port replicator) reside behind a panel door at the rear of the machine, along with the AC power adapter jack. The high-density floppy drive is mounted on the right side along with the modem port access panel and the LAN port access panel. This notebook complies with IEEE 802.3 and Ethernet specifications—a connector for interfacing with a LAN adapter card is provided under this panel. The left side houses the battery and the security bracket, a hardened steel loop that provides a means of securing the notebook to a desktop or other stationary object with a cable and lock.

Zenith has taken a modular approach in its expandability for the Z-Note. For example, you can replace the ten-inch VGA LCD screen with an active matrix color VGA display screen, upgrade the hard disk to a 120MB unit, and replace the standard 1.44MB floppy drive with an ultra-high-density 2.88MB floppy drive. This approach makes sense for users who anticipate needing more features in the future; they can be added or upgraded when the need arises.

The Zenith Z-Note is easily the battery-life champion. This machine regularly delivered charge life times approaching 3 hours under continuous heavy-duty use and 4½–5 hours of usable life under average use with all of the power-saving features activated. The secret of this charge longevity lies in the Z-Note's NiMH (Nickel-Metal Hydride) battery pack that provides approximately 40 percent more operational time than a standard ni-cad battery pack.

Couple this battery life with the APM (Intel's Advanced Power Management) features of the SL chip and complementing support circuitry, and you have a notebook that can keep you computing all the way on a cross-country flight and still have some power left.

If you need a high-performance notebook for today that gives you plenty of expandability for tomorrow, the Z-Note 325L may be the ticket for you. ❐

Circle Reader Service Number 314

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

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NEWS & NOTES

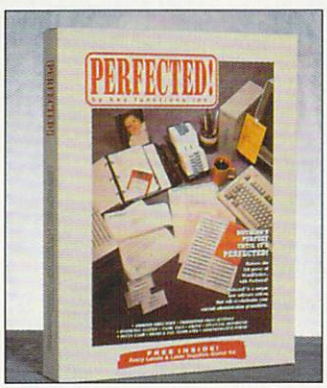
Edited by Jill Champion

Golf Comes to Windows

Work-weary Windows users needing an afternoon break can relax by enjoying a few holes of golf without ever leaving the office—or Windows. Microsoft teamed up with Access, makers of the classy Links series of golf simulators, to bring you Microsoft Golf, a Links-type golf game that features photo-realistic and topographically accurate simulations of the Torrey Pines golf course in San Diego.

Suggested retail price for Microsoft Golf is $64.95. For more information, contact Microsoft, One Microsoft Way, Redmond, Washington 98052-6399; (206) 882-8080.

Perfected! takes most of the work out of data management with WordPerfect.



To get the most out of the new Microsoft Golf, look for COMPUTE's *Links Pro: The Official Guide to Links and Microsoft Golf* by former COMPUTE magazine editor Peter Scisco. The 320-page book covers all versions of Links as well as Microsoft Golf and includes in-depth strategies and professional advice for cutting strokes from your scores. The book also includes hole-by-hole, stroke-by-stroke strategies for all eight Links courses. Suggested retail price for *Links Pro* is $16.95. For more information, contact COMPUTE Books, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408; (919) 275-9809. Or if you wish to order, call (800) 872-5627.

—Danielle Best

Perfected! Print Jobs

A program that saves hours on office procedures can also save manpower costs. That's the concept behind Perfected!, version 1.1, from Key Functions. Perfected! streamlines what would be time-consuming printer jobs and gives you professional-looking laser-printed results. All you need (besides Perfected!) is a computer, a laser printer, and WordPerfect 5.1.

Perfected! automates the merge process and maintains an address database in WordPerfect format. After entering names and addresses into the WordPerfect database, you can select data to create Rolodex address cards, address-book pages, business cards, nametags, telephone directories, office forms, lists, labels, and much more—without worrying about fonts and kerning, because everything is preformatted. The program also has procedures for invoicing, filing, writing financial reports, managing petty cash, and tracking calendars.

Suggested retail price for Perfected! is $149.95. To find out more, contact Key Functions, 60 Pleasant Boulevard, Suite J, Toronto, Ontario, Canada M4T 1K1; (416) 928-1943.

—Tracy Mygrant

Checkmate!

Can chess make a difference in learning? According to Fidelity Electronics, the world's largest manufacturer of electronic chess games, recent research suggests just that. American students introduced to chess in the classroom and in after-school programs are better able to master basic thinking skills, including reasoning, comprehension, and concentration. The game also increases communication and pattern-recognition skills and helps bolster self-confidence.

—Danielle Best

The Sound of Windows

Easy-to-use sound effects without expensive hardware—that's what Aristosoft is providing Microsoft Windows 3.1 users in Windows Sound Effects, Volume 1. You can add comments when editing reports and proposals or liven up normally dull presentations with 50 sound effects, including animals, music, and voices. Attach any of the sound effects to seven events defined by the Windows Sound Control Panel. For PC users with sound cards, off-the-shelf digitized sound effects are available for the first time.

The package retails for $29. Aristosoft plans to ship five new volumes by the end of the year, with 50 new sounds in each volume. For more information, contact Aristosoft, 6920 Koll Center Parkway, Suite 209, Pleasanton, California 94566; (800) 338-2629 or (800) 426-8288.

—Tracy Mygrant

Color Your Printouts

Want to spruce up your printouts? Add some color. New Canon bubble-jet print cartridges have been modified to print in red, blue, green, brown, and purple. Each cartridge is packaged with a bonus refill of ink, doubling the print yield.

The cartridge can be refilled numerous times. Refills are available in twin packs in all five colors as well as black. It takes only about 30 seconds to refill the cartridge, thanks to an accordion bottle and filler tube. The water-resistant refill ink is also formulated to prevent clogging.

The color cartridge with bo-

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nus refill sells for a suggested price of $54.95, while refill twin packs sell for $34.95. The cartridge can be used in any printer that uses BC-01 cartridges. To find out more, contact Repeat-O-Type, 665 State Highway 23, Wayne, New Jersey 07470; (800) 288-3330.

—Tracy Mygrant

A Stitch in Time

Dress Shop from LivingSoft prints custom-fitted clothing patterns for designing women who don't conform to an exact size. Once you've entered the 13 measurements required, you can select from 29 different patterns in a variety of cuts and styles tailored to your exact measurements.

Let your computer be your tailor and wear perfectly sized clothing, thanks to LivingSoft's Dress Shop.

Store and retrieve data from touch buttons—more versatile than bar codes for identification.

The program also eliminates the guesswork involved in trying to conform commercial patterns to your figure, because you can use the Dress Shop patterns as overlays for sizing patterns that you buy.

The patterns print out full-size on a dot-matrix printer with continuous-feed paper. If the printer isn't wide enough for a particular pattern piece, the pattern prints in sections, which you tape together.

Suggested retail price for Dress Shop is $99.95. For more information, sewing enthusiasts should contact LivingSoft, 1515 North Norma Street, Ridgecrest, California 93555; (800) 626-1262.

—Danielle Best

Fight Illiteracy

If your word processor's spelling checker and thesaurus leave you wishing for more, add Instant Definitions 3.0 from WordScience to your program. This pop-up dictionary, an update to Definitions Plus!, speedily accesses the 795-page *American Heritage Dictionary, Office Edition* and has some very desirable features not found in other spelling programs.

For instance, the DictionaryScan feature allows you to find words according to definition. Type in two words—*horse* and *mythology,* for example—and DictionaryScan will find a word based on your two entries—in this case, *centaur.* Ask about *money,* and DictionaryScan will generate a list of 194 related words. Currently, WordScience is offering a special double package as part of a special donation program designed to help combat illiteracy. The double package includes two complete sets of the software for the price of one. The company hopes buyers will donate their second set to Gifts in Kind America, a nonprofit organization working with WordScience, which will distribute the software to schools and literacy centers around the nation. In return for your donation, you receive a 50-percent tax deduction and the knowledge that you helped promote literacy in America.

Suggested retail price for Instant Definitions is $99.95. Definitions Plus! users can upgrade for $19.95. To find out more, contact WordScience, 1415 Oakland Boulevard, Suite 220, Walnut Creek, California 94596; (800) 869-9673.

—Danielle Best

Data-storing Buttons

Portable data collection just got more versatile than the standard bar-code method of reading and storing data. TouchProbe, a lightweight data reader about the size of a small pocket flashlight, transfers information to and from "touch buttons"—memory chips encased in small, water-resistant, stainless steel cases. Touch buttons, which can be attached to practically anything, work like electronic labels that the TouchProbe can access for reading information or storing data.

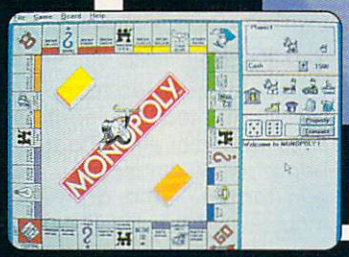
Suggested retail prices are $395.00 for the TouchProbe, $3.15 for individual buttons, and $277.00 for packs of 100 buttons. For more information, contact Videx, 1105 Northeast Circle Boulevard, Corvallis, Oregon 97330; (503) 758-0521.

—Tracy Mygrant

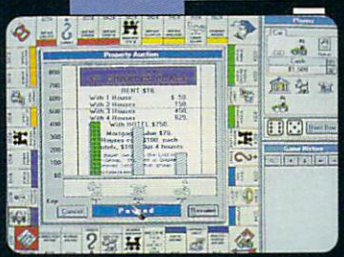
Companies with items of interest suitable for "News & Notes" should send information along with a color slide or color transparency to News & Notes, Attn: Jill Champion, COMPUTE, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. Although space is limited, all items will be considered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

Trade Up!

The Game You Grew Up With Has Grown Up Too!

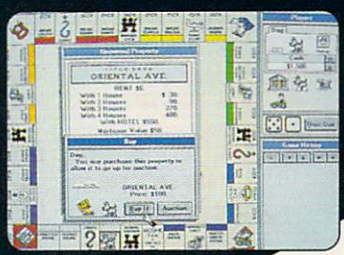


WINDOWS ™ version

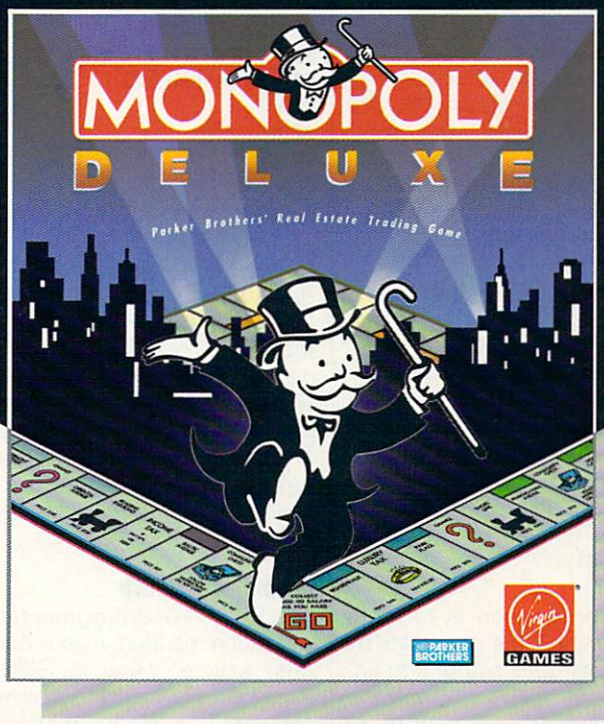


IBM PC version

WINDOWS ™ version



IBM PC version



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FEEDBACK

Learning to append, making 3-D images real, encrypting secret messages, and BBSing with Robotics

Merging BASIC

I'm looking for a way to make a text file using QBASIC's INPUT statement. It would ask for a name and insert it into a text file on a certain line of the file. How would I do that?

WYATT EHRMAN
MEMPHIS, TN

No matter what the language, it's easy to create a text file or to append to (add to the end of) it. Inserting text into the beginning or middle of a file simply can't be done in any language, and that's what you're asking. DOS won't allow it. You'll have to create the whole file yourself, like this.

```
OPEN "letter.txt" FOR OUTPUT
 AS #1
PRINT #1, "COMPUTE's
 Feedback"
PRINT #1, "324 West Wendover
 Ave."
PRINT #1, "Ste. 200"
PRINT #1, "Greensboro, NC
 27408"
PRINT #1, ""
INPUT "Name to write into file?",
 EdName$
PRINT #1, "Dear "; EdName$; ":"
. . .
CLOSE #1
```

Another solution is to input your original file character by character and output it to another file until you reach the place where you want to insert the new text, output the new text to the new file, and then finish copying the original file to the new file. You might even take a cue from word processors and insert some specific text into the original file where the BASIC file should insert the text. Begin by creating the following file with a word processor. Name it mergfil.txt.

```
This is a letter for ??1 from ??2.
```

Then use the following program to enter the text that should appear in place of ??1 and ??2.

```
INPUT "Enter name 1: ",
 name$(1)
INPUT "Enter name 2: ",
 name$(2)
OPEN "c:\mergfil.txt" FOR INPUT
 AS #1
OPEN "c:\newfil.txt" FOR OUTPUT
 AS #2
WHILE NOT EOF(1)
C$ = INPUT$(1, #1)
IF C$ = "?" THEN c1$ =
 INPUT$(1, #1)
IF c1$ = "?" THEN
c2$ = INPUT$(1, #1): c1$ = ""
C$ = name$(VAL(c2$))
END IF
PRINT #2, C$;
WEND
CLOSE 1
CLOSE 2
```

In fact, anywhere the program finds ??1 in the letter, this string will be replaced by the name you entered as name 1, and name 2 will be inserted anywhere ??2 appears. To be sure it works, enter type newfil.txt *after you've run the BASIC program to see how the names were inserted.*

Premature Death

FastTrax, the defragmenter you recommended in your August article "How to Fine-Tune Your Hard Disk," is alive and well. FastTrax International is now managed by the author of the program, Mark Elfield. Our new address and phone are 880 Ensenada Avenue, Berkeley, California 94707; (510) 525-3510. We emphasize service and provide 24-hour recorded answers to frequently asked questions.

FastTrax allows you to specify the placement of each file and directory for optimum performance. FastTrax can optimize any DOS disk, including hard disks larger than 1GB, and can handle any combination of files, directories, directory levels, clusters, and file sizes.

CAROLINE DAY
OPERATIONS MANAGER
FASTTRAX INTERNATIONAL

3-D Printing

Computer-assisted mapping (CAM), based on contour lines and elevation figures, brings rolling landscapes, exotic terrains, and dramatic mountains to 3-D life. Is it possible, though, to directly transform these fleeting monitor images into physical, hands-on, three-dimensional models?

K. G. WELLS
CRESCENT CITY, CA

It's being done now, but the machines are somewhat expensive for home use. They range in price from about $25,000 to $250,000. Variously called prototyping machines or stereoscopic modelers, they use the computer data to control a dye laser that literally carves the shape out of a soft polymer. The process takes hours and is most often used by big corporations to make prototypes of such intricate shapes as turbines or high-precision parts. Those busts you saw of the Star Trek crew members in the time-travel sequences of Star Trek IV *were created using such a machine.*

Missing Information

I have a Tandy 1000 SX and an Okidata 2182A Microline printer. I bought a cable from Radio Shack, but it doesn't work with the Okidata. No matter what I do, I can't get the printer to work with the computer. Please help. I don't want to buy a new printer.

JON SAUER
ZION, IL

Your letter omits some important information. Do you know if the printer has worked at all with any other computers?

ADVERTISEMENT

JOIN THE COMPUTE SEARCHSTAKES

WIN AIRFARE TO LONDON FROM VIRGIN GAMES! DIAL 1-900-454-8681!

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Virgin Games, Inc., the people who bring you DUNE, MONOPOLY DELUXE, and THE LEGEND OF KYRANDIA are sending this month's winner to London. The makers of the critically acclaimed THE 7TH GUEST and only the most cutting-edge, award-winning and fun-filled games available for your PC want to fly the winner to our company's birthplace across the pond. Enter the November Compute SearchStakes and you may find yourself staring Big Ben in the face or exploring dungeons in the Tower of London. To us, it's all Virgin territory. At Virgin Games, the only thing we're serious about is good, clean fun.

IT'S GRAND TO WIN

For six months now, you've had the chance to win fabulous prizes by entering the monthly Compute SearchStakes. And next month you'll have the chance to win the SearchStakes Grand Prize by submitting the solution to any two monthly SearchStakes, plus the solution to the Grand Prize SearchStakes, to be featured in our upcoming December issue.

IT'S FUN TO PLAY

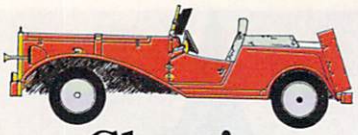
Each of the six picture disks displayed below is a portion of a photo or illustration taken from an ad in this issue. To solve the November SearchStakes, locate the ads from which these disks were taken and note the page number for each. If the ad has no page number, simply count that page or cover as zero. Then add up all six page numbers. That is the solution to this month's SearchStakes.

IT'S EASY TO ENTER

Once you find the solution, you may enter the November SearchStakes automatically on a touch-tone phone by calling 1-900-454-8681 by 12/31/92. The cost for the call is $1.50 for the first minute, $1.00 for each additional minute. Average call is estimated to be 2–3 minutes. Callers must be 18 or older. You may also enter by mailing your answer on a 3" x 5" piece of paper, along with your name, address, and phone number, to: "November Compute SearchStakes," 324 West Wendover Avenue, Suite 200, Greensboro, N.C. 27408 by 12/31/92. No purchase necessary. For more information on how you may win this month's prize, valued at $1,500, please turn to page 51!

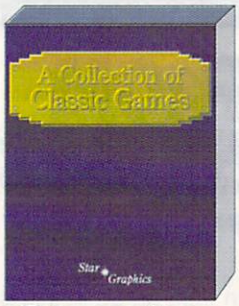
Virgin Games and *Compute* magazine. Enter early...and enter often!

Sponsored by Compute Int'l. Ltd., N.Y., N.Y.



Classic

Classic



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FEEDBACK

Does the cable work when installed on other systems? (It might just be a bad cable.) Does the printer work at all, perhaps printing garbage, or is there no output whatsoever? You may simply need to install a new printer driver for the software you're using. If your computer has more than one printer port, have you tried different ports?

Although COMPUTE doesn't respond to specific technical questions, we need to know all about your equipment in order to provide helpful information in "Feedback." If you're writing to us about a problem, we need to know all of the details. What software are you running? Have you tried different combinations of equipment? Are there any error messages? Not only will providing this kind of information make it easier to answer your question, but it will also make the response more useful to other readers.

Code Breaker

I want to encrypt a message with a password and then decrypt it again. I tried just raising the ASCII value of the letters in the message, but that was too easy to decipher.

AUBREY KILIAN
ALBERTON, TRANSVAAL, SOUTH AFRICA

A couple of times a year, we get a letter about encrypting files. There are many programs that will encrypt files for you. If you're writing your own, the secret is to use the password itself in the encryption process, as shown here. Begin by creating a text file to encrypt with a word processor, Edit, or Edlin. Save it with the name crypt.fil.

This file will be encrypted and decrypted.

Then run this BASIC program, which asks you for a password. It's a two-way encryptor. Running the very same program a second time with the same key decrypts the file.

```
INPUT "Enter name of file to en-
  crypt/decrypt: ", filename$
INPUT "Enter password: ",
  password$
OPEN filename$ FOR INPUT
  AS #1
OPEN "temp" FOR OUTPUT
  AS #2
passlen = LEN(password$)
WHILE NOT EOF(1)
c$ = INPUT$(1, #1)
FOR i = 1 TO passlen
c$ = CHR$(ASC(c$) XOR
  ASC(MID$(password$, 1, i)))
NEXT
```


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No purchase or phone call required. For automatic entry, call 1-900-454-8681 on a touch-tone phone. The cost for the call is $1.50 for the first minute and $1.00 per minute thereafter; average call is estimated to be 2-3 minutes. *Charges for calls to the above number will appear on your phone bill. Callers must be 18 or older.* To enter June SearchStakes drawing call from 9 A.M. EDT on 4/26/92 through midnight EDT 7/31/92, to enter July SearchStakes drawing call from 9 A.M. EDT on 5/26/92 through midnight EDT 8/31/92, to enter August SearchStakes drawing call from 9 A.M. EDT on 6/26/92 through midnight EDT 9/30/92, to enter September SearchStakes drawing call from 9 A.M. EDT on 7/26/92 through midnight EST 10/30/92, to enter October SearchStakes drawing call from 9 A.M. EDT on 8/26/92 through midnight EST 11/30/92,to enter November SearchStakes drawing call from 9 A.M. EDT on 9/26/92 through midnight EST 12/31/92, to give your name, address, telephone number, the *Compute* issue date (month), and the solution for the month you select. To enter the Grand Prize drawing, call from 9:00 A.M. EST 12/1/92 through midnight EST 1/29/93 to give your name, address, telephone number, the solution to the Grand Prize SearchStakes plus the solution to any two of the previous monthly SearchStakes. All call-in entrants will receive a $5.00 savings coupon toward caller's choice of: (1) Kathy Keeton's newest book, *Longevity*, or (2) a two-year subscription to *Compute*. Multiple coupons may not be combined on a single book or subscription purchase. Coupon expires 2/15/93.Call as often as you wish; each call is a separate entry. Call-in entry option is void in GA, LA, MN, OR, NJ and where prohibited.

Alternate Entry Method: Print your name, address, and phone number on a 3" x 5" piece of paper. (1) To enter the monthly drawings, print the *Compute* issue date (month) and solution for that month on your entry and address your envelope to include the issue date (month), for example: "June Compute Searchstakes." (2) To enter the Grand Prize drawing, print the words "Grand Prize," the Grand Prize solution, plus the solution to any two previous monthly SearchStakes on your entry. Address your envelope: "Compute SearchStakes Grand Prize." Mail all entries, addressed as directed above, to: 324 West Wendover Avenue, Suite 200, Greensboro, N.C. 27408. Enter as often as you wish; each entry must be mailed separately. All write-in entries must be postmarked by 1/31/93 and received by 2/15/93.

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

Odds determined by number of entries received, for example, 10,000 entries make odds 10,000 to 1. Prizes/Values: Grand Prize (1), minimum value $15,000-maximum value $40,000. Monthly prizes (6), one for each of the following *Compute* 1992 issue dates: June, July, August, September, October, and November, minimum value $1,500-maximum value $7,500. Maximum total prize value: $85,000. A description of each prize, including its approximate value, will appear in *Compute* prior to the first entry date for that prize. Prizes are not transferable or redeemable for cash. No substitution of prizes except as necessary, due to availability. Licensing, transportation, registration, and dealer charges, if applicable, are winner's responsibility. Winners may be required to pick up some prizes from the nearest dealership. Travel prizes must be from a major airport nearest winner's home and must be used within 12 months of award date. Additional restrictions may apply, i.e., local ordinances. Taxes are the winner's responsibility.

Open only to U.S. residents 18 and older, except employees and their families of Compute Int'l Ltd., POWER GROUP, INC., their respective subsidiaries, affiliates, and advertising agencies. All federal, state, local laws and regulations apply. Void where prohibited. This program is sponsored by Compute International Ltd., 1965 Broadway, NY, N.Y. 10023, (212) 496-6100. Monthly winners will be selected at random from among all eligible entries received by the judges by the following drawing dates: June issue-7/31/92, July issue-8/31/92, August issue-9/30/92, September issue-10/30/92, October issue-11/30/92, November issue-12/31/92. Grand Prize winner will be selected at random from among all eligible entries received by 2/15/93. Winners will be selected by POWER GROUP, INC., an independent judging organization whose decisions are final. Winners will be notified by mail and required to execute and return an affidavit of eligibility and release within 21 days of date on notification letter or alternates will be selected at random. Limit one winner per household.

This sweepstakes is subject to the Official Rules and Regulations. For a list of winners, send a self-addressed stamped envelope to: Compute SearchStakes Winners, Dept. RRW, 1965 Broadway, NY, N.Y. 10023-5965 by 3/31/93. Requests will be fulfilled after the sweepstakes ends.

```
PRINT #2, c$;
WEND
CLOSE 1
CLOSE 2
SHELL "del " + filename$
SHELL "ren temp " + filename$
```

Run the program and enter crypt.fil *when prompted for the file to encrypt. Enter any word or series of characters as the key.*

When the program has run, enter type crypt.fil *to see the changes that have been wrought. Run the program again using the same file and key. Enter* type crypt.fil, *and it will be back to normal again.*

In answer to those looking for a program that will decrypt an encrypted file: As far as we know, there is no such program available.

U.S. Robotics Reply

I enjoyed your June Test Lab on portable products. I'd like to point out two inaccuracies, however.

Mr. Benford states that the WorldPort fax software bundled with the WorldPort 2496 doesn't include mini-BBS capabilities.

Actually, it does. The BBS has password security and provides a menu allowing users to leave or read E-mail, examine the list of available files, and upload or download files using XMODEM, YMODEM, or ASCII file transfer.

The article also says that the WorldPort 2496 doesn't operate in the background, but it does. The software uses a 45K TSR which supports background operations for sending and receiving.

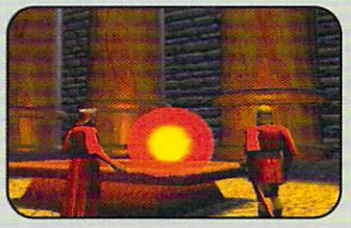
MARSHALL TOPLANSKY
U.S. ROBOTICS
SKOKIE, IL

Benford replies: The WorldPort 2496 is an excellent product that does indeed feature background operation and a mini-BBS.

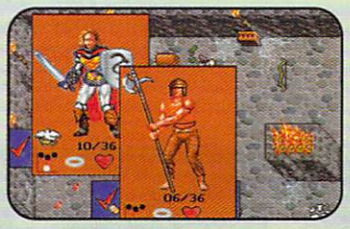
I apologize for any inconvenience or confusion about the features or capabilities of the 2496 that might have been caused by my review.

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. ❐

When the world is out of balance, someone has to tip the scales!



A magical scroll reveals that the source of the deadly magic storms and disease in Britannia lies on the Serpent Isle.



From a full-length view, you select clothing, armor, weapons and other items you'll carry on your journey through the Twin Pillars of Fire.

Storyline picks up where *Ultima® VII The Black Gate™* ended. Game features new terrain and magic, and an unexplored region of Britannia.

Ultima® VII
PART TWO
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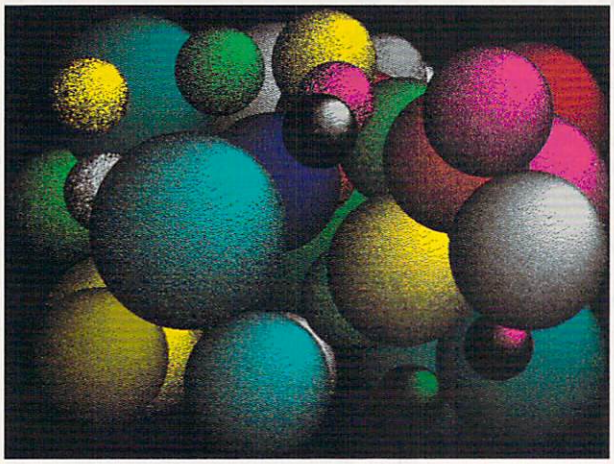
Circle Reader Service Number 192

WINDOWS WORKSHOP

Clifton Karnes

BLANK YOUR WINDOWS 3.1 SCREENS ANYTIME

Screen savers have always been hot items with Windows users, as the sales figures for programs like After Dark and Intermission attest. Why are screen savers so popular? Three reasons. They protect your monitor from burn-in, they provide security from prying eyes, and they're fun. Microsoft must have realized not only that screen savers have a practical side but that users like them too, because it included screen savers as part of Windows 3.1.



Blanking a screen on demand becomes easy once you realize one secret about screen savers.

If you've never experimented with the Windows 3.1 screen savers, run Control Panel and double-click on Desktop. You'll find the screen saver section is near the middle of the Desktop dialog box.

You can choose the screen saver you want to use by name, you can select the delay (or interval of inactivity) before the screen blanks, and you can set up the screen saver. In Setup, you can often control the number of objects the saver displays and their speed, among other things.

After everything is set, if you leave your computer idle by not typing on the keyboard and not moving the mouse for the number of minutes specified in the saver's configuration, your screen will blank, and you'll be treated to an animated display (unless you've chosen Blank Screen, which, as the name suggests, displays a completely blank screen).

Savers shipped with Windows 3.1 include Blank Screen, Flying Windows, Lissajous Figures, Marquee, Mystify, and Starfield Simulation. These are pretty neat, but they can't compete with the screens in After Dark and Intermission. On the up side, they're free, and they don't use much in the way of additional resources.

There are still two essential things missing in the Windows 3.1 screen saver system, however. First, you *should* be able to run a screen blanker on demand. In other words, if someone comes into your office and you have sensitive material on your screen, you should be able to blank your screen immediately. Second, you should be able to cycle through all your screen savers instead of having to choose just one to use.

Here are the solutions.

Blanking a screen on demand becomes easy once you realize one secret about screen savers: They are executable files. They all have scr extensions, I hear you say. That's true, but for an experiment, make a copy of one of your savers as an executable file. Let's experiment with the Lissajous Figures saver. Simply copy sslissju.scr to sslissju.exe (screen savers begin with *ss* by convention).

Now run sslissju.exe. As you'll see, it's a runnable program. The only problem is that you'll get the setup screen and not the saver screen. That problem is easy to solve. Run sslissju.exe again, but this time add the /s parameter. When you type *sslissju.exe /s,* your screen will blank and fill with the Lissajous swirls.

Now, to blank your screen on demand, you can simply install sslissju.exe as a program on your desktop, in your favorite menu program, or both. You could make copies of all your screen saver files so they have exe extensions, and run them at will. There's a simpler way to do this, however, that doesn't involve cluttering up your disk with duplicate files. You simply tell Windows to treat the extension scr as a program. To do this, load WIN.INI in your favorite editor, and find the line that begins with *Programs=*. It will probably say *Programs=com exe bat pif.* Simply add *scr* to the end of this line, so it reads *Programs=com exe bat pif scr,* and reboot Windows.

Now you're ready to install any blanker on your desktop or your favorite launcher and run it. To run Lissajous, you'd use the command line *sslissjou.scr /s.* If you use BackMenu, installing a menu option for your saver is an excellent choice.

As for the second problem—that you can't cycle through savers—that has been solved by programmer Gordon Harris. He's written a program that allows you to cycle through all your installed screen savers. The package also comes with a number of excellent savers, including a large analog clock that floats across your screen. You can find Harris's Cycle Screen Saver on CompuServe and most other online services, or you can contact Data Arts, 3349 Humboldt Avenue, South Minneapolis, Minnesota 55408, (612) 825-5436. Cycle Screen Saver is shareware with a $5 registration fee. ❐

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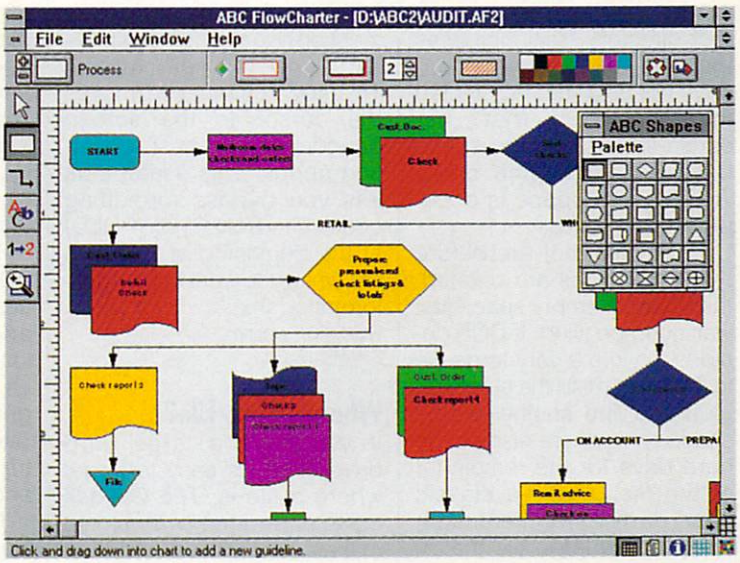

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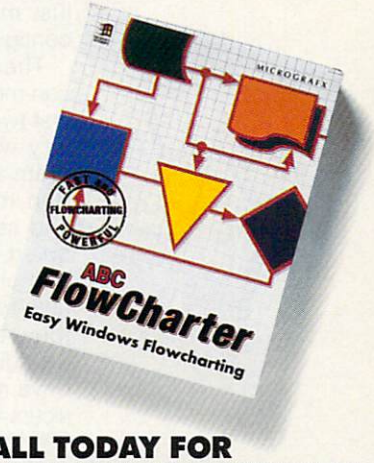

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TIPS & TOOLS

Edited by Richard C. Leinecker

Stop fragmentation before it begins, move your cursor faster in WordPerfect, and locate files quickly on your packed hard disk.

Organize System Files

If you've upgraded to MS-DOS 5.0, the system files io.sys and msdos.sys might not be the first files in your root directory. This increases the probability that your hard drive will become fragmented and slow down. That's because there's storage space before them on the drive. This storage space is occupied by other files.

If the files that are before the system files are deleted, then there's empty space just waiting to be filled. If DOS decides to write a very large file to the area, it'll fill the empty region and find another empty space somewhere else on the hard drive for the remainder of the file. That's a classic case of disk fragmentation. To read this large file that in part occupies the first part of the drive, the controller has to skip over sectors that are used for other files. This skip degrades performance and slows down disk access.

A disk optimizer or defragmenter may not move the system files to the beginning but just make sure every file is contiguous.

There is a solution. You can move them so they're the first two files in the root directory with the Disk Tool program in Norton Utilities 6.0. Run the Disk Tool program and select the procedure labeled Make a Disk Bootable and choose the C drive. The files will be relocated so they're the first files in the root directory, and your hard drive may perform better.

NICHOLAS F. CHAMPION
COSTA MESA, CA

Extended Keyboard Tips

The WordPerfect 5.1 manual lists two extended horizontal cursor movements. Home–left arrow (or right arrow) moves the cursor to the edge of the screen boundary, and Home-Home–left arrow (or right arrow) moves the cursor to the character next to the boundary.

I've found one it doesn't mention: Home-Home-Home–left arrow (or right arrow). This key combination moves the cursor to the screen boundary, even past formatting codes. This useful trick lets you bypass formatting codes like [ITALC] or [BOLD] at the beginning or end of a line when you want to insert unformatted text.

WILLIAM J. WOLFE
CHAMPAIGN, IL

Where's That File?

If you have a large hard drive, then it's easy to forget where a file is. The Chkdsk command with a /v argument makes a list of files and their paths on your hard drive. Combined with Find, this lets you look for a specific file. Here's a batch file that works great. To use it, type *locate* and the filename. If you wanted to find a file called mystuff.txt, you'd type *locate mystuff.txt.*

The /i argument after Find lets it do a search that isn't case sensitive. Here is the program locate.bat.

```
chkdsk /v | find /i "%1"
```

MALCOM MCCAFFERTY
SACKVILLE, CA

Windows Shorts

I prefer to avoid the Windows title screen, so I type *win :* to start Windows but keep the title screen from appearing.

If you want to launch a Windows application but don't intend to use it right away, hold down the Shift key while double-clicking on the program's icon, causing it to be immediately minimized. That's easier than running an application and then minimizing it.

ARJUN NAYYAR
WEST REDDING, CT

Built-in Windows Help

I got tired of referring to my manuals each time I had a question about using one of my applications. I created a picture using the Windows paint program, Paintbrush, and saved it as a bmp file. The picture contained useful information that I often referred to the manuals to obtain. Now, I just move the windows to view the help instantly.

To create a picture file, run Paintbrush from the Accessories group. Draw all the help and art you want. You can load pcx files into Paintbrush as a backdrop if you want to get fancy. Then, choose Save from the File menu, enter your filename, click OK, and the file will be saved.

Now you need to run the Control Panel from the Main group. Double-click on the icon labeled Desktop that appears. Down toward the bottom of the dialog box will be the Wallpaper selector. Use the selector scroll bar to find your file, highlight it with a mouse click, and then click on the dialog OK box.

Each time Windows runs, your custom file will appear as the wallpaper providing all the reminders you can fit in the picture file.

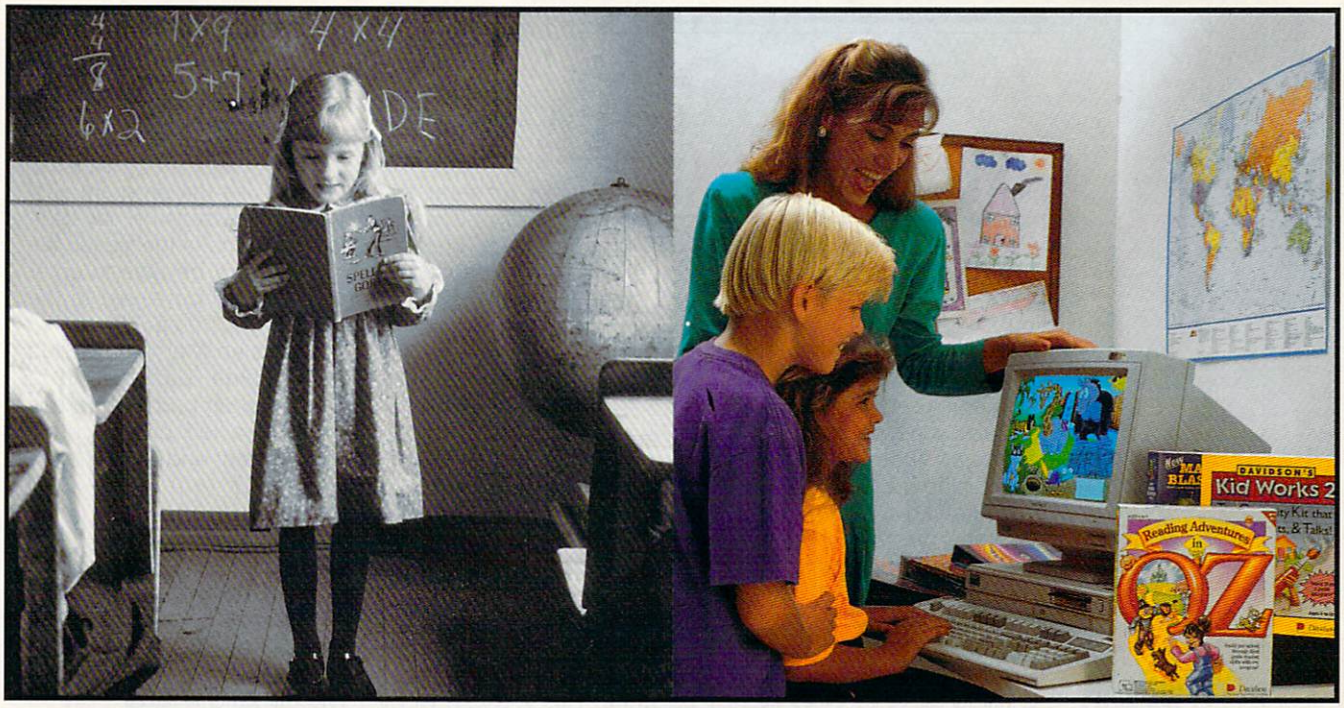
LOUIS COLLADO
ST. CLOUD, FL

Easy Disk Reuse

I've got a million old junk disks lying around. Many times when I want to use them, though, I have to spend time deleting files and subdirectories. You can use the Format a:/q command if you have DOS 5.0 or higher, but if you have an earlier DOS, you can use a program I wrote called Newdisk. It clears a floppy disk in seconds with a single command.

You can type in Newdisk using the DOS Debug command. Make sure the DOS pro-

That was Then. This is Now.



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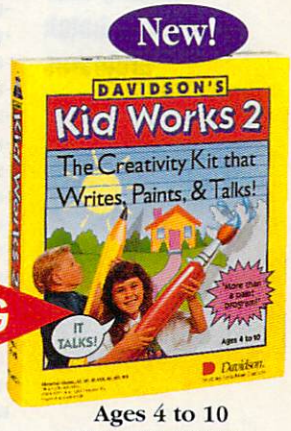

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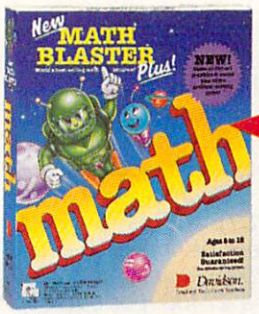

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gram called Debug is in your path or the current directory. In these examples, the italic text is what the computer prints; the roman text is what you should type. One way to be sure you get these programs exactly right is to have someone read the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

```
debug newdisk.com
file not found
-e 100 be 80 00 ac 0a c0 74 61
-e 108 ac 3c 0d 74 5c 3c 20 74
-e 110 f7 4e 24 df 3c 41 7c 51
-e 118 3c 42 7f 4d 88 04 1e 8a
-e 120 d0 80 ea 40 b4 32 cd 21
-e 128 8a 47 0f 2a e4 8b 5f 09
-e 130 1f 89 44 02 c7 44 04 01
-e 138 00 b1 03 d3 eb 89 5c 06
-e 140 b9 02 00 51 2a e4 e8 3c
-e 148 00 bf a4 01 e8 2e 00 2a
-e 150 e4 fe c4 e8 2f 00 8b 4c
-e 158 02 e8 11 00 e2 fb 59 e2
-e 160 e2 8b 4c 06 e8 06 00 e2
-e 168 fb b4 4c cd 21 51 bf a1
-e 170 01 e8 09 00 2a e4 fe c4
-e 178 e8 0a 00 59 c3 2b c0 b9
-e 180 d0 07 f3 ab c3 8a 04 2c
-e 188 41 bb a1 01 b9 01 00 8b
-e 190 54 04 0a e4 75 04 cd 25
-e 198 eb 05 cd 26 ff 44 04 9d
-e 1a0 c3
-rcx
cx 0000
:a1
-w
writing 00a1 bytes
-q
```

If you're using the Checksum program from the July 1992 issue, you'll get a value of 062.

To use the program, just type *newdisk a* or *newdisk b*. Make sure you're in the root directory of the disk. If you have trouble writing to the disk, try using the Chdir \ command or remove the disk from the drive and reinsert it.

There aren't any warnings or prompts asking if you're sure you want to clear the disk. Once Newdisk is done, you won't be able to unerase any of the files because the root directory is overwritten with zeros. To unerase a file, the directory entry for the file must still be intact.

RICHARD C. LEINECKER
MIAMI, FL

Powerful Batch Files

I could've used this little gem years ago. I'm amazed it took me so long to invent it. Every time I create a batch file of any complexity, I rack my brain for ways to let users type in a text string. Oh, it can be done. But you use Copy con in a batch file and have users hit F6 and then Enter. That's not a very elegant way to write a batch file.

The little program I wrote accepts a string that's typed in and saves it to a file. The file can have any legal DOS filename and is specified as a command line argument. Once it's saved to disk, there are endless ways to use it.

First, though, the program. To enter this program, follow the directions for the Newdisk program above.

```
debug getline.com
file not found
-e 100 be 80 00 ac 0a c0 74 42
-e 108 ac 3c 0d 74 3d 3c 20 74
-e 110 f7 8b fe 4f ac 3c 0d 74
-e 118 04 3c 20 75 f7 c6 44 ff
-e 120 00 ba 4e 01 b4 0a cd 21
-e 128 8b d7 b4 3c 2b c9 cd 21
-e 130 8b d8 8a 0e 4f 01 ba 50
-e 138 01 b4 40 cd 21 b1 02 ba
-e 140 4c 01 b4 40 cd 21 b4 3e
-e 148 cd 21 cd 20 0d 0a 50
-rcx
cx 0000
:4f
-w
writing 004f bytes
-q
```

If you're using the Checksum program from the July 1992 issue, the value you'll get is 062. To use the program, just type *getline filename*, substituting the name of the file for *filename*. You'll be able to enter text, and it'll be saved to the file that you've specified.

Here's an example of using the Getline program in a batch file. Its purpose here is to keep a log of who uses WordPerfect and what they're using it for.

```
echo off
echo Please type in your name.
rem Here the Getline program
rem takes control and lets
rem the user enter in a text
rem string.
rem The string is saved
rem to a file I named $$.
getline $$
rem Here the file $$ is
rem concatenated to my file
rem called wplog.
type $$ >>wplog
echo Please make a note of what
echo you're using WordPerfect
echo for.
rem Once again, the Getline
rem program takes control and
rem lets the user enter in a text
rem string.
getline $$
rem Here again, the file $$ is
rem concatenated to my file
rem called wplog.
type $$ >>wplog
rem Delete the $$ file.
del $$
echo Thanks!
```

RICHARD C. LEINECKER
MIAMI, FL

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

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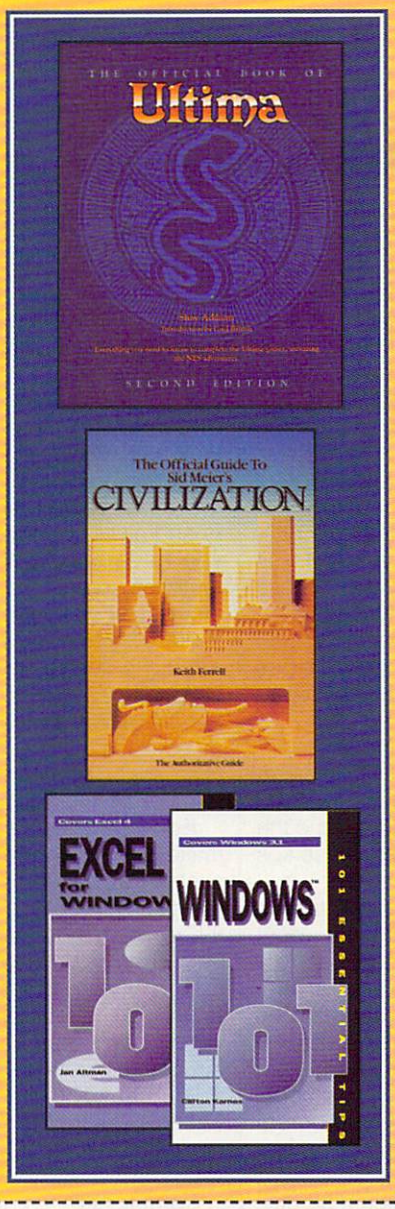

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INTRODOS

Tony Roberts

SURVIVAL TIPS FOR DOS HATERS

You can run from DOS, but you can't always hide: how to survive in an unfamiliar world.

Each year, new levels of insulation are erected between DOS and the average computer user. Batch files, menu programs, shell programs, and graphical user interfaces do what they can to eliminate the need for us to communicate with our machines at the DOS prompt.

These advances have made computers less frightening and less frustrating for users who are reluctant to sit down at the keyboard. (Those of us who are accused of living only to use computers do recognize that there are those who use computers only to earn a living.)

Even if you generally manage to avoid the DOS prompt, a little DOS knowledge will help you when you *do* face the dreaded C prompt. These tips should get you started.

Slashes (/) vs. backslashes (\). If you're confused about which slash to use when typing at the command line, keep in mind that backslashes are used as part of the filename path. Regular slashes are used to specify switches, or options for how a program should be run.

Chkdsk. If you use a hard drive, run the disk check utility every time you reboot your system. Include the command Chkdsk in your system's autoexec.bat file. Chkdsk determines if the disk's File Allocation Tables are intact and whether each file is in its proper place on the disk. If errors are reported, deal with them immediately—it takes only a few seconds. Well-maintained disks are much less prone to serious problems.

Dir. You're probably accustomed to using the Dir command to generate directories, but there are ways to use it more effectively. If your listings scroll past before you can get a good look at them, use the command Dir /p to pause the display after each screenful. If you know you're looking for a file that begins with the letter *s*, you could use the command Dir s*.* to instruct Dir to show you only files that begin with the letter *s*.

If you're using DOS 5.0, try Dir's other switches to sort the directory display the way you like it. Dir /od sorts by date. Dir /s displays the current directory and all its subdirectories. If you have one series of Dir switches you use all the time, instruct your system to use those switches by default by adding a line to the autoexec.bat file. I use the command Set dircmd=/l/ ogn to have my directories display in lower case, sorted by name, with subdirectories listed first.

Edit. Often, you need to make quick changes in a file—such as autoexec.bat or config.sys—but you don't need all the power of a word-processing program. Use DOS 5.0's Edit command. This is an easy-to-use text editor that's always handy. Don't worry; Edit is nothing like its older brother Edlin, a line-based text editor that has the distinction of being one of DOS's most confusing programs.

Format. Let's face it. Formatting disks is no picnic, but each of us has to deal with this chore. DOS 5.0 makes formatting easier than ever, so acquaint yourself with the switches that are appropriate for your size and type of disk. For example, the /f switch allows you to specify the size of the disk being formatted. If you have a 720K disk in drive B, use the command Format b: /f:720.

DOS 5.0's Format command is more forgiving than its predecessors. Now you can Unformat a disk if you realize quickly enough that you formatted the wrong disk. The Format command saves enough information about the disk to reconstruct it, should the Unformat procedure be necessary. This slows down the formatting, though, so if you're formatting a brand-new disk, save some time by executing the Format command with the /u switch. The *u* stands for *unconditional*. With this switch, DOS formats without saving data that might be useful in an Unformat operation.

Copy/Xcopy. Everyone copies files now and then. Usually, it's just a file or two from one disk to another. This is pretty straightforward, and the Copy command handles it well. If your copying becomes more complicated, however, look to the Xcopy command.

If you're copying several files, as with Copy *.* a:, Xcopy is faster because it reads and writes in batches of files rather than file by file. If you need to be selective about which files you copy, it's Xcopy to the rescue again. Xcopy includes switches that allow you to copy files based on the date the file was last modified or based on the status of the file's archive bit. The archive bit is turned on every time a change is made in a file. If you use Xcopy to copy changed files (those with the archive bit on), you provide yourself with a small backup system.

Help. Finally, one of the best things about DOS 5.0 is that it includes help for most commands. With this feature, you don't have to scurry for a manual to perform an unfamiliar routine. Typing *help xcopy*, for example, provides a screenful of information about how to use Xcopy and all its switches.

Call for help when you need it, and you'll be able to get back to your menu, shell, or graphical interface in no time. ❐

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Sure, you want to get your PC flying. With features like multiple open applications and background printing. Maybe even the ability to maintain your host connection while you work on something else.

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PC MAGAZINE EDITORS' CHOICE October 30, 1990 Software Carousel, Version 4.0

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PROGRAMMING POWER

Tom Campbell

USING PDS 7.1

We looked recently at several of Microsoft's BASIC dialects. This month's theme is Professional Development System 7.1, currently Microsoft's highest-end BASIC. PDS 7.1 is compatible with QuickBASIC and sports many more code generation options, OS/2 support, and incredibly powerful built-in ISAM database routines. Plus, it has a couple of libraries thrown in.

This month, we'll look at what you can do with the Presentation Graphics toolbox and how purchasing the $295 PDS 7.1 might be worthwhile just for that toolbox. If your billable time is worth $50 an hour, you could buy PDS 7.1 for a single business graphics project and have a topnotch development system after the gig is over.

If you've ever found a charting package lacking in flexibility, this month's PowerChart might well be what you need.

The toolbox has support for CGA, EGA, MCGA, VGA, Hercules, and Olivetti cards; and it uses Windows screen fonts. You're even licensed to distribute the half-dozen screen fonts that come with PDS 7.1 as part of your application.

If you've ever found a charting package lacking in flexibility, this month's PowerChart might well be what you need. A *data-driven* charting program, it creates its chart using its own command language. Feed it a text file, and it will create a chart or series of charts by reading the directions in the file and displaying the chart onscreen. Here's an example.

```
CHART 1 TYPE "BAR"
USE CHART 1
LABELS "Wayne's World", "Basic Instinct", "Lethal Weapon 3"
DATA 110.5, 87.9, 114.6
TITLE "Box Office in Millions"
JUSTIFY TITLE LEFT
SHOW
PAUSE
```

Put that in a text file called test.pc and run it through the PowerChart program by typing *pchart test.pc*. The chart will be shown on your graphics monitor and will await a keypress; then it will return to text mode. "Wait a minute," you say. "I did all that work just to create a bar chart? I could do that in Harvard Graphics in seconds!"

True. But PowerChart is an extensible language, one that you can add to by following the directions in the source code and program documentation. Don't like the way your graphics program displays axes? PowerChart gives you full control over how they're drawn, what pattern and color they use, and so on.

The JUSTIFY TITLE statement is included to show you how PowerChart changes a default value. Using a simple language also gives you the ability to write other programs in BASIC that generate source code for PowerChart. You might also notice that the source code listed above requires only 202 bytes of storage as a text file. Even the most parsimonious graphics file formats would have difficulty matching this figure.

To begin, you must first start QBX (remember that PDS 7.1 or higher must be used for this column; QuickBASIC doesn't come with the Presentation Graphics toolbox). To load the quick library for the toolbox, type *qbx /l chartbefr*.

If you start QBX without loading a quick library first, there's no way to load one without restarting. Another limitation is that you can only load one quick library at a time, so if you want features from several quick libraries, you'll have to monkey around with lib.exe to extract only those routines into a new library.

If you like to work in a separate directory for each project to avoid clutter, you should make sure that the QBX environment knows where you keep your libraries and include files. Choose Set Paths from the Options directory and write in the appropriate settings; on most systems, they would be c:include;c:src for include files and c:lib;c:src for library files.

The SRC directory is where the PDS 7.1 installation program puts all the graphics example files and the toolbox source. It also puts the font files there; that way, if you run a program such as the sample programs that come with PDS 7.1, it assumes the fonts are in the current directory.

PowerChart uses a general-purpose function called SearchPath, which takes a path-style string as its input and searches those directories for the named file. It also looks in the directory it started from, if you're using DOS 3.0 or higher (a DOS 2 program has no way of knowing from which directory it executed, but starting with version 3, that information is available just after the environment table).

PowerChart doesn't support all of BASIC 7's chart types, but adding to it is simple. Look at the TRANSLATE routine in translat.bas, and you'll see instructions on how to add chart types and examples of existing ones. That's why the first line of test.pc puts the word *bar* in quotes.

```
CHART 1 TYPE    "BAR".
```

Make it a string variable instead of a keyword, and you can add to SELECT CASE CHARTTYPE without adding keywords to the language. And later, you can even add chart types that aren't supported by the Presentation Graphics Toolbox, without disturbing the main parsing routines. Try *that,* Harvard Graphics! ❐

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HARDWARE CLINIC

Mark Minasi

SALT AND BATTERY

How to solve your laptop battery's memory problems

I *love* notebook computers!

That's my song. Hey, I'm on the road all the time. Without my notebook, I couldn't write books, articles, course handouts . . . heck, I'd be out of business.

For example, I recently did an Alaska-Ireland-England-Italy series of lectures. With the big Alaska flight coming up, I charged up two laptop batteries. I got about 45 minutes' work out of the first battery—less than I'd expected but not the end of the world. I saved my work, changed the battery, and powered up, expecting another 45 minutes or more. It was just when I was typing in a really great riff that the second battery died, after 15 minutes . . . and no warning.

Which reminds me of my other song or, perhaps better, dirge:

I *hate* laptop batteries!

I've owned six PCs that weighed less than eight pounds each and ran on batteries. And every one of them has left a pain in the pit of my stomach whenever I used it with on-board juice rather than AC power.

When the battery is new, all is well with the world, and you get almost two hours of work out of a 386SX notebook. But after six months, it's like playing Russian roulette every time you trust your work to batteries. Your car has a gas gauge; why can't a laptop tell you how much zap's left in its battery?

To find out, I called up Phil DeSantis. Phil is the marketing and sales manager for the Battery Systems Division of HM Electronics in San Diego. Phil's been in the battery business for 20 years, and I was quite surprised by some of the things that he told me.

It's pretty much common knowledge that the ni-cad batteries that are in laptops have a memory—a phenomenon whereby they remember how much they were charged up and eventually lose all charge capacity beyond the last charge.

For example, if you always recharge your battery when it still has a half charge on it, it'll eventually retain only the capacity to hold a half charge. That means that you have to be really religious about completely discharging your laptop before charging it again—no topping off.

All right, now, how many of you knew that or had heard something like it before? Hmmm . . . lots of hands raised. I'd heard that, too.

"Baloney," says Phil. "The 'memory' problem was solved years ago. You can charge and recharge your laptop all you like."

Hang on, you might be thinking; you can deny the memory phenomenon all you like, but it still happens. My old laptop batteries just don't take as much charge as they did when they were new.

Phil explains that the problem with your laptop's battery isn't memory; it's dendrites. These are salt-like crystalline formations that grow inside a battery when you overcharge it. When you try to charge a full battery, it gets hot, and the dendrites form.

Similarly, when you charge a battery that's empty or partially empty but hot, the charging process is much less efficient, and you get dendrite growth to boot. Dendrites act like an internal resistance in your battery, reducing its efficiency and its service time when charged.

So the person who plugs a laptop into the wall every night and gives it an eight-hour charge, when it only needs an hour or two, is doing the battery two hours of good and six hours of harm—and slowly growing a veritable dendrite farm.

Worse yet, the heat can cause other problems, such as internal chemical changes that cause short circuits right inside the battery. That kind of bad news means shorter battery life and greater heat.

Once your battery has dendrites, is it no good? No, it's recoverable. The battery can be conditioned. The way that's done is simple. Just discharge it until each cell produces no more than one volt—don't discharge any further, for reasons we'll take up in a few paragraphs—and then recharge. Do this discharge/recharge cycle three times, and most of the dendrites will be gone.

How Chargers Work

Ordinarily, a charger pumps power into a battery at about the same rate that the battery puts it out, though some go down to ½ that rate. That means a battery that can drain itself in one hour in the laptop should take no more than an hour or two to recharge itself.

Once it's charged, a certain amount of the charge dissipates, so a charger should then shift down to a tiny 1/20–1/50 of the previous charge rate.

The problem with this is that detecting when a battery is fully charged is a complicated process. Once the battery is full, a charger should detect a slight reverse voltage.

That's not completely reliable, however, as a slight power surge from the wall current could look like a voltage reversal. If the charger misses that voltage shift, it could notice that the battery is increasing in temperature.

Chargers today aren't very accurate in detecting when a

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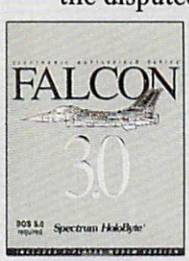

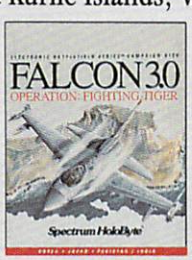

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Circle Reader Service Number 108

Mark Minasi

battery is full, and when they do detect it, they don't drop to 1/20 or 1/50 of the normal current—they only drop to 1/10. The result is a warming battery, with all the attendant problems.

Handling Your Battery

I had problems with the first battery that my notebook came with, problems that looked like memory problems. So I figured that the right thing to do was to completely discharge the battery.

Unfortunately, my laptop refused to run at all when the battery was low, so I never had a chance to completely discharge the battery. I had a brainstorm, however. As the battery pack is just four D-cell ni-cads, I just got a flashlight that took four D-cells and ran the flashlight until the light went out.

Rather pleased with myself, I did this through a few charge/discharge cycles, and then the batteries refused to charge at all.

"You did the exact wrong thing," Phil told me. (Now he tells me!) Ni-cads should never be discharged below one volt per cell. If you do that, they move into an unstable state and can reverse polarity.

Then when you try to recharge them, it's as if you put the batteries into the laptop backward before you started up the charge cycle, an activity that can be dangerous. In my case, my laptop heated up to over 130 degrees before giving up the ghost. Now that I have new batteries, it runs cool again.

And when you get a new battery, give it a good charge—don't worry about overcharging it the first time. The reason is something called stand loss. Here's how it works.

A battery discharges all by itself about 1 percent per day. Now suppose you have a laptop battery composed of four cells. This battery gets shipped over from Japan, sits in the warehouse, and sees a month or two of inactivity before you use it.

The problem is that each of the four cells discharges at a different rate, so the four of them may be in very different places in their discharge cycles. Remember the possible polarity reversal if the voltage drops below a volt? If you've got a cell that's at about one volt and turn on the laptop, you'll discharge all the cells, but the one that's on the fence may just flip.

This could leave you with a battery composed of three cells that agree on polarity and one that fights the others, with the resulting hot battery and short charge life.

One way to keep that from happening is to let your battery charge for 24 hours the first day that you get it. There will be some overcharge, but the effects of that are far outweighed by the benefits of ensuring that all the cells in your battery are in step.

Once you start using your laptop regularly, how should you handle the charging? First of all, try to get an idea of the

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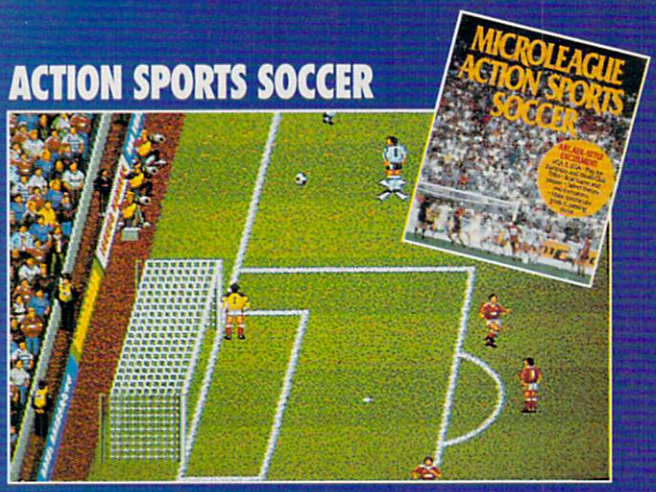

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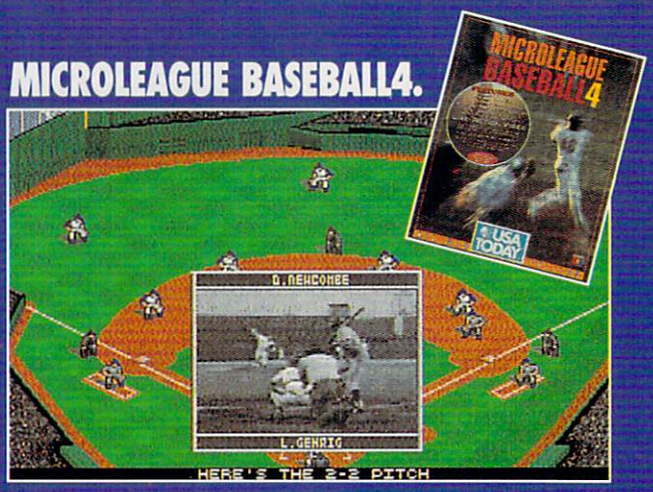

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ratio of charging time to running time.

Do an experiment to find out the longest running time for the battery. Then charge the battery for that amount of time, and see how long a run you get from that charge.

With a little experimentation, you can determine the running/charging time ratio that your system uses. Suppose you find that to get an hour's use from the battery, you must charge for 1½ hours. Then you should only recharge for the amount of time equal to how long you last used the computer while on batteries, multiplied by 1½.

Battery Gas Gauge

But what about my initial question? Why doesn't my laptop give me a warning sometime before it dies?

"Easy," says Phil. "Ni-cads have a funny discharge pattern. They give you just about full voltage, with very little decrease, until they quit." There's no straightforward way to know when your battery is about to die.

The computers that give you a percentage-depleted number are merely guessing, based on how long the battery's been running and when you last told the computer that you'd charged the battery. They assume the battery discharges at a pretty steady rate—a fairly heroic assumption.

What all this boils down to is that you can't trust the full- and low-power indicators on many laptops.

HM Electronics, however, sells a neat little doodad that solves many battery problems. This battery analyzer/charger unit does three things.

First, it charges your battery safely, as it knows when to stop charging. Once the battery has reached peak voltage, the charger continues to provide current, but only at a small fraction of the normal charging rate, so as not to heat up the battery and form dendrites.

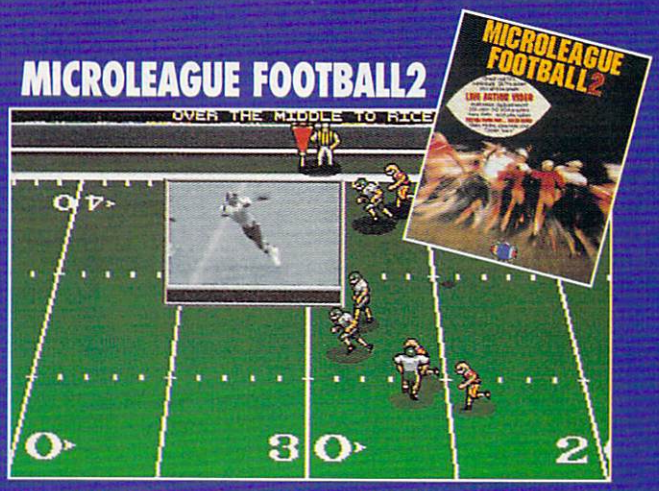
Second, it discharges the battery, which (1) discharges the battery safely, not allowing it to drop below one volt, and (2) monitors the discharge process, reporting exactly how much charge it held. You can use this to measure your battery's capacity, as you can charge and then discharge the battery to determine exactly how much juice it can hold.

Finally, it performs a conditioning function whereby it does three charge/discharge cycles, dedendriting your battery.

Currently, HM has units for only the Grid and Dataworld portables. I use one for my Dataworld portable, and I must admit that I love it. It has taken the mystery out of my battery capacity. It's as if I drove a car for years without a gas gauge, and all of a sudden someone installed one—I don't know how I lived without it.

The unit I bought cost $200, but Phil says that there should be a generic unit out for about $160 by the time you read this. ❐

MICROLEAGUE FOOTBALL2



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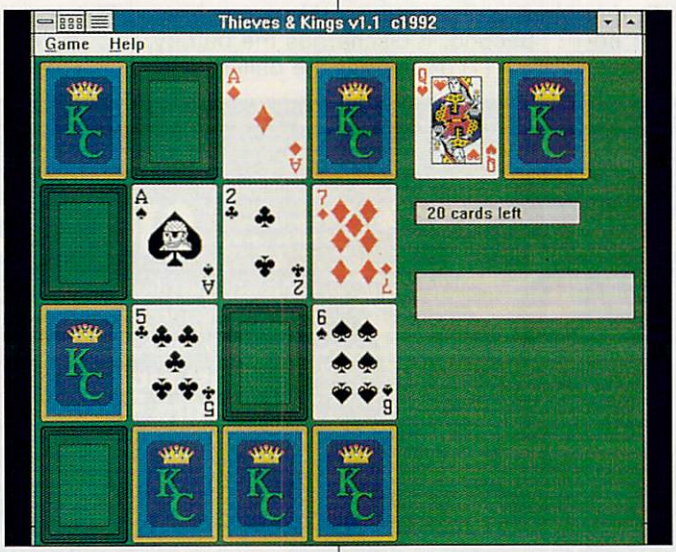
KNOCKOUT PUNCH FOR UNWANTED FILES

Get ready for both work and play with this issue's PC Disk. We've found some exciting shareware that's sure to make you smile.

With these selections, you can quickly erase unwanted files, customize your DOS screen, set up a miniature BBS, handle any conversion problem, and, when the work's all done, deal yourself a couple of new Windows solitaire games and relax.



If you love Windows Solitaire, you will love Kings Corners, but it isn't as easy as it looks!

PDELETE

PDELETE is one of the finest DOS file-deleting utilities I've seen. If you can describe what you want removed from your hard disk (or hard disks), PDELETE can definitely remove it.

PDELETE allows you to delete files based on name, file date, attribute, or size. The program provides wildcard options that are much more sophisticated than those provided by DOS. When your Delete command is executed, a window opens, showing you what files are being deleted. This gives you a chance to haul out the undelete program if you see you've erased something by mistake.

One of the best features of PDELETE, though, is its test option. When you include the /tf (test first) switch after a command, the program shows you a list of the files that would have been deleted. Once you've verified that your command has been interpreted as expected, you can answer the program's prompt affirmatively and delete the files for real.

PDELETE also permits you to create an exclude file. In this file you can list filenames and paths that you wish to exclude from the PDELETE process, and PDELETE will skip them.

PDELETE is so fast and easy to use that I cleaned up all the hard disks on a small network in just a few minutes, and I was disappointed that I had so quickly run out of files to erase.

Programmer Norm Patriquin has been steadily refining PDELETE since its first release, in October 1986. The program, now in version 4.4, is shareware with a $20 registration fee.

The Universal Converter

Jeff Napier had fun programming The Universal Converter, and it shows. The Universal Converter lets you view nearly anything in whatever terms you please.

Need to know how many cups are in 45 gallons? Do you want to calculate how much you earn each second? Do you wonder about the ASCII value of *H*? Or do you have to compute the volume of a cylinder? The Universal Converter has the formulas for these conversions plus hundreds more you've probably never thought of. How long, for example, does it take light to travel all of the way across your bedroom?

Napier says the Universal Converter project began in an effort to take a break from regular programming projects. He built The Universal Converter on a laptop while riding in a car, curled up in a recliner, and sitting under a tree. Napier included more than 600 conversions in the program; once you get started, you'll want to try them all.

When Napier transferred the finished program from his laptop to his desktop computer, though, he was in for a big surprise. Napier says that the color combinations that worked so well in gray scales on the laptop "were entirely wacky" on a color monitor. But you won't see yellow text on a red screen with a purple border in the current version of The Universal Converter. Napier's changed the color scheme to a pleasing white, green, and blue combination.

The Universal Converter is shareware with a $29.95 registration fee.

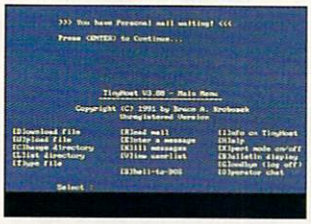
TinyHost

If you're a two-computer per-

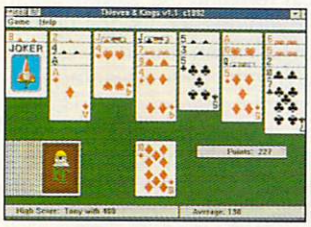
son (one at home, one at the office), TinyHost will solve one of your most common problems: leaving important files on the wrong system. Programmer Bruce Krobusek often found himself doing that, so he decided to create TinyHost.

PDELETE

The Universal Converter



TinyHost



Thieves and Kings

The program turns a computer into a miniature bulletin board system where you can dial in, view directories, and upload and download files. The program also includes operator chat, DOS shell capability, and message capability—and that's just the beginning.

TinyHost has most of the features of a full-blown BBS but not all the bells and whistles, the overhead, and the learning curve. It includes log-in and security provisions to protect your data and a ring-back option that makes the system easy to use on your regular voice line.

TinyHost supports up to 25 users and provides 11 security levels, making it practical to use as a small company BBS as well as a personal BBS. The shareware registration fee for TinyHost is $25.

Colors

Now you can put the best face on your DOS screens with Colors, an easy-to-use color-setting program. No more cryptic ANSI strings to remember. No trying to guess which color number refers to which color. With Colors, just tell it what colors you want.

For example, typing *colors blu on bla* gives you blue text on a black background, while typing *colors red on whi* gives you red type on a white background. Best of all, typing *colors nor* takes you right back to normal white on black when you've finished experimenting.

Aran Spence, who wrote the program and offers it as freeware, says he developed the utility after getting used to a similar feature that is part of the 4DOS operating system.

Thieves and Kings

Lovers of the Windows Solitaire game take note: Thieves and Kings brings two more solitaire games to your desktop, and both are highly addictive.

In Kings Corners, you try to fill in a 16-card grid with kings in the corners, queens on the sides, and jacks on the top and bottom. It's not as easy as it sounds.

The second game, 40 Thieves, is based on the solitaire standard known as Golf. Programmer Paul DeWolf has 2added a few twists to this version, though.

The deck includes wild cards that help prolong play, but each time you clear the table, one wild card is removed from the deck.

Also, 40 Thieves includes a two-player option, making the game great for family fun. Decide how many games you'll play, and the computer keeps running totals for each player. One word of warning: It's incredibly difficult to put this game away. I've been testing 40 Thieves for about three weeks, and my office mates think it's time I got on with my work.

This two-game shareware combination requires a $20 registration fee.

Many of the programs included on the PC Disk are shareware and are offered to you for your evaluation. When you find a shareware program that meets your needs and you intend to continue using the program, be sure to register it with the author.

If you are a shareware author and would like to submit your work for the PC Disk, you can send it directly to Tony Roberts at P.O. Box 10134, Greensboro, North Carolina 27404-0134. Due to the limited disk space available, your whole package should fit into an archive of no more than 100K. Please include a documentation file. ❐

COMPUTE/NET

Troy Tucker

COMPUTE AND POWERVISION

A little more than a year ago, we entered into an agreement with GEnie and America Online to provide you with an electronic version of COMPUTE magazine. This project has provided us with a wealth of information and experience. We tested the waters, and now we're ready to apply what we've learned to a new online service—PowerVision.

Sign up for PowerVision through COMPUTE and take advantage of a great deal from U.S. Robotics on a 9600-bps fax/modem.

PowerVision is different from anything you've ever logged on to. PowerVision breaks the old text-based barrier by fusing the latest in communications technology with beautiful VGA graphics. After just one look, you will see online services in a whole new light. All the usual features, such as electronic mail and chat, can be found on PowerVision. The difference is that each has been graphically enhanced. Electronic mail can have the sender's photo attached. As you open the letter for reading, a VGA photo pops up on your screen.

This graphical enhancement doesn't slow the service to a snail's pace. State-of-the-art compression techniques and smart terminal software move at an impressive rate. The video download process takes about 10 seconds at 9600 bps (or about 30 seconds at 2400 bps).

Getting around in PowerVision is easy. Each online area is accessed by clicking on buttons or by pressing designated keys. Almost every screen is unique because the information providers design their own screens, buttons, icons, logos, and photos. Besides digitized photos, vector graphics can also be transmitted. This type of graphic is designed with special software, then compiled into a format that can be transmitted from the host computer. When photos and vector graphics are combined with bitmapped fonts and 3-D buttons, you get an online service that packs quite a visual punch.

The cost of PowerVision is very reasonable. The basic service fee is $18.95 per month with a connect charge of $.09 per minute. You get two hours of free connect time every month, and there is no additional charge for 9600-bps use. Many services are provided at no extra charge: shareware library access, electronic mail (up to 900 letters per month), discount shopping, discount travel, and personal ads.

Service	PowerVision	Prodigy	CompuServe
Basic service fee	$18.95	$12.95	$ 7.95
4 hours access time (1 hour nonbasic)	10.80	n/c	12.80
50 E-mail messages	n/c	5.00	n/c
3 letters to Congress	n/c	7.50	3.00
1 hour shareware access	n/c	14.95	12.80
Discount shopping	n/c	n/a	3.30
Total charges	$29.75	$40.40	$39.85

n/c = no charge; n/a = not available

If you make a cost comparison between PowerVision, Prodigy, and CompuServe, you'll find that it's cheaper to use PowerVision. Take a look at the table to see how they stack up.

As you can see, the additional features offered by PowerVision don't increase the basic cost. And, besides getting a better price, you get to enjoy $20 in free grocery coupons each month, free 9600-bps access, personals with parameter searching, electronic mail with photos, real-estate listings with photos, shareware, chat, and much more.

By the time you read this, COMPUTE will already be on PowerVision, and *Omni* magazine will soon follow. If you're interested in signing up for PowerVision, the basic software price is $79.95, which includes the price of a subscription to COMPUTE, *Omni, Longevity, Four Wheeler,* or any other General Media publication. The COMPUTE area is found under Premium Services and can be accessed by clicking on the appropriate button. The initial COMPUTE screen details which areas are free and which charge a premium. In general, the premium will be around $.20 per minute. You will not be charged a special rate for access to COMPUTE's software library. All file descriptions will include the unit cost for each download. Whether you download at 2400 or 9600 baud, the cost remains the same.

Everyone who signs up for PowerVision through COMPUTE can take advantage of a special offer from U.S. Robotics, a 9600-bps V.32bis fax/modem for only $279 (the external unit costs $299). For more information on the new COMPUTE/NET and PowerVision, circle number 102 on the Reader Service Card or write us at COMPUTE/NET, 324 West Wendover Avenue, Suite 200, Department PV, Greensboro, NC 27408. For faster action, you can complete the coupon on the COMPUTE/NET–PowerVision ad appearing in this issue. ❐

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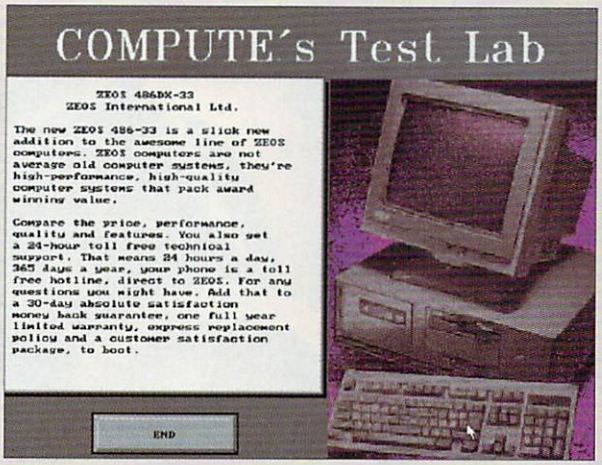

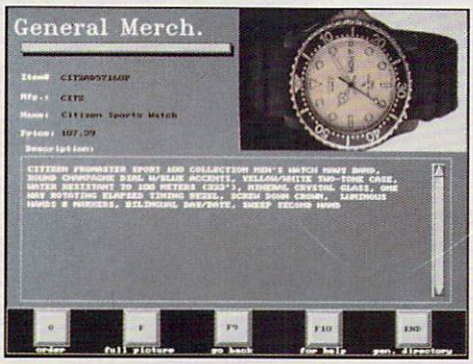

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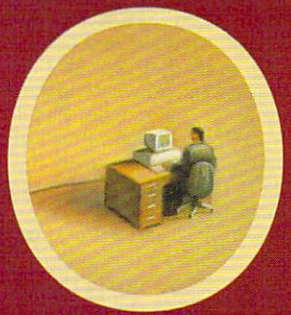
(Supports MS-DOS, 2400/9600 bps, VGA/SVGA only. Requires a 286 (386 recommended) with 256K video memory, 640K RAM minimum.) **Circle Reader Service Number 102**

Painting
By Bill Bruning

You can't do business without contacts, and poorly managed contacts are worse than no contacts at all.

KEEPING IN CONTACT



By Daniel S. Janal

Hundreds of Post-it notes greeted Ken Holyoak every morning when he went to work as president of Better Modular Buildings in Indianapolis. Not surprisingly, dozens of details fell by the wayside.

"I thought I could keep track, but this was not effective," he says. "The hard disk inside my brain was getting too full." If you've ever forgotten about a meeting or blown due dates, you can sympathize with Holyoak. He let perfectly good leads slip through his fingers because he couldn't keep track of the details.

One Percent Inspiration

If genius is in the details, contact management software programs that manage your contacts, notes, and meetings can help you become a genius.

These programs let you create a note card for each contact, complete with name, address, and phone number. You can then use the computer to automatically dial the number and open a notepad so you can keep notes. After the call, the computer asks when you need to call back. On that appointed date, the computer reminds you to make the call. The same process works for keeping track of your meetings, appointments, conferences. Most programs will let you print your notes as letters or faxes, or they'll hook into your word processor and keep a log of your correspondence. That way, you'll be able to look at a contact's records and see exactly how things stood the last time you spoke or corresponded. The program can keep track of any kind of information. If you're the type of person who forgets birthdays or needs to remember which client prefers gifts of white wine instead of red, then a contact manager is for you.

With more than 600 contact managers on the market, you can certainly have your pick. Although many offer generic call, record, and schedule functions that can be used by salespeople or anyone else who makes a lot of calls, others are targeted to specific industries, such as construction or public relations. Some are designed specifically to assist people on the road in exchanging data between desktop computers back home and palmtop computers.

For Holyoak, relief came with a program called PowerLeads!, which works under Windows.

"I call it up first thing in the morning. It tells me whom I need to call. It lets me prioritize my schedule and keeps track of what I am doing," says Holyoak, whose company makes modular buildings for commercial use. "It's always up and running. I found it keeps lots of little slips of paper off my desk and reminds me of things to do. The main thing is that it lets me keep track of leads, customers, and things I thought I could keep track of in my head."

Lost Time Is Not Found Again

Missing appointments and deadlines not only can be costly to an attorney but can lead to malpractice cases, according to the American Bar Association, which estimates that 60 percent of such cases were filed because attorneys blew deadlines.

That won't happen to Michael Jimmerson, an attorney in civil litigation and personal injury practice with Mesch, Clark, and Rothschild of Tucson. He uses PackRat, another Windows contact manager.

"It helps me prepare for court by keeping track of deadlines, dates, and phone conversations," he says. "I was looking for something to help me keep track of phone numbers, addresses, notes, and briefings. I need to be able to merge that data with my word processor."

He also manages to-do lists and calendar notes with PackRat. Before using this program, he experimented with other applications but found they did only part of the job.

"I used other packages, but they didn't integrate the information. For example, I called people with PC Tools but had notes in WordPerfect." To find data, he had to switch applications. "Now all the information is linked together. It has really opened up a whole new world of productivity for me."

Having all your records in one place is a prime benefit of a contact manager, because it can find data fast and plug it into the right spaces.

So if Jimmerson's writing letters, PackRat will type the names and addresses onto fax cover sheets or letters and envelopes. He also integrates the program with an electronic mail package to write to colleagues on ABAnet, an online service offered by the ABA.

"I talk to about 30 to 40 people a day, sometimes more," says Jimmerson, who has to manage more than 600 names in his telephone list. "PackRat saves time in small increments. It adds up to more than a half hour a day. You don't have to spend hours of time looking for notes. It is subtle but very powerful. I could not get along without it."

WORKING WITHIN THE STRUCTURE

If you're starting your recordkeeping system from scratch and want to type in new contacts when you meet them, you'd do well with just about any program mentioned in the article. However, if you have numerous records in your system, you could be in for a massive problem.

You see, each contact manager uses its own unique file format. For the contact manager to read your data, you first need to convert your current data to either ASCII or dBASE format. Some programs require the data to be in a certain order, or they won't read the data at all. Or they'll mismatch the data and fields so you'll find the company name where the phone number or the street address should be.

Some programs import data easily and quickly, like PowerLeads! and YourWay. Simply tell either program which file to read and then point and click on the field names.

Even with the best system, you will need to edit data. For instance, I exported data from my autodialer in an ASCII format. The name field contained both first and last names, like Smith, Betty. However, one program had separate fields for first and last names. I had to ask the new program to read the name field in the first name field and then manually type the last name in its proper place.

Another program required first and last names together, which was great for my autodialer output but bad for my database program, which used two fields for first and last names. Again, I had to edit data.

Finally, the autodialer used one field for the phone number, including area code. However, a contact manager required two fields. Again, in order to get the data in, I had to manually type the area code in the additional field.

Of course, I could've paid someone to retype my data from scratch. However, with 3000 contacts, this would've cost me a lot of time and money.

There's a crying need for a utility like Software Bridge or WORD FOR WORD that converts DOS-based word processor or database files to these contact managers. Fortunately, most BASIC languages contain commands that make reading and writing ASCII files a snap. If you store data in one format and you need to change it to another format, a brief and simple BASIC program could read one file format and convert it to another format. The highly structured nature of database files makes this even simpler.

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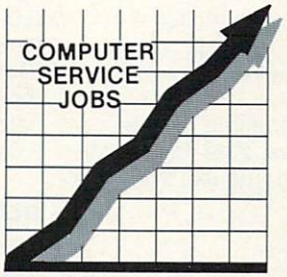

Jobs for computer service technicians will almost double in the next 10 years, according to the latest Department of Labor projections. For you, that means unlimited opportunities for advancement, a new career, or even a computer service business of your own.

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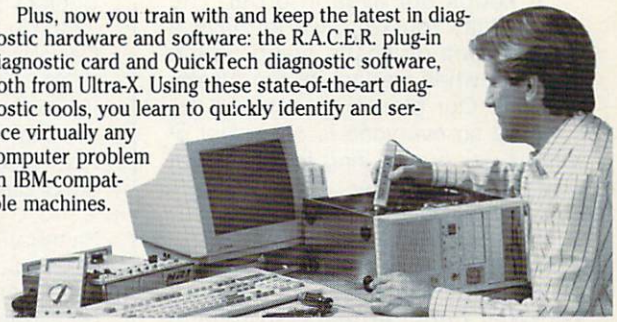

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Management by Contact

Running a business with several people can be a challenge, but YourWay contact management software has helped Channing Blackwell, consultant and civil engineer, bring more regularity to Blackwell Engineering in Washington, D.C.

"It keeps our lives in order," he says. "With YourWay, we all have a general idea of what's going on the next day when we look at the master task list. Our plan is to network the software so everyone is cognizant of what is going on during the day. That way no one can say, 'I left my notebook at home.' There are no excuses."

The software keeps track of meetings with employees and with clients. Like many contact managers, YourWay rings an alarm to remind Blackwell of meetings.

"I was engrossed in a project, and the alarm went off," he says. "It's like this computer reaches out and taps me on the shoulder and says, 'Excuse me.' It gives you lead time. If you have to be at a certain place in an hour, the computer will tell you when to leave."

TeleMagic, another contact manager, has changed the way Bill Brawner does business.

"I can now think about solving the clients' problems instead of trying to keep track of them," says Brawner, whose four-year-old company in Morgan Hill, California, helps corporations lower their taxes through innovative programs—or at least lowers their cost of income tax preparation by 35–75 percent. "I talk to a lot of people, and I need to track the sales call results. Because of the way TeleMagic stores information, I can cross-reference my sales results. People tended to fall through the cracks of my 3 × 5 note card system. Now they get callbacks and letters on time. With the push of two buttons, I can send notes saying, 'Thank you for requesting information,' and confirming appointments and have it be so personalized without my having to think about it. It's so great. It's really increasing my productivity."

Clients have noticed the difference. "A couple of clients say, 'You seem to be right on time.' When I say, 'I'll give you a call next Tuesday,' and they get a call on Tuesday, they're impressed with the follow-through," he says. It's easy to follow through when you have the whole history on the screen. That way, you don't have to leave the phone to run for a file folder and shuffle index cards while trying to make small talk. When you make 20–30 calls a day, as Brawner does, that saves a lot of time.

When he visits clients, their information is at his side in a notebook computer.

"I can use it from the car with my car phone or in someone else's office. I can work on the client's project right there. It is extremely fast. I can usually find anything within five seconds," he says.

What Have You Done for Me Lately?

Keeping clients happy is one thing Pat Meier can do with ACT!, a contact management program with versions for DOS and Windows.

"One of the things our clients like is that they can call us and say, 'What have you done for me lately?' and I can say, 'Let me show you,'" says Meier, president of Pat Meier Associates, a public relations agency in San Francisco representing high-technology clients. "With a couple of keystrokes, I can pull out a contact management report and show them whom I contacted and what the results were."

She remembers in particular one time ACT! saved her: "One client asked me to call one reporter. After a few days, the client said, 'How come we haven't heard from this person yet?' I pulled up a record and showed how many times I called and there was no answer and I left messages," she says. "Turns out the reporter was out of town."

She can also improve productivity through ACT!'s word processor. Every month she creates a transaction list of out-of-pocket expenditures for each client by using Quicken. She saves the file to ASCII and then loads it into an ACT! template letter. "Voilá I had an instant invoice. Complete with invoice number."

Contact managers can also be used to update employees in field offices. Waterside Productions, a literary agency in Del Mar, California, uses TeleMagic to keep track of calls to publishers and writers. Every night, the computers talk to each other and update each other's databases so everyone knows the status of each project, says Matt Wagner, a Waterside agent who works from an office in Santa Monica.

Little wonder contact management software is one of the fastest growing segments in software development. Whether you need to be reminded of calls, meetings, appointments, or notes, there's nothing like the easy access to data in a contact manager.❑

CONTACT MANAGEMENT PRODUCTS

Windows Based

ACT! for Windows—$495
Contact Software International
1840 Hutton Dr., Ste. 200
Carrollton, TX 75006
(800) 365-0606
IBM PC or compatible capable of running Windows, 2MB RAM, 2MB hard disk space, mouse, Windows 3.0 or higher.

PackRat—$395
Polaris Software
17150 Via Del Campo, Ste. 307
San Diego, CA 92127
(619) 674-6500
IBM PC or compatible capable of running Windows, 1MB RAM, Windows 3.0 or higher.

PowerLeads!—$295
Pyramid Data
1650 S. Amphlett Blvd., Ste. 212
San Mateo, CA 94402
(415) 312-7070
IBM PC or compatible capable of running Windows, 2MB RAM, 2MB hard disk space, mouse, Windows 3.0 or higher.

YourWay—$99
Prisma Software
2301 Clay St., Ste. 100
Cedar Falls, IA 50613
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DOS Based

ACT!—$395
Contact Software International
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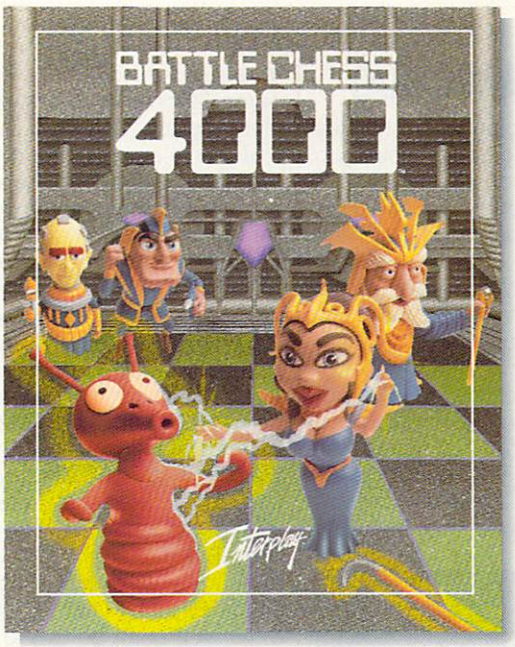

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SHAREPAK

Steve Draper

A DYNAMIC DUO

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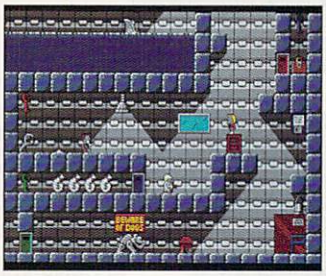
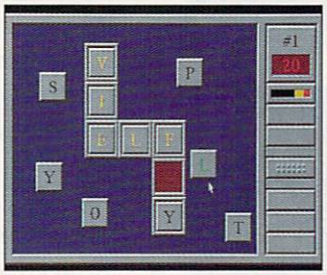


Complete an impossible mission in Secret Agent.



Make words and outscore the opposition with KrisKros.

First, there's Secret Agent, an awesome action-adventure game with full-screen scrolling. Then, there's KrisKros, a word game that quite simply blows other Scrabble-related games away. Both games are guaranteed to challenge everyone in your family and provide hours of fun.

With Compute's SharePak disk, you never have to take the chance of plunking down a large sum of your hard-earned money on a commercial program, only to find out that you're stuck with a piece of software that you'll never use. Shareware authors realize that you don't want to buy a product you've never seen. Would you buy a car without looking it over closely and giving it a test drive? The same principle applies to shareware. You can try the package before deciding whether to buy it. Load it up, kick the tires, and, if you like it, register it. And if there's any reason you're not satisfied with the SharePak disk, just return it for a refund. So whether you're getting the disk for yourself or as a gift, you can't go wrong.

Secret Agent

Secret Agent: The Hunt for Red Rock Rover is a recent production from Apogee Software, one of the top shareware companies today. It's loaded with state-of-the-art features not found in most commercial games. First, there's the graphics. Secret Agent has huge levels with full-screen scrolling , much like those seen in Super Nintendo and Sega games. Other prominent features are multiple save and restore keys, joystick support, and EGA or VGA graphics.

Your mission begins when you parachute onto the island fortress of DVS, the world's most dangerous terrorist organization. You have to recover the stolen blueprints for the ultimate satellite weapon before it's too late. To complete your mission, you will need to knock out the vast security system, bypass dozens of clever and deadly traps, and overcome hundreds of multi-talented guards (such as thugs, ninjas, sharpshooters, knife throwers, and sentries) as well as several different types of attack robots.

Secret Agent runs on any IBM PC or compatible. EGA or VGA graphics and a hard disk are required. A joystick is optional. The registration price is $15.

KrisKros

KrisKros is a unique game for one to four players. Imagine a cross between Scrabble and a crossword puzzle, then sprinkle in liberal doses of strategy and timing, and you've got an idea of what KrisKros is about.

The object of the game is to form words by placing letter tiles on a grid similar to a small crossword puzzle. Scattered around the grid are 12 randomly selected letter tiles. To complete the puzzle, you have to put the tiles on the grid and form words. When you form a word that's in KrisKros's 7000-word dictionary, the letters turn yellow to let you know you have an acceptable combination. If it looks hopeless, you can get new letters anytime, but all the letters are replaced, including any that may already be forming a word.

Each player is given 90 seconds to complete a turn. If you finish the first grid with time to spare, you can try to complete more than one puzzle and get more points. However, if you don't complete the current puzzle before the time expires, then the points awarded for all previous patterns completed on your turn will be lost.

The number of points awarded for completion of each puzzle varies from 10 to 25, depending on the puzzle's difficulty. The winner is the player who reaches 500 points first.

KrisKros runs on any IBM PC or compatible (80286 or faster) with EGA or better graphics. A mouse and hard drive are required. The registration price is $15. ❐

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PRODUCTIVITY CHOICE

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Jan Altman

MICROSOFT EXCEL 4.0

If you thought Microsoft Excel 3.0 just couldn't be any better, hold on to your hat. It is. Better mouse implementation, more shortcuts, and improved presentation features are just a few reasons you'll want to look into this upgrade.

Developers focused on user feedback when they upgraded Excel. Some 80 percent of the requests Microsoft received over its WISH phone line since the release of version 3.0 are fulfilled in Excel 4.0. Many of these improvements center on making user-intensive tasks easier and at times automatic. This is accomplished in part by the mouse.

Not since Word for DOS 5.0 has Microsoft taken such great advantage of the right mouse button, but it was worth the wait. Because of the numerous mouse shortcuts, I pull down menus at least 40 percent less often than before.

Following the lead of WinWord 2.0, Excel now incorporates Drag and Drop. This means you can drag the mouse to move or copy cells. Drag and Drop lets you select any range and drag its border to move it; an outline shows you exactly where to drop it. I can't imagine going through the Clipboard anymore—the chore of cutting and pasting is gone.

Autofill is a shortcut that cuts down on using Edit Fill and Data Series. Every selection now has a fill handle (a small square) in the lower right corner. Drag the fill handle to the right or down to perform an Edit Fill—a rather quick and elegant way to fill a range with formulas.

Use the fill handles to extend a series, too: Drag a cell that says January and create a series of months; drag Monday to create a series of days. If your initial selection is two or more cells with numbers, Excel will calculate the trend and extend the series as you drag. (The fill handle has an ingenious twist: Drag it to the top of a selection to perform an Edit Clear.)

Excel's most common editing and formatting operations have been condensed into new shortcut menus. Point to any cell and click the right mouse button. A small menu pops up with your favorite choices; for example, Cut, Copy, Paste, Clear, Delete, and Insert pop up from the Edit menu. You no longer have to move the mouse off the worksheet to drop down a menu. The right mouse button works on other parts of the screen, also. Row Height and Column Width are added to the above choices when you click on a row or column heading.

Toolbars can be customized and are task oriented.

Excel 4.0 comes with seven built-in toolbars (including one that mimics Excel 3.0's). The standard toolbar is chock-full of goodies, but if your idea of goodies differs from the default, you can easily change them with a couple of clicks and drags. Drag buttons around to change their order. Add another button by picking it from a box and dragging it onto a toolbar. If you add a button into empty space, a new toolbar is created.

A mere click of the right mouse button allows you to show or hide specific toolbars or display the box to customize them. Once you've shown a toolbar, it can be positioned onscreen wherever you drag it or be docked along the screen's edge.

The program includes an intricate set of add-in functions and macros. If you install the whole package, you'll need a scant 11MB of free space. (The minimum required for installation is about 5MB.) These add-ins range from the highly technical (specialized engineering, financial, and sta-

tistical functions) to the simple but useful (Autosave, a custom color palette, a Word-like glossary, and so on). To use an add-in for the first time, pull down Options Add-Ins (the Add-In Manager is launched), select the add-in you want, and wait a few seconds. In most cases, a new command is added to a menu. (I experience a small delay when installing an add-in on my 20-MHz 386SX, but your experience may be different.)

Many of Excel's glossy new features are complex add-in macros. The Crosstab ReportWizard is a handy database-reporting device that gives you a summary or comparison of specific data. Scenario Manager lets you create different what-if scenarios and views of your data in a single file and then print them. You can also create slide-show presentations that include worksheets, charts, and even graphics from other applications. And Worksheet Auditor will report on errors in your worksheet.

Lotus 1-2-3 users will find that Microsoft has gone all out to win them over. Macro Interpreter allows Lotus 1-2-3 users to continue running their old macros unmodified. They can also call Excel macros from within Lotus macros to take advantage of Excel's powerful macro language.

File format compatibility is also worth noting. Excel reads and writes Lotus 1-2-3 WKS, WK1, and WK3 file formats as well as Impress files, FMT, and FM3.

To further help Lotus users make the transition, there's interactive online help that demonstrates how to execute Lotus commands in Excel. And an onscreen tutorial provides hands-on practice for important Excel features.

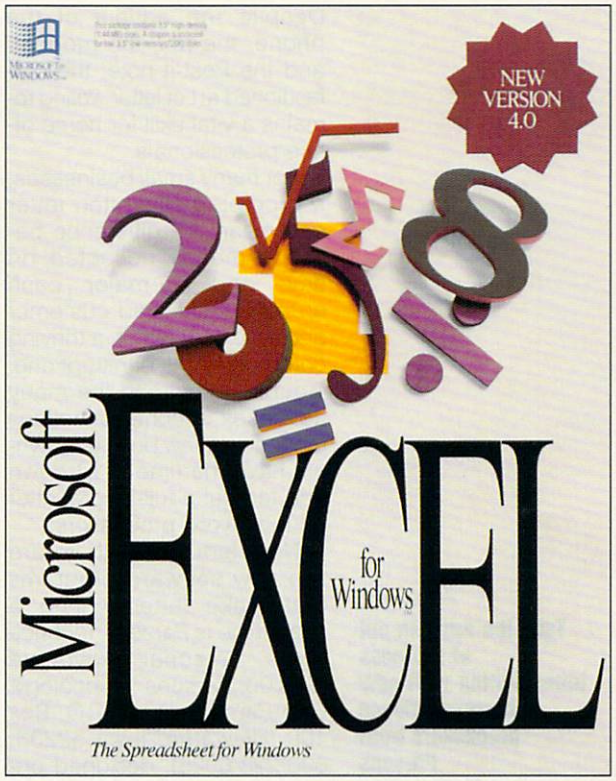
Excel has become much more intuitive; the aforementioned Autofill, shortcut menus, and customizable toolbars attest to this. But there are many other ways in which it keeps a step ahead of you. When you're typing in a function and forget the closing parenthesis, Excel enters it for you. When you create a formula that refers to formatted cells, Excel automatically applies the same number format to the formula. You no longer have to split panes before you freeze them; if you go to Window Freeze Panes, Excel first splits them at the location of the cursor.

Chart creation also requires less thinking, and ChartWizard is great for those unfamiliar with the process. When you're working with a chart, the chart toolbar appears on the screen automatically. Three-dimensional charts can be rotated with a drag of the mouse. And, yes, even charts have shortcut menus.

You'll also see ways in which Excel and Word are becoming more alike. Excel now includes a spelling checker, a glossary, a document comparison function, a zoom factor (you can even fit the selected area onto the page automatically), and the ability to open several files at once. And you have much more control over printing, page layout, and graphic objects.

In spite of it all, I still have a wish list. I wish I could still operate Window Arrange All from the menu (it now requires going into a dialog box). I wish Formula Goto would place a cell in the middle of the screen where I could see it in context (it winds up in the lower right corner). And I wish Microsoft would standardize its shortcuts: This program would be even better if you could double-click on the status bar to get the Goto box (Word does that) or if a little window would pop up and direct you when you drag a scroll box on the scroll bar (Project does that). But these details are so minor that their absence does not in any way detract from the beauty of the program.

Excel is truly a program that lives up to its name. It's simple and elegant, and it puts power into your hands. The more I use it, the more I feel that I'm seeing the software of the future. ❐



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PERSONAL PRODUCTIVITY

Rosalind Resnick

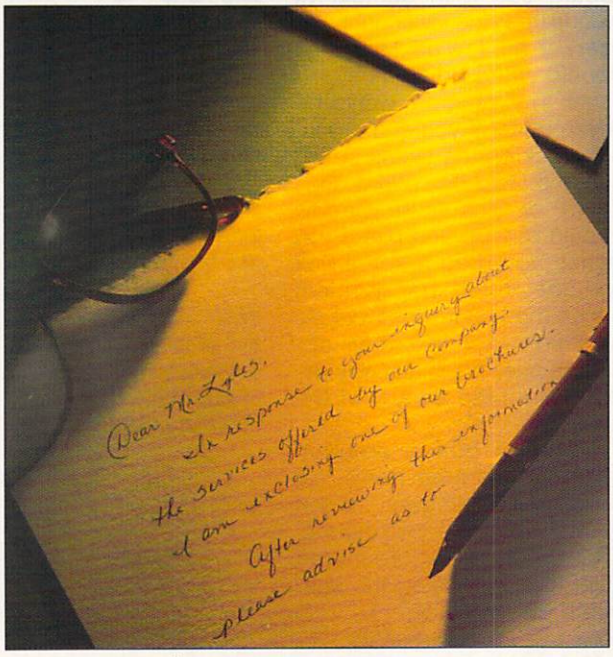
CORRESPONDENCE SCHOOL

Despite the advent of the phone, the fax, the modem, and the Post-it note, the old-fashioned art of letter writing remains a vital skill for home office professionals.

For many small businesses, a prompt, well-written letter can mean the difference between money collected on time and a major cash crunch, a satisfied customer and an ex-customer, a thriving company and a bankrupt one. Trouble is, despite the many advances in communications technology, few business owners have the time to sit down and tap out a full-length letter on their word processors.

Now, fortunately, there are two new software programs that make letter writing a snap. One is Parsons Technology's Personal Advocate ($69.00; Parsons Technology, One Parsons Drive, P.O. Box 100, Hiawatha, Iowa 52233; 800-223-6925), designed primarily with the individual consumer in mind, which churns out everything from complaints to the Better Business Bureau to demands for past-due alimony and child support. Personal Advocate requires an IBM PC compatible computer, hard drive, 512K RAM, DOS v. 2.11 or higher. There's also MyQuickWriter ($24.95; MySoftware Company, 1259 El Camino Real, Suite 167, Menlo Park, California 94025; 415-325-9372), intended for the small-business crowd, that lets users tailor a series of form letters to create their own collection notices, product announcements, thank-you letters, and other correspondence. MyQuickWriter requires an IBM PC compatible computer, 512K RAM, DOS v. 2.0 or higher

Take the anguish out of business letter writing with new correspondence processors from Parsons and MySoftware.



Both programs are quick, easy to learn, and simple to use. Personal Advocate provides interactive templates that prompt users to fill in the blanks; MyQuickWriter lets users edit prewritten form letters. Both programs allow letters to be printed out or saved as ASCII text files for further refinement on the word processor of the user's choice.

Of the two programs, Personal Advocate clearly covers more turf. Aimed at helping consumers cut through red tape to get action, receive information, or just express their views, Personal Advocate is capable of spitting out close to 40 of the most commonly written letters to credit, consumer, and governmental agencies. Personal Advocate also includes an expandable address book database of roughly 2500 names, addresses, and phone numbers of major corporations, Better Business Bureaus, consumer groups, and other organizations across the country.

Also, Personal Advocate goes out of its way to make sure you do things right. Every time a blank space appears in one of the letter templates, a prompt appears at the bottom of the screen to tell you what to do. If you forget to fill in a blank, a help screen pops up, commanding you to go back and insert the missing data. In addition, there's a glossary of legal and technical terms, an expert guide help system, and a shortcut key list, plus special features like mouse support, a math calculator, a notepad, a calendar, and resizable windows. On the other hand, Personal Advocate hogs a lot of disk space—over 3MB.

MyQuickWriter, by contrast, is a more modest program that, for the home office professional, is probably more useful. Though MyQuickWriter lacks an address book, online prompts, mouse support, and a number of other niceties, it takes up only half a megabyte of storage and churns out all the standard business correspondence plus a nifty QuickFax form. MyQuickWriter's letters, while a little less polished than Personal Advocate's, are short, businesslike, and to the point. Especially noteworthy is a series of 30-day, 60-day, and 90-day past-due collection letters, each progressively more threatening.

MyQuickWriter also offers vital editing features, such as a spelling checker, search-and-replace capability, page numbering, autoindent, and a novel formatting feature that instantly converts correspondence into memos, business letters, and five other styles.

At the same time, some of MyQuickWriter's letters are hackneyed. On the other hand, these PC-generated business letters do get the job done and do it fast. After all, 'tis better to have mailed a trite but grammatically correct form letter than never to have mailed at all. ❐

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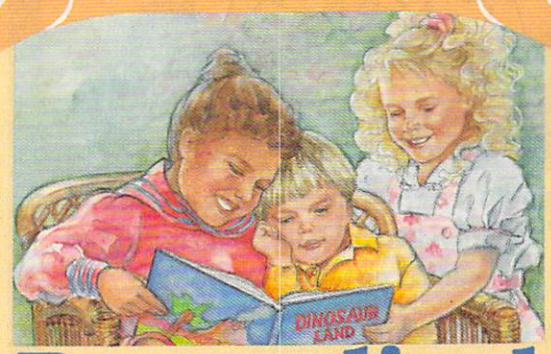

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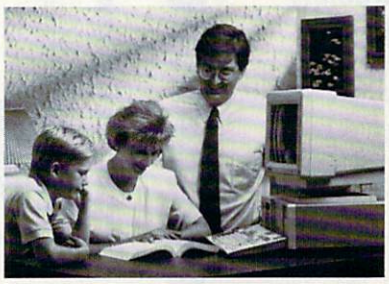

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PALMTOP STRATEGIES

By Rosalind Resnick

Tools to make lives easier and work more efficient or just executive toys? If you think palmtops are too small to do useful work, read on.

Painting by Tim Teebken

Reed Barker, an agricultural researcher for the U.S. Department of Agriculture who works in Corvallis, Oregon, has what some people might consider the world's most boring job.

It used to be much worse—before he bought a palmtop computer.

That's because, as a geneticist, Barker spends much of his time studying plants to gauge the effects of various pesticides. Before he bought his hand-held HP 95LX, this often meant spending four hours at a stretch examining some 4000 plants while his assistant took notes. The handwritten jottings then had to be typed into the desktop computer back at his office, another four-hour chore.

Now that Barker's got a palmtop, his assistant merely enters the numerical ratings into a palmtop-size Lotus 1-2-3 spreadsheet and "dumps" the data into his Macintosh without any retyping. From there, the data can be manipulated quickly and easily.

"I can't do without it," Barker says.

Barker is not alone. These days, everyone from doctors and teachers to airplane pilots and major league pitchers are using palmtop computers to manage their business and professional activities. Nearly 400,000 palmtops were shipped worldwide in 1990, mostly in Japan, according to Dataquest, the market research firm. By 1994, palmtop sales are expected to top 5.2 million units.

A Computer for Every Pocket

Unlike larger portables such as laptops and notebooks, a palmtop typically weighs in at a pound or less, runs on AA batteries that last for weeks, and can be purchased for as little as a few hundred dollars. Many business users, such as sales managers and real-estate brokers, use palmtops to gather data in the field for later transmission to desktops; a few palmtop enthusiasts have junked their desktop computers altogether, making palmtops their main machines.

Nanci Williams, for one. Williams, who runs a home-based public relations firm in San Jose, California, needed a computer to take with her as she traveled to clients' offices throughout the Bay Area. Scrapping the idea of buying a laptop after finding out how heavy they were to lug around, Williams opted for a palmtop. Four years ago, she bought a Poqet PC.

"The Poqet literally just slipped into my briefcase," Williams says.

About a year ago, Williams got divorced. Her husband got the couple's desktop computer; Williams got the palmtop and the printer. Replacing the desktop, she says, is not a priority. With her Poqet, she can take notes, write press releases, track billings, store contact names and addresses, even keep her calendar.

The only problem, she says, is convincing skeptical clients to accept it.

"Nobody believes that this thing I carry around with me is actually a computer," Williams says. "They tell me, 'I want you to do my job on a real computer.'"

Not a Toy

Kyle Shannon, a graphic artist and aspiring screenwriter who lives in New York and uses a Poqet to jot down notes for his scripts, says "It looks like a toy. People don't realize that something this small could be this powerful."

Clearly, palmtop computers have come a long way. Ten years ago, Hewlett-Packard—the maker of the HP 95LX—introduced one of the first hand-held computers, the HP 75C. Weighing in at 26 ounces and powered by a rechargeable ni-cad battery that could operate for only 30 hours, it featured a 32-character display; a proprietary operating system; and 16K RAM. The price: nearly $1,000.

Today's palmtops are full-featured DOS-compatible computers that, with the exception of Poqet's top-of-the-line PoqetCom (formerly called the Poqet Communicating Computer), cost far less. The HP 95LX, for example, offers built-in software such as the popular Lotus 1-2-3 spreadsheet program, an appointment book with alarms, a world time clock, a phone book, a memo editor, data-communications software, a file manager, and an advanced financial calculator that operates in either algebraic or reverse Polish notation. One-key access allows users to launch applications instantly and move among them without losing their place.

Getting in Touch

Like larger portables, palmtops are gaining the ability to communicate with computers in remote locations, enabling business and professional users to scan E-mail, send faxes, and search online databases. The PoqetCom, which retails for $4,995, includes communications software, a 9600-baud fax/modem, and serial and parallel ports. For wireless communications via the ARDIS network (a radio network analogous to cellular telephone technology), the PoqetCom even has a built-in radio. A WorldPort 2400 Modem with a serial adapter or cable is available for $250 to $260 for other Poqet models.

More and more palmtop software is becoming available, too. Besides the Lotus 1-2-3 spreadsheet program that comes bundled with the machine, the HP 95LX offers customized applications for doctors, pilots, sales reps, and other business and professional users. The FX-7 Flight Pak from Paragon Technologies, for example, provides pilots with a comprehensive set of flight-planning tools. CM Software's Pocket Salesforce is a contact management program that allows users to enter company records, sales leads, and other marketing information into a portable database. And Computer Books' Patient Management software lets physicians keep track of their patients' medical histories, medications, and lab results.

For the Atari Portfolio, another palmtop, Pulse Metric's Dynapulse program offers a computerized blood-pressure and pulse-rate measuring system. Features include systolic, diastolic, mean arterial pressure, and pulse rate measurements with clinical-graded accuracy. Essex Marketing Services offers UTIL, an interactive FORTH programming system designed to run on the Portfolio.

But today's palmtop market is not limited to DOS compatibles alone. There's also a thriving market for hand-held electronic organizers, such as Sharp's Wizard. LINK Resources, a New York–based consulting firm, estimates that 13.4 percent of U.S. households own an electronic organizer and that the number is expected to rise.

Calendar Computer

Though electronic organizers can't run PC software, they do provide basic personal information tools such as an appointment book, phone book, notepad, and calculator. Many also offer add-in software available on proprietary integrated circuit cards. Communications links are available, too. Sharp recently unveiled its OZ-8B02 Organizer Fax/Modem, a 4800-baud pocket fax/300-baud modem that gives the Wizard standard terminal and send-only fax capabilities. This means that Wizard users can now send and receive messages through virtually all E-mail systems, including AT&T Easy Link, U.S. Sprint SprintMail, MCI Mail, CompuServe, and GEnie.

The uses people have found for their Wizard organizers are as varied as the people who buy them. Relief pitcher Rob Murphy of the Seattle Mariners has compiled a pocket database of hitters in the American League. Each batter's name is stored alphabetically along with the hitter's style and other notes. To track his effectiveness, Murphy also records the pitches that he throws, the first and

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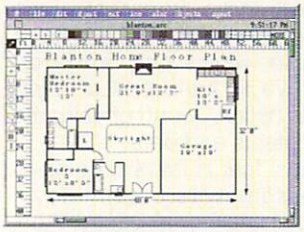

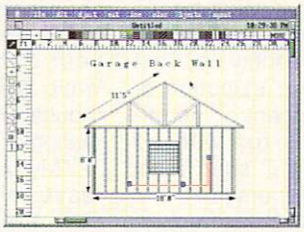

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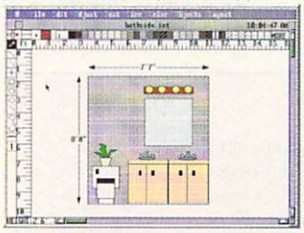

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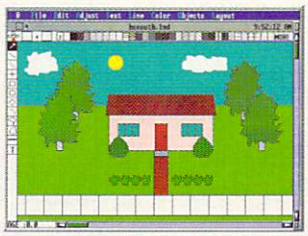

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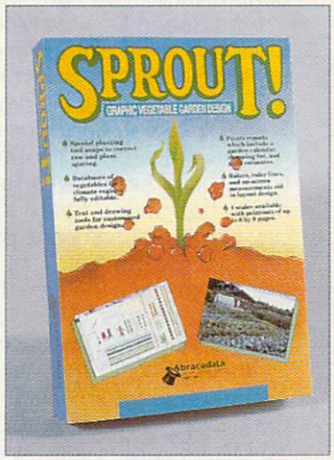

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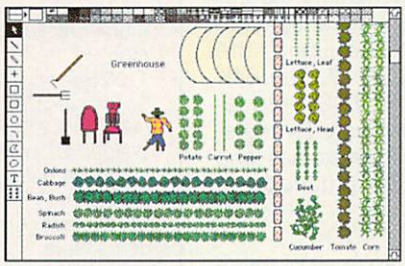

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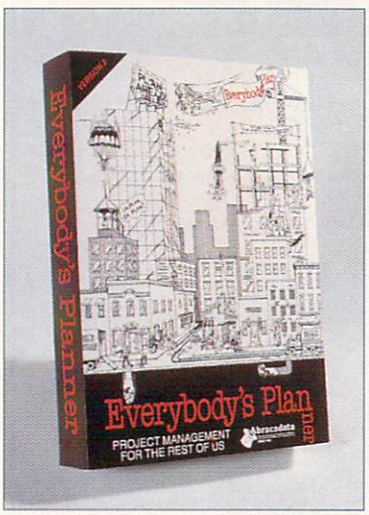

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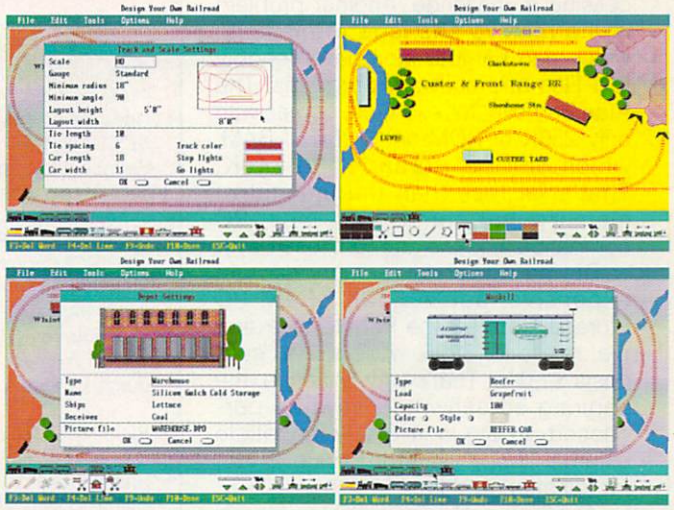

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last pitch of each at bat, and the result. Likewise, Fordham University rowing coach Ted Bonanno of Bronx, New York, uses the Wizard to track the performance of his oarsmen.

And Robert Dunn, a Mountain View, California, writer of children's books, uses the Wizard to collect his thoughts and ideas, boosting his productivity.

"While I keep daily working hours, a writer is writing and thinking all of the time," Dunn says. "What truly amazes me is how much time I spend each day waiting for someone or something beyond my control. I've composed many of my best four-line rhymes while waiting in doctors' offices, post offices, airports, and even traffic jams."

In addition to the Wizard, Sharp also markets the PC-3000, featuring a CGA 640 × 200 pixel LCD screen, a 10-MHz 80C88A processor, 1MB of RAM, and 1MB of ROM. It can be connected to a 3½-inch disk drive, but its principal storage is on memory cards.

Zenith Data Systems recently introduced two pocket organizers, the ZDS-106 and the ZDS-112. The 64K ZDS-106 and the 128K ZDS 112 feature equipment and software for transferring files to a PC. And Casio has long manufactured its B.O.S.S. organizer.

Limited Resources

Despite the many advantages of palmtops, however, users say that they still have a long way to go. One drawback is the tiny keyboard and display screen, which can make word processing a challenge. Another problem is the relative shortage of memory, which can hamper storage of lengthy text files and software programs. The Atari Portfolio, for example, comes with only 256K of ROM and 128K of RAM, which can be expanded to 640K. That's far less than the amount of memory that comes with most PC compatibles on the market these days.

Buying additional memory can get expensive fast. A 512K SRAM PC Storage Card for the Poqet, for example, retails for $295, while a 2MB card costs $1,095. That's why Shannon, the aspiring screenwriter, says he purchased an 3½-inch DOS-compatible external floppy drive (list price, $495) for transferring data.

Another problem is the relatively slim selection of compatible software. Palmtops are too small to run conventional 5¼-inch and 3½-inch floppy disks and require software applications burned into tiny ROM cards. Even using the external floppy drive mentioned above, users would have trouble using most DOS applications on a palmtop primarily because of its small screen size. Another problem is that some palmtops automatically shut down the microprocessor between keystrokes to prolong battery life. This can cause some conventional programs to terminate or make mistakes. Lucy Honig, a Hewlett-Packard spokesperson, says that software loaded into the HP 95LX must be XT compatible and warns that some graphics displays won't show up. That still leaves a fairly large selection of software. "About 85 percent of the off-the-shelf software will run with no problem on the Poqet," says Matt Schmist, a Poqet spokesperson.

Barker, the agricultural researcher, notes that his HP 95LX runs only Lotus 1-2-3 and not the Microsoft Excel spreadsheet program he uses on his desktop Macintosh. This has forced him to master both software programs. Shannon, for his part, says he's currently beta-testing an interactive scriptwriting program for a software company that he hopes will one day come out with a version for the Poqet. Ironically, the biggest problem with palmtops may be their small size. Unlike a laptop computer, palmtops are as easy to leave on a customer's desk as a pair of sunglasses. Lose your palmtop, users say, and you wave goodbye to hundreds or even thousands of dollars' worth of valuable customer contacts and data.

"My biggest fear is that I'm going to leave mine somewhere someday," says Williams, the home-based marketing consultant. "I'm surprised I haven't done that already."

Even so, say the palmtop enthusiasts, once you've experienced the freedom of truly portable computing, there's no going back to the desktop grind. ❑

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Three AA batteries last six to eight weeks.
System commands are MS-DOS 2.11 compatible.
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128K RAM expandable to 640K
QWERTY keyboard with embedded numeric keypad

HP 95LX—$699.00
Hewlett-Packard
Corvallis Division
1000 NE Circle Blvd.
Corvallis, OR 97330
(800) 443-1254
Weighs 11 ounces
Two AA batteries last up to two months in normal use.
MS-DOS ROM 3.22
1MB ROM containing applications software
512K RAM (HP 95LX with 1MB RAM available for $799.00)
QWERTY keyboard with separate numeric keypad

PC-3000—$999.99
Sharp Electronics
Sharp Plaza
Mahwah, NJ 07430
(800) 237-4277
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MS-DOS 3.3
1MB ROM
1MB RAM
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Poqet PC Classic—$1,095.00
PoqetCom—$4,995.00
Fujitsu Personal Systems
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Wizard OZ-8200—$399.99
Wizard OZ-8600—$499.99
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Mahwah, NJ 07430
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Buffalo Grove, IL 60089
(800) 227-3360
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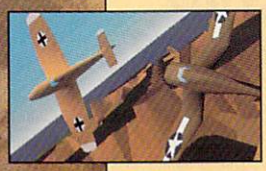

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ART WORKS

Robert Bixby

TWO IMPORTANT DESKTOP ADVANCES

The pace of advance in computer software quickens all the time. Once you could count on a piece of software's remaining current for 18 months to two years with minor updates to add a feature, clean up a bug, and so forth. But lately, less than a year goes by between major upgrades of some software. You can thank the intense competition for market share, the advances in programming and hardware that make more features possible, and the conventional wisdom that anything new is better than anything old.

Two new products are now out for desktop publishing—Ami Pro 3.0 and CorelDRAW! 3.0. Since I've had the privilege of working with the betas and writing about each of these products, I'd like to introduce some of their most important improvements to you.

It's good news for desktop publishers: CorelDRAW! and Ami Pro both turn three.

Ami Pro has added a slew of new macros, a grammar checker, drag-and-drop editing, newly designed icons, and dozens of smaller convenience features. For example, the SmartIcon option is much more logical than in the previous version and even includes a tiny paint program so you can edit your icons and create new ones.

You can view files without opening them, making it easier to locate the specific file you want to work on.

The Ami Pro File menu will show the last four files accessed so you can load them instantly by clicking on their names in the File menu. It now prints envelopes with a special menu option.

A Clean Screen option eliminates all the distracting little Windows doodads like menu bars and scroll bars, allowing you to work with Ami Pro more as you would work with a traditional DOS word processor while retaining the advantages of WYSIWYG. Don't worry, though, the menus are an Alt-key combination away. Most touch-typists hate accessing menus via the mouse, anyway. If you want to retain some part of the Windows display during Clean Screen, Lotus has allowed for that, too.

The right mouse button has been provided with new powers. Right-clicking on a paragraph will call up the Modify Style dialog box, and right-clicking on a frame will call up the Modify Frame dialog box. Ami Pro 3.0 is full of little improvements that make writing even more effortless while making Ami Pro even more powerful than last year's winner of the COMPUTE Choice award for best word-processing program: Ami Pro 2.0.

CorelDRAW! is the graphics success story of the Windows age. CorelDRAW! 2.0 was a significant advance over 1.2 about a year ago. But CorelDRAW! 3.0 is literally in a league by itself. It's one of the best drawing programs available, with better text handling than before and a more standard drawing interface (no more side-by-side wireframe and preview—now there's only one window, in which you can elect to see wireframe or preview). Extrude has taken a quantum leap, allowing you to shade all sides of an extruded object and allowing for a positionable light source. The extruded object can be rotated in three dimensions. But there's even bigger news.

First, WFNBOSS is history. CorelDRAW! now works with TrueType fonts, eliminating the need for font conversion.

CorelPHOTO-PAINT! is a powerful paint program capable of performing darkroom-like magic on scanned grayscale or color photographs. It includes image-editing features like contrast, edge sharpening, and posterizing. You can fill shapes with gradients and patterns, or clone images from one location to another.

If you're considering one of the powerful graphing and charting programs for business use, consider CorelDRAW!. It now comes with CorelCHART! to generate bar, pie, and area charts; histograms; scattergrams; and many other kinds of charts, including several kinds of shaded 3-D graphs.

Once you have your charts created, you might want to put them into a presentation. If so, Corel has provided CorelSHOW!, an extremely simple presentation program that makes displaying your charts and CorelDRAW! drawings a snap. It's the easiest presentation package I've seen yet. And not only will it show drawings from its sister applications, but it has a special button that allows you to import documents, graphics, animation, or sounds from other Windows applications. ❐

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PATHWAYS

Steven Anzovin

ASIMOV ON DISK

I met the late Isaac Asimov more than 20 years ago, when he came to give a talk at a local college on "The Future of the Earth." Most of the audience, including me, came to hear him because he was a famous SF writer. His film, the cult classic *Fantastic Voyage,* had been released only a year or so before, but he was already one of the most prolific and popular nonfiction authors of all time, with more than 100 books to his credit. (His life total was just under 500 volumes, on nearly every subject imaginable, from the Bible to biochemistry to dirty limericks.) Asimov, sporting the muttonchop whiskers that became his trademark, was witty and ebullient, though he didn't have anything particularly hopeful to say about the fate of the world. No small talk for Asimov: "If our technical civilization destroys itself, as is not unlikely," he remarked heartily to me, "the survivors will not be able to rebuild it, because most of the metal ores will already have been mined from the earth." Still, I came away with the idea that if Asimov thought it was worthwhile to keep on writing, there must be reason to hope.

Author Isaac Asimov maintained his distance from computers, but Knowledge Adventure was able to put his talents to use in Science Adventure.

His death last April at the age of 72 reminded me that Isaac Asimov, by the sheer weight and quality of his output, did more than anyone else to raise the level of science awareness in this country. Carl Sagan called him "a natural resource, a Renaissance man born out of his time—thank God." And I'll wager that most of today's computer developers were inspired to think about thinking machines by his famous robot stories. After all, it's Asimov's robots, with their deceptively simple rules of moral conduct, that today's roboticists dream of building. In fact, Joseph Engelberger, who with George Devol was the first commercial developer of robots in the U.S., was inspired to enter the field by reading Asimov's *I, Robot.*

Oddly enough, Asimov never wrote a book about computers. In fact, this compulsive writer apparently didn't have much use for computers at all. By his own account, Asimov drafted all his tens of millions of words not on a word processor but on a typewriter. Asimov knew exactly what he wanted to say, and he said it right the first time.

Interestingly, in his 1953 novel, *Second Foundation,* Asimov does describe a distinctly Mac-like portable word processor owned by the book's teenage heroine, Arkady Darell, who lives in the far future. She's thrilled because her father has bought her a model that prints in a flowery, violet-inked script that's perfect for her galactic-history term paper. Even more exciting, she doesn't need to type any longer, because this new model understands and accurately transcribes human speech. Asimov appears to have been the first to predict that practical speech recognition would require another 50,000 years of development.

While Asimov didn't write much about computers, shortly before his death he did lend his efforts to an educational software program about the history of science called Science Adventure (published by Knowledge Adventure, 4502 Dyer Street, La Crescenta, California 91214; 818-542-4200; $79.95). Science Adventure, like its popular sibling Knowledge Adventure, is an interactive multimedia reference tool and game that encourages curious students to wander through a body of knowledge by pointing and clicking. The program looks handsome, with a clever and responsive interface, many striking 256-color VGA pictures, and some cool digitized sounds, but its biggest asset is the onscreen text, adapted from the 1989 book *Asimov's Chronology of Science and Discovery.*

A couple of the good things about Asimov's science writing is that he doesn't offer perfectly neutral informational prose and that he doesn't suffer fools, even brilliant fools, gladly. In the entry for Darwin, for example, he lets us know that Darwin was "naive" for believing his work on the origin of species was so self-evident that everyone would agree with him. And he notes that the seventeenth-century battle royal between Isaac Newton and Wilhelm Gottfried Leibniz over who invented calculus "poisoned the scientific community" to the detriment of everyone. That's the kind of valuable detail we've learned to expect from Asimov. ❐

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Peter Scisco

ORBITS

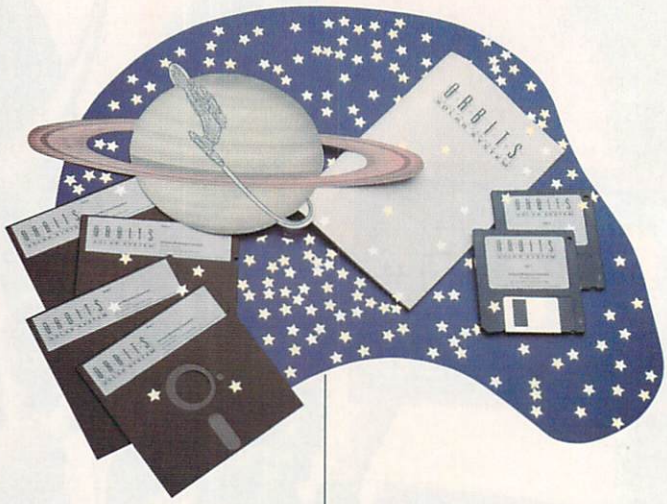
Outer space may be considered the final frontier in the popular imagination, but in the context of the celestial universe, there's nothing final about it. The universe may or may not have enough mass to sustain itself; it may or may not at some point begin a slow collapse into nothingness. What we know about the cosmos is dwarfed by the very subject we study.

Orbits helps amateur cosmologists understand the dynamics of the universe by bringing the final frontier into our own backyard. Rather than casting its eye outward to the stars, Orbits limits its study to the solar system of which our earth is part. This family of planets, circling a medium-sized star, serves as a fine introductory point to the study of astronomy.

The program's design is clean, simple, and easily navigated. Small touches, like using a tiny space shuttle as a cursor, create a feeling of adventure and fun. The promise of adventure makes it easier to approach the complex workings of the solar system and its planets.

In general terms, the program is divided into animated displays that describe the solar system, written explanations, and a series of "games" (orbital simulations and a jigsaw puzzle) that allow the user to experiment with the gravitational laws that control orbits and reconstruct jumbled pictures of space objects.

The descriptive parts of the program are listed at the top of the animated main menu screen. Here, our solar system is divided into its main components: sun, earth, moon, and planets. You can choose to have the screen animated or not. The animation consists of colored bands, or rings, that define the orbits of the planets around the sun and their relative position to each other as seen from a perspective just above the plane of the solar system. The General menu includes such topics as gravity and the motions of planets; it offers a path into the study of orbital mechanics. In addition to selecting from the pull-down menus, users can move the cursor over any of the solar system bodies to gain access to information about a particular planet or celestial body.



If Orbits concerned itself only with pretty pictures and animated display, its usefulness would be short-lived. But the information that accompanies the still pictures and animations is accurate and presented in a manner appealing to beginning astronomers of any age. The program makes use of authoritative sources for both its explanations and its graphic displays. These sources include NASA and the Jet Propulsion Laboratory at the California Institute of Technology in Pasadena, California.

The blend of graphic displays and explanatory notes is seamless and graceful. For example, if you're interested in the earth's moon, you can explore lunar features, study the moon's internal structure, and compare the moon to other bodies in the solar system. Each of these selections, or paths, branches to more specific areas of study.

A student interested in lunar features could explore maria (the dark plains created by ancient lava flows), craters, rays (bright streaks emanating from craters, believed to be composed of rock and dust thrown up at the time of impact), atmosphere, and such lesser features as lunar mountains and the steep crevasses called rills.

Every planet is covered in the same way, as are asteroids, comets, and the sun. Each discussion includes the subject's distinct characteristics and offers pictures and animations that explain the ideas behind the words.

But, as Einstein might say, all of these voyages of discovery are relative. An eager student may journey into the core of the moon or explore the atmosphere of Jupiter. But what can be made of the facts encountered? Orbits boosts the process of discovery by allowing users to compare planetary descriptions side by side. The juxtaposition of facts and pictures creates a basis of comparison that helps users envision the facts and details that describe the solar system.

A parent using this program with a child, for example, might compare the structure of Mars with the structure of the earth to illustrate the similarities of the two. Or a student studying the earth's moon might compare that body with the earth and discover enough similarities to fuel a school report.

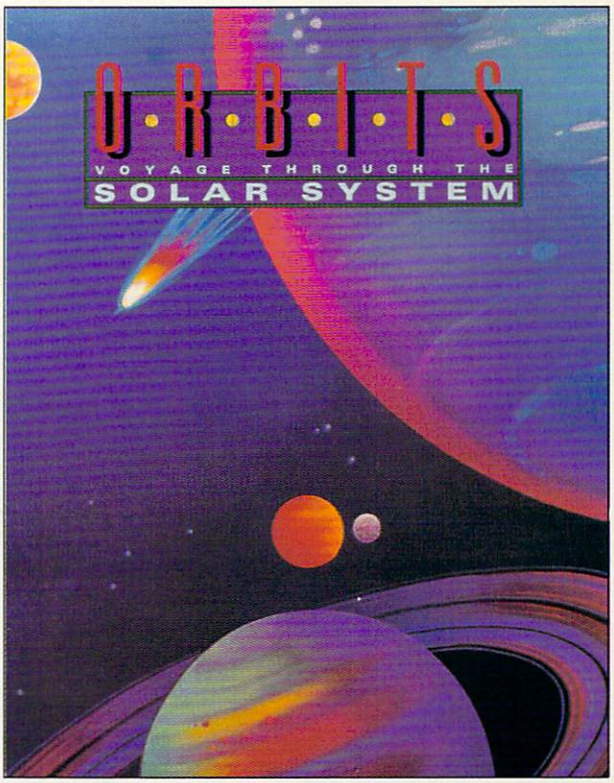
Once you've studied the major planets and other bodies that constitute our solar system, you can begin a journey into the physics and phenomena that play a role in our tiny corner of the galaxy. Detailed and animated explanations for eclipses, phases of the moon, gravitational attraction, and orbital mechanics make it easy to understand the dynamics behind them.

For example, eclipses both lunar and solar are displayed in a split-screen fashion that makes the alignment of the earth, moon, and sun understandable. The top part of the screen is from a perspective outside the earth's orbit; you can see the moon revolving around the earth and how it crosses between the sun and the earth, blocking the light (solar eclipse). At the bottom of the screen, the view is from the earth, looking toward the sun. You can see the shadow of the moon as it passes over the sun and compare that to the position of the moon, sun, and earth as displayed above.

Likewise, the relationship between the sun, moon, and earth as it affects the phases of the moon is made clear through another well-presented bit of animation. Although an astronomy hobbyist could do the same on paper by observing the position of the moon throughout a full cycle and by sketching the moon's phases at separate stages of the cycle, the animated display in Orbits provides more instant recognition.

Orbits provides more than information and tools for understanding; it also includes an extremely challenging orbital simulator. To gain entry to this part of the program, select the Other menu and then select Orbital Mechanics. From here you can brush up on Kepler's Laws (you probably remember all of those) and see the importance of Kepler's mathematical theories to the study of our solar system.

With a clear understanding of orbital mechanics (or with at least a hearty sense of adventure), you can choose to play Orbit-Trek, which tests your knowledge under different conditions. You may select from four different missions: Near Earth, which is a good shakedown cruise for your newly acquired skills; Deploy, which requires that you reach and maintain a specific orbit and then launch a satellite; Intercept, which requires that you capture an orbiting satellite; and Rendezvous, which tests your ability to match orbits with a second satellite and fly in formation.



The Orbit-Trek games employ a control panel from which you select the direction and strength of your navigational thrusters. Early experimentation with the game sometimes results in a fifth scenario, which could be called Lost in Space. Just for fun, see how far you can drift from the earth before you reach the point of no return.

With its combination of authoritative explanations and well-designed graphic displays, Orbits is a very good computer-based introduction to our nearest heavenly neighbors. By illustrating the workings of the family of planets we call the solar system, Orbits lays the groundwork for a continuing mission. ❐

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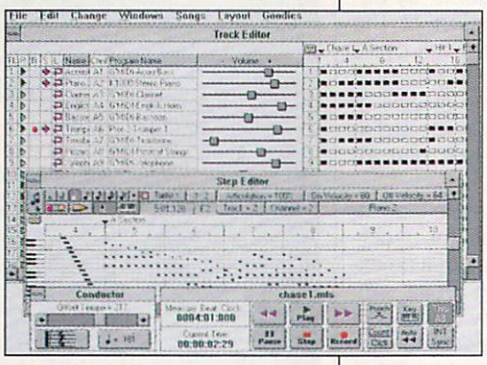
David English

WINDOWS GOES MIDI

I confess. Until recently, I did almost all my MIDI work on a Macintosh. It wasn't really my fault. I just couldn't find programs on the PC that were as powerful and easy to use as Opcode's Vision and Mark of the Unicorn's Performer—both available only on the Mac. Fortunately, that's beginning to change. Two new Windows-based MIDI sequencing programs have made making music on the PC just as much fun as it is on the Mac.



Master Tracks Pro 4.5 features a new easier-to-use Track Sheet.

You may be wondering, What is MIDI, and what is a sequencing program? MIDI stands for Musical Instrument Digital Interface. It's a communications standard that allows electronic musical instruments to talk to computers and to each other. Most electronic keyboards have a MIDI interface built in, and most sound cards (including the popular Sound Blaster and Pro Audio Spectrum cards) come with a MIDI interface or offer one as an option. If you're running Windows 3.1 or Windows 3.0 with the multimedia extensions, you're ready for the flood of Windows-based MIDI programs.

A sequencing program is a sort of elaborate tape recorder that records and plays back MIDI music. It doesn't actually record sounds; instead, it records the various on and off positions of the keyboard's keys as you play, along with the force that you use to strike each key (the harder you strike a key, the louder it sounds) and the time that passes between each note. Taken together, this is enough information to play back a nearly identical performance when used with the same or a similar musical instrument.

Because a sequencing program records a limited amount of information when compared to a full audio recording, MIDI is especially appropriate for multimedia applications and presentations. Where a typical audio recording might take up 10MB when recorded in 16-bit stereo, that same music, stored as a MIDI performance, would take up less than 100K. And because you can use a sequencing program to edit MIDI data much as you would use a word processor to edit words and sentences, you can easily alter the music to fit your needs.

Either of these new sequencing programs would suit the needs of a professional musician, weekend composer, or multimedia artist. The first, Cakewalk Professional for Windows (Twelve Tone Systems, P.O. Box 760, Watertown, Massachusetts 02272; 800-234-1171; $349), has a number of exciting features, most notably the ability to mix real audio data (in WAV format) with MIDI sequences. You can use the program with Windows' Media Control Interface (MCI) to control other multimedia devices during playback. In addition to the usual piano-roll and event-list notation of MIDI notes, this latest version of Cakewalk lets you view and edit your notes in staff notation—the kind you see with traditional sheet music. The program even includes its own built-in programming language and sample programs, so you can write your own editing commands.

While Cakewalk is new to Windows, Master Tracks Pro 4.5 for Windows (Passport Designs, 100 Stone Pine Road, Half Moon Bay, California 94019; 415-726-0280; $395) is a substantial upgrade to the very first MIDI sequencing program for MPCs (Multimedia PCs). New features include the ability to perform many editing functions while the music is playing, an easier-to-use Track Sheet (song and track information are now in one area), and recordable volume faders. The program has special support for the Miracle Piano Teaching System, allowing you to hook up your Miracle keyboard to your computer's serial or MIDI interface. And while Master Tracks doesn't offer staff notation, you can export your files to either of Passport's notation programs, Encore for Windows ($595) and MusicTime for Windows ($249). A stripped-down version of Master Tracks, called Trax for Windows, is also available from Passport. At $99, it's one of the best bargains in music software and a great way to get started with MIDI.

I tried both programs with a MultiSound board, a Sound Canvas, and a Miracle keyboard, and had no problems at all. These are highly sophisticated programs that are surprisingly easy to use. If you've wanted to make music with MIDI, and you're looking for a program that you won't easily outgrow, you can't go wrong with either program. ❐

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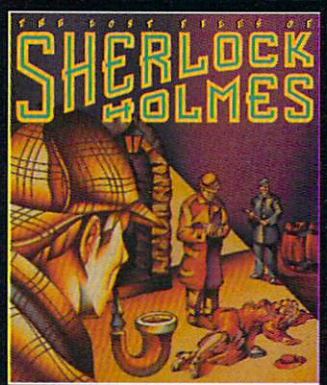

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Scott A. May

ACES OF THE PACIFIC

For two hours on December 7, 1941, the skies cracked and rained terror upon the Hawaiian island of Oahu. The Japanese Navy's surprise attack on Pearl Harbor left more than 2400 military and civilian casualties. Dive bombers and torpedo planes destroyed or badly damaged more than 300 aircraft and 18 ships of the U.S. Pacific Fleet. A stunned nation officially entered World War II.

It's easy to say what you would've done had you been there to fight; now, with Aces of the Pacific, you can put your money where your mouth is. An incredible air combat simulation, Aces may be too realistic for the faint of heart. The vintage bombers are meticulously rendered, complete with sometimes unpredictable power and inherent design flaws. Computer-controlled pilots seem to have real-life intelligence and intuition. And the graphics and sound effects will make you think you've actually stepped back in time and entered the scene you see onscreen.

Aces salutes the historic events, budding technology, and heroism of this unique theater of conflict. Designed by Dynamix cofounder Damon Slye, Aces soars above and beyond his best-selling World War I combat simulation, Red Baron. Indeed, this tribute to the Pacific campaigns captures the passion and spirit of a generation better than any previous effort in the genre.

The true stars of the show are the more than 30 types of vintage fighters and bombers, each with distinctive flight characteristics painstakingly reproduced here. Some will amaze you with their innovative craftsmanship and intuitive control; others will ultimately scare the wits out of you with their untamed power and intrinsic design flaws.

First-time flyers should complete the game's comprehensive training missions. Here, you can learn the intricacies of each aircraft and fine-tune techniques like dive bombing and carrier landings. Many such tests of skill and courage have never before been realistically implemented in a computer simulation.

Veteran pilots eager to see action can choose from ten types of single missions. Match wits with a famous ace or learn team effort as you direct a squadron against your enemy counterparts. As in Red Baron, the designers simulated real-life combat intelligence for all computer-controlled pilots. The results are some of the most entertaining, heart-pounding aerial ballets ever to grace the computer screen.

Players can also choose from a variety of individual historic missions or embark on a career campaign. Among the game's many preflight variables is the ability to choose which side and branch of service to fly for: the U.S. (Navy, Marines, or Army Air Force) or Japan (Navy or Air Force). This decision immediately limits or expands your courses of action and available aircraft. For example, become a U.S. Navy flier and choose from 33 missions divided among five historic campaigns. Likewise, the game includes seven campaigns (24 missions) for Japanese Navy pilots.

Historic missions cover the entire spectrum of the war. The choices are as historically rich and varied as they are challenging. Do well, and receive service medals and special commendations.

Other single missions test your ability to complete specific combat objectives: combat air patrol, fighter sweeps, emergency scramble, bomber escort, bomber interception, strikes against shipping and ground attacks. Multiply each by more than two dozen

user-defined mission conditions, and play value soars to staggering heights. The number of pilots on either side, their skill level, and their aircraft may be changed. Three levels of overall realism include such fine points as gun jams, changing weather, and midair collisions. There are also three levels of combat difficulty and flight-model realism.

Graphics consist of textured solid-fill polygons and bitmapped overlays, beautifully rendered from a 256-color VGA palette. Although the visuals break no new ground in the genre, they are clean, bright, and fast—by far the best of any Dynamix simulation. You'll need at least a 386-based computer running at 25 MHz to enjoy the sophisticated flight mechanics and full graphic splendor. Users can tweak the frame rate, as well as world and aircraft detail, if the simulation runs too slowly.

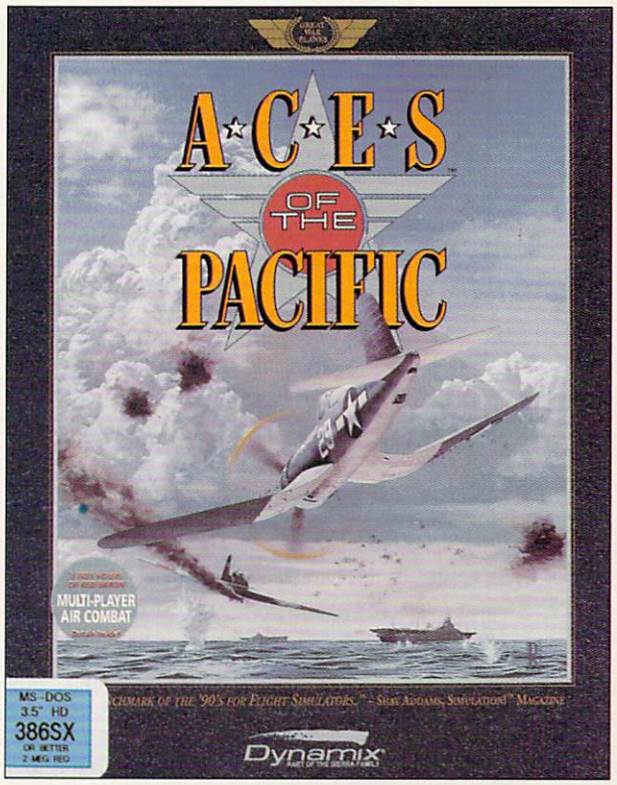
Steep hardware requirements pay off with generous special effects, like the bubbling path of a torpedo or the splash of bullets strafing the water. Views of cockpits boast a digitized quality, while external views feature dramatic light-and-shadow effects. Sound effects are also vivid, from the whines peculiar to different models of radial engines to the remarkable Doppler shifts of passing aircraft. Explosions, however, could use a little more oomph to match the brilliant pyrotechnics.

The game can be played with keyboard or mouse, although a joystick offers the best response and most realistic feel. The simulation also supports a second joystick for rudder control and for flight-specific devices such as yoke, rudder pedals, and the Thrustmaster Flight Control System. Dynamix's joystick routines have significantly improved since Red Baron and A-10 Tank Killer, but they still tend to slip out of calibration easily. The designers should put this problem near the top of their list of things to fix in their next project.

Blemishes are few but noticeable. The handsomely illustrated 233-page manual, faultless in its details of war history, aircraft specifications, and combat tactics, falls short when describing actual gameplay. As if written too far in advance of the final release, the manual virtually omits discussion of the mission scenarios. Too bad, since onscreen preflight instructions are limited to short, vague descriptions. Ironically, one source of valuable information—reconnaissance data gathered from the navigation flight map—is mentioned in the manual but is not present in the actual game.

Initial releases of Aces had some annoying bugs, as well as some poorly though-out features. Dynamix has been very receptive to user feedback and bug reports and has released a series of patch files that fix reported bugs and add some new features, such as changeable waypoints. These patches are available on online networks and the Sierra BBS.

No air combat simulation is complete without a mission recorder, and Dynamix provides one of the best. The playback screen uses VCR-style controls to rewind, pause, single-frame advance and fast-forward. The recorder's only shortcoming is its lack of incremental rewind; miss an important moment, and the tape must be replayed from the beginning. Editing controls let you move and rotate the camera in three dimensions, and you can switch between friend, foe, or independent views. Use this feature to confirm kills, study mistakes, and watch attacks from any angle. Because each change in camera movement and perspective can be saved to tape, would-be directors can use this feature to create intricate combat films. A special demo function will even play such films full-frame, without the VCR overlay.



Breathtaking in scope and great fun to play, Aces of the Pacific might be the most widely appealing combat simulator on the market. You won't want to miss this one. ❐

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GAMEPLAY

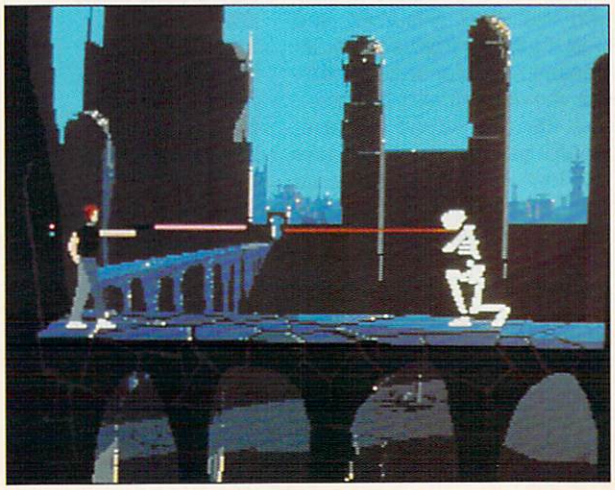
David Sears

CINEMA INFERNO

Computer industry commentators often compare adventure games to films, but most contemporary games resemble good films no more than modern films resemble *The Great Train Robbery*. Pretty pictures and droopy animation don't make great cinema, and it's time we became more critical of B-movie videogames—games that don't fulfill the computer's potential for action and involvement.

Out of this World (Interplay) is a prime example of just how filmic a game can be. Bucking the trend of large design teams, Eric Chahi, who is artist, designer, and programmer, hurls players into a surrealistic other world while maintaining extreme playability. Inspired by the world's first laser disc–based game, Dragon's Lair, but possessing the critical eye of a director, Chahi saw through the glitz and into the heart of that game's prime failure: It offers little interactivity. Push the joystick forward, pull it back—the laser disc driver shows you what happens next. There are no alternate paths to save the princess; a single mistake means annihilation. In Chahi's alternative world, players interact with the environment as they work to return to Earth. There are no seams between scenes here, no annoying dropouts as disk drives struggle to load megabytes of graphics data. This fluidly animated marvel requires only 1.5MB of your hard drive.

Artist, designer, and programmer Eric Chahi hurls players into a surrealistic other world while maintaining extreme playability in Out of This World.



In film school, students learn to make the most of available resources. After all, early artistic efforts rarely have corporate funding. In contrast, few computer game designers exploit personal computers to their natural limits.

Sometimes game designers push the hardware to the edge, but as often as not, they're pushing in the wrong direction. In the eighties, for instance, filled polygon animation was largely abandoned (except in flight simulators). Digitized games today seem bent on their own brand of cinéma vérité, the height of realism. But most people don't have gigabyte hard drives to handle the files a fully digitized game would require.

Instead of turning to digitizing, game designers should develop faster, more detailed polygon animation systems.

And designers should allow us to dabble in plot development, not force-feed us whole chunks of story in which we can't participate.

Computers can inexpensively simulate special effects. The rippling of water in Out of this World puts us immediately below the surface, where light refraction causes marvelous distortion. Explosions flash white, accompanied by suitable booms and crashes. These effects cross the screen boundary to fill the room. They ease us toward the suspension of disbelief, a priceless commodity for anyone about to spend several days playing a game.

Soundtracks don't tax the hardware, either. While cinema purists may declare that a Spielbergian score manipulates emotion, we should welcome this in a game. In spite of our concern with cinematic quality, we do still play games for the sheer joy of play. Designers should pack the most punch possible into every thrill.

Special effects and music don't necessarily make good films. The basics of lighting and direction don't matter much when the film will play out on a computer. Editing technique, however, remains as important for PC movies as for the big screen. Cutting on action establishes the pace. In Out of this World, when a venomous worm strikes, you don't just fall down dead. First, you're treated to an extreme closeup of the deadly thing's spiked appendage, followed by an immediate cut to another extreme closeup, this time of a deadly slash to your knee. Then, at last, you fall. But these events occur so quickly that you don't have time to realize that joystick control has been taken away. No long interludes here—the action almost never stops.

Out of this World plays on every platform at the same speed with the same quality. Chahi might've added photorealistic backgrounds, but most players will happily settle for his distinctive and beautiful matte paintings instead.

Can we expect a series of auteur games from Chahi and Interplay? Unfortunately, it won't happen in the immediate future. Chahi's at work on real film at the moment—the big-screen sort—and won't begin work on another computer project for a year or so. Maybe soaring sales of Out of this World will give other game companies the cue to rethink their production values, though, and we won't have to wait quite so long for more interactive cinema. ❐

DARKSEED™

Based upon the fantastic artwork of H.R.GIGER

CYBERDREAMS™

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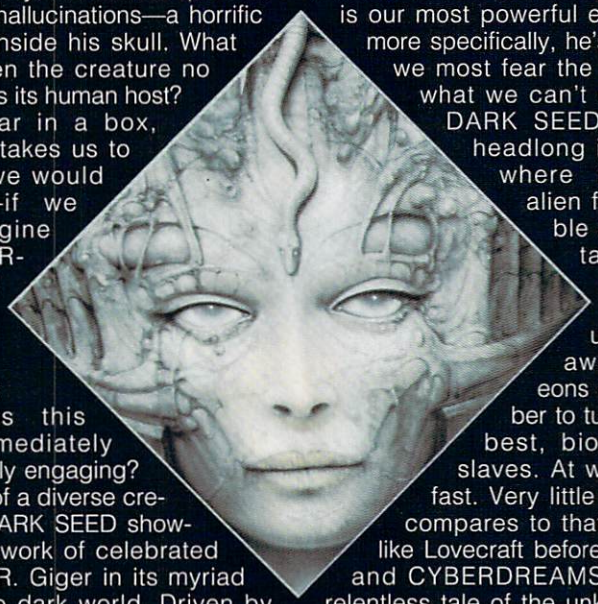
Circle Reader Service Number 151

DARK SEED

Unarmed and confused, your alter ego Mike Dawson will cross between worlds to ferret out the source of his nightmares. Ironically, he carries the wellspring of his hallucinations—a horrific alien fetus—inside his skull. What happens when the creature no longer requires its human host?

Digital fear in a box, DARK SEED takes us to the places we would fear most—if we could imagine them. CYBERDREAMS knows where horror sleeps.



Shock in a Box

What makes this game so immediately and perpetually engaging? The progeny of a diverse creative team, DARK SEED showcases the artwork of celebrated surrealist H. R. Giger in its myriad scenes of the dark world. Driven by Giger's unique macabre energy, DARK SEED crawls into the psyche of its viewers from the first tentative steps. Giger's work simultaneously attracts and repels the viewer with its horrible beauty.

CYBERDREAMS has tapped something primal in this production. Horror writer H. P. Lovecraft has said that fear is our most powerful emotion. And more specifically, he's told us that we most fear the unfamiliar—what we can't understand. DARK SEED throws us headlong into a world where malevolent, alien forces capable of incapacitating, dismembering, and eating us need only awaken after eons of fitful slumber to turn us into, at best, biomechanical slaves. At worst, breakfast. Very little in our world compares to that threat, and like Lovecraft before them, Giger and CYBERDREAMS bring us a relentless tale of the unknown that is chilling for its potential believability.

Giger knows well the threat of the ancients. Inspired in part by the transdimensional spell book—the fabled,

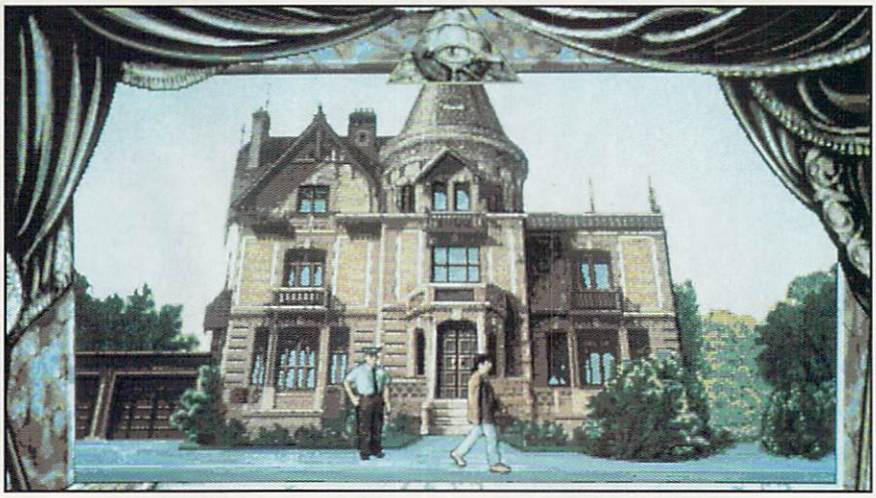
BY DAVID SEARS

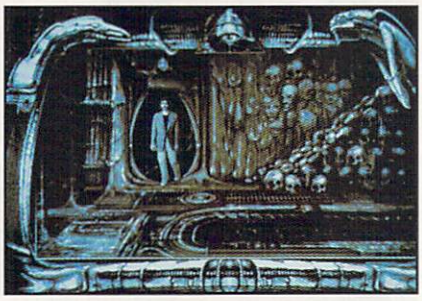
fragmentary Necronomicon, Giger's work never fails to elicit a visceral reaction. His tormented designs for the original Alien movie changed the face of science fiction forever. But Alien was set in the far reaches of the galaxy. In DARK SEED, aliens stalk the earth. DARK SEED merges not just science fiction and horror but also mystery. Who better to supply the images for such a game than Giger? Excited by the possibilities of a collaboration with computer game designers, Giger opened his doors to the artists from CYBERDREAMS, with only some minor hesitations.

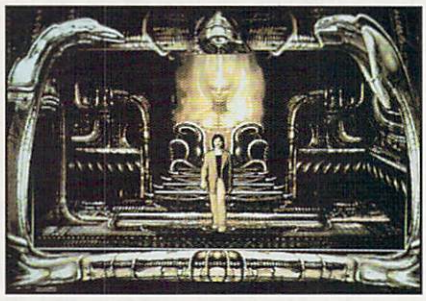
Crisis Resolution

Giger was unimpressed by the blocky pixels of low-resolution VGA graphics. A computing neophyte, Giger nonetheless recognized the deficiencies of the low-resolution graphics screens and insisted that CYBERDREAMS increase the resolution to one more compatible with his work. Giger wanted the most pixels possible.

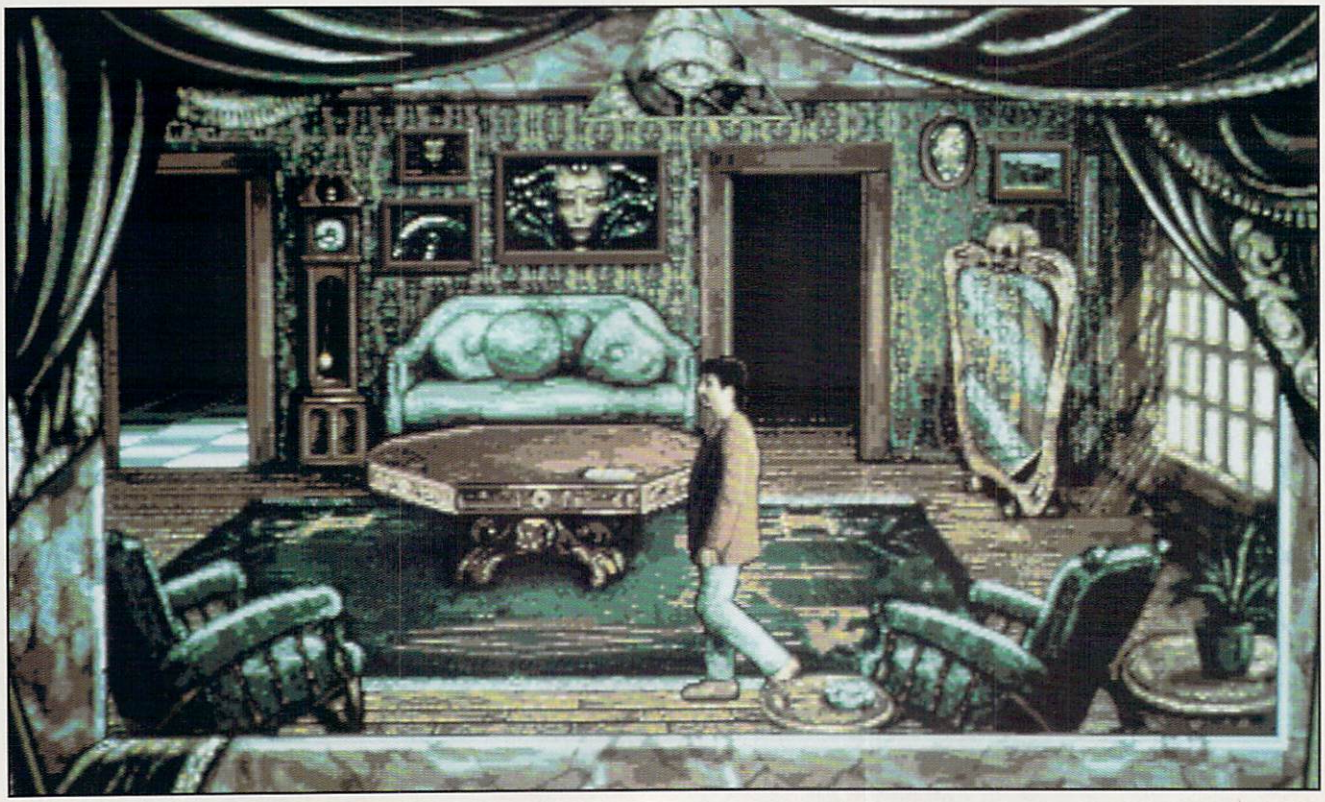
Back in California, DARK SEED team members increased the display resolution to 640 × 350, which reduced the number of available colors from 256 to 16 because of hardware limitations. The airbrushed, crepuscular nature of Giger's work withstood the translation well, however. And, disk in hand, CYBERDREAMS representatives returned to Switzerland, this time to meet with approval.







Top, Mike Dawson approaches the mansion he's just bought. Center left, he enters the hatchery. Center right, he arrives at another level of the hatchery. Bottom, he explores the house for clues.



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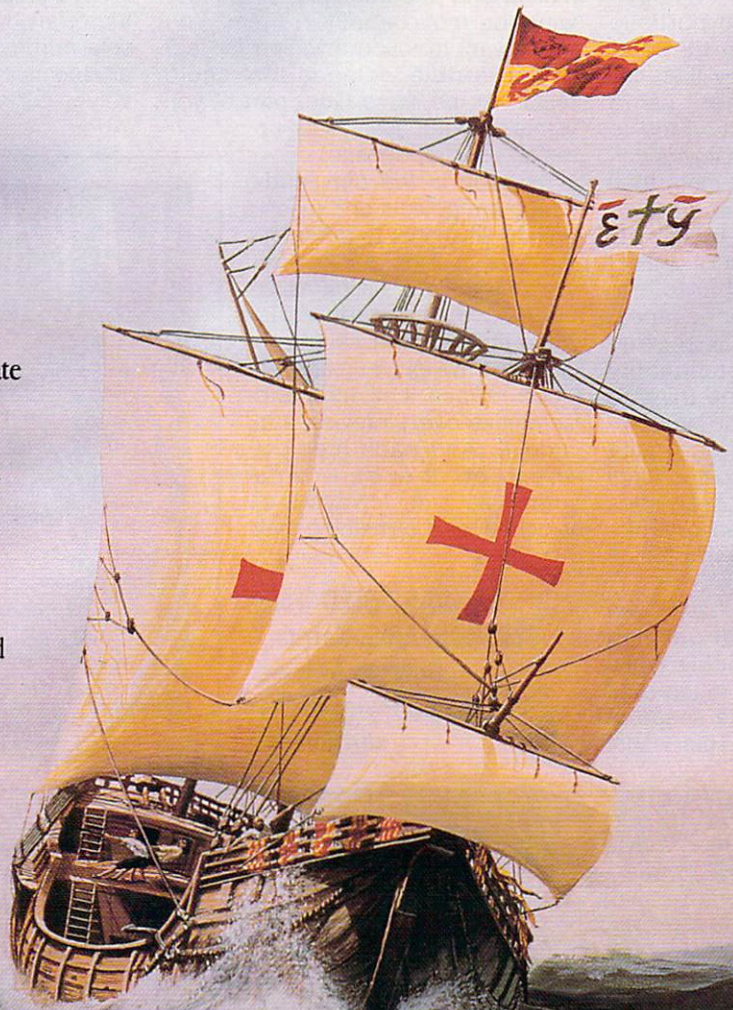

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Impressions

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Giger's response to the new digitizations was, "Beautiful!" Rumor has it he's so pleased that he's willing to collaborate with CYBERDREAMS on a second game, possibly to include new, original artwork.

Candid Chimera

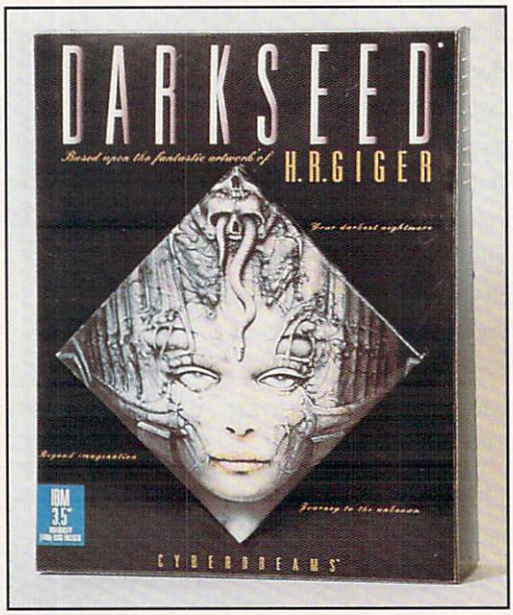
To incorporate Giger's fantastic realizations into the confines of a PC simulatation environment, CYBERDREAMS artists scanned portfolio selections with an Epson ES-300C flatbed color scanner. They then further altered the images using DeluxePaint IIe on the PC. Free to choose from virtually all of Giger's collection, the artists located more than enough faces, arms, legs, and assorted (if somewhat distorted) body parts to piece together a number of distinct menacing dark world characters. DARK SEED excels at landscapes, however, for the once-flat Giger paintings attain three-dimensionality through animation. It's one thing to admire the monochromatic smoothness of a Giger painting and quite another to walk past his bloated fungi in the foreground, twisted flesh trees to the left, and blasted planes of biomechanical tissue stretching to the horizon.

Furthermore, what may have been a gateway in the original painting becomes a floor in DARK SEED; tubes and conduits become so much slick wallpaper contoured to the shape of other Giger extractions. This visual cut-and-paste technique, similar to the literary cut-up approach popularized by William S. Burroughs in Naked Lunch, does here what words do in that science fiction novel. Fragments of larger images combine to provoke and disturb. In new associations with one another, these images seem capable of reprogramming the way you think about and perceive environments, and this definitely affects the way you move about in them. You won't want to touch anything for fear of the terrible violence that could result. At the same time, part of you wants to touch everything, no matter how repugnant.

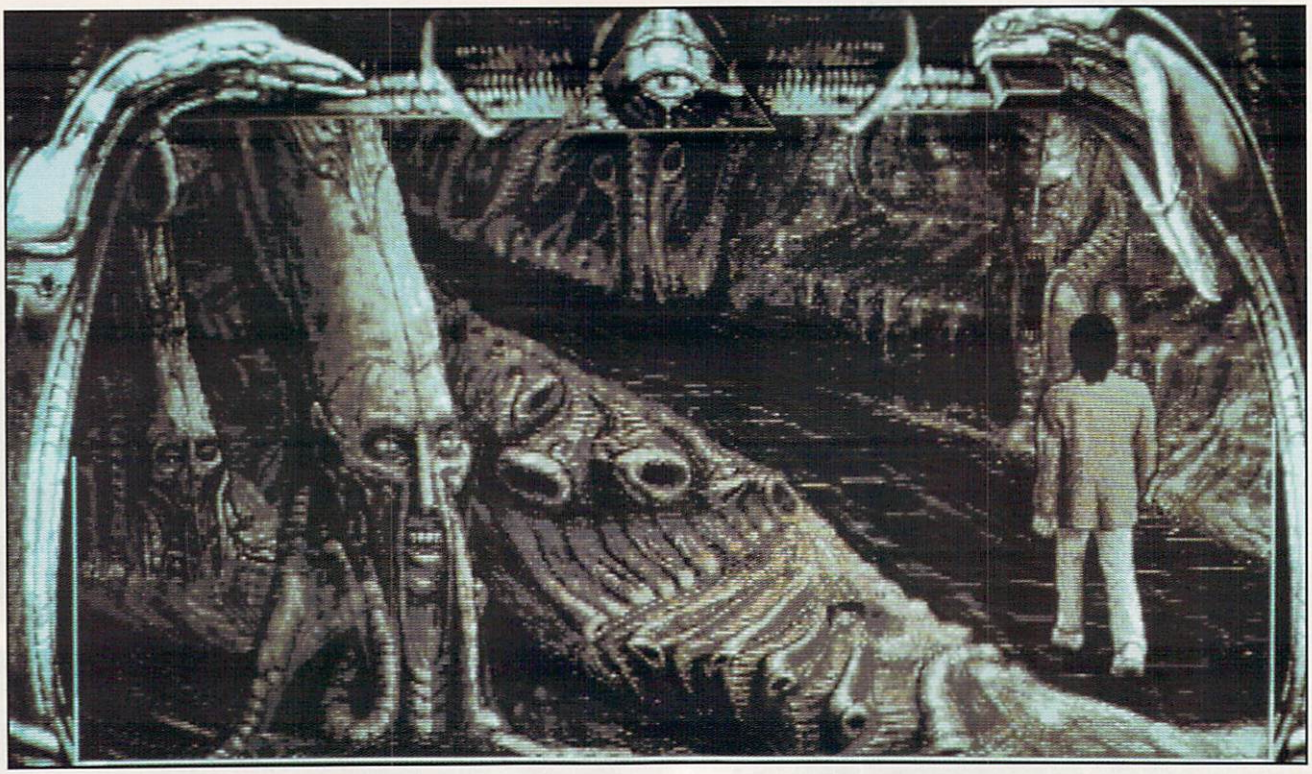
Hidden in the dim landscape are objects and mechanisms essential to completing your mission and removing Dawson's brain parasite. Natives of the dark world have little trouble seeing in perpetual twilight; humans will need to take their time and scrutinize every crevice and alcove. And each moment spent on the dark side unnerves; you always feel watched, as if something may rise from the gloom to put an untimely end to your intrusion. DARK SEED designers appear to have consulted the architect responsible for the ancient city of Lovecraft's Cthulhu mythos—a city whose alien geometry would drive humans insane.

Haunted House Party

Meanwhile, back on earth normal, all is not well, either. Dawson's queer old Victorian house, purchased for the sole purpose of getting away from it all, seems menacingly derelict. Faded velvet curtains block the warm sun



Top, DARK SEED from CYBERDREAMS. Bottom, Dawson follows the pathway to the catacombs.



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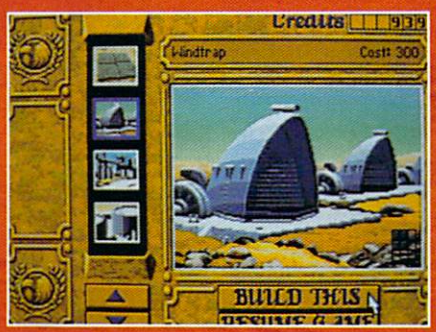

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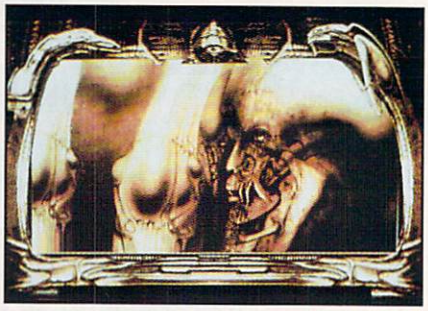
Circle Reader Service Number 257

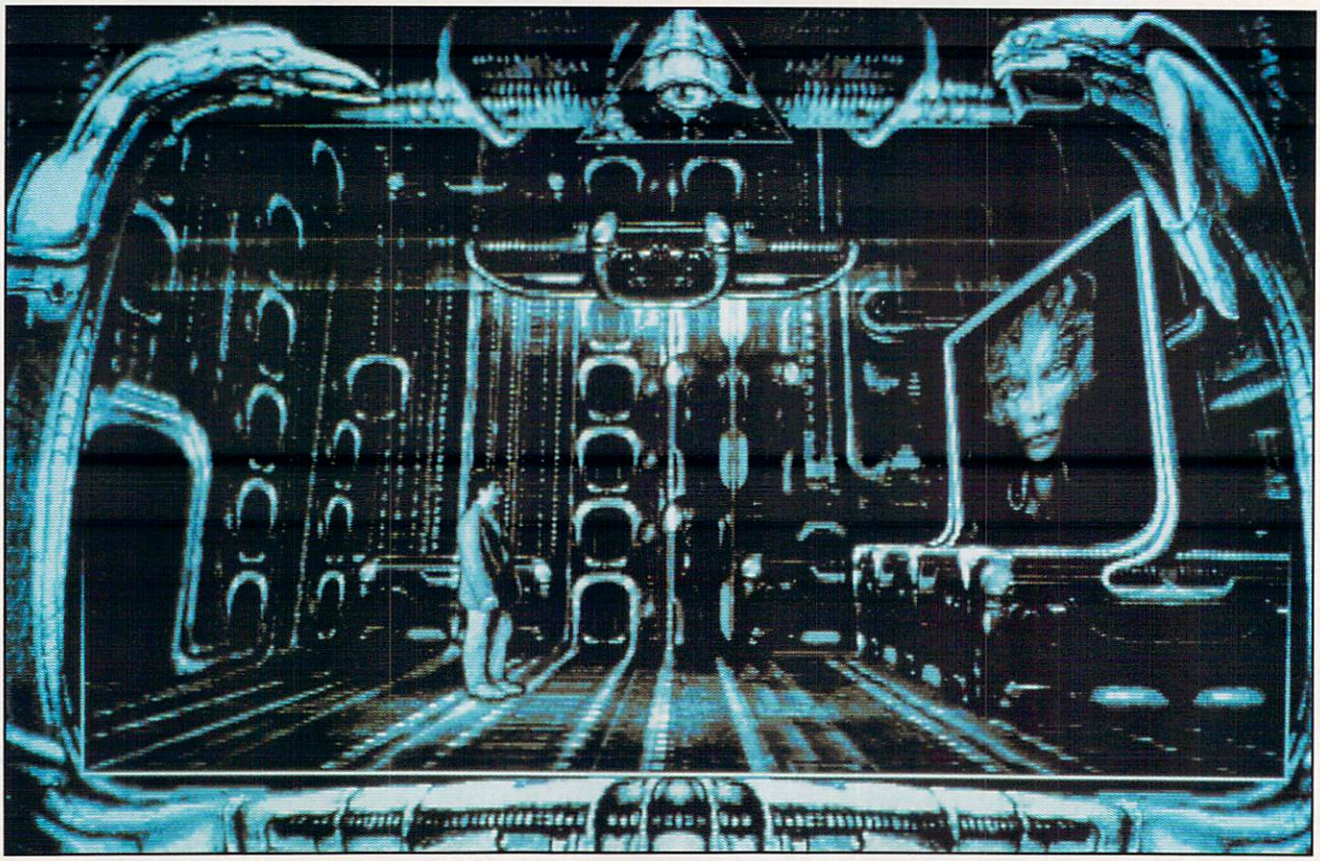
and offer only shadows in exchange. Intricately patterned wallpaper peels away; floorboards groan underfoot. Ethereal voices offer cryptic advice over an old AM radio. What lurks in the wine cellar? Why won't the librarian talk? Solving all the mysteries in the sleepy little town of Woodland Hills will have you robbing graves and running from the police—situations you wouldn't normally enjoy, but the threat of the dark world can make you a hero and justify your actions.

The high-resolution display allows the Giger paintings hanging in Dawson's home to glare at you in striking detail. You can almost count the leaves on trees and the bricks in buildings, though time for such pursuits seems short. A journey through the varied landscape takes you from mausoleums to attics to public libraries and back again, and no matter how many times you pass through a certain location, you'll never fail to appreciate the attention to detail.

To animate the players in this nightmare, artists used an Amiga, a Digiview, and a Mitsubishi SVHS video recorder to digitize actual human models in various poses. Saved in 16-color gray scale, these images were edited in the Amiga version of DeluxePaint, saved as IFF files, and transferred via CrossDOS to the PC for further editing. The sound samples



Top, an ancient rests in suspended animation. Pray his slumber is undisturbed. Center, Sargo is a prisoner of the dark side. Bottom, Dawson speaks to the keeper of the scrolls, who is portrayed by Li II, the guiding image of DARK SEED.



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were first taken on an Amiga, too, and the remarkable morphing title at the outset of the game originated there, as well. Imagine for the Amiga has the ability to map the reflections of objects in a virtual 3-D environment onto invisible bitplanes. Bowing to market demand, however, the Amiga version of DARK SEED won't debut until December, but it will make exceptional use of the Amiga's built-in sound capabilities. DARK SEED's art director comments that the game wouldn't have been possible without the interactivity of the two platforms. This synergism is welcome in computer game development, and in the case of CYBERDREAMS, reflects the company's approach to design itself.

To conserve memory and reduce hard drive access time, DARK SEED displays your current location in a 500 × 200 pixel window. At first, this seems a bit of a cheat, since CYBERDREAMS touts this game as the first high-resolution adventure game, but this screen fragment still packs in more pixels than standard VGA 256-color low-resolution mode. The windowing effect places some distance between you and Dawson—welcome distance, since DARK SEED has a way of getting under your skin. A second and unanticipated side effect of this windowing is a sense of claustrophobia. The draped curtains, the third eye of the Illuminati that watches you from the top of the display—you'll feel as though you're watching a stage play from a darkened box seat. The theater, of course, has only a single occupant. DARK SEED never lets you forget that the fate of the world is on your shoulders.

A Pinch of Gestalt

Nearly at the end of the original DARK SEED development schedule, the design team members examined their work and found it lacking. The black-and-white side images just didn't have enough visual appeal. The answer? Colorization by hand. With just 16 colors to choose from, altering the pictures took time—six more months, but the results are as beautiful as they are sinister. This illustrates the concern for and attention to detail found throughout DARK SEED. As in nightmares, every hair is in place.

With the stated purpose of bringing artistic and literary talent from outside the industry into computer gaming, CYBERDREAMS may have a string of hits on its hands. After this brooding horror tale, the company's looking forward to somewhat lighter fare, though the treatment of the subject matter will remain adult in orientation. Future projects include Cyber Race, a racing game envisioned by Syd Mead (a designer for Blade Runner, 2010, and Aliens).

Ongoing negotiations with prolific author Harlan Ellison could yield No Mouth, an adaptation of his widely anthologized story "I Have No Mouth, and I Must Scream." As with Giger's input—his suggestions were never limited by preconceptions of what a computer could and could not do—perhaps the new visionaries will demand that CYBERDREAMS push the PC past its acknowledged limits when showcasing their work. But survivors of DARK SEED will be eagerly awaiting whatever entertainment CYBERDREAMS produces next.

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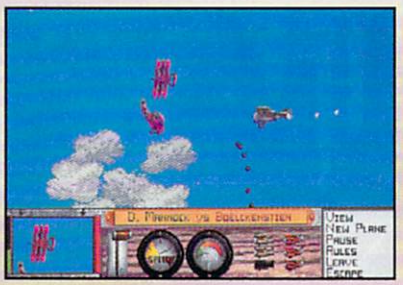

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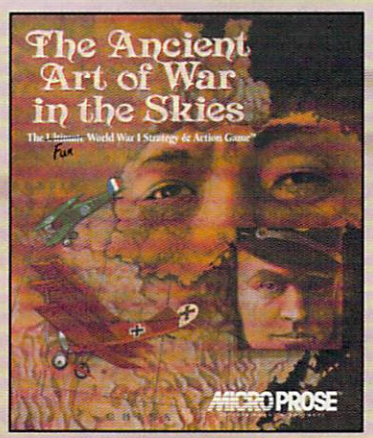

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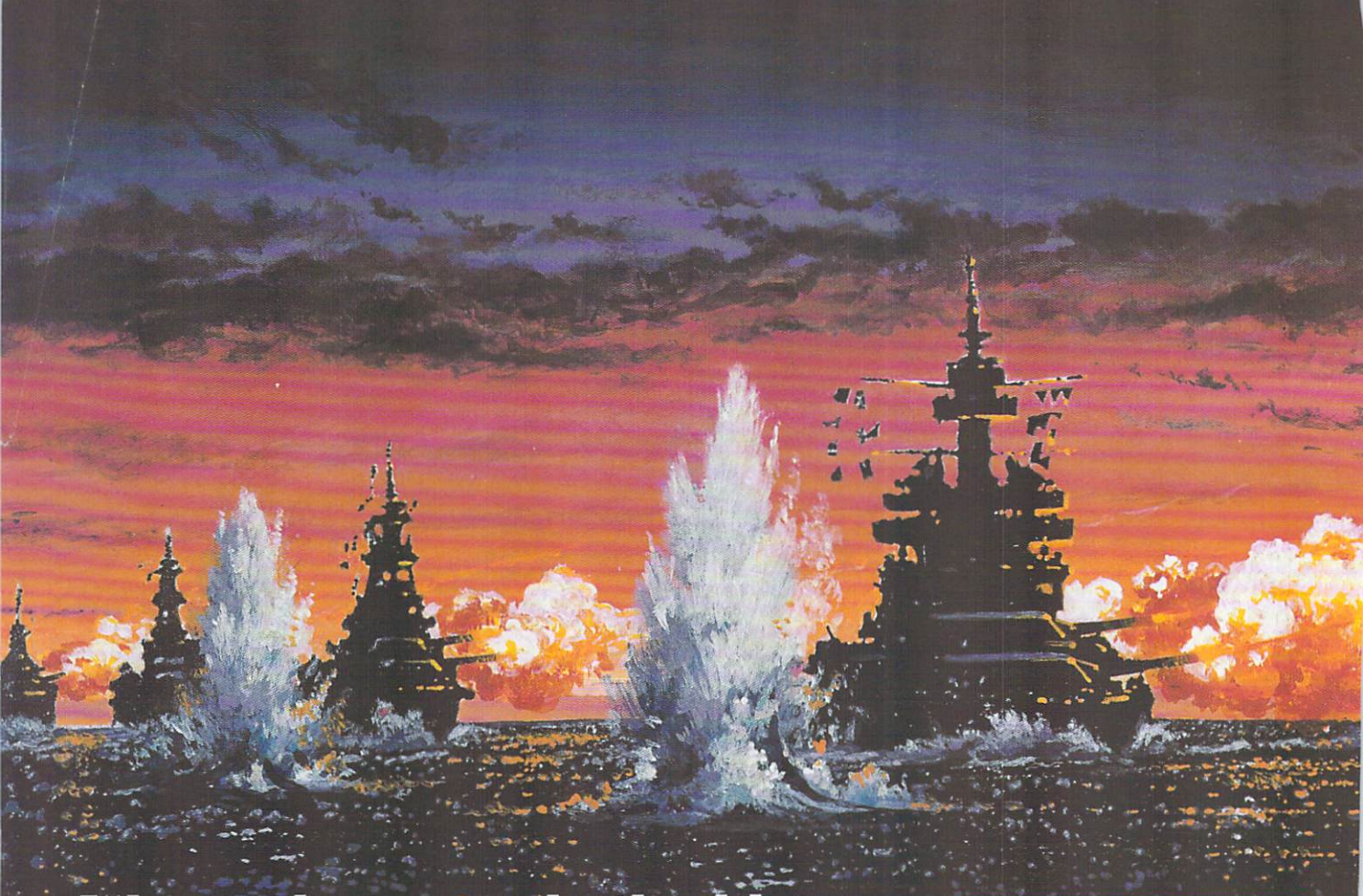

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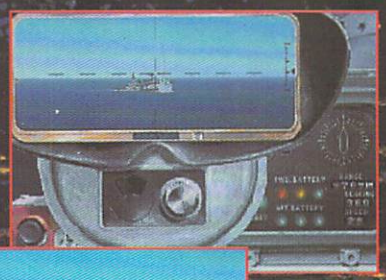

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64/128 VIEW

If you've submitted a program recently and are still waiting to hear from us, please be patient.

Tom Netsel

There is good news and bad news to report this month. The good news is that we've been swamped with excellent type-in submissions. The bad news is that we've been swamped with excellent type-in submissions.

I made a pitch for programs in this column and in fillers elsewhere in the magazine encouraging submissions. Boy, did they work!

In fact, they've worked almost too well. For the past few months we've been deluged with good and great programs. We now have a large stack of them waiting to be reviewed. This has led to a new problem: Since it takes time to evaluate a program properly, we've been slow in mailing out contracts and rejection notices.

If you've submitted a program and haven't heard from us, please be patient. The quality as well as the quantity of submissions has been excellent this year, and we want to buy as many programs as we can. It just takes time to go through them all. When we've selected the programs that we plan to use in an issue and then come across another good program, we hate to reject it. We'll often hold it and use it the following month. But when we start holding too many programs, the system backs up. We'll get things moving shortly.

Actually, I love having too many submissions—so please keep them coming! With your help, we've been able to publish some great programs, and we want to continue the practice. A couple that come to mind from last month are two SpeedScript spelling checkers for the 64 and 128.

I normally don't have two such similar programs in the same issue, but I thought that each spelling program would offer advantages to 64 and 128 users.

In this issue, we have a couple of programs that'll help programmers who work with sprites. These programs are geared more for the intermediate-to-advanced programmer who is already familiar with sprites and some of the problems associated with them.

MOB Master, by Hong Pham, adds ten new graphic commands to the 64 that make programming sprites much easier. Programming sprites on a 64 usually requires a lot of code filled with POKEs, but MOB Master gives the 64 many of the same features and sprite commands found in BASIC 7.0 on the 128. With these commands, you'll find it much easier to define, position, and animate sprites.

Most people know that the 64 is capable of producing 16 different colors, but how would you like to boost that number to 136? You can with 136 Colors, a program by David Kwong.

Machine language programmers who use a 128 will want Bassem 128. Long a popular assembler for the 64, the 128 version is too large to type in, but it's available as this month's Gazette Disk bonus program.

I hope you'll find these and the other Gazette programs to be entertaining and informative. Be sure to let us know which programs you like or dislike. ❐

GAZETTE

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Great submissions flood Gazette office.
By Tom Netsel.

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Cut through the confusion of programming the Sound Interface Device.
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SID SIMPLIFIED

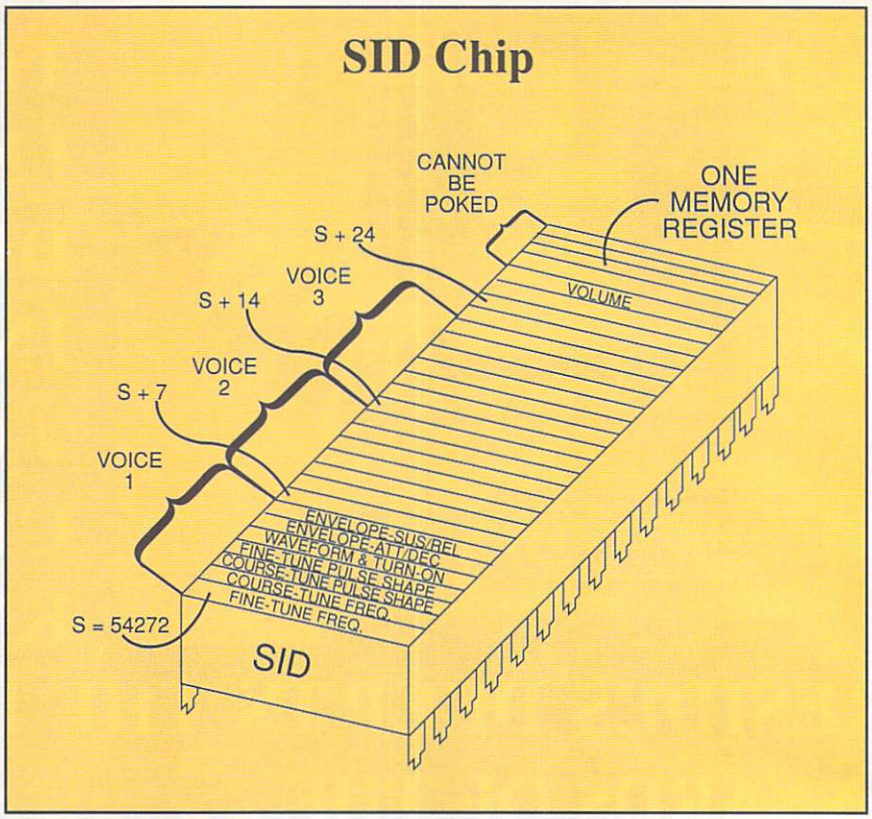
BY LARRY COTTON

With all SID's capabilities, programming it in BASIC 2.0 remains an exercise in tedium, because of the many POKEs required to access the chip. (BASIC's POKE puts a number from 0 to 255 into a specific location in the computer.)

Fortunately for 128 owners, Commodore included with that machine a much-advanced BASIC 7.0, which does support SID and makes programming sounds much easier.

This article will attempt to cut through the confusion of programming SID and show you, step by step, how to access this marvelous chip. I'll confine my remarks to BASIC 2.0's commands, common to both the 64 and 128, and I'll show you how to cut down drastically on the number of POKEs. We'll start with the very simplest exercises and progress to the more advanced. If you'll stay with me from the beginning, you'll be pleased with the results.

If you're confused about programming SID, it will first be necessary to power down your own mind to rid it of all past frustrating programming sessions. Start from scratch. Remember that we're talking about only 29 of the 64's 64,000 or so memory registers. How complicated can they be?



Voices

A human being has only 1 voice; a saxophone has only 1 voice. A six-string guitar has 6; a piano, 88. SID has 3. Think of SID as a three-string guitar. That is, up to three notes can be played simultaneously, each under separate control (except for volume).

We'll limit our initial discussions to voice 1, which occupies SID's first seven memory registers. Remember that number, 7; it'll crop up again.

Order of POKEs

Here's a subject rarely addressed and, I think, fairly critical to the success of SID programming: the order that the memory registers are poked. Here is the normal order for playing a simple sound.

1. Clear the chip.
2. Turn up the volume.
3. Wait.
4. Set a frequency.
5. Set an envelope.
6. Turn on a waveform.

Clear the Chip

SID occupies memory registers 54272 through 54300. All those registers (except the last four, which cannot be poked) should always be cleared of their contents near the beginning of every BASIC program which uses sound. Here's how.

```
10 S=54272: FORJ=S TO S+24: POKEJ,0:
   NEXT: REM CLEAR SID
```

SID's first memory register should be defined as a constant; we'll use S. Then every other register may be defined as an offset of S. A FOR-NEXT loop pokes a 0 into each of the SID memory registers, effectively silencing the chip and preparing it for action.

Turn Up the Volume

SID's last pokable register is the volume control. Its range varies from 0 to 15, with 0 being the quietest setting. Let's turn the volume wide open with the following statement.

```
20 POKES+24,15: REM FULL VOLUME
```

Any memory register will accept values from 0 to 255, but 54296 uses only values from 0 (silent) to 15 (loud) to control volume. Normally, S+24 can keep a value of 15 throughout a BASIC program.

Wait

Turning up SID's volume makes a popping noise in the TV or monitor's speaker, and this can interfere with your carefully crafted sound. Always introduce a period of silence after first turning up SID's volume. We'll show a do-nothing time delay, but ordinarily at this point in a program you'd be preparing the screen, reading data, setting variables, and so forth.

```
30 FORT=1 TO 1000: NEXT
```

Set a Frequency

SID needs several other values poked to it before it will speak up. For instance, it needs a frequency. A frequency controls a note's pitch.

```
40 POKES+1,16: REM FREQUENCY
```

SID's voice 1 memory location 54273 (S+1) can use all values from 0 to 255. A value of, say, 5 produces sounds of low pitch (like a tuba). A value of 200 produces a high- pitched sound (like a piccolo).

Set an Envelope

What's an envelope? Nothing more complicated than how the volume of a single particular note (or sound effect) changes as it plays.

Think about the way a single guitar string sounds as it's being plucked. The guitar makes no sound at first, but its sound level rises from silence to maximum volume immediately after the string is plucked. That's called attack. The sound then gradually fades away to silence. This is called decay.

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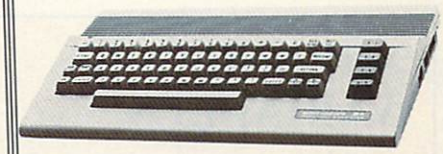

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G6B

SID can create sounds quickly, like a guitar, or slowly, more like a bowed violin. It can also do two more things to a sound which a guitar can't. It can prolong a sound's volume at a particular level. This is called sustain. SID can also cause the sound to stop at a controllable rate with a process called release.

So, there you have it. The sound's envelope is made of attack, decay, sustain, and release. Each of these properties is controllable. For now though, the properties we'll use are attack and decay. A value of 12, in fact, poked to the envelope simulates the plucking of a guitar string. Later, we'll see how to determine values to poke. Where do we poke that envelope value? We poked the frequency into S+1, so the envelope must be poked into S+2, right? I'm afraid not; S+2 and S+3 are reserved for fine-tuning the pulse wave. S+4? Nope. That turns on voice 1. S+5 (54277) is voice 1's main envelope-controlling register.

```
50 POKES+5,12: REM ATTACK/DECAY
```

If you want to experiment with sustain and release, add this line.

```
52 POKES+6,4: REM SUSTAIN/RELEASE
```

Turn On a Waveform

Last, but certainly not least, the sound needs a waveform. The 64 and 128 both feature four waveforms, each with a characteristic timbre. The triangle's sound is soft and mellow, the sawtooth mimics a saxophone, the pulse is hollow, and the noise is, well, noisy.

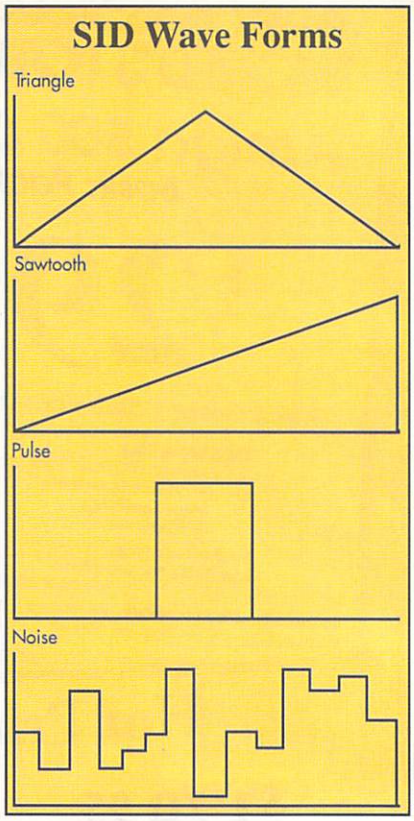
To actually begin the sound, we use voice 1's control register, S+4. We usually poke one of four particular values to produce the desired waveform.

Triangle	17
Sawtooth	33
Pulse	65
Noise	129

Here's the way we'll select a waveform in our program. For this example, let's select a triangle waveform and poke its value into S+4.

```
60 POKES+4,33: REM TURN ON SAWTOOTH
   WAVEFORM
```

I like waveform 33, the triangle; it has a nice bite to it. If you've been entering the lines as presented, you can now run the program. You should be rewarded with a nice strong note that begins suddenly and gradually dies out. (Be sure to turn up the volume on your TV or monitor. The 15 that we poked to 54296 ensures that a good strong signal leaves the computer, but it won't be heard if your monitor volume is too low.)



Six lines to create a sound; that's not too bad, is it? Just remember the order.

1. Clear the chip (S through S+24).
2. Turn up the volume (S+24).
3. Wait.
4. Set voice 1's frequency (S+1).
5. Set voice 1's envelope (S+5).
6. Turn on voice 1's waveform (S+4).

Other Registers

We produced sound with only three of voice 1's memory registers; we didn't use registers S, S+2, S+3, and S+6. Let's look at them now.

S is the register that fine-tunes voice 1's frequency, which was coarsely set with S+1. If you wanted just a noise or a beep of no particular frequency, S+1 would be enough frequency control. To accurately produce musical notes, however, we must also poke a value to S.

What value? For frequencies of musical notes, the values are listed in your User's Guide in a table appropriately called Music Note Values. For nonmusical sounds, such as drums, it's mostly a matter of trial and error. Let's fine-tune the frequency we poked into S+1 in line 40. Add this line to the program to give us an exact

SID AND VARIABLES

Using a variable such as F, instead of a number like 16, yields a whole new world of sounds. Here's an example which emulates a warning siren.

```
10 S=54272: FORJ=STOS+24: POKEJ,0:
   NEXT: REM CLEAR SID
20 F=16: REM DEFINE VARIABLE
30 POKES+24,15: REM FULL VOLUME
40 FORT=1TO200: NEXT: REM SHORT
   PAUSE
50 POKES+1,F: POKES+8,F*1.3: REM
   COARSE FREQUENCIES
60 POKES,195: POKES+7,31: REM FINE-
   TUNE FREQUENCIES
70 POKES+5,12: POKES+12,12: REM
   ATTACK/DECAY
80 POKES+6,255: POKES+13,255: REM
   SUSTAIN/RELEASE TO MAXIMUM
90 POKES+3,8: POKES+10,8: REM SHAPE
   OF PULSE
100 POKES+4,65: POKES+11,65: REM
    TURN ON PULSE WAVEFORM
110 F=F+1: REM INCREMENT FREQUENCY
    VARIABLE
120 IFF=36THENF=16: REM CHECK FOR
    UPPER FREQUENCY LIMIT
130 POKES+1,F: POKES+8,F*1.3: REM
    CHANGE FREQUENCIES BOTH VOICES
140 GOTO110
```

We're using the variable F (defined in line 20) instead of the number 16 for the coarse frequency. The coarse frequency pops up first at line 50. In line 130, voice 2's frequency is calculated as a multiple (1.3 times) of voice 1's. Why? We do it to keep the interval between the two voices' frequencies roughly constant for a more authentic siren sound.

In line 110, we increase variable F by 1. Try different increments or try decreasing, instead of increasing, F. Line 120 limits the upper value of F. Try other limits or values less than 16 if you're decreasing F.

Once a limit is reached, F is reset to its original value. Line 130 once again pokes new values to both voices' frequency registers. Voice 1 gets newly increased F; voice 2 gets a multiple of F. Line 140 sends control back to line 110, which increases F again. The program stays in a loop from line 110 through line 140 until you stop it by pressing the Run/Stop key.

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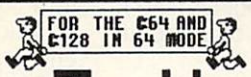

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pitch of middle C on the piano.

```
45 POKES,195: REM FINE-TUNE FREQUENCY
```

Shaping the Pulse

While S+2 and S+3 control the shape of voice 1's pulse waveform, S+2 is rarely used. Poking a value of 8 to S+3 will give the pulse waveform a nice, even shape. It's not necessary, however, to shape a pulse waveform unless you plan to use it. To hear what the pulse sounds like, add line 55 and change line 60 as follows.

```
55 POKES+3,8: REM SHAPE OF PULSE
60 POKES+4,65: REM TURN ON PULSE WAVE
   FORM
```

Run the program again, and listen to the difference in the sound. Now experiment. Try waveforms 17 (triangle) and 129 (noise). Try various frequencies and envelopes. A reminder: Don't confuse voices with waveforms. SID has three voices (remember our three-string guitar?) and four waveforms (triangle, sawtooth, pulse, and noise).

Voices 2 and 3

So much for voice 1. If you want to play more than one voice at a time, each must be set up independently. For instance, let's add another note to harmonize with the last one. Modify lines 40–60.

```
40 POKES+1,16: POKES+8,21
45 POKES,195: POKES+7,31
50 POKES+5,12: POKES+12,12
55 POKES+3,8: POKES+10,8
60 POKES+4,65: POKES+11,65
```

Voice 2's values follow the colon in each line. To program voice 2, just add 7 to voice 1's memory registers. In line 40, S+1 for voice 1 becomes S+8 for voice 2; in line 45, voice 1's S becomes voice 2's S+7; and so on.

Notice that in this example I've poked all voice 2 registers with the same values—except frequency in lines 40 and 45. Frequency values 21 and 31 (from the Music Note Values table) are needed to produce E above middle C on the piano. You may, if you like, set different envelopes for each voice (line 50) or different waveforms (line 60). If you run the program now, you'll hear a two-note chord in perfect harmony.

As you've probably noticed by now, SID's three voices are arranged within the chip in groups of seven registers each. Thus the control registers for voices 1, 2, and 3 are 54276, 54283, and 54290, respectively. The attack/decay portion of the three envelopes is set in registers 54277, 54284, and 54291, respectively. Therefore, to program voice 3, just offset the memory registers by 7 again.

As promised, here's how to reduce the proliferation of POKEs for this particular program. This technique won't always be applicable, but it may give you some ideas. Begin by copying lines 10 and 30 from the above program. Then delete the remaining lines. Now add these lines.

```
40 FORG=1 TO 10: READL,D:POKES+L,D
50 NEXT:END
100 DATA 1,16,8,21,0,195,7,31,
    5,12,12,12,3,8,10,8,4,65,11,65
```

That's it! All SID's offsets from S (54272) and the pokable values have been compressed into one data line. One FOR-NEXT loop does the rest of the work.

While this simple program touches on only a few of the SID chip's wonderful possibilities, you can have fun experimenting with changing waveforms, frequency values, and voices. I hope programmers will be encouraged to further explore the sound capabilities of their 64s and 128s. ❑

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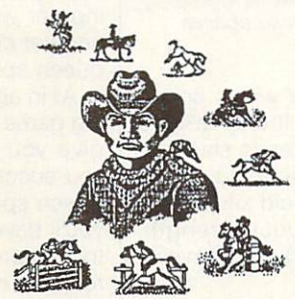

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Thus begins the arachnids' reign of terror in communities across America. This Disney arcade game for the 64 closely follows the basic premise of the studio's hit movie *Arachnophobia*.

Homes are overrun, citizens terrorized, and whole communities abandoned. Residents have tried everything to rid themselves of the unwanted guests, but nothing seems to stop these creepy crawlers. The eight-legged enemy is upon us. It's enough to make your skin crawl.

As a last resort, the U.S. Department of Agriculture sends a frantic plea to Delbert McClintock, owner of the McClintock Infestation Management Company. McClintock is the inventor of a patented insecticide, Toxi-Max, which is said to be strong enough to kill the arachnids. Fearless Delbert loads his bugmobile with the lethal Toxi-Max and a supply of bug bombs, and sets out to free his country from the invading horde.

You won't need a lot of practice to get into the swing of playing this game, nor will you need to refer to the instruction manual throughout play. Disney does recommend that you make a backup of the game's double-sided disk before playing and use the backup for play. The game is compatible with most Fast Load cartridges, too. Since there's enough variety in Arachnophobia's sharp, colorful graphics to keep you playing for hours, you'll find using a Fast Load cartridge will save you a lot of time, since you must flip sides during the game.

When you load Arachnophobia, you'll see the bugmobile as it drives past homes, farms, schools, and cemeteries. Pick the building you want to enter; then use your joystick to guide the bugmobile there.

Delbert McClintock is the nation's last line of defense against hordes of invading spiders from South America.

When you stop at a location, the screen changes to an interior scene showing Delbert. Your mission is to help him clear the infested rooms by hunting down and destroying all the spiders and the egg sack that's hidden in every structure. Sound easy? Don't be so sure.

Spiders are everywhere. They'll do all they can to guard their egg sack. Sneaky ones drop from the ceiling to land on you; others slither down web strands and bite you from behind. You'll be attacked at ground level, too. Often, the soldier spiders work in groups, testing both your sense of timing and your joystick skills.

Spider webs are a real nuisance. Blundering into one will slow you down to half speed and make you more vulnerable until you break free.

A single spray of deadly Toxi-Max is enough to kill a soldier spider within spraying distance. It only takes a few spider bites to slay you, however, so keep your eyes open for first-aid kits. These will restore your strength. There's at least one kit in every building.

Don't forget you're wearing heavy work boots, too. You can stomp on some of the creepy crawlers, conserving your limited supply of insecticide.

The quickest way to clear a room is to use a bug bomb. You start the game with only three of these, so use them wisely. Other items you find as the game progresses are almost as useful as bug bombs. Matches and aerosol cans can be fashioned into nifty flamethrowers, which have a better range than your insecticide sprayer. More important, the homemade flamethrowers can clear an entire floor or ceiling of a room with just one pass.

When you've cleared a structure, you can safely return to the bugmobile. But there's no time for you to rest. The battle has only begun! There are more buildings and towns needing your bug-slaying skills. Just guide your bugmobile to another building and start exterminating spiders.

Every building in every town is filled with hordes of vicious spiders, defending an egg sack. Only one structure in each town hides a queen spider. The queen is the same size as the original South American spider. You'll know this mean mama by the distinctive yellow markings on her legs. Watch out! She's tougher than her soldiers and can even bite after she's been stunned. Slaying her will transport you to another city with yet another queen spider to roust.

All in all, this is a challenging game that's designed to give you a real workout. If you succeed in besting the queen spider in every town, you'll have saved the country and proved yourself a hero. As a reward, the United Nations will give you a secret assignment in the Amazon rain forest. The monstrous arachnids there will make you wish you'd been a little less successful.

To aid you during play, the bottom of the screen displays status information. There's an amusing picture of Delbert that monitors the state of your health. It changes from smiling to frowning to screaming in pain, depending on how many times you've been bit. First-aid kits will restore Delbert's smile.

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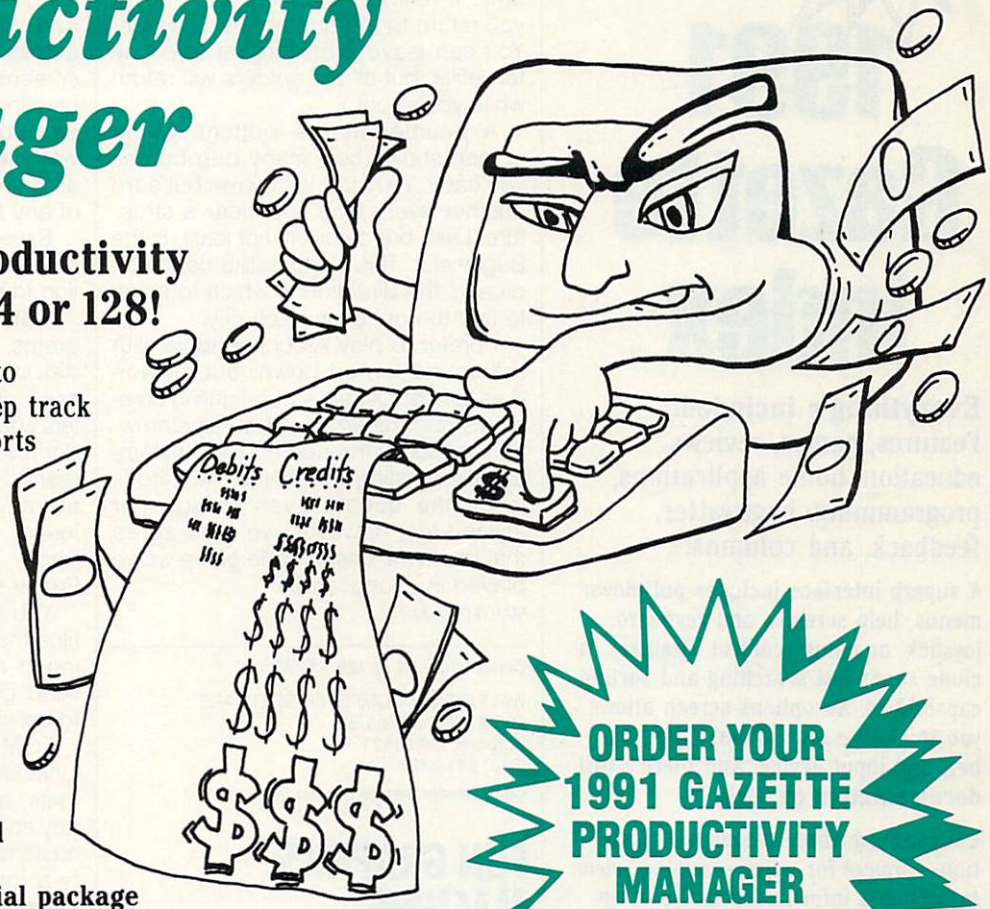

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REVIEWS

is an indicator showing how much Toxi-Max insecticide remains in your spray tank. It refills automatically whenever you return to the bugmobile. (Beware! You can leave a building at any time for refills, but all the spiders will return while you're out.)

A counter at the bottom of the screen shows how many bug bombs you have. You start with three but earn another every time you clear a structure. Last, but definitely not least, is the Bugometer. This compasslike device indicates the direction in which to travel to find the queen in each city.

I prefer to play Arachnophobia with the sound turned down, but my son likes to hear Delbert's bug-fighting comments and the sizzle of his flamethrower. I like to go through houses systematically rousting arachnids; he zeroes in on the queen. Even though our styles vary, however, we both agree that this is the best arcade game we've played in a long while.

MARTI PAULIN

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FUN GRAPHICS MACHINE

Fun Graphics Machine is a great way to create and manipulate graphics and hi-res screens on a 64. My introduction to the program was a free demo that's available on QuantumLink. I was amazed at the ways that I could work with the designs on the screen: flip, flop, reverse, stretch, shrink, crop, rotate, fasten, copy, and print the results. The demo won't allow you to save and print features, but the asking price for the registered version makes it a real must-have bargain. The reference manual is the first good feature.

The spiral-bound manual lies flat, so you can really use it. Some of the instructions are duplicated, but that stops the page flipping when you need to refer back to some detail that has slipped your memory.

The manual itself was produced with FGM. It even shows step-by-step instructions of how various pages were composed. This is not a drawing program. It doesn't have lines, circles, or squares, and there are no colors—just a white screen (or rather, three white screens) to work with.

The program uses color in a useful way. The cursor and borders change color to let you know what mode you're in. Blue cursor is text, gray is grab, purple is adjust, and so on.

You work on a 40-column screen, and the screens can be linked both across and down. By combining two screens across, you have your 80-column format for printing a full page. You can use a third screen as a workplace. Link the screens down for as many as you need. Print a banner of any length.

Save your work with a simple method of coding, and then use one instruction to print all of your work.

FGM is really a collection of programs, not just one. With the program disk in one drive, it'll recognize the presence of any other two drives. Create lets you do your own thing. Demo runs demos that are available on the program disk or replays those that you create and save. Clip-Art uses artwork found in other programs like The Print Shop, The Newsroom, and Doodle. Printer sends your work to your printer.

You can print your work to disk in files that others can view without having to run FGM. You can design and send greeting cards or draw screens to be used as titles on your VCR.

FGM has its own department on Q-Link. Download a file with 50 different fonts, and you can type in just about any style that you like. FGM contains a customizer, which will design or modify a font. Updates are always being added. If you have a question, someone online will have the answer, and samples of what users have done are always interesting to study.

If you're using a 128 and have the reset switch, you'll discover something remarkable. Suppose you're running a program in 64 mode and see a graphic on the screen that you'd like to save. Hit the reset switch. The program will be gone, but then load and run FGM. On most occasions the graphic will be available on one of FGM's screens. Now you can save it, grab part of it, and paste it on another screen. Have fun; that's what the program is all about—having fun with graphics.

Since you can edit at the pixel level, you can do some finely detailed work, and a smoothing technique takes away some of the rough spots on captured pictures. With the overlay method of grabbing and pasting, you can design and save different templates and then use them for various projects. A simple template with a musical symbol font and score lines is useful for writing musical scores. A grid pattern can be overlaid with needlework designs.

Playing with FGM can become addictive. Searching for different graphics to manipulate, adding new eyes to a face from a Print Shop cartoon, using part of a picture as the cover for a greeting card, and designing your own letterhead are just some of the fun you can have working with graphics.

In text mode you can link two screens across, use word-wrap, select a font, set the margins, and type your document. The size of the cursor can be changed with a single keypress. And with that size change, the size of your font changes, all the way to a full screen.

Great graphic work on the screen can be work wasted if you can't send it to a printer. FGM supports most printers, and it gives you the option of telling your printer to perform various effects. You can select dots-per-inch density; single or double height; single, double, or triple width; various margins; and so on.

Try printing the same screen with different options, and you'll be surprised by the results. Not only does FGM let you design and work with your own graphics, but you have the ability to load files from other programs. The possibilities are endless. You have complete control over every pixel on the screen. Artwork can be stretched, shrunk, slanted, rotated, overlaid with shadows, and more. By using two screens and flipping between them, you can create simple automation for your demos.

Learning to use the program can take time, but you don't have to learn it all at once. If you go too far, a couple of keystrokes will always take you back to where you started. There's no need to remember filenames.

Selections are made from a screen menu, and a disk directory is always available. You can use up to three drives with FGM, and the program will ask you which one you want to access. You can customize your program disk so that it will default to your particular printer.

If you'd like the cursor and borders to be different colors, you can change them. Copy the program disk and then customize the copy with your most used fonts, character sets, and graphics for a program default to suit your own needs.

FGM is always being updated on Q-Link. The author, whose Q-Link handle is RonH8, is often online in the Starving Artists' Cafe. He is always offering new hints and suggestions.

Q-Link members can download an FGM demo and try it before buying. But once you try FGM, you'll be hooked on graphics—and spoiled. No more having a graphic that won't fit in the space you need on your document. With FGM you can copy it, shrink it, expand it, paste it, and then smile at the results.

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ESTHER OLSON

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DWEEZILABEL

If Dweezil is anything like the program that bears his name, he must be one clever dog. Once again, Dave Ferguson, GEOS programmer *extraordinaire* and human who lives with Dweezil, has released an intriguing and useful GEOS program with a picture of a dog in a party hat on the label.

DweeziLabel is everything a GEOS user could want in a label program. Well, to be fair, it's everything Ferguson would want in a label program. He'll be the first to admit that the program evolved more as an answer to his specific needs than as a general-purpose label maker. Even so, it includes enough features to function as a minidatabase, a minipublisher, and who knows what else.

In the course of running Quincy Softworks, Ferguson needs to keep track of customers from all over the world and to keep notes on what they've ordered, how much they've paid, and so on. DweeziLabel emerged as his ideal multipurpose low-end business application. You can find it on Dweezil Disk #3, which includes MYgeoDIARY and geoWORDS.

Since Ferguson runs his business exclusively with GEOS products, data from DweeziLabel is compatible with applications such as geoMerge and geoCalc. Text scraps and numeric data can be neatly clipped in formatted chunks to fit those GEOS applications.

An even better example of DweeziLabel's versatility is the way it handles data. The program works with files of up to 50 records, similar to a card file database. These files can be created from within DweeziLabel, geoWrite, or geoFile. Ferguson wanted room in those records for more than just names and addresses. He wanted to keep notes about what products people had ordered and the amount of

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money they'd paid, so he added several extra data lines for that express purpose, data that the labeler part of the program doesn't print unless you want it to. So far, that's pretty tame stuff, but this is no wimpy Rolodex.

Tucked away in the Text menu is a series of search commands that let you sail through your data with ease. The six possible lines of data could be names and addresses. You could store shoe sizes and a recipe for Pan Galactic Gargle Blasters in there if you wanted, but DweeziLabel restricts you to the number of spaces you can use. In fact, aside from the size limit and the lack of the trivial feature of saving a graphic to a record, DweeziLabel can hold its own with geoFile for usefulness. As I said before, it even creates merge files for geoMerge.

But, hey, what about labels? Yes, DweeziLabel does labels, any kind of labels. It produces any kind of printed output that is 2 inches tall, for that matter, on pages up to a full 11 inches tall. Using a technique called layering in the work window, you can put together combinations of graphics and text to create just about any kind of label you can imagine.

By paging through the database, you can select label text that can be modified however you like. You can use any GEOS font you might have available (on either disk, up to the file selector's limit—no six or seven font maximum here) and any style, including reverse. The work window is conveniently sized to fit Ferguson's premier graphics desk accessories, NewTools and geoStamp (available on other Dweezil Disks). This means you can stamp yourself a border around a label or curve and angle graphics and text to your heart's delight.

All this power doesn't come as easily as it could, however. The documentation provided on disk is extensive but a bit thin in spots. The entire process of layering a graphics label is not particularly intuitive, which is not necessarily bad, but a step-by-step tutorial for this process would save the user some trial and error.

The words *scrap* and *label* appear often, sometimes meaning one thing and sometimes another. While these variations are defined in the short glossary, they do get confusing. Maybe since this program has become second nature to Ferguson, he's lost the perspective of a neophyte. The documentation should've been written from the perspective of the user who hasn't a clue about how this program operates—but it wasn't. As a result, this program runs the risk of being tossed aside after a half hour of frustration by casual users who don't care to figure out things on their own.

That would be a shame. DweeziLabel is too powerful an application to be missed by anyone who has some honest-to-goodness work to do with GEOS. The results are worth the extra effort it takes to master the intricacies of the interface. Heck, when used in conjunction with NewTools and geoStamp, DweeziLabel might be, as the ads claim, the "hottest GEOS label program to come along in years!"

STEVE VANDER ARK

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Circle Reader Service Number 343 ❐

TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and *The Automatic Proofreader* are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each *Gazette Disk* and are printed in all issues of *Gazette* through June 1990.

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ONLY ON DISK

In addition to the type-in programs found in each issue of the magazine, Gazette Disk offers bonus programs. Here's a special program that you'll find only on this month's disk.

BASSEM 128
By Fernando Buela Sanchez
Querétaro, QRO
Mexico

Symbolic label-based assemblers are the most convenient way to write machine language programs. You enter instructions as source code, and they are later assembled into object code. Rather than using memory locations, you can use meaningful labels.

Many programmers have used—and raved about—Bassem for the 64, and now there's an improved version for the 128. Bassem 128 works in conjunction with BASIC 7.0, and because of the 128's larger memory, it can store larger source code programs. With the addition of new commands, you can also develop your programs with less effort.

Bassem 128 and complete instructions are available only on disk. You can have this program and all the others that appear in this issue by ordering the November Gazette Disk. The price is $9.95 plus $2.00 shipping and handling. Send your order to Gazette Disk, COMPUTE Publications, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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FEEDBACK

Questions and answers about computer memory, onscreen messages, and more

More Memory

What exactly is the purpose of expanding the 64's memory, using cartridges such as the 1750? On an IBM, certain amounts of memory are required to use certain software. Is there any software for the 64 that requires more memory than the 64 has?

JOHN VEILLEUX
ORRINGTON, ME

There's no software that we know of which requires more memory of the 64 than what is native to the machine. On the other hand, several software packages, such as GEOS, can make use of RAM expansion if it's available. Many programs—games in particular—use the disk drive for virtual storage when either the program or its data is too large to be loaded and maintained in memory at one time. If more of the game can be stored in memory, then the game runs faster and the user doesn't have to wait for the computer to access the data stored on disk.

Large spreadsheets and databases are two reasons why business applications benefit from larger memories. Programmers can use more memory, which allows for code that is more highly developed and interpreters or compilers that are more sophisticated. More memory is also a boon to graphics, especially animation, where several scenes must reside in memory at once for smooth screen updates. A computer can do great things with digitized sound, but a lot of storage space is needed to contain reasonable sound samples.

Where speed isn't a critical factor, disk drives are a practical means of extending the 64's 64K limit. But where speed and quick responses are needed, more memory is very handy indeed.

Flashing Message

I've been working on some games for the 64 and have run up against a problem. There are certain messages, such as *DANGER*, that I'd like to have flash on the screen. How do I do this?

CAL BODWIN
GREENSBORO, NC

You could flash a message in BASIC by alternately printing in normal and reverse mode again and again. The program would have to stop while the message blinked, however. When the program continued, the flashing would stop.

Here's a machine language solution. The following program will flash in black any message that is printed on the screen. Other colors will print normally.

```
10 FOR A=828 TO 914: READB:
   POKEA,B: C=C+B: NEXT: IFC
   <>8545THENPRINT"DATA
   ERROR": STOP
15 POKE 6,0:SYS828
   :POKE53281,1: POKE53280,1:
   PRINT"{CLR}{3 DOWN}{15
   RIGHT}{BLK}DANGER!"
20 DATA 120,169,81,141,20,3,
   169,3,141,21
30 DATA 3,169,0,141,147,3,
   141,148,3,88
40 DATA 96,206,148,3,16,58,
   169,10,141,148
50 DATA 3,169,0,133,2,133,4,
   169,4,133
60 DATA 3,169,216,133,5,162,4,
   160,0,177
70 DATA 4,41,15,197,6,208,9,
   77,2,41
80 DATA 127,13,147,3,145,2,200,
   208,236,230
90 DATA 3,230,5,202,208,227,
   173,147,3,73
100 DATA 128,141,147,3,76,
   49,234
```

If you want a different color to flash, poke its color code (0–15) into location 6. The speed of the flashing can be adjusted by poking location 855 with a number from 0 to 255; the smaller the number, the slower the flash rate. SYS 828 enables the flashing messages. To stop the flashing, press the Run/Stop key and tap the Restore key.

Sequential Files

Could you please explain what a sequential disk file is and how to create one?

JACK DEMEANOR
CHARLESTOWNE, MA

A sequential file provides a way of keeping information separate from the program that uses it. This allows you to create general-purpose programs that can act on different sets of information. Instead of writing one program to keep track of a stamp collection, for example, and a second program to list a collection of rare books, you could write (or buy) a general inventory program that stores data in sequential files. One file would contain notes about stamps, and another would have the data about the books.

A single program could handle two or more different files. Sequential files are like DATA statements because you start reading at the beginning and continue until the end.

To create a sequential disk file, open it for writing, write one or more pieces of information to it, and then close the file. It's important to close a file when you've finished using it; otherwise, some of the information will be lost.

Reading the file requires an operation similar to that for writing. Open the file for reading, read the information, and then close the file.

Here's a short program that creates a sequential file.

```
10 PRINT "ENTER THREE
   NAMES"
20 PRINT"(PRESS RETURN AFTER
```

```
   EACH ONE"
30 PRINT"OR SEPARATE THE
   FIRST TWO WITH COMMAS)"
40 INPUT A$,B$,C$
50 OPEN 1,8,2,"NAMES,S,W"
60 PRINT#1,A$: PRINT#1,B$:
   PRINT#1,C$
70 CLOSE1
```

The three numbers after the OPEN command in line 50 are the logical file number, the device number, and the channel. The file number can be any number that's not already being used by a peripheral. If you had previously opened a file to printer with OPEN 1,4 (file 1, device 4), you couldn't use logical file number 1 for opening the disk file. The logical file number is important because it's the number used to read from and write to a file.

The second number after OPEN is the device number (a single disk drive is device 8). The third number is the channel to be used. There are 16 disk channels, numbered 0–15. Channels 0 and 1 are used for loading and saving, and 15 is the command channel, so that leaves channels 2–14 for sequential files. It doesn't matter which channel you use, as long as it's not being used by another disk file. You can open more than one disk file, but each must have a different logical file and channel number.

The "S,W" after the filename means that the file will be sequential (S) and that you'll be writing (W) to it. Note the five commas in line 50; they're all necessary to separate the various parts of the OPEN command.

When the file is open, the red light on the front of the 1541 (or green light on the front of the 1571) drive will turn on and stay on until the file is closed. In line 60, PRINT# writes information to the file. It must be followed by the logical file number, a comma, and the information. If line 5060 had been OPEN 5,8,3, line 60 would have used PRINT#5 instead of PRINT#1. Line 70 closes the file. CLOSE is followed by the logical file number.

Now that we've written a file called NAMES, here's a program to read the data.

```
10 OPEN 5,8,4,"NAMES,S,R"
20 INPUT#5,A$,B$,C$
30 PRINT A$:PRINT B$:PRINT C$
40 CLOSE 5
```

Since we're reading the file, there's an R, *rather than a* W, *at the end of the OPEN command in line 10. In this instance, we're using logical file 5 and channel 4, although we could have used 1 and 2 as in the first program. INPUT# reads information from the file. Like PRINT#, it's followed by the logical file number and a comma. GET# acts like INPUT#, but it reads a single character at a time.*

The programs have similar structures: They both INPUT from one source and PRINT to another. The first used INPUT/PRINT# to read the keyboard and write to a file, while the second used INPUT#/PRINT to read from the file and write to the screen.

Double-Width Printing

I use SpeedScript with my Star NX-1000C printer, but the PRINT command for double-width characters does not work. Is there a way to modify the program to use these commands, or should I use a Ctrl-£ command?

DON SYWASSINK
SIERRA VISTA, AZ

A Ctrl-£, or stage 2, command should do the trick. With SpeedScript, you can define printkeys that will print whatever codes your printer uses for features such as double-width or emphasized mode.

To define a printkey, at the top of your document press Ctrl-£ (or Ctrl-3), followed by the key that you want to assign as the printkey. Then enter the equal sign (=) and the ASCII value to be substituted for the printkey during printing. Many systems use an escape (ESC) code to break out of the word processor, and then certain ASCII values to activate various print modes.

For convenience, SpeedScript has already set four printkeys. Printkey 1 is defined as the escape key (ASCII 27). (With some printers and interfaces, you must send two escape codes to bypass the emulation.) Printkey 2 has a default value of 14, which is the ASCII code that puts most printers into double-width mode. Therefore, to switch to double-width mode, press Ctrl-£ and then press 1, press Ctrl-£ again, and then press 2. Next, enter the text you want printed in double-width mode.

Printkey 3 has a default value of 15, which turns off double-width on some printers and selects condensed mode on others. Printkey 4 is defined as 18, which selects reverse field on Commodore printers and some interfaces in emulation mode. On other printers, it switches to condensed mode. (See your printer manual for exact codes.)

To print the word WIDE *in double width in the following example and then revert back to normal printing, your screen should look like this.*

This is 12WIDE3 printing.

Remember, some printers require two escape codes. In that case, you would have 112 *in front of the word* WIDE. *Codes can vary from printer to printer, so check your manual for specific values.* ❐

How to create and use sequential files and use double-width printing with SpeedScript

MACHINE LANGUAGE

Jim Butterfield

CODING CHOICES

When programming, there's usually the fastest way or the most compact way. Here's an attractive compromise.

Recently, I saw the following message posted on a computer network: "I have a value in a single byte, and I want to calculate the remainder after dividing by 5. What code do you suggest?"

The remainder after division is often called the modulo; I don't know why the user wanted to calculate this, but there are several methods available that we can try. In this column, we'll discuss a couple of methods for solving the problem, and we'll also demonstrate the tradeoff between a program's speed and size. While we're at it, this might be a good time to gain some insight into hexadecimal numbers.

The standard method for solving this problem would be to use a conventional division routine that would yield both quotient and remainder. There are methods, however, that are designed either to achieve maximum speed or to utilize minimum memory. One rarely finds a piece of code that offers both. Almost all coding is a tradeoff between these two extremes.

A sample program called MOD5, printed at the end of this column, provides us with three approaches. The first routine offers speed, the second efficiency, and the third is a compromise of the two. You may want to examine the code of each one.

The fastest method is to look up the remainder in a table. Since a one-byte number can contain only 256 possible values, we can do this with a table of 256 bytes. This method couldn't be faster. We put the original byte into the Y register, and do the translation with a single instruction: LDA TABLE,Y. You'll find this at hex address 2015 in the program at the end of this column.

The method wastes memory, since we must devote 256 bytes to hold the table. The table could be loaded in, but it's quicker to calculate it when the program starts. You'll see this one-shot table build at addresses $2000–$2011. If only a few values were to be calculated, we couldn't justify this extra work. On the other hand, if there were thousands of values, this program would be speed efficient.

If the byte in question contains a value of 5 or more, we could subtract 5 and then repeat. Eventually, we end up with a value of 0 to 4; that's the remainder. The calculation loop, at addresses $202C–$2033, requires only four instructions: compare to 5, branch out if less (BCC), subtract 5, and branch back to the loop (BCS). Serious students of code will be able to explain why we don't need to set the C (carry) flag before subtraction and why the BCS (Branch Carry Set) command always branches.

The code is compact, fitting within eight bytes, but it could be slow. Since the original value could be as high as 255, the loop might be repeated as many as 51 times!

Most programs trade off speed against size. Programs that need to be fast will unfold their loops; this saves time but calls for more instructions. In this case, it really doesn't matter much. We have plenty of memory, and even the slowest method runs plenty fast for our purposes.

I wanted to add one more method, however. This third piece of code is moderately compact and fast. More important, it helps to show an interesting aspect of hex numbers.

It takes only a glance at a decimal number to tell whether it divides evenly by 5 or what the remainder would be. The last digit of the number tells the story (5 is a factor of 10, the base of decimal numbers). That's not true of hexadecimal numbers. The last digit will signal whether the number is divisible by 2, 4, 8 or 16, but it won't help you on the mod-5 question. Hex numbers such as 20 and 65 seem as if they should divide by 5, but they don't. Their decimal values are 32 and 101.

There is, however, a quick way to inspect hex numbers to see whether or not they will divide by 5. It's similar to the method we use with decimal numbers in testing whether or not a number divides by 9 or by 3. Add the decimal digits together; the total will have the same mod-9 value as the original number. Thus, decimal value 1234 will have a remainder of 1 when divided by 9. Calculate 1+2+3+4, giving 10, and the answer is a snap. The same holds true for division by 3, which is a factor of 9.

In hex, the sum of digits tells us about division by 15 or either of its factors (3 or 5). So, hex 23 will divide exactly by 5, and hex BC would have a remainder of 3. We know this because 2+3 gives 5, B+C or 11+12 gives 23, which would leave a remainder of 3 when divided by 5.

How would we do this in a computer program? A hex digit corresponds to four bits. We can extract the value of the high hex digit by shifting the number right four places. We extract the low digit value with a simple AND #$0F. Add them together, and we have the sum of the two hex digits within a byte.

This sum cannot be greater than 30 (decimal), so we know that the simple subtraction of method 2 will now loop not more than six times. Quite an improvement from a possible 51 times around the loop.

Four LSR (Logical Shift Right) commands extract our high hex digit. We store the re-

sult and then call back the original value; masking with AND #$0F isolates the low digit. Add them together (don't forget to clear the carry flag first with CLC), and we can repeat the subtract loop of method 2. The whole thing goes from hex address 2040 to 205B. That's a bit longer than the previous method, but there's quite a speed advantage.

The program works on almost any Commodore 8-bit computer. It first pokes the machine language code into place. Then it does the mod-5 calculation four times.

The first calculation is in BASIC, followed by each of the three above methods. The values used for the calculation are from ROM, hex addresses E000 through E006. You'll get the same results each time, of course.

You might want to use a machine language monitor to inspect the MOD5 code more closely. That'll give you an even better understanding of what's happening in the different routines.

```
100 DATA 162,0,160,0,152,157,
    0,33,200,192,5,144,2,160,0
110 DATA 232,208,242,188,0,224,
    185,0,33,9,48,32,210,255
120 DATA 232,224,7,144,240,169,
    13,76,210,255
130 DATA 162,0,189,0,224,201,5,
    144,4,233,5,176,248,9,48
140 DATA 32,210,255,232,224,7,
    144,235,176,226
150 DATA162,0,189,0,224,72,74,
    74,74,74,141,255,32,104
160 DATA 41,15,24,109,255,32,
    201,5,144,4,233,5,176,248
170 DATA 9,48,32,210,255,232,
    224,7,144,220,176,186
200 FOR J=8192 TO 8295
210 READ X:T=T+X
220 POKE J,X
230 NEXT J
240 IF T<>12902 THEN STOP
400 PRINT "BASIC:"
410 FOR J=57344 TO 57350
420 X=PEEK(J):PRINT X-5*INT(X/5);
430 NEXT J
440 PRINT
450 PRINT"TABLE LOOKUP:"
460 SYS 8256
470 PRINT "SUBTRACT LOOP:"
480 SYS 8231
490 PRINT "HEX CHECKSUM:"
500 SYS 8256
510 PRINT "END."
```

❐

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BEGINNER BASIC

Larry Cotton

ADDING ZIP TO BASIC

When your BASIC programs need a burst of speed, give them a shot of machine language.

I get lots of requests for programming tips on ways to use BASIC with many applications, ranging from games to databases. A typical question might be, "How do I write a fast subroutine for doing searches for a given name and address in BASIC?" Another might be, "How do I make the aliens move faster while monitoring the joystick port, keeping score, and moving background scenery?"

The answer to these questions is simple: If you want to do it fast, forget BASIC. Any program can be written in BASIC (assuming it will fit the computer's memory), but you might drop off to sleep waiting for something to happen.

Many articles have been written on maximizing BASIC's speed, and you can get some improvement using these techniques. However, none but the shortest, most elementary database programs should be written in BASIC. Any program that is more sophisticated is best written in some other programming language—preferably machine language (ML). To learn more about those programming techniques, consult Jim Butterfield's "Machine Language" column elsewhere in Gazette.

As for games, some can easily be written in pure BASIC, especially those that don't require blinding speed. Some examples would be word-search, spelling, math-drill, and even simulated board games. These types of games don't require much speed, and the user wouldn't notice if the computer slowed a little during execution.

Actually, BASIC and ML can be used together. One way is to use a BASIC program as an ML loader. Then a SYS command puts you into machine language to stay.

The other way is to incorporate a speedy routine within a relatively slow BASIC program. Here's an example of the latter.

Suppose you're writing a pick-a-card-any-card game. You need to shuffle a deck of 52 cards quickly. By generating a nonrepeating list of 52 numbers, you could assign the numbers to an array of all the cards. The following program is one way to generate those numbers in BASIC.

BASIC RND

```
10 PRINT"{CLR}{DOWN}PRESS
   ANY KEY TO RANDOMIZE 52
   NUMBERS
20 PRINT"{DOWN} WITH OUT
   REPEATS.
30 GETA$:IFA$="" "THEN 30
40 PRINTCHR$(147)
50 Q=RND(-TI/101)
60 C=52:DIMRN(C)
70 FORX=1TOC
80 RN(X)=INT (C*RND(1))+1
90 FORT=XTO1STEP-1:
   IFRN(X)=RN(T-1) THEN80
100 NEXT
110 PRINTRN(X),
120 NEXT
130 PRINT"{DOWN} I'M SURE
    YOU DON'T WANT A REPEAT!
```

Now, let's try doing the same thing using machine langage. (Don't worry, Jim Butterfield. Your column is safe!)

ML RND

```
10 Q=RND(-TI/101):
   PRINTCHR$(147)
20 FORT=49152TO49221:
   READD:POKET,D: NEXT
30 POKE54286,255:
   POKE54287,255: POKE54290,
   128: REM SET UP VOICE 3
40 CB=49480
50 A=52:REM RANDOMIZES
   FROM 1 TO A WITHOUT
   REPEATS; MAX. VALUE OF A
   IS 255.
60 POKE49222,A
70 PRINT"{DOWN} PRESS ANY
   KEY TO RANDOM-
   IZE"A"NUMBERS
80 PRINT"{DOWN} WITH OUT
REPEATS.
90 GETA$:IFA$="" "THEN90
100 PRINTCHR$(147): SYS49152
110 FORT=CB+1TOCB+A:
   PRINT(PEEK(T)),: NEXT
120 PRINT:PRINT:PRINT"AGAIN?
   (Y=YES, N=NO)
130 GETA$: IFA$<>"Y" THENIFA
   $<> "N"THEN130
140 IFA$="N"THENEND
150 GOTO100
1000 DATA 172,70,192, 69,0,153,
     72,193,136,208,250, 173,
     70,192,170,160, 0,153,72
1010 DATA 192,200,240,11,202,
     138,208,246,173,70, 192,
     170,76,17,192,173,70,192,
     141
1020 DATA 71,192,173,27,212,
     170,189,72,192,172,70,
     192,217,72,193,240,241,
     136,208
1030 DATA 248,172,71,192,153,
     72,193,206,71,192,208,
     227,96
```

Run both programs and observe the difference in how long it takes to generate 52 nonrepeating numbers. Allow plenty of time in the BASIC version, especially for the last several numbers.

To use embedded ML subroutines in a BASIC program, just SYS to the routine (see line 100 in ML RND). After the numbers are generated, they appear in memory registers 49481 through 49532 (for 52 numbers).

Here's an invitation to you programmers. I'd like to see your own versions of both BASIC and ML no-repeat randomizing programs. Please send them to me in care of COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. If you keep them small enough to print on one page of the magazine, I'll publish the best examples in a future column. ❐

D'IVERSIONS

Fred D'Ignazio

CAPTAIN FUTURE AND HIS POCKET COMMANDER

In this exciting episode, read how a mild-mannered magazine columnist is transformed into Captain Future.

Hello. This is Captain Future. People used to call me Fred, but that's when I was stationary, physical, and sitting in a real chair in a real office with real wires tying me to one spot.

Now I'm Captain Future. I'm mobile. I'm cordless. I'm wireless. I'm on the go. Where I call you from one minute is not where I'll be the next. You may be *there* (where you really are), but I'm only *here* in a metaphorical sense. I'm totally virtual. I beam you up from my little pocket phone somewhere on the planet. You beam me up, and I might be on a rock cliff or in my minivan or under a giant sequoia.

The revolution in my personal communications style occurred two months ago when I began renting my little Fujitsu Pocket Commander phone. The phone weighs just a few ounces; it's about five inches long and two inches deep. I wear it in a little case on my belt.

When I'm wearing my Pocket Commander, I feel like a new man. With that little phone strapped to my side, I pretend I'm James Bond with his shoulder holster. But instead of a warlike secret agent, I'm a peaceful agent, armed for the future, ready to communicate with the world.

As soon as the Fujitsu lady checked me out on my new phone, I placed my very first call to my wife. I found her in an unlikely spot: the kitchen. She picked up the kitchen phone and said, "Hello?"

"Hello, dear," I said. "It's Captain Future, your husband."

"Where are you?" asked my wife, not at all impressed with my new secret identity.

"Right outside the kitchen door, dear," I answered proudly. "About five feet away from you, in the driveway."

Next I called my mom. "Hello, Mom," I said. "It's your son, Captain Future."

"Who is this really?" my mother asked suspiciously.

"Aw, Mom," I said. "I'm calling you with no wires. No cables. Just thin air. And we're talking just like on a real phone. Isn't it grand?"

"I don't know any Captain Future," my mother said. "And whoever this is, you sound like you're calling me from inside a fish tank or a tin can. Please go away." Clink!

After calling my mom, I called everyone else I could think of. I called people from restaurants, bowling alleys, baseball diamonds, petting zoos, and public marinas.

Suddenly, I realized that I had become an addictive communicator. I first realized this after I installed the Fujitsu Pocket Commander in a cellular dock inside my minivan. Now I had a boosted power source, a cellular antenna corkscrewing up the side of my car, and an in-car speaker phone with a tiny mike clipped to the sun visor over the driver's seat. After I ran out of other people to call on my car phone, I began calling my wife again.

"Hello, dear!"

"Is that you, Fred?" my wife asked, from inside the house. "Where are you now?"

"Outside in the driveway, in our car."

"If you're already home, why don't you come inside and talk, like a real person?"

"Because it's more fun to call you from the car. It's kind of like an intercom. Besides, I've got my laptop computer out here, and I'm trying to plug it into the car phone so I can call online bulletin boards and maybe even send faxes."

"Why would you want to send faxes from your car?" my wife asked. "Especially when you're parked in our driveway?"

Since then, my wife has slowly warmed to pocket phones. For example, last week she and I were trekking around a rock quarry on the seacoast north of Boston. There wasn't another person for miles around. Nature was in bloom all around us. Suddenly, my wife reached for my belt.

"Dear!" I screamed, jumping backward. "What's got into you?"

"Your phone," she said. "I want your phone. I just remembered I have to call my office."

While my wife sat on the quarry's edge talking with her boss and her secretary, I began climbing down the vertical wall of the quarry. After about 15 minutes, I made it down to the level of the water that filled the quarry's inner basin. I took off my shoes and dangled my bare toes in the water, scaring away a couple of polliwogs that were sunning themselves on a big boulder just beneath the surface. I listened to my wife as she talked on the cellular phone, her voice crystal clear high above.

"This is weird," I thought. Somehow, my wife's phone call to her office didn't seem out of place even here, deep in the heart of undisturbed nature. In addition, the call didn't stress me out or make me lose my sense of awe and appreciation for my surroundings. Somehow, everything seemed to fit in.

It'll be amazing to see how this revolution changes the future face of work and leisure. Maybe in the future it'll be normal to conduct business on a rock cliff while on a daylong trek into a remote granite quarry. As I gazed out at the deep blue quarry lake all around me, I thought that might be kind of nice. ❐

GEOS

Steve Vander Ark

ULTIMATE GEOS

Now that the holiday season is fast approaching, here's the GEOS system I'd really like to find under the tree.

In an IBM magazine recently, a senior editor describes his quest for the ultimate PC. The cost of this system would buy a pretty nice sports car.

That started me thinking about the ultimate GEOS setup. I wondered just how powerful GEOS could be with all the right gizmos hooked up to it. And, since Christmas is just about once again to take over prime time and the malls, I figure this is a great time to make yet another GEOS wish list. While the total wouldn't buy a snazzy sports car, it might be enough to buy, oh, a used Ford Escort.

My dream GEOS setup has to start with a computer, of course. I'll go with the 128, since an 80-column screen is essential. Now, the 128D does have a detachable keyboard, which is nice, and an extra 64K of video RAM, but I don't like the idea of having that darn 1571 permanently set up as drive 8. I have much better ideas for disk drives, so I'll stick with the flat 128.

One advantage to the Commodore computer is that you don't have to spend heaps of money on extra cards to do things like create color screen displays. Our 128 has 40-column and 80-column modes built right in; all we need to do is to choose a monitor which can display either mode on command. Since nothing but the best will do for our ultimate setup, I'll add a Commodore 1084S monitor.

Mode switching can become a constant chore when you work with GEOS on the 128; many programs, from little utilities like Blue Pencil to big utilities like geoPublish, run fine on the 128 but demand 40 columns. To make life a little easier, I'll add a 13-inch 40-column monitor on the side. You'd be surprised how handy this configuration can be. When you switch to 40-column mode, the image jumps from one monitor to the other, and the screen of the unused monitor goes peacefully blank. If you can't afford a second monitor, a color TV works about as well. I'm going for broke here, though, so I'll pick up an 1802 monitor.

One or two more details are needed before we tackle the big question of drives and RAM expansion. We must, for example, have an input device. Speaking from experience, having used a joystick, mouse, KoalaPad, and light pen with an assortment of drivers, I strongly recommend a mouse. Speaking from the experience of friends, the mouse of choice is the Commodore 1351.

OK, let's talk disk drives. It would be nice to include drives to handle both 5¼-inch and 3½-inch disks. For the 5¼-inch disks, the best bet is the good old 1571, which can read single- or double-sided floppies. That's pretty much standard stuff.

Let's take a leap into the big leagues for the 3½-inch drive. We have a couple of very impressive choices, now that Creative Micro Designs (CMD) has released a pair of high-density drives: the FD-2000, with 1.6 megs per disk, and the FD-4000, with a whopping 3.2 megs of data on a floppy! We're talking dream material here, folks! The ultimate GEOS system has to have an FD-4000.

That accounts for two of the drives. GEOS can effectively handle only three drives, so this next choice might be a little sticky. Some form of RAM expansion is a must with GEOS, but if it's configured as a RAM drive, there goes the third drive. It's hard to imagine an ultimate system, however, without a hard drive. For now, anyway, I'll just choose both.

The hard drive of choice will be one of the CMD HD-series drives, which are compatible with GEOS and practically everything else. Since money's no object, I'll take the HD-200 with 200MB capacity.

I do need RAM expansion as well, so let's take a look at the options. The Commodore 1751 RAM expansion unit can be upgraded to larger capacities than the stock 512K, but it's still a pretty bland unit. A much more exciting choice would be either the RAMLink or RAMDrive from CMD. Each has two invaluable features no RAM expansion device should be without: a separate power supply, which keeps the data intact when you shut down your system, and a battery backup, which means that in the event of a power failure, your data won't evaporate like spit on a hot skillet. Both are fine units. RAMLink can be upgraded to 16 megs, while RAMDrive is limited to 8 megs. RAMLink also can be fitted out with a realtime clock circuit to set your clock in GEOS, and it also features a pass-through port that I just might need before this system is completed. I'll add RAMLink, maxed out to 16 megs.

I'll have to decide how to configure all those drives when I pick a desktop program, but I'll do that next month when I talk about software. For now, let's recap my shopping list.

128 CPU (used)	$ 200.00
1084S monitor	$ 289.00
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1351 mouse	$ 32.95
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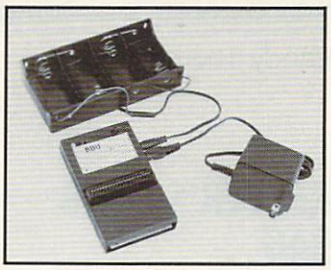

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PROGRAMMER'S PAGE

Randy Thompson

READER'S GRAB BAG

Readers take over this month's column with a collection of handy tips for the 64 and 128.

From the mailbox to the printer, this grab bag of programming gems comes from you, our readers. Keep 'em coming. We pay up to $50 for each tip we publish.

64 or 128?

There's an easy way for your BASIC program to detect which 8-bit Commodore computer it's running on. Simply check the variable DS$ in the first line of your program. If DS$ is equal to a null string (DS$=""), your program is running on a 64 or on a 128 operating in 64 mode. That's because in 128 mode, the DS$ string returns the current status of the disk drive, whereas on a 64, DS$ doesn't hold anything until you define it.

Incidentally, checking DS$ on a 128 that has no drive attached can crash your program, but how many driveless 128 owners do you know?)

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Redefining Restore

This two-line program turns your Restore key into a computer reset button. After you type in and run the program, tapping (sharply, of course) the Restore key will yield the same results as the BASIC command SYS 64738.

```
10 FOR I=32768 TO 32776:
   READD: POKEI,D: NEXT
20 DATA 248,252,226,252,195,
   194,205,56,48
```

To disable your new reset key, turn the computer off and then on again.

Here's how the program works. Whenever you press the Restore key, the computer checks memory locations 32772–32776 for the numbers 195, 194, 205, 56, and 48. These numbers are the PETSCII codes for the reversed capital letters *CBM* followed by the number 80. If that string is found, the computer jumps to the machine language subroutine pointed to by memory locations 32770 and 32771. The program listed above redirects this vector to point to the 64's reset routine found at 64738. Things get a bit tricky here, because the reset routine at 64738 also looks at memory locations 32772–32776 for the string *CBM80*. If it finds those characters, it jumps to the subroutine pointed to by the vector at 32768. To avoid such jumpy behavior, our Restore-reset routine sets this vector so that it points right back into the 64's reset routine, forcing the computer to continue the reset operation from where it left off.

One of the neat features of this program is that you can set the vector found at 32770 so that it points to your own machine language program—one that will execute every time you press Restore. In the program above, this vector is set equal to the third and fourth numbers found in the DATA statement on line 20.

Note that this program disrupts the normal operation of the Run/Stop–Restore key combination. Now, pressing Run/Stop–Restore resets the computer, also, but it clears any program that may have been in memory.

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Convenient Comma Key

This hack is for 128 owners who enter a lot of data via their numeric keypads. It transforms the keypad's Enter key into a comma key. Such a setup is ideal for people who type in a lot of MLX listings.

```
10 FOR I=0 TO 28: READ D:
   POKE 4864+I,D:C=C+D: NEXT
20 IF C<>3231 THEN PRINT
   "ERROR IN DATA STATE
   MENTS": END
30 BANK 15: SYS 4864: PRINT
   "NUMERIC COMMA KEY
   ACTIVE"
40 PRINT "TO DISABLE: POKE
   830,128:POKE 831,250"
50 PRINT "TO REACTIVATE:
   BANK 15:SYS 4864"
60 DATA 160,0,185,128,250,
   153,29,19
70 DATA 200,192,89,208,245,
   169,19,141
80 DATA 63,3,169,29,141,
   62,3,169
90 DATA 44,141,105,19,96
```

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ReDIMing Arrays

If you ever want to erase and/or redimension (DIM) your variable arrays, execute the following two commands from within your program.

```
POKE 49,PEEK(47): POKE
50,PEEK(48)
```

This will erase all arrays. Unlike the CLR command, however, these POKEs will not affect nonarray variables.

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Monitoring 64 Code on the 128

The most popular area for programmers to store machine language programs on the 64 is in the 4K area starting at 49152 ($C000). Of course, this area is relatively useless on the 128 because 49152 is where editor ROM is mapped, but that doesn't mean you'd never want to load your 64 code here. Because RAM underlies 128 editor ROM, 64 machine code can be stored here and worked on using the 128's built-in machine language monitor.

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MOB MASTER

By Hong Pham

Sprites (or movable object blocks) are large user-defined graphics that can be placed anywhere on your monitor's screen. The 128 has a powerful sprite controller that is built into its BASIC operating system to make sprite programming fairly easy. The 64, which has the same sprite capabilities as the 128, lacks the 128's sprite controller system. Programming sprites on a 64 usually requires many lines of code filled with awkward POKEs—but now there's MOB Master.

MOB Master gives the 64 many of the same features and sprite commands that are found on a 128. It also has extras, such as sprite animation and boundary-handling commands.

While this article explains how to use MOB Master's commands, it doesn't provide a complete tutorial for creating and using sprites. Programmers who already use sprites should have no trouble using MOB Master. Beginners can find more detailed descriptions of sprites and video banking in such reference books as *Commodore 64 Programmer's Reference Guide* or *Mapping the Commodore 64*.

Getting Started

MOB Master is written entirely in machine language. Use MLX, our machine language entry program, to type it in. If you don't have a copy of MLX, see "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

Starting address: 7D00
Ending address: 86EF

When you've finished typing in MOB Master, be sure to save it before exiting MLX.

To activate MOB Master, load it with the ,8,1 extension and then type *SYS 32000*. At this point you'll see a title screen that lets you know MOB Master has been activated. You may now begin writing your own sprite program. Instead of using cumbersome POKEs to control your sprites, however, you'll have a whole new library of commands at your disposal.

Ten Sprite Commands

MOB Master adds ten new BASIC commands for easier sprite definition, positioning, movement, animation, and other miscellaneous functions. The first three commands are similar to the 128's sprite commands of the same name.

Here's an important programming note to remember: When using a MOB Master command within a BASIC program, you must precede that command with a slash (/). In immediate mode, however, you don't need to use the slash.

SPRITE *#, on/off, fgnd, priority, x-exp, y-exp, mode*

The SPRITE command defines most of the characteristics of a sprite. Select the sprite number *(#)* with a value ranging from 0 to 7.

Use a 1 in the *on/off* parameter to turn on your sprite; use a 0 to turn it off.

The sprite foreground *(fgnd)* color is defined with a value between 0 and 16.

To make the sprite appear in front of objects on the screen, set its *priority* parameter to 0. To make it appear behind the objects on the screen, set the parameter to 1.

The sprite can expand to twice its original size horizontally *(x-exp)* or vertically *(y-exp)* by setting the next two parameters to 1. Set these parameters to 0 to turn off sprite expansion.

Turn on multicolor *mode* with a 1 or turn it off with a 0.

MOVSPR *#, x, y*

MOVSPR either positions or moves the sprite. The first example plots the sprite anywhere on the screen, with *x* being any pixel number between 0 and 319 and *y* any number between 0 and 199. Unlike normal sprite programming, MOB Master lets you place sprites beyond the 255th pixel without additional programming.

MOVSPR *#, direction # speed*

This variation moves the sprite in a specific direction and speed. The *direction* value can range from 0 to 255. This value can be converted to degrees by multiplying it by 45/32. To move the sprite up, use a value of 0. To move it to the right, use a value of 64. To move down, use 128. To move left, use 192. Intermediate values will move the sprite at different angles across the screen.

The value for *speed* can range from 0 to 255, with 0 being fastest and 254 being slowest. A value of 255 means that the sprite is stationary.

The format for this command is similar to that used for positioning a sprite, but instead of using a comma to separate the values, use the # sign. For example, MOVSPR 0, 64 # 100 would move sprite 0 to the right at a fairly slow speed.

SPRCOLOR *color 1, color 2*

In multicolor mode, the two multicolor colors are shared among all eight sprites. The first parameter defines multicolor 0, and the second parameter defines multicolor 1.

ANIMATE *#, speed, mode, start frame, end frame*

ANIMATE defines a sprite image or animates the sprite by successively changing its image pointers. The animation *speed* can range from 0 to 255, with 0 being fastest and 254 being slowest. A value of 255 means that the sprite has no animation. The *mode* parameter tells MOB Master how the sprite will be animated. A value of 0 means that the sprite will always be animated, and a 1 means that the sprite will be animated just once. Any other value will stop the sprite from being animated.

Sprite data resides in blocks of 64 bytes each. These blocks are numbered from 0–255. To calculate the location of a block of sprite data in memory, multiply the block number by 64. The result gives you the location where the first byte of a sprite definition should be poked. If you define several sprites whose shapes differ slightly and then switch rapidly among these blocks with the ANIMATE command, the sprite will appear to move in an animated fashion.

The *start frame* parameter indicates the first sprite image or block for animation. The *end frame* parameter indicates the ending block number for the animated sequence. Any sprite

frames that are in between these will be automatically called.

BOUNDARY *#, mode, top, bottom, left, right*

Each sprite has its own individual screen boundaries. Once the sprite reaches a boundary that you set with a pixel number, the *mode* parameter indicates the action that the sprite will take. A 0 means that the sprite will wrap around and be placed on the opposite boundary. A 1 indicates that the sprite will bounce off the boundary. A 2 indicates that the sprite will stop at the boundary. Any other value indicates that the sprite will be turned off when it reaches a boundary, discontinuing motion.

For convenience, MOB Master allows only the horizontal boundary to be accurate to within two pixels. The actual boundary occurs on every even pixel. MOB Master will automatically divide the value that you have supplied with the boundary parameter by 2.

BOUNCE *#, mode*

BOUNCE bounces a sprite in a certain way, even if it's not at its boundary. *Mode* indicates how the sprite will bounce. A 0 argument means that the sprite will bounce vertically; a 1 indicates that the sprite will bounce laterally. Any other value will reverse the sprite's direction.

SPLIT *mode*

MOB Master supports two different raster-interrupt routines for flicker-free sprites. It accomplishes this task by updating its shadow registers when the raster scan is at a certain position on the screen. To select one of the two raster-interrupt routines, set *mode* to either 0 or 1. The only difference is that the latter routine allows you to display sprites on the top and bottom borders. If no argument follows SPLIT, it will turn off the raster-interrupt routine.

Before attempting an input or output operation, especially with a disk drive, it's best that you turn off the raster-interrupt routine. If you don't turn off the routine, the computer may freeze until you hit the Run/Stop and Restore keys simultaneously.

IRQ *enable/disable*

When you move multiple sprites as if they were one sprite, one sprite may move ahead of the others, creating a gap. This is because MOB Master updates the sprites 60 times a second, and BASIC may be too slow to move all the sprites before MOB Master updates them. One sprite may be updated before BASIC updates the others.

To temporarily stop MOB Master from updating the sprites, use IRQ 0. Any other value will allow MOB Master to continue updating the sprites. Be careful not to hold the system for too long, or the computer may hang up.

ZAP

ZAP clears all the sprite registers.

KILL

KILL disables MOB Master and restores the previous interrupt and BASIC vectors.

Additional Notes

For all MOB Master statements, with the exception of IRQ, you can substitute an unknown parameter with an asterisk (*). You can also use the asterisk if you don't want to make any changes to the current parameter. You don't have to supply all of the parameters of the command, but you must denote the sprite number. You cannot substitute an asterisk for the sprite number.

Collision Detection

Sprite-to-sprite or sprite-to-background collisions can be monitored by using the USR command. To return the status of the last sprite-to-sprite collision, type in *PRINT USR(0)*. Likewise, to return the status of the last sprite-to-background status, type *PRINT USR(1)*.

Shadow Registers

MOB Master updates its shadow registers to the VIC-II during a raster interrupt, or once every 1/60 of a second, to avoid sprite flickers. An advantage of this setup is that the sprites continue to move while your program does something else. You shouldn't make a direct POKE to the VIC-II registers to define a sprite, because once a raster interrupt occurs, MOB Master overwrites the VIC-II register with the contents of the shadow register. Therefore, poke to the shadow register instead. Below is the memory map of the shadow register and its VIC-II equivalent.

VIC-II Location	Equivalent Shadow Register	Description
	(Base + offset)	
$D000 (53248)	Base + 1312	Sprite 0 *x* position
$D001 (53249)	Base + 1320	Sprite 0 *y* position
$D010 (53264)	Base + 1328	Most significant bits of sprites 0–7 horizontal positions
$D015 (53269)	Base + 1329	Sprite enable register
$D017 (53271)	Base + 1330	Sprite Y-Expand register
$D01D (53277)	Base + 1331	Sprite X-Expand register
$D01B (53275)	Base + 1332	Sprite-to-foreground priority register
$D01C (53276)	Base + 1333	Sprite multicolor mode register
$D025 (53285)	Base + 1334	Sprite multicolor register 0
$D026 (53286)	Base + 1335	Sprite multicolor register 1
$D027 (53287)	Base + 1336	Sprite 0 color register
$07F8 (2040)	Base + 1344	Sprite shape data pointers. The actual location of this register depends on the location of the video matrix.

The default base is $7D00 (32000).

MOB Master and Machine Language

MOB Master's sprite-handling ability is not restricted to BASIC programs. Machine language programmers will find

MOB Master useful, as well. In fact, MOB Master and machine language are a great combination because you can do much more with machine language than you can with BASIC.

To make access to MOB Master's subroutines easier, MOB Master has a jump table. For all of MOB Master's subroutines, enter it with a JSR instruction, and use the X register to denote the sprite number. The following is the memory layout of the jump table.

Location	Description
(Base + offset)	
Base	Enable MOB Master's BASIC interface.
Base + 3	Enable raster-interrupt routine 1.
Base + 6	Enable raster-interrupt routine 2.
Base + 9	Disable raster-interrupt routine.
Base + 12	Zap all sprite registers.
Base + 15	Turn sprite on or off; C flag set = sprite is on.
Base + 18	Position sprite at *x, y*. AC = LSB of *x* position; C flag = MSB of *x* position; YR = *y* position.
Base + 21	Set sprite color; put sprite color in AC.
Base + 24	Set sprite multicolor mode characteristics. C flag set = multicolor mode on. AC = multicolor 0; YR = multicolor 1.
Base + 27	Set sprite to background priority; C flag set = background has priority.
Base + 30	Set Y-expand; C flag set = expand sprite vertically.
Base + 33	Set X-expand; C flag set = expand sprite horizontally.
Base + 36	Set sprite speed; AC = sprite speed.
Base + 39	Set boundary action mode (similar to BASIC BOUNDARY statement).
Base + 42	Set sprite direction; AC = sprite direction.
Base + 45	Set animation speed and mode. AC = animation speed; YR = mode.
Base + 48	Set animation start and end image pointers. AC = start image location; YR = end image location.
Base + 51	Set top and bottom borders. AC = top border; YR = bottom border.
Base + 54	Set left and right borders. AC = left border; YR = right border. Note: Divide border value by 2.
Base + 57	Bounce sprite vertically.
Base + 60	Bounce sprite laterally.
Base + 63	Reverse sprite direction.

Note: C flag = Carry flag, AC = Accumulator, XR = X register, YR = Y register

If you're using MOB Master exclusively in machine language, you may delete the BASIC interface module starting at location $82CC (33484) or (base) + 1484 to $86EA 34538 or (base) + 2538.

MOB MASTER

```
7D00:4C CC 82 4C 7A 7D 4C 81 4D
7D08:7D 4C 88 7D 4C A1 7D 4C ED
7D10:AB 81 4C 94 81 4C BC 81 4C
7D18:4C C2 81 4C D9 81 4C EA 37
7D20:81 4C FB 81 4C 60 81 4C B9
7D28:80 81 4C 69 81 4C 6D 81 7D
7D30:4C 75 81 4C 84 81 4C 8C F2
7D38:81 4C 12 81 4C 1F 81 4C 8F
7D40:29 81 78 CD 14 03 D0 05 6F
7D48:EC 15 03 F0 0E 48 AD 14 6F
7D50:03 8D DA 7D AD 15 03 8D B8
7D58:DB 7D 68 8D 14 03 8E 15 65
7D60:03 A9 7F 8D 0D DC A9 81 C0
7D68:8D 1A D0 AD 11 D0 29 7F 43
7D70:8D 11 D0 AD 1E D0 AD 1F 1A
7D78:D0 60 A9 B9 A2 7D 4C 42 AA
7D80:7D A9 DC A2 7D 4C 42 7D 89
7D88:78 A9 81 8D 0D DC A9 00 62
7D90:8D 1A D0 AD DA 7D 8D 14 C9
7D98:03 AD DB 7D 8D 15 03 58 F2
7DA0:60 A2 80 A9 00 9D 20 82 58
7DA8:CA 10 FA A2 07 A9 FF 9D 13
7DB0:48 82 9D 78 82 CA 10 F7 03
7DB8:60 AD 19 D0 8D 19 D0 29 1B
7DC0:01 F0 16 20 1E 7E AD 11 94
7DC8:D0 29 7F 8D 11 D0 A9 FA 59
7DD0:8D 12 D0 20 BC 7F 20 70 C7
7DD8:7E 4C 31 EA AD 19 D0 8D FB
7DE0:19 D0 29 01 F0 19 A9 00 11
7DE8:D0 21 20 1E 7E AD 11 D0 18
7DF0:29 7F 09 08 8D 11 D0 A9 FD
7DF8:F9 8D 12 D0 EE E7 7D 20 D5
7E00:BC 7F 20 70 7E 68 A8 68 95
7E08:AA 68 40 AD 11 D0 29 77 EC
7E10:8D 11 D0 A9 00 8D E7 7D 50
7E18:8D 12 D0 4C D9 7D A2 07 50
7E20:A0 0E BD 20 82 99 00 D0 F5
7E28:BD 28 82 99 01 D0 BD 38 F6
7E30:82 9D 27 D0 BD 40 82 9D 59
7E38:F8 FF 88 88 CA 10 E3 AD 57
7E40:30 82 8D 10 D0 AD 31 82 CA
7E48:8D 15 D0 AD 32 82 8D 17 14
7E50:D0 AD 33 82 8D 1D D0 AD DF
7E58:34 82 8D 1B D0 AD 35 82 9D
7E60:8D 1C D0 AD 36 82 8D 25 1C
7E68:D0 AD 37 82 8D 26 D0 60 4F
7E70:A2 07 BD 48 82 C9 FF F0 E8
7E78:11 C9 40 90 14 BD 50 82 3C
7E80:F0 0F DE 50 82 D0 03 20 18
7E88:9D 7E 20 83 7F CA 10 E2 5A
7E90:60 38 BD 48 82 E9 3F 9D DF
7E98:50 82 4C 87 7E BD 58 82 7E
7EA0:DD 60 82 F0 09 9D 60 82 06
7EA8:20 2E 7F 9D 68 82 BD 58 2C
7EB0:82 C9 20 90 21 C9 40 90 AF
7EB8:26 C9 60 90 2B C9 80 90 62
7EC0:30 C9 A0 90 35 C9 C0 90 48
7EC8:3A C9 E0 90 3F 20 45 7F FE
7ED0:20 15 7F 4C 4E 7F 20 45 CD
7ED8:7F 20 15 7F 4C 48 7F 20 DA
7EE0:48 7F 20 15 7F 4C 45 7F 6E
7EE8:20 48 7F 20 15 7F 4C 4B 84
7EF0:7F 20 4B 7F 20 15 7F 4C B7
7EF8:48 7F 20 4B 7F 20 15 7F D8
7F00:4C 4E 7F 20 4E 7F 20 15 70
7F08:7F 4C 4B 7F 20 4E 7F 20 94
7F10:15 7F 4C 45 7F 20 2E 7F AF
7F18:18 7D 68 82 C9 20 90 08 AF
7F20:38 E9 20 9D 68 82 38 60 B1
7F28:9D 68 82 68 68 60 BD 58 7F
7F30:82 29 20 08 BD 58 82 29 BC
7F38:1F 28 F0 08 8D 43 7F 38 20
7F40:A9 20 E9 FF 60 A0 00 2C 0B
7F48:A0 01 2C A0 02 2C A0 03 6C
7F50:BD 48 82 C9 40 B0 1E 38 66
7F58:A9 41 FD 48 82 20 D0 80 77
7F60:98 F0 09 88 F0 09 88 F0 3F
7F68:09 4C 98 80 4C D1 7F 4C 0F
7F70:49 80 4C 16 80 BD 48 82 2D
7F78:38 E9 3F 9D 50 82 A9 01 B0
7F80:4C 5D 7F BD 98 82 30 0F 07
7F88:BD 78 82 C9 FF F0 08 BD 03
7F90:80 82 F0 04 DE 80 82 60 2D
7F98:BD 78 82 9D 80 82 BD 40 88
7FA0:82 DD 90 82 F0 04 FE 40 68
7FA8:82 60 BD 98 82 F0 06 A9 CF
7FB0:FF 9D 98 82 60 BD 88 82 DF
7FB8:9D 40 82 60 AD 00 DD 29 3F
7FC0:03 AA AD 18 D0 29 F0 4A 7A
7FC8:4A 18 7D 1C 82 8D 39 7E 9F
7FD0:60 BD 28 82 DD A0 82 B0 C3
7FD8:33 20 5B 81 F0 27 88 F0 23
7FE0:1E 88 F0 0F AD 31 82 3D 94
7FE8:14 82 8D 31 82 A9 FF 9D AF
7FF0:48 82 60 BD A0 82 9D 28 0F
7FF8:82 A9 FF 9D 48 82 60 20 AA
```

```
8000:12 81 4C 3F 80 BD A8 82 B6
8008:9D 28 82 60 38 BD 28 82 C3
8010:E9 01 9D 28 82 60 BD A8 36
8018:82 DD 28 82 B0 21 20 5B A4
8020:81 F0 15 88 F0 0C 88 F0 03
8028:03 4C E4 7F BD A8 82 4C 34
8030:F6 7F 20 12 81 4C 0C 80 87
8038:BD A0 82 9D 28 82 60 18 8E
8040:BD 28 82 69 01 9D 28 82 62
8048:60 20 DD 80 BD B8 82 20 3B
8050:55 81 F0 02 B0 31 20 5B 80
8058:81 F0 23 88 F0 1A 88 F0 35
8060:03 4C E4 7F A9 FF 9D 48 5B
8068:82 AD CA 82 8D C8 82 AD D9
8070:CB 82 8D C9 82 4C F4 80 F5
8078:20 1F 81 4C BF 80 BD B0 72
8080:82 20 32 81 4C 69 80 18 4A
8088:AD C8 82 69 01 8D C8 82 CB
8090:90 03 EE C9 82 4C F4 80 C4
8098:20 DD 80 BD B0 82 20 55 32
80A0:81 F0 02 90 1A 20 5B 81 71
80A8:F0 0F 88 F0 06 88 F0 B4 EE
80B0:4C E4 7F 20 1F 81 4C 87 22
80B8:80 BD B8 82 4C 81 80 38 4A
80C0:AD C8 82 E9 01 8D C8 82 0C
80C8:B0 03 CE C9 82 4C F4 80 09
80D0:8D 11 80 8D 44 80 8D 8C 91
80D8:80 8D C4 80 60 AD 30 82 BA
80E0:3D 0C 82 D0 03 A9 00 2C CB
80E8:A9 01 8D C9 82 BD 20 82 1B
80F0:8D C8 82 60 AD C8 82 9D 74
80F8:20 82 AD 30 82 3D 14 82 17
8100:8D 30 82 AD C9 82 F0 09 44
8108:AD 30 82 1D 0C 82 8D 30 C5
8110:82 60 38 A9 40 FD 58 82 3B
8118:18 69 40 9D 58 82 60 A9 9A
8120:00 38 FD 58 82 9D 58 82 34
8128:60 BD 58 82 49 80 9D 58 DD
8130:82 60 18 0A 8D CA 82 90 5D
8138:03 A9 01 2C A9 00 8D CB 3E
8140:82 60 38 AD CA 82 ED C8 83
8148:82 8D 53 81 AD CB 82 ED 02
8150:C9 82 09 FF 60 20 32 81 63
8158:4C 42 81 BD C0 82 A8 60 DF
8160:9D 48 82 A9 00 9D 50 82 C8
8168:60 9D 58 82 60 9D 78 82 23
8170:98 9D 98 82 60 9D 88 82 6F
8178:9D 40 82 98 9D 90 82 60 C8
8180:9D 70 82 60 9D A0 82 98 D1
8188:9D A8 82 60 9D B0 82 98 28
8190:9D B8 82 60 8D C8 82 B0 2C
8198:03 A9 00 2C A9 01 8D C9 80
81A0:82 78 20 F4 80 58 98 9D 8A
81A8:28 82 60 AD 31 82 90 05 01
81B0:1D 0C 82 B0 03 3D 14 82 58
81B8:8D 31 82 60 29 0F 9D 38 1E
81C0:82 60 48 AD 35 82 3D 14 43
81C8:82 90 03 1D 0C 82 8D 35 1E
81D0:82 68 8D 36 82 8C 37 82 7B
81D8:60 AD 34 82 90 05 1D 0C 05
81E0:82 B0 03 3D 14 82 8D 34 7F
81E8:82 60 AD 32 82 90 05 1D 9B
81F0:0C 82 B0 03 3D 14 82 8D AD
81F8:32 82 60 AD 33 82 90 05 66
8200:1D 0C 82 B0 03 3D 14 82 A9
8208:8D 33 82 60 01 02 04 08 17
8210:10 20 40 80 FE FD FB F7 15
8218:EF DF BF 7F C3 83 43 03 B2
8220:00 00 00 00 00 00 00 00 25
8228:00 00 00 00 00 00 00 00 2D
8230:00 00 00 00 00 00 00 00 35
8238:00 00 00 00 00 00 00 00 3D
8240:00 00 00 00 00 00 00 00 45
8248:FF FF FF FF FF FF FF FF 4D
8250:00 00 00 00 00 00 00 00 55
8258:00 00 00 00 00 00 00 00 5D
8260:00 00 00 00 00 00 00 00 65
8268:00 00 00 00 00 00 00 00 6D
8270:00 00 00 00 00 00 00 00 75
8278:FF FF FF FF FF FF FF FF 7D
8280:00 00 00 00 00 00 00 00 85
8288:00 00 00 00 00 00 00 00 8D
8290:00 00 00 00 00 00 00 00 95
8298:00 00 00 00 00 00 00 00 9D
82A0:32 32 32 32 32 32 32 32 A5
82A8:E5 E5 E5 E5 E5 E5 E5 E5 AD
82B0:0C 0C 0C 0C 0C 0C 0C 0C B5
82B8:A0 A0 A0 A0 A0 A0 A0 A0 BD
82C0:00 00 00 00 00 00 00 00 C5
82C8:00 00 00 00 20 94 85 20 4C
82D0:A1 85 A9 79 A2 85 8D 11 2C
82D8:03 8E 12 03 38 A5 37 ED 2A
82E0:EE 82 85 0F A5 38 ED F0 7A
82E8:82 05 0F 90 08 A9 00 A2 E4
82F0:7D 85 37 86 38 20 44 E5 16
82F8:A9 0D 20 D2 FF A2 08 20 02
8300:3A 86 A9 9B A0 86 20 1E 32
8308:AB A2 06 20 3A 86 A9 CC 5C
8310:A0 86 20 1E AB A2 09 20 09
8318:3A 86 20 30 E4 4C 74 A4 CA
8320:A6 3A E8 F0 10 20 73 00 1D
8328:C9 AD D0 06 20 AC 85 4C 05
8330:3B 83 4C 93 83 20 AC 85 F3
8338:20 73 00 A9 45 A2 86 85 0E
8340:26 86 27 A0 00 84 28 20 6D
8348:B7 85 A0 00 B1 26 F0 29 D1
8350:20 73 00 D1 26 D0 03 C8 A4
8358:D0 F2 20 B7 85 E6 28 E6 03
8360:28 A5 28 CD 44 86 90 02 26
8368:B0 2C A0 00 20 CA 85 B1 CF
8370:26 D0 F9 20 CA 85 4C 47 4C
8378:83 20 73 00 A6 28 BD 87 90
8380:86 8D 8C 83 BD 88 86 8D A2
8388:8D 83 78 20 FF FF A9 00 9B
8390:F0 01 58 20 D1 85 4C FF 9A
8398:FF 20 1F 86 20 0E E2 C9 BC
83A0:AC D0 1F 20 73 00 C9 23 6A
83A8:F0 12 BD 20 82 8D EE 83 12
83B0:AD 30 82 3D 0C 82 8D E9 2E
83B8:83 4C D2 83 20 73 00 4C 42
83C0:FE 83 20 E7 85 8C EE 83 6A
83C8:8D E9 83 20 79 00 C9 23 06
83D0:F0 20 20 73 00 20 ED 85 75
83D8:90 09 AE 43 86 BD 28 82 72
83E0:A8 B0 05 20 F4 B7 8A A8 4F
83E8:A2 FF 20 0F 86 A9 FF 4C 5D
83F0:12 7D 20 73 00 AD EE 83 B3
83F8:AE 43 86 20 2A 7D 20 DA 5D
8400:85 20 ED 85 B0 0A 20 F4 CC
8408:B7 8A AE 43 86 4C 24 7D C4
8410:60 20 1F 86 20 06 86 B0 74
8418:06 20 0C 86 20 0F 7D 20 6E
8420:DA 85 20 06 86 B0 06 20 7F
8428:18 86 20 15 7D 20 DA 85 DB
8430:20 06 86 B0 06 20 0C 86 F5
8438:20 1B 7D 20 DA 85 20 06 FC
8440:86 B0 06 20 0C 86 20 1E 54
8448:7D 20 DA 85 20 06 86 B0 A2
8450:06 20 0C 86 20 21 7D 20 EE
8458:DA 85 20 06 86 B0 13 20 D1
8460:0C 86 AD 35 82 90 05 1D 97
8468:0C 82 B0 03 3D 14 82 8D 2B
8470:35 82 60 AD 97 83 8D 08 89
8478:03 AD 98 83 8D 09 03 20 70
8480:AC 84 A9 B5 A0 86 4C 1E 67
8488:AB 20 79 00 F0 1E C9 3A 6C
8490:F0 1A C9 AC F0 1E 20 F4 D1
8498:B7 8A F0 02 A9 01 CD C1 0D
84A0:85 F0 06 8D C1 85 20 09 AF
84A8:7D 4C C0 85 A9 00 8D 15 71
84B0:D0 4C 09 7D 20 73 00 4C 49
84B8:C0 85 20 ED 85 B0 06 20 81
84C0:F4 B7 8E 36 82 20 DA 85 37
84C8:20 06 86 B0 06 20 F4 B7 91
84D0:8E 37 82 60 20 1F 86 20 EF
84D8:06 86 B0 06 20 18 86 9D 09
84E0:78 82 20 DA 85 20 06 86 B7
84E8:B0 06 20 18 86 9D 98 82 AF
84F0:20 DA 85 20 06 86 B0 09 28
84F8:20 18 86 9D 88 82 9D 40 8C
8500:82 20 DA 85 20 06 86 B0 DE
8508:06 20 18 86 9D 90 82 60 1E
8510:20 1F 86 20 06 86 B0 06 77
8518:20 18 86 9D C0 82 20 DA 0F
8520:85 20 06 86 B0 06 20 18 15
8528:86 9D A0 82 20 DA 85 20 B1
8530:06 86 B0 06 20 18 86 9D 62
8538:A8 82 20 DA 85 20 06 86 29
8540:B0 06 20 29 86 9D B0 82 4A
8548:20 DA 85 20 06 86 B0 06 7E
8550:20 29 86 9D B8 82 60 20 11
8558:1F 86 20 F1 B7 8A AE 43 40
8560:86 C9 00 F0 07 C9 01 F0 82
8568:06 4C 3F 7D 4C 39 7D 4C D7
8570:3C 7D 20 F4 B7 8E 8F 83 E6
8578:60 20 AA B1 85 0F 98 05 CA
8580:0F F0 0B AC 1F D0 A9 00 0B
8588:20 91 B3 4C 73 7D AC 1E 4C
8590:D0 4C 86 85 AD 08 03 8D 61
8598:97 83 AD 09 03 8D 98 83 99
85A0:60 A9 20 A2 83 8D 08 03 D9
85A8:8E 09 03 60 A5 7A 8D B8 8E
85B0:85 A5 7B 8D BC 85 60 A9 96
85B8:FF 85 7A A9 FF 85 7B 60 7C
85C0:A9 00 D0 03 4C 03 7D 4C A0
85C8:06 7D E6 26 D0 02 E6 27 F8
85D0:60 A5 7A D0 02 C6 7B C6 BA
85D8:7A 60 20 79 00 F0 05 C9 6C
85E0:3A F0 01 60 68 68 60 20 31
85E8:8A AD 4C F7 B7 A0 00 B1 9F
85F0:7A C9 AC F0 02 18 60 20 A1
85F8:73 00 F0 08 C9 3A F0 04 79
8600:C9 2C D0 F3 38 60 20 0E E7
8608:E2 4C ED 85 20 F4 B7 18 0C
8610:8A F0 01 38 AE 43 86 60 32
8618:20 F4 B7 8A 4C 14 86 20 F1
8620:F4 B7 8A 29 07 8D 43 86 F4
8628:60 20 E7 85 84 26 85 27 B1
8630:46 27 66 26 A5 26 AE 43 BF
8638:86 60 A9 20 20 D2 FF CA EE
8640:D0 FA 60 00 14 4D 4F 56 4B
8648:53 50 52 00 53 50 52 49 27
8650:54 45 00 53 50 52 43 4F AF
8658:4C B0 00 41 4E 49 4D 41 3F
8660:54 45 00 42 4F 55 4E 44 BD
8668:41 52 59 00 42 4F 55 4E 1E
8670:43 45 00 53 50 4C 49 54 40
8678:00 5A 41 50 00 49 52 51 64
8680:00 4B 49 4C 4C 00 00 99 4A
8688:83 11 84 BA 84 D4 84 10 68
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8690:85 57 85 89 84 0C 7D 72 41
8698:85 73 84 4D 4F 42 20 4D BB
86A0:41 53 54 45 52 20 20 56 AB
86A8:32 2E 31 30 2F 39 32 30 76
86B0:33 30 39 0D 00 0D 4D 4F 79
86B8:42 20 4D 41 53 54 45 52 75
86C0:20 44 49 53 41 42 4C 45 3E
86C8:44 2E 0D 00 43 4F 50 59 76
86D0:52 49 47 48 54 20 31 39 85
86D8:39 32 20 20 42 59 20 48 15
86E0:4F 4E 47 20 50 48 41 4D 87
86E8:0D 00 00 00 00 00 00 00 7C
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136 COLORS

By David Kwong

As most people know, the 64 is capable of producing 16 different colors. How would you like to increase that number to 136 colors?

You can with 136 Colors. This interesting program does it by placing differently colored pixels side by side to produce a third color. Since the 64 has 16 built-in colors, it would appear that you could create 256 colors by combining the 16 × 16 color matrix. In reality, you get a total of 136 different hues, since 120 of them would be duplicated.

There are three programs built into the main 136 Colors program. The first program is an editor that will produce sprites capable of 136 colors. Additionally, each sprite character can have up to four colors simultaneously in high resolution mode. The second program is an interrupt program designed to make programming in BASIC with 136 Colors a lot easier. The third program is also an interrupt program designed to be used with other programs to make 136 Colors available for use.

Typing It In

Since 136 Colors is written entirely in machine language, enter it with MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

Starting address: C79C
Ending address: CFAB

Be sure to save a copy of the program before exiting MLX.

Program 1

Load the program with the ,8,1 extension, and then type *NEW*. To activate the first program, type *SYS 51200*.

The first thing to do is to select a block number, indicated at the upper right corner. A block number is an address where sprites can be stored. Recommended block numbers are 128–255 (block numbers range from 0 to 255). To find the actual address where the sprite is stored, multiply the block number by 64.

After you've selected a block number, a cursor appears in a grid that is used to create a sprite. The sprite that the grid represents is located at the upper right of the screen. The keys used to move the cursor are displayed at the lower right of the screen. Press f1 to begin drawing. A menu at the bottom provides other options. One option, NO DR/ER, means that the cursor will neither draw nor erase. This option lets you move the cursor without affecting what's on the screen.

To change colors while in draw mode, press either 1, 2, or 3. To change a sprite into its 136-color shape, either exit or change the block number. The program will then ask you whether or not to change the sprite into 136-color mode. If you elect to do so, the program then will ask you where to store the 136-color sprite.

Each 136-color sprite is composed of two normal sprites, one on top of the other. Sprite 1 is represented by color 1; sprite 2 is represented by color 2. Color 3 is divided between the two sprites. When the two sprites are overlapped, color 3 is capable of producing a color from the 136-color palette. The two sprites must have the same coordinates for them to overlap perfectly.

Program 2

The second program, which is an interrupt program, is activated or deactivated by SYS 52600. When activated, you'll see a message onscreen that says *136 BAS ON*.

This program provides 16 new sprite registers that will ease the usage of the four high-resolution sprites and 136 colors. There are only four high-resolution sprites, instead of the normal eight, because of the fact that each hi-res sprite requires two normal sprites. This program defines hi-res sprite 1 as the overlap of sprites 0 and 1. Hi-res sprite 2 is the overlap of sprites 2 and 3, hi-res sprite 3 is the overlap of sprites 4 and 5, and so on.

The first eight registers from 52882 to 52889 provide the *x*- and *y*-coordinates of the four high-resolution sprites. The first high-resolution sprite can be moved by using the horizontal register 52882 and the vertical register 52883, much like the system used by the 64 to move the eight normal sprites. Therefore, every two registers provide the horizontal and vertical registers of one hi-res sprite.

The next four registers, 52890 to 52893, provide the colors of each of the four hi-res sprites. The color numbers range from 1 to 136.

The last four registers, 52894 to 52897, provide the block numbers for the four hi-res sprites.

This interrupt program supposes the block numbers for each hi-res sprite to be next to each other. Keep in mind that one hi-res sprite is composed of two normal sprites. Therefore, when you choose block number 200, the two overlapping sprites will be composed of blocks 200 and 201.

All registers are write-only registers. When you attempt to read them, they will return a 0. When the registers are 0, the interrupt program will not alter any sprites. Therefore, should you poke 52882,0, nothing will happen, meaning that if you originally poked 140, poking a 0 will not move it from location 140 to location 0.

In order to see the sprites you have produced, you must first set register 53269 to turn on the sprites you desire. Hi-res sprite 1 can be turned on with a POKE 53269, 3. POKE 53269, 12 turns on hi-res sprite 2. POKE 53269, 40 turns on sprite 3, and POKE 53269, 192 turns on sprite 4. To turn on more than one sprite, simply add up the previous values.

Program 3

The third program is activated or deactivated by SYS 52900. When activated, you'll see *136C ON* printed on the screen. This simple program is designed to work with other programs that can make use of the 136 colors.

The only register provided is at

52844. This register is a 136-color register. By poking colors 1 to 136 into this register, 2 colors will be returned at locations 52898 and 52899. When the 2 colors are placed together, they'll combine to create 1 of the 136 available colors.

Since machine language programs may be too fast for the interrupt to be effective, you must keep track of location 52844. After execution of the interrupt, 0 will be stored in location 52844. If using machine language, you may choose to poke the required color in 52844 and then JSR $CE5A (make sure the interrupt is deactivated) to obtain the two colors in locations 52898 and 52899.

Technical Notes

This program takes up minimal space from $C79C (51100) to $CFAA (53162). Considering that 136 Colors is composed of three programs, applications that require only one of these three programs may isolate that particular program for usage.

The first program is located from $C79C (51100) to $CD77 (52599), the second program is located from $CD78 (52600) to $CFAA (53162), and the third program is located from $CE5A (52826) to $CFAA (53162).

Since different color combinations may produce the same color, there may in fact be less than 136 colors. Following is a color chart of the 136 colors. The colors are organized from brightest to darkest. (These colors were very difficult to organize. Please excuse some slight mistakes!)

White–Black	(1–13)
Gray 2	(14–16)
Extra Gray	(17–23)
Brown 1	(24–32)
Brown 2	(33–35)
Brown 3	(36–38)
Brown 4	(39–42)
Red	(43–51)
Orange	(52–57)
Yellow	(58–64)
Tan	(65–71)
Green 1	(72–77)
Green 2	(78–81)
Green 3	(82–86)
Green 4	(87–93)
Green 5	(94–95)
Cyan	(96–102)
Blue	(103–111)
Purple 1	(112–118)
Purple 2	(119–123)
Purple 3	(124–127)
Purple 4	(128–134)
Purple 5	(135–136)

Seeing Is Believing

The 136 Demo program is designed to show the various colors in action and to provide programmers with additional details on how to use 136 Colors.

The demonstration consists of a BASIC program and machine language sprite data. To avoid typing errors, use The Automatic Proofreader to enter the BASIC portion. Use MLX to enter the sprite data. When MLX prompts, respond with the following values.

Starting address: 3200
Ending address: 347F

Before leaving MLX, save the sprites with the filename Sprites. When the demonstration runs, it loads 136 Colors and Sprites and looks for those filenames.

136 COLORS

```
C79C:A2 00 A0 00 BD F3 CC 85 6E
C7A4:FD BD 08 CD 85 FE A9 0E 0A
C7AC:91 FD C8 C0 18 D0 F9 E8 8A
C7B4:E0 15 F0 03 4C 9E C7 A9 5E
C7BC:00 8D 52 CD 4C 62 C8 29 7D
C7C4:07 49 07 A8 4C DF C9 20 2B
C7CC:E4 CB A9 01 8D 15 D0 4C B5
C7D4:08 CB BD 21 04 29 0F 18 20
C7DC:65 FB 85 FB A9 00 65 FC A3
C7E4:85 FC F0 03 4C 0A CB A5 8C
C7EC:FB 8D F8 07 A0 06 06 FB 92
C7F4:26 FC 88 D0 F9 A9 00 8D F8
C7FC:52 CD 60 00 A9 06 8D 21 D6
C804:D0 A9 0E 8D 20 D0 8D 86 E8
C80C:02 A9 80 8D 8A 02 A9 0A AB
C814:8D 00 D0 A9 3C 8D 01 D0 0C
C81C:A9 93 20 D2 FF A9 01 8D CE
C824:10 D0 8D 27 D0 8D 15 D0 CD
C82C:8D D6 CB A9 04 8D D7 CB 20
C834:A9 FE 8D B8 CB A9 CB 8D C1
C83C:B9 CB 20 B5 CB A9 01 8D 91
C844:E4 D8 A9 0F 8D 5C D9 A9 DF
C84C:07 8D D4 D9 A2 00 BD E4 72
C854:CC E8 A8 A9 03 99 98 DB C1
C85C:4C 55 CD 20 0A CB A9 00 F7
C864:8D 4D CD 8D 4E CD A9 29 C8
C86C:8D 90 C8 A9 04 8D 91 C8 DE
C874:A9 15 8D CE C8 A0 00 A2 2A
C87C:00 A9 80 8D 85 C8 B1 FB 10
C884:29 00 F0 05 A9 51 4C 8F D3
C88C:C8 A9 2D 8D 00 00 E8 E0 1E
C894:08 F0 0E E0 10 F0 0A E0 6F
C89C:18 F0 06 4E 85 C8 4C 5F 63
C8A4:CD C8 E0 18 F0 0B EE 90 0F
C8AC:C8 D0 03 EE 91 C8 4C 7D EB
C8B4:C8 18 AD 90 C8 69 11 8D 0B
C8BC:90 C8 AD 91 C8 69 00 8D 11
C8C4:91 C8 CE CE C8 F0 04 4C 76
C8CC:7B C8 EA AC 4D CD AE 4E C3
C8D4:CD BD F3 CC 85 FD BD 08 AF
C8DC:CD 85 FE AD 52 CD F0 0F 2C
C8E4:C9 01 F0 07 A9 0E 91 FD D0
C8EC:4C F3 C8 A9 01 91 FD 38 D7
C8F4:A5 FE E9 D4 85 FE A9 80 9F
C8FC:11 FD 91 FD 20 E4 FF F0 2E
C904:FB AC 4D CD AE 4E CD C9 5B
C90C:55 F0 43 C9 49 F0 40 C9 E3
C914:4F F0 40 C9 4A F0 42 C9 94
C91C:4B F0 39 C9 4E F0 39 C9 C7
C924:4D F0 3B C9 2C F0 36 C9 F9
C92C:31 F0 37 C9 32 F0 38 C9 A7
C934:33 F0 39 C9 85 F0 3D C9 95
C93C:86 F0 3E C9 87 F0 3F C9 FB
C944:88 F0 43 C9 93 F0 45 C9 12
C94C:42 F0 4F 4C 00 C9 88 CA EE
C954:4C A7 C9 CA C8 4C A7 C9 6E
C95C:E8 88 4C A7 C9 C8 E8 4C 1A
C964:A7 C9 A9 01 4C 72 C9 A9 EC
C96C:0F 4C 72 C9 A9 07 8D F0 FA
C974:C8 4C 6A C8 A9 01 4C 84 C7
C97C:C9 A9 02 4C 84 C9 A9 00 03
C984:8D 52 CD 4C C5 C9 20 14 9B
C98C:CA 4C 03 CA A0 00 A9 00 FD
C994:91 FB C8 C0 3F D0 F9 4C 92
C99C:9C C7 20 14 CA 4C 1C C8 3E
C9A4:EA EA EA C0 FF D0 02 A0 B9
C9AC:17 C0 18 D0 02 A0 00 E0 7F
C9B4:FF D0 02 A2 14 E0 15 D0 06
C9BC:02 A2 00 8C 4D CD 8E 4E CF
C9C4:CD AD 52 CD F0 36 8A 0A 51
C9CC:6D 4E CD AA 98 29 18 F0 99
C9D4:06 C9 08 F0 01 E8 E8 98 04
C9DC:4C C3 C7 A9 01 88 30 04 A9
C9E4:0A 4C E1 C9 48 8A A8 68 8F
C9EC:AE 52 CD E0 02 F0 07 11 27
C9F4:FB 91 FB 4C 00 CA 49 FF EC
C9FC:31 FB 91 FB 4C 6A C8 A9 61
CA04:00 8D 8A 02 8D 15 D0 8D 5E
CA0C:10 D0 A9 93 20 D2 FF 60 F8
CA14:A9 00 8D 15 D0 A9 25 8D 86
CA1C:B8 CB A9 CD 8D B9 CB A9 A7
CA24:6A 8D D6 CB A9 04 8D D7 3A
CA2C:CB 20 B5 CB 20 E4 FF F0 A8
CA34:FB C9 59 F0 07 C9 4E D0 41
CA3C:F3 4C 05 CB 20 E4 CB A9 12
CA44:3E 8D B8 CB A9 CD 8D B9 89
CA4C:CB A9 6A 8D D6 CB 20 B5 34
CA54:CB 20 0A CB A5 FB 85 FD FB
CA5C:A5 FC 85 FE A9 32 8D 72 48
CA64:04 20 0A CB A0 3F A9 00 57
CA6C:88 91 FB 91 FD D0 F9 8D F7
CA74:A3 CA A9 40 8D C4 CA A9 86
CA7C:29 8D 86 CA A9 D8 8D 87 DA
CA84:CA AD 00 00 29 0F AA A9 6F
CA8C:80 E0 0F D0 04 11 FB 91 77
CA94:FB E0 01 D0 04 11 FD 91 7F
CA9C:FD E0 07 D0 1F AA A9 00 4E
CAA4:29 01 D0 07 8A 2C A1 CA AC
CAAC:4C B3 CA 8A 2C 09 CB D0 45
CAB4:07 11 FB 91 FB 4C C0 CA 08
CABC:11 FD 91 FD AD 86 CA C9 53
CAC4:00 D0 1C 18 69 11 8D 86 C4
CACC:CA AD 87 CA 69 00 8D 87 BE
CAD4:CA AD C4 CA 69 28 8D C4 4C
```

```
CADC:CA EE A3 CA 4C EB CA EE 4B
CAE4:86 CA D0 03 EE 87 CA AD 93
CAEC:8C CA C9 01 F0 06 4E 8C 8D
CAF4:CA 4C 85 CA A9 80 8D 8C 57
CAFC:CA C8 C0 3F F0 03 4C 85 E7
CB04:CA 4C CB C7 60 55 A9 00 B5
CB0C:85 FB 85 FC A9 20 A2 03 FB
CB14:9D 21 04 CA D0 FA A9 A0 56
CB1C:9D 22 04 8E 4F CD 20 E4 4B
CB24:FF F0 FB AE 4F CD F0 0C 02
CB2C:C9 14 F0 17 C9 0D F0 1C BD
CB34:E0 03 F0 EA C9 30 90 E6 E0
CB3C:C9 3A B0 E2 9D 22 04 E8 F1
CB44:4C 1A CB A9 20 9D 22 04 5C
CB4C:CA 4C 1A CB A9 20 9D 22 87
CB54:04 E0 01 F0 23 E0 02 F0 E6
CB5C:12 AD 22 04 A0 06 20 88 D2
CB64:CB A0 05 20 88 CB A0 02 63
CB6C:20 88 CB BD 20 04 A0 03 E0
CB74:20 88 CB A0 01 20 88 CB 27
CB7C:4C D6 C7 EA EA EA EA EA 5B
CB84:EA EA EA EA C9 00 F0 03 8B
CB8C:8D 90 CB A9 00 29 0F 8D 73
CB94:50 CD A9 00 8D 51 CD 18 62
CB9C:0E 50 CD 2E 51 CD 88 D0 8F
CBA4:F6 18 AD 50 CD 65 FB 85 F9
CBAC:FB AD 51 CD 65 FC 85 FC DB
CBB4:60 A2 00 BD 00 00 E8 C9 9C
CBBC:80 90 16 F0 22 29 7F 18 57
CBC4:6D D6 CB 8D D6 CB A9 00 54
CBCC:6D D7 CB 8D D7 CB 4C B7 A1
CBD4:CB 8D 00 00 EE D6 CB D0 F0
CBDC:03 EE D7 CB 4C B7 CB 60 A2
CBE4:A9 20 A2 00 E0 1C F0 11 18
CBEC:E0 0E B0 06 9D 6A 04 4C D9
CBF4:F9 CB 9D 84 04 E8 4C E8 BD
CBFC:CB 60 37 36 35 34 33 32 EF
CC04:31 30 37 36 35 34 33 32 9F
CC0C:31 30 37 36 35 34 33 32 A7
CC14:31 30 83 02 0C 0F 03 0B 90
CC1C:23 86 30 A7 31 A7 32 A7 9D
CC24:33 A7 34 9B 31 20 03 0F A0
CC2C:0C 0F 12 20 31 83 35 9B 71
CC34:28 13 10 12 09 14 05 31 9D
CC3C:29 83 36 A7 37 9B 32 20 39
CC44:03 0F 0C 0F 12 20 32 83 8E
CC4C:38 9B 28 13 10 12 09 14 0E
CC54:05 32 29 83 39 A7 30 9B BE
CC5C:33 20 03 0F 0C 0F 12 20 C9
CC64:33 83 31 9B 28 31 33 36 FA
CC6C:20 03 0F 0C 0F 12 13 29 89
CC74:32 A7 33 A7 34 9B 0B 05 1D
CC7C:19 02 0F 01 12 04 3A 83 AD
CC84:35 A7 36 9D 15 20 09 20 9E
CC8C:0F 85 37 9E 0A 5B 0B 86 3A
CC94:38 9D 0E 20 0D 20 2C 85 3C
CC9C:39 A7 30 D2 02 20 03 08 8E
CCA4:01 0E 07 05 20 02 0C 0B 9F
CCAC:23 84 03 0C 12 20 03 0C 3D
CCB4:05 01 12 20 13 03 12 05 23
CCBC:05 0E 84 06 31 20 04 12 71
CCC4:01 17 82 06 33 20 05 12 8B
CCCC:01 13 05 82 06 35 20 0E C7
CCD4:0F 20 04 12 2F 05 12 82 D3
CCDC:06 37 20 05 18 09 14 80 29
CCE4:03 14 15 16 28 29 31 32 83
CCEC:3B 3C 48 49 FF FF 00 29 F9
CCF4:51 79 A1 C9 F1 19 41 69 46
CCFC:91 B9 E1 09 31 59 81 A9 36
CD04:D1 F9 21 49 D8 D8 D8 D8 74
CD0C:D8 D8 D9 D9 D9 D9 D9 D9 E6
CD14:DA DA DA DA DA DA DA DB B0
CD1C:DB 00 00 00 00 00 00 00 A5
CD24:00 03 0F 0E 16 05 12 14 40
CD2C:20 13 10 12 09 14 05 9E 01
CD34:28 19 2F 0E 29 3F 80 BF F7
CD3C:00 00 13 10 12 09 14 05 1D
CD44:20 23 31 80 00 10 FF BF E6
CD4C:00 00 FF FF 00 00 FF FF E7
CD54:00 E0 0C F0 03 4C 52 C8 6F
CD5C:4C 5F C8 EE 90 C8 D0 03 4A
CD64:EE 91 C8 4C 82 C8 FF FF F0
CD6C:00 00 FF FF 00 00 FF FF 08
CD74:00 00 FF FF AD 14 03 C9 9D
CD7C:E3 D0 31 AD 15 03 C9 CD 55
CD84:D0 2A 78 AD F0 CD 8D 14 EA
CD8C:03 AD F1 CD 8D 15 03 58 4F
CD94:A2 00 BD A2 CD 20 D2 FF F7
CD9C:E8 E0 0E D0 F5 60 0D 31 30
CDA4:33 36 43 20 42 41 53 20 AF
CDAC:4F 46 46 0D AD 14 03 8D 6C
CDB4:F0 CD AD 15 03 8D F1 CD 43
CDBC:78 A9 E3 8D 14 03 A9 CD 22
CDC4:8D 15 03 58 A2 00 BD D6 B9
CDCC:CD 20 D2 FF E8 E0 0D D0 67
CDD4:F5 60 0D 31 33 36 43 20 51
CDDC:42 41 53 20 4F 4E 0D A2 C6
CDE4:00 BD 92 CE D0 08 E8 E0 88
CDEC:10 D0 F6 4C 00 00 BD 92 76
CDF4:CE A8 A9 00 9D 92 CE E0 0D
CDFC:08 90 1B E0 0C 90 35 8A C9
CE04:38 E9 0C 0A AA AD 11 D0 59
CE0C:10 FB 98 9D F8 07 C8 98 AB
CE14:9D F9 07 4C EF CD 8A 29 99
CE1C:01 F0 07 8A 0A AA CA 4C DC
CE24:29 CE 8A 0A AA AD 11 D0 FA
CE2C:10 FB 98 9D 00 D0 9D 02 3E
CE34:D0 4C EF CD 8A 38 E9 08 39
CE3C:0A 48 8C 6C CE 20 5A CE C3
CE44:68 AA AD 11 D0 10 FB AD F3
CE4C:A2 CE 9D 27 D0 AD A3 CE 68
CE54:9D 28 D0 4C EF CD A9 20 D3
CE5C:8D 69 CE A9 CF 8D 6A CE E7
CE64:A2 00 A0 00 AD 00 00 C9 9E
CE6C:00 F0 17 E8 E0 10 D0 07 A7
CE74:C8 98 AA C0 10 F0 11 EE 53
CE7C:69 CE D0 03 EE 6A CE 4C D7
CE84:68 CE 8E A2 CE 8C A3 CE C4
CE8C:A9 00 8D 6C CE 60 00 00 6F
CE94:FF FF 00 00 FF FF 00 00 32
CE9C:FF FF 00 00 FF FF 00 00 3A
CEA4:AD 14 03 C9 07 D0 2D AD 9E
CEAC:15 03 C9 CF D0 26 78 AD 89
CEB4:10 CF 8D 14 03 AD 11 CF 02
CEBC:8D 15 03 58 A2 00 BD CE AB
CEC4:CE 20 D2 FF E8 E0 0A D0 DB
CECC:F5 60 0D 31 33 36 43 20 4B
CED4:4F 46 46 0D AD 14 03 8D 96
CEDC:10 CF AD 15 03 8D 11 CF BD
CEE4:78 A9 07 8D 14 03 A9 CF B2
CEEC:8D 15 03 58 A2 00 BD FE 0C
CEF4:CE 20 D2 FF E8 E0 09 D0 0A
CEFC:F5 60 0D 31 33 36 43 20 7B
CF04:4F 4E 0D AD 6C CE F0 03 DE
CF0C:20 5A CE 4C 00 00 00 00 F0
CF14:00 00 00 FF 00 00 FF FF B3
CF1C:00 00 FF FF 0D 17 33 66 4D
CF24:76 4D 6F 40 39 20 32 0C FE
CF2C:0B 4C 6E 0A 01 2C 60 70 BC
CF34:57 68 3A 34 24 2B 12 03 19
CF3C:48 67 02 31 16 74 55 7B D5
CF44:3E 30 1E 2F 1D 1C 53 79 3F
CF4C:1A 61 81 5F 6B 42 27 56 80
CF54:13 10 0F 5E 69 0E 72 07 B8
CF5C:88 2D 73 75 71 7E 7D 14 E5
CF64:87 7C 4B 65 4F 54 51 45 5A
CF6C:5D 5C 4A 63 5A 6D 28 7F A9
CF74:2A 7A 86 85 64 6C 83 3B 08
CF7C:3D 3F 3C 46 44 4E 11 41 35
CF84:36 38 35 23 22 52 78 21 92
CF8C:1F 37 26 25 50 29 47 2E 84
CF94:1B 19 43 77 18 09 08 5B 38
CF9C:84 15 06 59 82 05 49 62 37
CFA4:58 6A 80 04 00 00 00 00 5B
```

136 DEMO

```
EQ 10 REM COPYRIGHT 1992 - COM
      PUTE PUBLICATIONS INTL L
      TD - ALL RIGHTS RESERVED
AC 20 REM BY DAVID KWONG
JD 30 REM
DK 40 POKE53281,0:POKE53280,0:
      POKE53269,0
RE 45 IFPEEK(52720)=49THEN90
RK 50 PRINTCHR$(147)"PLEASE WA
      IT..."
MD 60 IFF=0THENF=1:LOAD"136 CO
      LORS",8,1
AA 70 IFF=1THENF=2:LOAD"SPRITE
      S",8,1
QQ 80 SYS52600
CS 90 PRINTCHR$(147):POKE198,0
MG 100 POKE52882,150:POKE52884
      ,174:POKE52886,198:POKE
      52888,1
KE 110 POKE52883,100:POKE52885
      ,100:POKE52887,100:POKE
      52889,1
BB 120 POKE52894,200:POKE52895
      ,202:POKE52896,204
XP 130 POKE52890,13:POKE52891,
      13:POKE52892,13
DM 135 IFPEEK(52896)<>0THEN135
ES 136 POKE53269,255
GK 140 FORL=13TO1STEP-1
FB 150 POKE52890,L:POKE52891,L
      :POKE52892,L
QD 160 FORW=1TO10:NEXTW
RC 170 NEXTL
ED 180 PRINT"{HOME}{10 DOWN}
      {WHT}";
KM 190 DIMCL(13,1)
KM 200 FORL=1TO13
KP 210 READCL(L,0),CL(L,1)
EE 220 NEXTL
QG 230 DATA 1,13,24,32,43,51,5
      2,57,58,64,65,71,72,77,
      82,86,88,93,96,102,103,
      111
GX 240 DATA 112,118,128,134
QR 250 C=INT(RND(1)*13)+1:D=1
PR 260 LO=CL(C,0)
KB 270 POKE52890,LO:POKE52891,
      LO:POKE52892,LO
FC 280 LO=LO+D
MX 285 IFPEEK(198)>0ANDEN=1THE
      NPOKE198,0:GOTO400
```

```
HF 290 GOSUB2000
GE 300 IFLO=CL(C,1)THEND=-1:GO
       TO270
AB 310 IFLO<CL(C,0)THEN250
AJ 320 GOTO270
KG 330 DATA "COLORS*"
FK 340 DATA "£12"
QF 350 DATA "BY DAVID KWONG*"
SJ 360 DATA "£12345678"
FX 370 DATA "{BLU}*"
DC 380 DATA "PRESS ANY KEY TO
       {SPACE}CONTINUE<"
RH 400 POKE53269,0
MH 410 PRINTCHR$(147)
HX 420 POKE52882,0:POKE52883,7
       5:POKE52894,206:POKE528
       90,129
PM 430 POKE53269,3
EE 440 FORX=0TO174STEP2:POKE52
       882,X:NEXTX
MQ 450 EN=0:SN$="":PRINT"
       {HOME}{7 DOWN}{GRN}"
JG 460 C=INT(RND(1)*136)+1
CP 470 POKE52890,C
XD 480 FORW=1TO30
MB 490 GOSUB2000
CQ 500 IFPEEK(198)>0ANDEN=1THE
       NPOKE198,0:GOTO700
GQ 510 NEXTW
AF 520 GOTO460
CS 530 DATA "IN ADDITION TO BE
       ING ABLE TO PRODUCE*"
SR 540 DATA "136 COLORS, THIS
       {SPACE}PROGRAM CAN ALSO
       *"
RK 550 DATA "CREATE 4 HIGH RES
       OLUTION (1 PIXEL RES-*"
FS 560 DATA "OLUTION) SPRITES,
        EACH WITH 4 COLORS.*"
GS 570 DATA "OF THOSE 4 COLORS
       , 1 COLOR IS CAPABLE*"
CA 580 DATA "OF 136 COLORS. TH
       E OTHER 3 COLORS ARE*"
PA 590 DATA "RESTRICTED TO THE
        16 COLORS OF THE*"
EX 600 DATA "COMMODORE 64. EAC
       H HIGH RESOLUTION*"
GG 610 DATA "SPRITE IS CREATED
        FROM TWO SPRITES.*"
FP 620 DATA "INCLUDED WITH THE
        PROGRAM IS AN EDITOR*"
CA 630 DATA "TO PRODUCE THESE
       {SPACE}4 HIGH RESOLUTIO
       N*"
XR 640 DATA "SPRITES. THERE AR
       E ALSO TWO INTERRUPT*"
EK 650 DATA "ROUTINES INCLUDED
        TO EASE THE USAGE*"
EP 660 DATA "OF 136 COLORS AND
        HI-RES SPRITES.*"
JC 670 DATA "{BLU}*"
DB 680 DATA "PRESS ANY KEY TO
       {SPACE}CONTINUE<"
ED 700 POKE53269,0:PRINTCHR$(1
       47)
AH 710 POKE52882,138:POKE52884
       ,162:POKE52886,186:POKE
       52888,210
RE 720 POKE52883,75:POKE52885,
       75:POKE52887,75:POKE528
       89,75
MQ 730 POKE52894,208:POKE52895
       ,208:POKE52896,208:POKE
       52897,208
RP 740 POKE52890,1:POKE52891,2
       :POKE52892,3:POKE52893,
       4
FE 745 IFPEEK(52897)<>0THEN745
HH 750 POKE53269,255
MB 754 PRINT"{HOME}{10 DOWN}
       {WHT}";:EN=0:SN$=""
ED 755 GOSUB2000
QM 756 IFEN=0THENGOTO755
EQ 760 PRINT"{HOME}{6 DOWN}
       {WHT}";TAB(15);"↑"
PX 770 PRINT"{DOWN}";TAB(12);"
       COLOR"
BM 780 DIMC(3):C(0)=1:C(1)=2:C
       (2)=3:C(3)=4:D=0
PR 790 FORS=0TO3
FC 800 POKE52890+S,C(S)
ER 810 NEXTS
RJ 815 PRINT"{HOME}{8 DOWN}";T
       AB(17);"{4 SPACES}"
HM 816 PRINT"{UP}";TAB(17);C(0
       )
XP 820 GETA$:IFA$=""THEN820
BQ 830 IFA$="J"THEND=-1
FJ 840 IFA$="K"THEND=1
JP 850 FORLR=0TO3
JQ 860 C(LR)=C(LR)+D
BG 870 IFC(LR)>136THENC(LR)=1
XF 880 IFC(LR)<1THENC(LR)=136
EE 890 NEXTLR:D=0
KB 900 IFA$="E"THEN1020
PA 910 GOTO790
AR 920 DATA "NOW, YOU MAY OBSE
       RVE THE 136 COLORS*"
QP 930 DATA "YOURSELF BY SCROL
       LING TO THE LEFT BY*"
CM 940 DATA "PRESSING 'J' AND
       {SPACE}SCROLLING TO THE
        RIGHT*"
GX 950 DATA "BY PRESSING 'K'.
       {SPACE}TO END, PRESS 'E
       '.*"
XR 960 DATA "YOU WILL NOTICE T
       HAT THE COLORS ARE*"
BK 970 DATA "ORGANIZED INTO SE
       VERAL GROUPS. I HAVE*"
EP 980 DATA "ARRANGED EACH GRO
       UP FROM BRIGHTEST TO*"
AX 990 DATA "DARKEST. EACH SPR
       ITE HAS ITS OWN COLOR*"
RK 1000 DATA "ADDRESS IN WHICH
        TO POKE ITS COLOR*"
GD 1010 DATA "NUMBER.<"
FF 1020 PRINTCHR$(147):POKE532
        69,0
BR 1030 POKE53281,6:POKE53280,
        14:POKE646,14
RA 1040 END
EA 2000 IFEN=1THEN2075
ER 2010 IFSN$<>""THEN2045
GH 2020 READSN$
GK 2030 IFLEFT$(SN$,1)="£"THE
        N2080
HA 2040 L=LEN(SN$):CH=0:PRINTT
        AB((41-L)/2);
FA 2045 CH=CH+1
HP 2050 IFMID$(SN$,CH,1)="*"TH
        ENSN$="":PRINT:GOTO207
        5
RM 2060 IFMID$(SN$,CH,1)="<"TH
        ENEN=1:GOTO2075
RG 2070 PRINTMID$(SN$,CH,1);
JF 2075 RETURN
QJ 2080 R=LEN(SN$)-1
GR 2090 FORRT=1TOR:PRINT:NEXTR
        T
EB 2100 SN$="":GOTO2075
```

SPRITES

```
3200:00 2A 00 00 54 00 00 AA 3C
3208:00 01 54 00 02 AA 00 05 F6
3210:14 00 00 2A 00 00 14 00 49
3218:00 2A 00 00 14 00 00 2A D1
3220:00 00 14 00 00 2A 00 00 AF
3228:14 00 00 2A 00 00 14 00 61
3230:00 2A 00 00 14 00 02 AA 6E
3238:A0 05 55 50 0A AA A8 00 2A
3240:00 54 00 00 AA 00 01 54 65
3248:00 02 AA 00 05 14 00 0A 05
3250:2A 00 00 14 00 00 2A 00 5F
3258:00 14 00 00 2A 00 00 14 27
3260:00 00 2A 00 00 14 00 00 5A
3268:2A 00 00 14 00 00 2A 00 77
3270:00 14 00 00 2A 00 05 55 8A
3278:50 0A AA A8 05 55 50 00 85
3280:00 0A 00 00 55 40 02 AA C1
3288:A0 05 51 50 0A 00 28 04 52
3290:00 14 00 00 08 00 00 14 4E
3298:00 00 28 00 15 50 00 2A 16
32A0:A0 00 15 50 00 00 28 00 4D
32A8:00 14 00 00 08 04 00 14 76
32B0:0A 00 28 05 51 50 02 AA E9
32B8:A0 00 55 40 00 0A 00 00 44
32C0:00 15 00 00 AA 80 01 55 19
32C8:50 02 A0 A8 05 00 10 0A C6
32D0:00 08 00 00 14 00 00 08 DF
32D8:00 00 14 00 2A A8 00 55 09
32E0:50 00 2A A8 00 00 14 00 65
32E8:00 08 00 00 14 0A 00 08 20
32F0:05 00 10 02 A0 A8 01 55 F8
32F8:50 00 AA 80 00 15 00 00 37
3300:00 2A 80 01 55 40 02 AA 6B
3308:A0 05 00 50 02 00 20 04 59
3310:00 00 0A 00 00 04 00 00 C7
3318:0A 2A 00 14 55 40 0A AA B9
3320:A0 15 40 50 0A 00 08 14 9D
3328:00 14 0A 00 08 04 00 14 39
3330:0A 00 28 05 00 50 02 AA E0
3338:A0 01 55 40 00 2A 00 FF 86
3340:00 55 00 00 AA A0 01 55 2B
3348:50 02 80 20 05 00 10 0A BB
3350:00 00 04 00 00 0A 00 00 5F
3358:04 15 00 08 AA A0 15 55 DD
3360:50 0A 80 A8 15 00 14 0A E6
3368:00 08 04 00 14 0A 00 08 22
3370:04 00 10 02 80 A8 01 55 F8
3378:50 00 AA A0 00 55 00 FF BB
3380:00 01 F8 00 07 F0 00 7F C1
3388:FE 01 FF FC 03 FF E0 07 5F
3390:FF 00 1F FC 00 3F F0 00 89
3398:7F 80 08 FF 00 54 7C 00 2A
```

```
33A0:AA 38 01 55 20 0A AA 00 5E
33A8:15 54 00 AA A0 01 55 50 5D
33B0:02 AA A0 15 54 40 2A AA CA
33B8:00 05 40 00 0A 00 00 FF B8
33C0:00 00 00 00 00 00 00 00 27
33C8:00 00 00 03 00 00 1F 00 9D
33D0:00 FE 00 03 FD 00 0F FF 35
33D8:00 7F F6 00 FF AA 03 FF AE
33E0:55 07 FE AA 1F F5 54 3F F6
33E8:EA A8 7F 55 50 7E AA A0 A6
33F0:ED 55 40 8A AA 00 15 55 29
33F8:00 0A A0 00 11 00 00 FF 7E
3400:AA AA AA 55 55 55 AA AA 13
3408:AA 55 55 55 AA AA AA 55 C5
3410:55 55 AA AA AA 55 55 55 23
3418:AA AA AA 55 55 55 AA AA 2B
3420:AA 55 55 55 AA AA AA 55 DD
3428:55 55 AA AA AA 55 55 55 3B
3430:AA AA AA 55 55 55 AA AA 43
3438:AA 55 55 55 AA AA AA 00 A0
3440:55 55 55 AA AA AA 55 55 FD
3448:55 AA AA AA 55 55 55 AA 5B
3450:AA AA 55 55 55 AA AA AA 0E
3458:55 55 55 AA AA AA 55 55 16
3460:55 AA AA AA 55 55 55 AA 73
3468:AA AA 55 55 55 AA AA AA 26
3470:55 55 55 AA AA AA 55 55 2E
3478:55 AA AA AA 55 55 55 00 E0
```

David Kwong, 17, says he hopes this expanded palette program will generate many new ideas and give the 64 a new look. He lives in Edmonton, Alberta, Canada.

TUNNEL TRAP

By Danny English

In the days of knights and castles, disputes could be settled by a sword fight, a joust, or a good game of Tunnel Trap. The first two activities have pretty much faded into obscurity, but you can still enjoy this game for the 64.

Challenge a friend to a heated battle inside a 32-screen maze of tunnels. Destroy your opponents by slingshot or by strategically set traps. Tunnel Trap features a realtime split screen and responsive controls.

Getting Started

Tunnel Trap is written entirely in machine language. To enter it, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

Starting address: 0801
Ending address: 1990

Be sure to save a copy of the program before exiting MLX.

The Challenge

When you're ready to play, connect two joysticks to the computer. Although Tunnel Trap is written in machine language, it loads and runs like a BASIC program. When the title appears, you have the option of turning trap sensors on or off. Pressing f1 will enable trap sensors, and pressing f3 will disable them. They will be explained later in the article. Pressing the space bar begins the game.

The Split Screen

Playing Tunnel Trap can be a bit confusing at first. The top screen belongs to player 1, and the bottom to player 2. Each player is controlled by joystick, and each player has a status line.

The two views represent windows on different sections of a large maze. The two players begin their search for each other at opposite ends of the maze. Players control their knights with joysticks. Pressing the fire button launches slingshots. The shot fires in the last direction that the player moved. When the players enter the same screen, an image of each player appears in each window. The best way to avoid confusion is to look only at your own window.

The Deadly Traps

Besides being able to shoot at each other, each player begins the game with 25 traps. Player 1 can dig a trap anywhere in the tunnel by pressing f1; player 2 presses f7. Your enemy cannot see the traps you set, and you cannot see his. You cannot fall into your own traps. On the title screen, you have the option to enable trap sensors. These are state-of-the-art warning devices. When they're activated, a green light at the far right of the screen flashes a warning when you're near an enemy trap. The sensor won't pinpoint the trap's exact location, but it does warn you to take caution.

How to Win

On the left side of each player's status bar is a green stamina indicator. Each time a player is hit with a slingshot or falls into a trap, he loses one stamina point. When all points are gone, the other player wins that round. The game continues until someone wins three rounds. The victorious knight will be crowned champion of the day. To return to the title screen at any time, press the Commodore key in the lower left corner of the keyboard.

TUNNEL TRAP

```
0801:0B 08 70 17 9E 32 34 30 6E
0809:37 00 00 00 20 20 20 20 96
0811:20 20 20 20 20 A0 C4 B9 06
0819:3C 08 99 F8 00 B9 FD 08 F6
0821:99 33 03 88 D0 F1 A0 09 4C
0829:B9 0C 08 99 FF 03 88 D0 A1
0831:F7 A9 3C 85 2D A9 20 85 5D
0839:2E 4C 00 01 12 F0 00 3C 14
0841:20 07 18 B9 6E 09 99 E8 75
0849:07 C8 D0 F7 EE 02 01 EE 19
0851:05 01 C6 F9 D0 ED A2 03 23
0859:20 34 03 F0 33 C9 07 D0 95
0861:16 A2 01 20 34 03 D0 0A A0
0869:A2 04 20 34 03 18 69 07 65
0871:10 05 A2 0A 20 34 03 85 1D
0879:A8 A5 A7 85 A9 A5 FE 85 FB
0881:F7 A5 FF 85 F8 20 6C 03 73
0889:A5 F8 85 FF A5 F7 85 FE 72
0891:E8 20 34 03 D0 1E A2 08 21
0899:20 34 03 A0 02 84 A8 85 2A
08A1:A6 18 A5 FC 65 A6 85 F7 58
08A9:A5 FD 65 A7 85 F8 20 6C EF
08B1:03 4C 13 01 E8 20 34 03 FB
08B9:D0 1C A0 03 84 A8 E8 20 36
08C1:34 03 F0 08 A2 08 20 34 F4
08C9:03 4C 5C 01 A2 0C 20 34 C3
08D1:03 E6 A7 4C 5C 01 E8 20 AF
08D9:34 03 D0 0A E8 20 34 03 B2
08E1:18 69 04 A8 D0 D6 E8 20 37
08E9:34 03 D0 0A A2 02 20 34 21
08F1:03 18 69 06 D0 ED A2 08 A2
08F9:20 34 03 D0 E6 A9 00 85 F7
0901:A7 A4 FB F0 0C 06 FA 2A 37
0909:26 A7 C6 FB CA D0 F2 A8 D8
0911:60 48 B1 FE 85 FA A9 08 FE
0919:85 FB 68 A4 FE D0 02 C6 4A
0921:FF C6 FE C0 E7 D0 DE A4 B5
0929:FF C0 07 D0 D8 A9 37 85 BA
0931:01 58 4C 10 08 A4 A8 F0 79
0939:22 A5 F7 38 E5 A8 B0 03 7E
0941:C6 F8 38 85 F7 A5 FC E5 8A
0949:A8 B0 02 C6 FD 85 FC B1 3A
0951:F7 88 91 FC 98 D0 F8 C4 42
0959:A9 F0 0A B1 F7 C6 FD C6 76
0961:F8 C6 A9 10 EC 60 78 E6 98
0969:01 4C 16 08 60 00 0B 08 73
0971:0A 00 9E 32 30 36 34 E3 26
0979:02 45 00 78 A9 34 07 3E CF
0981:A2 05 BD 42 08 9D 2D 03 16
0989:8F 10 F7 9A B7 75 C6 32 63
0991:CE 2C 08 B1 31 E0 0E 00 5B
0999:E2 F8 A5 32 C9 08 A0 67 4A
09A1:B9 48 08 B6 01 2E EB C5 6D
09A9:66 01 08 FD E8 3C 20 ED 76
09B1:00 01 2A 2A 29 07 AA BD 64
09B9:1A 01 8D 18 C6 97 29 1F 52
09C1:AA 3A 8B 4C FF 01 A4 43 7E
09C9:AB 79 58 3B 3F 29 92 93 26
09D1:C4 60 13 13 E2 F0 C5 A9 02
```

```
09D9:87 EF A9 46 74 EB 82 73 11
09E1:E2 F0 A8 05 B2 20 83 01 25
09E9:1D C5 C8 F5 3C 23 F1 30 F6
09F1:8F 86 39 2D AA 4C 22 01 33
09F9:20 71 01 02 70 99 E6 2F 9F
0A01:AC 82 30 E6 2D D0 02 E6 18
0A09:2E 82 EB ED C6 39 10 E9 56
0A11:E8 50 2C DA 01 A9 37 85 83
0A19:01 58 20 00 40 4C AE A7 FF
0A21:CF 0D 84 EE A9 04 2C A9 3F
0A29:08 85 FF B1 2F 91 2D C8 A0
0A31:C4 FF E8 2A 10 2D 21 11 EF
0A39:2D A5 2E 5D 44 2E A0 85 8A
0A41:08 E5 4C 2F 65 FF 85 2F B4
0A49:A5 30 0B 70 F9 30 4C 00 CD
0A51:01 B9 00 EF 99 00 FF C8 E8
0A59:D0 F7 CE DC 01 CE A3 BA C0
0A61:AD DF 01 C9 DF 80 66 2C FA
0A69:9F FE 00 90 13 7B 5C C7 1D
0A71:48 1C 02 05 71 BD 33 00 2A
0A79:18 1E 4A 1B 26 1F 1E 1A 20
0A81:2C 0D 42 E1 B0 B1 38 D0 E2
0A89:28 D5 30 33 D2 E1 3A 43 36
0A91:B1 78 23 CE 20 08 44 62 F9
0A99:AF D2 98 9C 78 68 34 34 19
0AA1:08 85 C3 C6 42 1C 13 19 C1
0AA9:87 0C 80 14 18 EC 38 C5 80
0AB1:21 5C 20 45 1E 3B 02 73 1B
0AB9:C2 22 21 6D B8 21 07 A2 AD
0AC1:2A 6D 41 0F 23 0A 20 67 48
0AC9:07 80 30 96 B1 21 1A D2 0A
0AD1:08 C0 44 61 51 EC C4 BC 3D
0AD9:80 2D 17 52 C7 44 86 CA A8
0AE1:86 33 8D 34 6C 70 99 34 87
0AE9:0A 7E 80 24 00 08 21 3D 94
0AF1:52 09 00 C8 8C B2 4F A5 71
0AF9:24 3C 80 00 19 07 0B 3E 78
0B01:88 40 21 7C 20 02 BC 22 FB
0B09:3C 20 02 66 A2 21 E7 AE 04
0B11:21 18 85 40 00 26 C8 EF 8C
0B19:96 64 49 A3 6D 36 04 08 4B
0B21:8D E6 03 A2 00 CA D0 FD 0D
0B29:CE F0 CF E1 70 A0 B9 E8 5D
0B31:67 27 AB C4 99 90 D9 88 D1
0B39:39 C8 D0 F0 58 2C 08 99 64
0B41:91 D9 99 31 DA 13 3C D0 49
0B49:30 80 99 3F A9 57 0F 8D 15
0B51:1D BC 80 C6 17 39 00 4A 89
0B59:A9 1F 8D 27 7C 29 90 87 61
0B61:8C 96 D2 40 6E 28 E6 2A CD
0B69:41 1E E0 60 30 46 8A 18 91
0B71:07 2B E6 2D 40 D0 19 2C 29
0B79:D0 8D 2E D0 A9 E5 8D FC 2B
0B81:8B 0B FD 88 FE 07 8D FF 97
0B89:00 6E 00 B9 43 03 AD BA 13
0B91:60 10 02 AD BB 56 00 20 4E
0B99:05 BC F2 01 20 0F BD 42 CA
0BA1:05 AD BE 40 85 04 AD BF D8
0BA9:20 BC 02 D0 AD C0 40 40 7D
0BB1:A3 86 60 04 5B 6C 3A 07 8F
0BB9:7B 6C DA C9 20 E4 E4 52 51
0BC1:F0 4C 39 53 F0 03 DB 06 11
0BC9:94 27 B1 14 72 90 64 38 42
0BD1:6C 90 80 C3 46 08 61 90 34
0BD9:C4 05 43 B2 01 3A 1A 24 70
0BE1:19 0E 1B CF 84 41 12 0B C0
0BE9:0F 49 0A 3C 24 1B 7E A1 0B
0BF1:41 92 E1 B0 41 02 0E 1B DD
0BF9:24 0C 0D 49 50 3C 15 19 12
0C01:D3 03 0F 4F 0D 10 0E 18 77
0C09:69 5B 0E 1B 38 0D CF AD 63
0C11:C1 15 C0 A0 BE BC D0 0B 07
0C19:02 2C 64 E4 85 C6 C6 02 EE
0C21:A6 02 02 E6 05 03 3C 0A 72
0C29:19 EB 90 17 76 24 43 5E 75
0C31:C8 21 51 E4 05 1C 12 E4 10
0C39:39 12 1B D7 49 E4 05 1C 57
0C41:05 45 5E 10 3D C5 41 46 C3
0C49:5E 68 D4 00 91 17 D3 40 16
0C51:5A 6E 80 91 17 48 F8 3E 65
0C59:79 41 2C 14 05 C5 42 2D 36
0C61:53 11 20 05 20 21 59 A1 95
0C69:3F 42 C6 03 98 17 02 E6 C6
0C71:03 5C 5E 58 78 38 40 5E F6
0C79:D0 81 01 11 1B 0A 90 17 C4
0C81:76 60 C1 F4 61 F4 14 79 F4
0C89:61 E1 61 73 D1 58 64 B4 9B
0C91:64 58 14 41 4C C3 64 01 C3
0C99:7C 87 20 67 A5 2E 18 2A 8C
0CA1:19 82 20 62 4C BB 41 13 F7
0CA9:01 32 91 8A 33 91 B1 14 01
0CB1:18 13 A8 41 55 5E 10 B1 B9
0CB9:40 05 CB 70 2D 08 8D 58 B0
0CC1:11 4C 95 41 20 B3 2A D6 37
0CC9:42 20 F9 42 4C 17 43 20 D3
0CD1:5C 24 2C A7 28 C3 00 F2 64
0CD9:42 43 A4 93 1E 91 0B 0F 0E
0CE1:3E C9 70 02 CA 30 80 BC 8E
0CE9:D0 18 29 AC 42 7F 42 CB C0
0CF1:2A E4 E8 88 23 2F 34 3A 76
0CF9:8A BC D0 E8 D8 68 E9 A8 14
0D01:A3 06 F2 02 0E 9E EE 04 B9
0D09:B9 B6 02 51 42 6B 2B C0 D9
0D11:46 B0 62 32 12 00 76 F2 5A
0D19:C2 8E 4F 23 9C 8A 06 21 90
0D21:AC 01 9A 9F 8C BC C0 0A 02
0D29:F9 B9 AD 27 06 F2 82 C4 9C
0D31:43 21 8E 27 C8 0B 42 00 70
0D39:0E 84 C9 78 CA 0B 38 A6 D5
0D41:83 40 33 0E CF 8A 23 0E 71
0D49:D0 82 EE 43 38 E2 C8 0B 68
0D51:8C 8A 22 2F 34 38 8A BC DF
0D59:D0 E0 CE 10 01 30 C8 30 79
0D61:10 AD 08 31 33 C8 0B 0C E1
0D69:9D BC 90 1D 41 E6 6F 21 0B
0D71:00 67 A1 30 05 04 04 A6 83
0D79:04 E0 FF 75 2A 28 41 21 BA
0D81:E1 47 61 8E 52 48 C8 6E 27
0D89:42 52 43 22 E3 47 A2 E3 49
0D91:91 D8 E4 91 D8 58 3D E1 E4
0D99:86 30 E1 98 82 A9 E2 AC F5
0DA1:9E 8C 83 04 F0 09 BC 7B 7F
0DA9:02 79 FC 17 4C C0 F8 40 CB
0DB1:AD 73 03 0F C9 0E F0 56 8F
0DB9:C9 0D F0 64 C9 0B F0 32 EE
0DC1:C9 07 F0 3E C9 0A F0 12 EE
0DC9:C9 06 5E F0 86 09 F0 16 75
0DD1:C0 11 25 18 A9 E0 77 76 EC
0DD9:C4 0C 2C 14 05 C5 42 A7 8B
0DE1:53 8B 20 05 20 9B 44 4C 21
0DE9:B9 44 C6 05 A0 FF 79 BC CF
0DF1:E6 05 81 16 E2 31 60 A0 8F
0DF9:01 74 28 22 3C 76 22 04 DC
0E01:44 A0 2C 22 F9 43 20 2F 5B
0E09:62 41 60 0B AB B8 2C 8C 88
0E11:9E 20 C1 40 AE BA 43 60 08
0E19:AA 2F C2 A2 ED B1 C8 68 09
0E21:C9 B0 28 82 4C 3D C8 04 68
0E29:42 2C E1 72 54 A0 00 54 4E
0E31:32 04 20 C5 4C 35 82 26 2A
0E39:01 64 22 04 44 4B 0F 34 15
0E41:26 22 44 B6 32 8D 88 05 CA
0E49:2A 43 B9 18 69 08 8D 28 B2
0E51:23 4C 0F 44 20 2D 54 50 E6
0E59:45 20 73 45 4C 91 45 40 56
0E61:B8 48 A4 4E 51 86 38 ED 68
0E69:01 89 5C 0D 45 78 89 54 38
0E71:78 F0 C9 E8 11 50 86 18 BC
0E79:6D 09 40 8D 81 8E 08 8C 52
0E81:54 05 20 F9 44 AC F0 CF 33
0E89:DC F4 21 1D 16 F3 50 67 CF
0E91:74 14 33 CE 39 1D E2 3B 7F
0E99:1D 75 D4 C9 4A 50 66 06 3F
0EA1:CF EE 05 CF A0 26 20 CB A8
0EA9:44 88 D0 FA 4C 06 47 FC D9
0EB1:3C 26 23 61 01 DC 29 10 CD
0EB9:33 41 AD 11 CF F4 9C 32 44
0EC1:32 0B AB C2 15 7E 20 F3 32
0EC9:4E BA 10 F8 B9 AD 27 06 26
0ED1:68 0D 1A 6A 14 64 36 84 72
0ED9:4E 31 0E 2D 60 CE 4E 21 F9
0EE1:A0 90 0C 60 EE 5E 01 C8 B5
0EE9:C9 F0 AC 34 0C 8E AF 22 1C
0EF1:7E 0F 18 56 E0 D8 18 45 59
0EF9:82 EE 43 38 E2 58 01 8E 08
0F01:4E B0 2D 8E 01 F0 D1 F8 69
0F09:38 CE 72 04 C0 20 FF F0 FC
0F11:10 8F A4 C9 05 90 01 60 19
0F19:AD 0D CF E1 72 B4 60 4C DC
0F21:42 41 AD 00 41 F0 02 04 3C
0F29:29 02 90 02 06 29 08 90 04
0F31:02 0C 29 0A D0 8D 0E 40 32
0F39:04 01 E9 00 90 05 06 03 7E
0F41:41 40 07 76 2E F8 64 A0 17
0F49:AD 70 96 4A 63 A0 18 C1 61
0F51:D0 69 26 04 0D 41 0B D0 8B
0F59:38 E9 78 50 B2 AD 61 54 85
0F61:09 06 A9 33 BE 82 A9 FF 41
0F69:8D 3C 57 C3 C0 46 4C 06 42
0F71:47 DD 07 A2 E8 C8 CF 46 06
0F79:AB E8 C2 C3 00 40 8A 04 56
0F81:A2 C8 F2 8A 78 72 8A 15 E1
0F89:48 C8 20 AD 05 A8 02 B0 5C
0F91:AD 06 40 B0 86 82 B0 15 CF
0F99:CA 52 40 12 A5 40 1D 29 6C
0FA1:40 51 82 15 40 4C 15 47 7A
0FA9:44 01 30 08 01 FA 84 FB A9
0FB1:A0 06 A2 58 03 6E A0 07 95
0FB9:A2 20 20 4C 47 20 DA 49 B3
0FC1:4C 39 48 8C D0 F3 07 8E 19
0FC9:79 80 97 20 04 AC 64 03 58
0FD1:7E AC 25 AE 42 0A 20 8B EF
0FD9:47 AD B0 00 C4 8D 08 AA 34
0FE1:03 09 CF A2 EE 10 01 AD 4F
0FE9:07 CF C9 04 D0 DA E0 89 36
0FF1:19 5F 90 58 86 FE 84 FF 45
0FF9:AC 03 F7 AB 40 86 FC 84 83
1001:FD AA E0 00 F0 11 70 5C EF
1009:25 32 47 A5 CA 4C 9A 47 8F
1011:4E 00 C1 B1 FC 91 FE C8 A0
1019:C0 0A D0 F7 A5 FE E4 0C B4
1021:28 85 FE A5 FF CA FF D0 EC
1029:E0 1A 0A 0E AE D1 E8 E0 D1
1031:05 D0 D6 EB D8 20 0E 04 09
1039:8D 43 E1 01 0E A9 DA 59 63
1041:17 A9 06 74 67 58 4C 02 96
1049:50 00 53 10 0C 19 10 41 23
1051:FA 4F 9B 59 78 D4 C2 D1 3A
1059:1C 23 1B 1E 43 30 92 31 C6
1061:04 23 22 3B 46 52 B0 14 35
```

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1069:A9 0B 91 F8 77 70 A1 ED 91
1071:7A 84 E7 76 02 83 4C 46 51
1079:12 DC 11 91 0F D9 1F 91 C4
1081:90 1D 91 68 48 20 EB 47 CB
1089:7B D7 0B 43 32 10 20 FA FF
1091:47 A5 F9 C9 DB D0 F1 A5 46
1099:F8 C9 E8 D0 EB 60 A8 AE B3
10A1:91 FA 4C 8B 5B 26 C0 11 91
10A9:40 B5 48 6D D5 64 40 CD C5
10B1:04 03 95 A1 5C E1 01 75 43
10B9:A8 0F 41 02 0E 53 03 4E 4C
10C1:54 1C 02 AD C2 00 51 DA C1
10C9:F1 38 42 DB 05 60 AD 14 10
10D1:22 41 F0 03 4C 06 49 82 31
10D9:DA B0 D0 64 19 C0 9A 03 F7
10E1:30 0E C5 F6 85 00 4F 62 F2
10E9:13 4F 96 2C EC 01 41 04 EE
10F1:0E 23 A5 05 50 1E A1 CE F3
10F9:23 AD 20 0C C9 AF 84 CE C0
1101:2A 56 79 B9 8D 2B 06 62 20
1109:43 E1 52 18 0D 05 71 D1 42
1111:A5 4B 40 F2 4B A5 4C 79 13
1119:54 4C 8D 42 46 8E C2 A0 E0
1121:28 20 54 49 88 C0 00 3C 02
1129:1C 77 30 FC 04 23 AC DE F1
1131:D9 0A 2B 9E 40 17 E4 88 C2
1139:DB 08 BB F0 88 DA 08 AB 3D
1141:83 61 C3 83 01 A8 36 18 5D
1149:32 06 33 C2 36 06 33 C2 8B
1151:14 76 C2 32 38 84 2E 06 CC
1159:A9 08 8D 2E DA E0 7E 83 C1
1161:CF 63 09 04 F2 3C D0 08 D7
1169:64 41 A2 52 20 74 3C A0 73
1171:01 B4 03 E4 A1 20 3C 4A 40
1179:C7 B0 E1 C1 90 FF C3 50 60
1181:47 08 30 5A 49 48 46 5E 4B
1189:F9 A2 53 47 12 CF 4C 47 DF
1191:4A 98 04 19 1D 4D 4D 03 CC
1199:5C F8 38 E9 01 85 F8 A5 83
11A1:F9 E9 11 BF F9 92 E0 22 57
11A9:24 C7 98 87 26 A8 85 12 4C
11B1:2A 3C 12 EE C8 B1 F8 C9 F1
11B9:20 D0 03 E0 21 A0 29 68 D4
11C1:4C A9 B0 04 1D 60 A5 4D CD
11C9:18 69 07 85 4D A5 4E 18 41
11D1:AF 1E 4E A6 23 A2 00 2B 56
11D9:8A 42 08 C8 24 32 C0 07 D1
11E1:D0 F7 33 A2 E8 31 E0 64 2D
11E9:D0 EA C2 29 96 4A E0 00 B9
11F1:F0 07 20 9F 4A CA 4C CE 31
11F9:4A E6 56 A2 00 CF F5 10 2B
1201:22 03 04 8D 10 C2 31 11 4F
1209:08 1C 8D 01 41 02 2F 10 7A
1211:D7 8D 72 5E AC 04 8D 09 52
1219:96 0B 80 08 0D D0 8D 0F B1
1221:A0 78 99 BF 50 A3 40 C3 38
1229:68 08 D1 02 D3 F4 C4 5D 37
1231:D3 93 E1 B0 D1 B3 31 50 7B
1239:F4 C0 01 F4 C4 97 D3 13 B6
1241:04 4F CF 04 4E 4F 1D 6C CB
1249:A0 31 04 C9 53 DC 23 20 9B
1251:80 48 A0 E6 B0 0E 20 33 7B
1259:4F A0 E7 AD 71 0F C8 C8 47
1261:41 20 92 4B A0 E9 9E 4B 6A
1269:98 6B BA AE CD 20 CB 4A C7
1271:A0 34 62 0B 91 4D 85 0A C6
1279:44 4E A9 93 02 A3 8C 82 FB
1281:8C 2E F1 60 8C F9 07 8C A2
1289:FB 07 C0 99 1E D0 C9 A5 8C
1291:F0 0A C9 5A F0 11 8C EB 60
1299:6D 0C 08 A1 90 0B 46 4C 1C
12A1:CC 49 03 26 69 20 91 43 73
12A9:4C DF 4B AC 05 3F 80 87 CD
12B1:D0 CE 11 AD 12 20 89 3B 4E
12B9:60 AC BC 03 E0 07 30 06 8A
12C1:CE 4E AD 13 80 F4 00 F0 90
12C9:1B 8D 01 1E 8D 24 01 46 26
12D1:8D 9A 04 60 AD EE 2B 80 E9
12D9:84 EF CF 8D 0E 02 C0 41 4A
12E1:AD CA 05 C0 18 33 4C 23 85
12E9:4C EE 5A 01 AD 1A 06 C9 F6
12F1:B3 F0 74 20 F2 4B E3 2D 76
12F9:01 47 2F 60 74 04 C6 4B E8
1301:85 47 A7 10 0A A1 4C FF 21
1309:4B D7 94 B1 D3 94 E1 01 2E
1311:D3 94 66 03 03 98 D0 B4 14
1319:E3 81 00 4D F8 F3 34 FA 61
1321:49 72 93 34 89 4C 20 FA F6
1329:65 DA B2 8D E9 05 AD 04 AA
1331:CF CD 05 CF F0 08 A9 02 4D
1339:39 3F 4C B4 A8 60 0A 64 DF
1341:16 88 0A D1 90 10 39 C6 F0
1349:01 D0 03 4C 6F 3F 63 18 A0
1351:65 AD 60 10 C9 E9 08 A9 52
1359:E9 8D F9 07 8D FB 07 4C 3E
1361:C0 4C A9 EA 4C D7 4C AD E6
1369:17 C7 BA 46 06 EE 8E 08 D9
1371:40 4B 28 B0 09 DE 39 64 35
1379:14 1E 60 AD 14 9D 41 0A BB
1381:AD 15 9E 01 F0 0B 4C 1E 12
1389:85 1E DE 05 4C 07 4D A9 E8
1391:54 8D 2E 06 AD 64 F2 04 54
1399:C9 50 B0 01 54 00 8D 16 B2
13A1:8A 20 DA 9C 04 AD 4A 20 C5
13A9:19 40 20 BA 46 20 3B 40 85
13B1:4C 8C 40 13 EC 11 39 90 09
13B9:12 B4 9F C1 CC 30 20 49 D6
13C1:7C 11 43 48 D4 50 23 2C B1
13C9:21 0D 2D 85 A8 5D 2E 13 EB
13D1:EE 11 22 92 05 E3 F8 70 3B
13D9:15 21 41 F2 57 92 2E 50 DB
13E1:4C 41 59 45 52 F6 1C 54 F8
13E9:49 EA 06 56 A0 A4 54 59 2F
13F1:59 20 47 41 4D 45 E2 02 11
13F9:48 1F E4 20 E9 94 5B 05 08
1401:25 46 31 2F 46 33 5D 20 40
1409:20 9F 54 52 41 50 6E AE AF
1411:45 4E 53 4F 52 53 3A 20 43
1419:4F 41 BC 9D E3 11 21 9E EE
1421:E8 20 62 5D 50 52 45 53 91
1429:53 20 53 50 41 43 45 20 34
1431:54 4F 20 42 45 47 49 4E A7
1439:C8 C1 43 A9 A0 99 90 A0 66
1441:66 C7 63 04 5D 1B 82 3E D5
1449:4D 65 37 3C 95 40 31 0E 3A
1451:0F 45 A9 20 25 91 01 23 1E
1459:B1 91 F1 2D 07 20 F2 06 74
1461:8D F3 06 A0 28 17 CF 15 6A
1469:07 83 28 C1 42 85 07 66 B3
1471:70 DB 75 28 24 98 A9 1D ED
1479:95 2C 10 D8 8D 16 D8 46 C3
1481:20 4E 0B 84 7C 8D 86 02 20
1489:A9 93 B4 32 A9 05 8D 22 C3
1491:25 0D 8D 23 D0 01 22 15 57
1499:D0 54 6C 5A 82 8D 21 D0 CF
14A1:D4 49 02 34 05 28 04 B9 94
14A9:F2 62 99 18 05 C2 19 F0 EE
14B1:D0 EF 4C B9 73 4D 20 D2 47
14B9:FF 9D 87 87 D0 F5 4C A5 4F
14C1:38 88 4E 07 03 C6 40 41 57
14C9:4E A5 C5 C9 3C F0 0B C9 5D
14D1:04 F0 0C C9 05 F0 10 A7 0A
14D9:33 85 C6 60 A9 01 20 19 86
14E1:6C F0 83 20 2E 4E 4C B1 E3
14E9:78 1D 60 BC 68 00 65 18 93
14F1:19 2F 3E 32 81 7C 3E 0A E1
14F9:72 3E 4A 50 7C 3E 32 07 81
1501:7C 3E 36 60 20 E7 4E A9 AC
1509:14 BC 43 E6 21 8D 04 23 AD
1511:0C 8D 05 30 82 06 1C 02 AE
1519:0F A1 84 06 32 8D 82 D8 C9
1521:8D 00 D4 8D 01 D4 A9 03 37
1529:E1 86 CE 8D AD FF 00 59 5F
1531:01 D0 E8 9A 19 10 29 FE 31
1539:90 54 41 29 FB 44 44 D0 C5
1541:FA D6 84 A9 D0 90 A9 30 16
1549:05 7D A0 00 B1 FA 91 E8 EE
1551:FA 84 30 FA A5 FB E4 31 E7
1559:FB A5 FC 18 69 01 85 FC 63
1561:34 BC 69 40 86 FD A5 FD 7B
1569:C9 38 D0 DA B9 5C 5F 99 E5
1571:08 32 98 63 A0 D0 F5 A5 4F
1579:01 09 04 85 01 AD 18 27 55
1581:09 01 8D 0E DC 50 10 A8 F3
1589:99 12 C8 C0 3F D0 F8 60 B9
1591:AD 8D 02 C9 02 F0 01 60 09
1599:4C E2 90 AE C1 8D 18 03 17
15A1:A9 FF C3 35 45 85 C6 20 5A
15A9:70 4F 20 86 06 70 01 5A 9A
15B1:4E 20 2C 4D EE 16 AD 10 A0
15B9:04 C9 10 90 17 A9 00 8D 50
15C1:F3 CF 20 16 E4 02 54 82 99
15C9:CE 41 20 48 44 20 A5 4B 6D
15D1:20 D7 4F A9 02 20 0B 40 6D
15D9:20 35 60 5D 67 43 20 A7 73
15E1:42 20 A3 00 F8 AF 82 08 3D
15E9:E1 88 21 45 20 F4 48 20 25
15F1:5B 46 20 E5 4C 4C FC 4F 9A
15F9:8F 1A 00 22 80 F5 0E E3 70
1601:AF 26 DB 00 EA FE FE C4 20
1609:28 00 54 94 A4 A4 E8 E8 8F
1611:F8 E3 6A 2D A0 EE 56 55 95
1619:55 FF BF BF AF AB AB AA 12
1621:56 E6 FC 60 42 BC A8 47 75
1629:65 EA A5 9D 7A 64 D5 54 B6
1631:26 6B 3D 02 F8 74 65 45 BC
1639:74 17 62 9D 51 65 57 55 AF
1641:4E E9 91 16 95 5D 45 15 64
1649:90 67 9C 50 E4 D4 79 5D FA
1651:16 16 07 09 55 06 19 55 C9
1659:66 6B 75 E5 51 10 10 04 8F
1661:44 48 5D E5 65 75 65 A8 40
1669:C2 E4 D5 C5 21 99 CC A8 F8
1671:2D FF D7 5A 5A 6A 6A DB 02
1679:8B 21 1E 08 FE 10 B0 98 2A
1681:A4 64 BC 58 01 09 A2 25 CC
1689:1A 81 84 C2 30 4E 46 00 27
1691:9A A2 42 08 54 46 32 12 AE
1699:28 9A A1 22 04 41 8A 3D 4E
16A1:9B 35 88 89 23 0D 41 46 A8
16A9:03 03 28 3B C3 03 B2 C1 22
16B1:03 9E 0B E3 01 A2 60 27 21
16B9:EA 10 38 29 04 40 0C 05 37
16C1:81 EE 0A 0A B8 03 2D 88 01
16C9:CD 08 09 08 0A B0 25 11 EE
16D1:49 00 41 0A 0C 5A 2D 92 22
16D9:84 62 03 0C 8A 4E E2 E3 39
16E1:0C 27 00 3C 09 69 12 A3 57
16E9:60 30 11 30 09 45 EA 8A 35
16F1:81 E2 04 E6 20 61 E3 04 D8
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16F9:12 0E 12 E8 64 02 12 12 E4
1701:0D 33 A7 58 03 3C 05 79 89
1709:08 93 A1 22 0F 2C 12 37 FA
1711:99 28 12 0E 0F 28 A1 0C A1
1719:49 0F 0F 0D 00 C0 03 08 73
1721:81 92 02 0C 0C 0D 72 A7 D6
1729:0B 61 00 0D 24 02 0B EB 31
1731:33 11 09 E8 0A 60 04 60 27
1739:08 11 2A 09 C8 07 90 04 0D
1741:02 A2 27 0D 5C 05 0A A0 7A
1749:04 A2 2D 02 00 10 01 04 2E
1751:01 E1 09 02 0D 02 01 E3 10
1759:04 26 05 47 00 0B 04 04 60
1761:E4 0C 2A 13 13 20 3E 06 17
1769:00 01 01 80 14 E3 13 A1 F7
1771:0F 88 91 C1 A2 C1 0F 79 4B
1779:90 22 00 FB 0A 99 FF 23 12
1781:50 11 80 05 10 0F C2 A1 60
1789:60 E1 C0 23 4C 42 36 B7 3A
1791:73 AC D5 28 B3 36 07 4C B2
1799:87 47 41 1C 24 71 C0 54 04
17A1:22 F8 0C 04 88 44 25 CE 4F
17A9:54 06 C7 32 3C 63 77 74 72
17B1:C5 01 51 B0 ED E5 18 26 95
17B9:ED A0 6D 94 04 06 50 C1 98
17C1:B7 C1 75 80 31 20 2C 27 7C
17C9:4A 68 1C 81 D2 02 8E 41 CF
17D1:29 4E CF C6 0D 14 EA 48 65
17D9:48 1C 03 10 92 34 33 76 D6
17E1:E1 C1 B3 21 92 51 00 84 58
17E9:48 E4 8E C8 2E 4E 41 41 42
17F1:B0 71 0D C4 20 10 11 F0 17
17F9:B1 C1 08 18 19 46 82 01 DB
1801:1E 73 70 6C 64 E7 E4 AC 2B
1809:44 C9 24 E5 30 17 1B 5E 23
1811:21 32 08 2B 0C C1 86 38 BE
1819:43 20 50 C1 40 EC 01 80 51
1821:2B 20 21 63 07 76 FF 00 5B
1829:32 FE 00 46 C2 06 40 14 59
1831:13 4B 39 1D 4B E3 47 3E 6D
1839:99 29 A0 00 04 30 91 61 F9
1841:00 01 10 48 20 7E 47 32 F3
1849:02 03 45 47 80 E0 43 52 B8
1851:C6 10 DC C6 81 05 0D 17 42
1859:1E 06 49 42 00 87 1B 65 21
1861:1B 32 20 71 E1 81 B1 31 70
1869:42 D1 5C 80 40 20 20 20 A5
1871:F8 20 EA 4E EA 4D C5 6F EF
1879:C1 A7 78 5B F1 38 2C 7C 7E
1881:8A 9B 47 49 B8 DA E2 70 C2
1889:81 BB 0C B9 8C 9A 22 7B 15
1891:2A 80 A3 60 82 A0 38 5A D2
1899:0A AA 82 A7 F8 00 8D 4C 73
18A1:4B 2A A1 4D 09 02 82 48 A8
18A9:1C 82 8D 96 8C 90 4E 4E 35
18B1:AD 0F 20 2B 1C 0A 82 0D 4E
18B9:82 48 46 22 47 87 24 4C 15
18C1:47 C3 0C A0 A5 4D 4D 47 56
18C9:73 00 02 4C 4A 22 4B 4C 76
18D1:A8 12 4A 4B E8 4E 4B 85 75
18D9:21 43 FE F9 06 02 1B 82 DB
18E1:41 23 AA A1 C3 C3 60 0E E6
18E9:83 24 1D B5 62 AC 58 E3 3E
18F1:6A 16 2E F1 7C 0A 60 A1 30
18F9:E7 20 23 7B E4 68 FC 5A 5F
1901:EA 20 35 FC A4 36 3C C8 66
1909:E6 90 88 83 60 83 00 10 3D
1911:E8 1A 2C 41 E9 92 00 90 02
1919:28 1C 90 0C 91 E2 20 22 B3
1921:9E 03 02 31 C8 28 20 8A 68
1929:28 12 43 E6 20 2F 41 DA E5
1931:8D 8C 88 39 06 02 1A 88 E6
1939:E9 20 34 BC 81 20 46 A0 74
1941:41 42 43 1B 20 68 04 44 AD
1949:45 46 80 32 20 21 0A 3E BA
1951:FE A0 28 D5 A5 CC B1 93 E4
1959:72 E3 E4 A0 80 28 51 29 D4
1961:A0 90 8C 81 99 85 92 CD 87
1969:33 20 27 97 89 8E 93 41 8A
1971:1F B0 E3 A0 2E 94 92 81 50
1979:90 93 A0 8C 85 86 94 BA DF
1981:A0 B2 B5 E5 A0 EA 50 FD 15
1989:A0 00 00 68 F0 00 00 00 1A
```

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BASIC MOVE AND SAVE

By Daniel Lightner

Have you ever been in the middle of a great BASIC programming session when all of a sudden an *OUT OF MEMORY ERROR* message appears on the screen? Perhaps you've had a large program to halt in the middle of execution with a similar error message?

As a programmer, you may know that there's a 4K block of free RAM hidden under BASIC's ROM and RAM from 49152 to 53247. Wouldn't it be great if you could store some of your BASIC code there?

Well, you can with BAMOV and BASAV. These two utility programs for the 64 let you use this block of RAM that's usually reserved for machine language programs. They are particularly useful when you're using programs that require a lot of sprite or character data.

Getting Started

BASAV and BAMOV are written in machine language. To enter them, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts for starting and ending addresses for BASAV, respond with the following.

Starting address: C000
Ending address: C0C7

When entering BAMOV, respond with these addresses.

Starting address: CF62
Ending address: D001

Be sure to save each program before leaving MLX.

A Few Rules

Before these programs can be used, certain techniques must be employed and certain rules followed. Your large BASIC program must be divided into two parts. The second part of the program will be called by the first part during execution.

It's important to note that program 2 must be at least 42 bytes shorter than program 1. In most cases you won't have any problems determining this size differential, but here's a way to check. Load program 1 and type this line of code in direct mode.

```
PRINT INT(PEEK(46)*256)+PEEK(45)-2049
```

The value returned is the length of the program in bytes. Load the second program and enter the line again. To determine the difference, subtract the value given for program 2 from the value given for program 1. The number returned must be 42 or greater.

Special Coding

Program 1 must contain these or similar lines of code at the end of the program. Just be sure the line numbers are high enough to place the code at the end of the listing.

```
50000 GOSUB 50005
50001 SYS 53090: RETURN
50005 SYS 53090: GOTO10
```

When you want program 1 to call program 2, read its data, or whatever, have it GOSUB to line 50000. When program 2 has finished executing, the program will return normally to the next statement following the GOSUB 50000. However, it's not mandatory that control return to program 1.

Program 2 must also begin with whatever line the GOTO in line 50005 of program 1 dictates. In the above example, it's line 10. Remember to keep this number below 50000.

To pass control back to program 1, program 2 must end with a RETURN that is not part of any GOSUB routine in program 2.

A Demonstration

Two short demo programs labeled Prg1 and Prg2 are included to demonstrate how BASAV and BAMOV work.

These programs are written entirely in BASIC. To help avoid typing errors, enter them with The Automatic Proofreader. See "Typing Aids" again.

Running the Demos

Note that when Prg1 executes, it loads BAMOV and a file called Program2 into memory. Having the program load these two is not mandatory. You could load these two programs in direct mode before loading and running Prg1. If you decide to load them in immediate mode, delete lines 25 and 30 of Prg1. This will be better understood as we continue.

Load BASAV with the ,8,1 extension. Then type *NEW* and press Return. Now load Prg2 as you would any BASIC program. Before you go further, be sure there's a formatted disk in drive 8 in order to receive a relocated version of Prg2. Then type *SYS 49152* and press Return. The program will run, and the file will be saved as BAS-TMP. After the file has been saved, enter the following line of code in direct mode.

```
OPEN1,8,15, "R0:PROGRAM2=BAS-TMP": CLOSE1
```

It should be clear now that PROGRAM2 as listed in Prg1 is Prg2 relocated. Place a copy of BAMOV on the same disk as Program2. Reset the computer by either typing *NEW* or turning it off and on again. Load Prg1 and place the disk containing Program2 and BAMOV in drive 8. When you run the program, notice that control alternates between the two programs.

As its name implies, BAMOV is the BASIC mover. It pulls program 2 from beneath BASIC's ROM and places part of program 1 there. When activated again, it does the reverse.

When control is passed to line 50000 in program 1, it does a GOSUB to line 50005 so that when a RETURN is encountered, it will return to the next set of commands. At line 50005, BAMOV is activated, pulling program 2 into BASIC's memory while removing program 1. After it returns from the SYS call, the program encounters the GOTO10 command, and BASIC passes control to line 10 of program 2.

Program flow continues from there until it encounters a RETURN. At that point, control returns to line 50001 following the GOSUB in line 50000 of program 1.

Note that this line must remain at the same location in memory. This is the reason for making sure that program 2 is at least 42 bytes shorter than program 1. Next, BAMOV is called again, and program 1 is put back in place. The RETURN in line 50001 returns control to the line that originally called the GOSUB50000, in this case line 65. All the switching back and forth may sound confusing, but it should become clear when you run the programs.

BASIC programs that require sprite and character data can read the data into memory and then pass control to the second program. But remember that this can only work as long as the second program is shorter than the first program.

BASAV

```
C000:AD 0E DC 29 FE 8D 0E DC 31
C008:A5 01 29 FE 85 01 AD 0E 4B
C010:DC 09 01 8D 0E DC A9 C1 34
C018:8D 18 03 A9 34 8D 14 03 64
C020:A5 2D 8D 00 A0 A5 2E 8D F6
C028:01 A0 A9 01 85 FB A9 08 0F
C030:85 FC A9 03 85 FD A9 A0 31
C038:85 FE A5 2D 8D B2 02 A5 A4
C040:2E 8D B3 02 A0 00 B1 FB 37
C048:91 FD 20 9F C0 A5 FB CD 72
C050:B2 02 D0 F2 A5 FC CD B3 65
C058:02 D0 EB A9 07 A2 BA A0 FF
C060:C0 20 BD FF A9 02 A2 08 A4
C068:A0 02 20 BA FF A6 FD A4 A5
C070:FE A9 00 85 FD A9 A0 85 91
C078:FE A9 FD 20 D8 FF AD 0E D5
C080:DC 29 FE 8D 0E DC A5 01 A3
C088:09 01 85 01 AD 0E DC 09 F7
C090:01 8D 0E DC A9 47 8D 18 23
C098:03 A9 31 8D 14 03 60 18 8A
C0A0:A5 FB 69 01 85 FB A5 FC 95
C0A8:69 00 85 FC 18 A5 FD 69 1C
C0B0:01 85 FD A5 FE 69 00 85 51
C0B8:FE 60 42 41 53 2D 54 4D 73
C0C0:50 00 00 00 00 00 00 00 6A
```

BAMOV

```
CF62:AD 0E DC 29 FE 8D 0E DC B1
CF6A:A5 01 29 FE 85 01 AD 0E CB
CF72:DC 09 01 8D 0E DC A9 C1 B4
CF7A:8D 18 03 A9 34 8D 14 03 E4
CF82:A9 01 85 FB A9 08 85 FC 1D
CF8A:A9 03 85 FD A9 A0 85 FE 2A
CF92:AD 00 A0 8D B2 02 AD 01 EF
CF9A:A0 8D B3 02 A0 00 B1 FB E8
CFA2:8D B4 02 B1 FD 91 FB AD 6D
CFAA:B4 02 91 FD 20 E0 CF A5 01
CFB2:FB CD B2 02 D0 E8 A5 FC AC
CFBA:CD B3 02 D0 E1 AD 0E DC 3A
CFC2:29 FE 8D 0E DC A5 01 09 D1
CFCA:01 85 01 AD 0E DC 09 01 3E
CFD2:8D 0E DC A9 47 8D 18 03 96
CFDA:A9 31 8D 14 03 60 18 A5 FD
CFE2:FB 69 01 85 FB A5 FC 69 2D
CFEA:00 85 FC 18 A5 FD 69 01 06
CFF2:85 FD A5 FE 69 00 85 FE CE
CFFA:60 00 00 00 00 00 00 00 CA
```

PRG1

```
EA 10 REM COPYRIGHT 1992
GJ 15 REM COMPUTE PUBLICATIONS
      INTL LTD
GM 20 REM ALL RIGHTS RESERVED
HA 25 X=X+1:IFX=1THENLOAD"PROG
      RAM2",8,1
AP 30 IFX=2THENLOAD"BAMOV",8,1
AJ 35 PRINT"{CLR}":POKE53280,0
      :POKE53281,0
HA 40 PRINT"{2 DOWN}{2 RIGHT}
      {7}THIS IS PROGRAM ONE O
      F THE BAMOV DEMO."
MQ 45 PRINT"{DOWN}{2 RIGHT}PRO
      GRAM TWO IS UNDER BASIC'
      S ROM."
DQ 50 PRINT"{2 DOWN}{2 RIGHT}I
      T WILL CLEAR THE SCREEN
      {SPACE}AND"
CM 55 PRINT"{2 DOWN}{2 RIGHT}C
      HANGE THE SCREEN AND BOR
      DER COLORS"
ES 60 PRINT"{2 DOWN}{2 RIGHT}W
      HILE DISPLAYING A MESSAG
      E."
FB 65 FORT=1TO5000:NEXTT
AX 70 GOSUB50000
PX 75 POKE53280,0:POKE53281,0:
      PRINT"{CLR}{2 DOWN}
      {2 RIGHT}{7}BACK AT PROG
      RAM ONE NOW!"
HE 80 END
RA 50000 GOSUB50005
RQ 50001 SYS53090:RETURN
MX 50005 SYS53090:GOTO10
```

PRG2

```
EA 10 REM COPYRIGHT 1992
GJ 15 REM COMPUTE PUBLICATIONS
      INTL LTD
GM 20 REM ALL RIGHTS RESERVED
EQ 25 PRINT"{CLR}":POKE53280,6
      :POKE53281,6
PX 30 PRINT"{2 DOWN}{2 RIGHT}
      {WHT}THIS IS PROGRAM TWO
      OF THE BAMOV DEMO."
MX 35 PRINT"{2 DOWN}{2 RIGHT}W
      HEN THIS PROGRAM FINISHE
      S, IT WILL"
HR 40 PRINT"{2 DOWN}{2 RIGHT}R
      ETURN CONTROL TO LINE 50
      001"
XC 45 PRINT"{2 DOWN}{2 RIGHT}O
      F PROGRAM ONE."
PC 50 FORT=1TO5000:NEXTT
PD 55 RETURN
```

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NOAH'S READER

By Daniel Lightner

Last year (July 1991) we published Noah's Arc, a program that creates self-dissolving archive (SDA) files. People who use that program will find this short utility program for the 64 valuable.

Archiving is a convenient method for combining a number of related files into one master file. This process is convenient for uploading and downloading programs and instructions to and from a BBS. Many files and programs can be stored within one large file. When the SDA file is loaded and run, it dissolves into the original individual programs and saves them to disk.

The problem with archive files is that unless you have the filenames written down, there isn't any way of knowing the contents of the archived file. This is especially true if you have just downloaded a new file from a BBS or have come across a forgotten SDA file in your library. Dissolving the file will do the trick, but it's time-consuming and a bit awkward.

Noah's Reader solves this problem. Noah's Reader reads the beginning of the SDA files from disk and lists the names of the files that are stored within the archive file.

Entering the Program

Noah's Reader is written in machine language and will have to be entered using MLX, COMPUTE's machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts for starting and ending addresses, respond with these values.

Starting address: 0801
Ending address: 09F7

Make sure that you save a copy of Noah's Reader before you exit MLX.

Running the Program

Noah's Reader loads and runs like a BASIC program. The first thing it does is to ask for an SDA filename. It then searches drive 8 for that filename and reads information until it locates the various filenames.

Noah's Reader then lists those files to the screen. The listing can be stopped by pressing any key. When the key is released, the listing continues until it prints the names of all of the archived files.

Run Noah's Reader again to read another SDA file.

NOAH'S READER

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:31 00 00 00 A0 00 8C 20 EF
0811:D0 8C 21 D0 B9 8F 09 C9 C5
0819:FF F0 07 20 D2 FF C8 4C BC
0821:15 08 A0 00 20 FA 08 B9 88
0829:85 09 20 D2 FF C8 C0 0A 1E
0831:D0 F5 20 FA 08 A9 3E 20 5E
0839:D2 FF 20 15 09 AC 34 03 6E
0841:A2 00 BD 81 09 99 35 03 8E
0849:EE 34 03 C8 E8 E0 05 D0 70
0851:F1 CE 34 03 AD 34 03 A2 AB
0859:35 A0 03 20 BD FF A9 02 D1
0861:A2 08 A0 02 86 FC 20 BA 1C
0869:FF 20 C0 FF 20 CC FF A5 73
0871:BA 20 B4 FF A9 6F 85 B9 4D
0879:20 96 FF 20 A5 FF C9 30 32
0881:D0 0D 20 A5 FF C9 30 D0 F3
0889:06 20 AB FF 4C 96 08 20 07
0891:AB FF 4C E7 08 A2 02 20 6E
0899:C6 FF 20 FA 08 A9 01 85 2F
08A1:FB 20 F1 08 20 E4 FF 85 90
08A9:FE 20 07 09 A5 FB C9 B0 14
08B1:D0 F2 A5 FC C9 09 D0 EC 6C
08B9:20 E4 FF 85 FD A2 00 20 06
08C1:E4 FF C9 2C F0 08 20 D2 FA
08C9:FF E8 E4 FD D0 F1 A9 0D 3F
08D1:20 D2 FF 20 F1 08 20 F1 8A
08D9:08 20 E4 FF A5 CB C9 40 C2
08E1:D0 FA C6 FE D0 D2 A2 00 F8
08E9:20 C6 FF A9 02 4C C3 FF 1F
08F1:20 E4 FF 20 E4 FF 4C E4 F1
08F9:FF A9 0D 20 D2 FF 20 D2 C1
0901:FF A9 9A 4C D2 FF 18 A5 02
0909:FB 69 01 85 FB A5 FC 69 C5
0911:00 85 FC 60 A0 00 A9 00 82
0919:8D 34 03 20 E4 FF C9 00 1C
0921:F0 F9 C9 14 F0 41 C9 7B 40
0929:B0 F1 C9 11 F0 ED C9 13 40
0931:F0 E9 C9 1D F0 E5 C9 22 16
0939:F0 E1 C9 2C F0 DD C9 0D D7
0941:F0 10 AC 34 03 C0 14 F0 DC
0949:D2 20 D2 FF 20 5E 09 4C FF
0951:1C 09 AC 34 03 C0 00 F0 98
0959:C2 20 D2 FF 60 AC 34 03 50
0961:99 35 03 EE 34 03 60 AC F7
0969:34 03 C0 01 B0 03 4C 1C C4
0971:09 20 D2 FF 38 AD 34 03 4E
0979:E9 01 8D 34 03 4C 1C 09 40
0981:2C 50 2C 52 46 49 4C 45 9D
0989:4E 41 4D 45 20 3F 93 9A D0
0991:0D 20 20 20 20 20 20 4E 48
0999:4F 41 48 27 53 20 53 44 25
09A1:41 20 52 45 41 44 45 52 F2
09A9:0D 20 20 20 20 20 20 20 32
09B1:43 4F 50 59 52 49 47 48 67
09B9:54 20 31 39 39 32 0D 43 A7
09C1:4F 4D 50 55 54 45 20 50 76
09C9:55 42 4C 49 43 41 54 49 46
09D1:4F 4E 53 20 49 4E 54 4C 04
09D9:20 4C 54 44 0D 20 20 20 27
09E1:20 20 41 4C 4C 20 52 49 C9
09E9:47 48 54 53 20 52 45 53 99
09F1:45 52 56 45 44 0D FF 00 B0
```

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LOCATE

By Farid Ahmad

Programmers who use BASIC are familiar with the various tricks for positioning text on a screen. Most use various PRINT statements and a lot of trial and error, but now there's a better way.

Locate is a short machine language routine for the 64 that provides BASIC programmers with two commands for cursor positioning and text color adjustment. Although the program is written in BASIC, it stores its machine language subroutine in a BASIC REM statement. This technique provides the speed of machine language with the convenience of BASIC.

Preparing Locate

Notice that Locate's first line contains a REM followed by 73 periods. It looks strange, but it's important not to change this line in any way. Since this line fills two screen lines, enter it without a space between the line number and the word REM. If you include the space, your cursor will drop down a line after you type the final period. Should that occur, cursor back up to the line and press Return.

Locate is written entirely in BASIC. To help avoid typing errors, use The Automatic Proofreader to enter the program. See "Typing Aids" elsewhere in this section. Be sure to save a copy of the program when you've finished.

Load and run the program. Now list it again. You'll see that Locate's first line number is missing and the line itself contains a number of meaningless characters. Next, delete lines 30–90. Delete a line by cursoring to an empty spot on the screen, typing *30*, and then pressing Return. Do this for lines 30–90. Finally, the program will consist of only two lines: the unnumbered line 10, which contains the meaningless symbols, and line 20. Save this two-line program with the usual SAVE command.

Using the Program

Before starting to write a BASIC program, load this two-line program. Now start writing your program with a line

number greater then 20. When you want to position text, the following two commands are available.

SYS AT, *row, column, color*

The row may be from 0–24 and the column from 0–39. The color may be from 0–15, the usual Commodore colors. This parameter will effect the color of following text. Values outside these limits will produce an *ILLEGAL QUANTITY ERROR* message.

For example, SYS AT, 5, 0, 1 will position the cursor at the beginning of the sixth screen line and change text color to white. The color parameter is optional. If you don't want to set the text color, omit this parameter and the preceding comma. SYS AT, 5, 0 will position the cursor at the same place but will not change the text color. Spaces after the commas are also optional. Any PRINT statement that follows this or the following command will begin printing at the cursor position that you have indicated.

SYS CL, *row, column, color*

The syntax of this command is exactly the same as that of SYS AT, but it clears the screen before positioning the cursor. For example, SYS CL, 0, 0, 1 will clear the screen, position the cursor at the upper left corner, and set text color to white. As with SYS AT, the color parameter is optional.

Other Considerations

The machine language routine in Locate is relocatable. It will work correctly even if the start of BASIC pointer has been changed. The only condition is that the two lines of Locate be the first two lines of the program. The line numbers, however, may be changed with a renumbering utility.

The variables *AT* and *CL* are defined by Locate as the starting addresses of the Locate routines. These variables must not be used elsewhere in the program, or the program might crash.

If you want to use Locate with an existing program, you'll need a merge utility, such as the MERGE command in METABASIC. Renumber your program so that the first line number is greater than 20. Then merge it with Locate.

A Demonstration

Demo is a demonstration program that illustrates some of the ways Locate commands can be used and modified. It's also written in BASIC and should be entered with Proofreader.

With a merge program, you can combine the two programs later. If you don't have a merge program, load and run Proofreader, load the two-line Locate program, and then enter Demo, starting with line 30.

The Technique

The technique used with Locate is a convenient way of adding short machine language routines to BASIC programs. A few things must be kept in mind, however. First, the ML routine must not contain the number 0. This is because 0 is reserved by the BASIC interpreter to mark the end of a BASIC line. Since 0 is the ML instruction for BRK, it's seldom required. It may be needed, however, as the argument of an ML command. It's usually possible to get around this problem. For example, to load the X register with 0, use LDX#1, :DEX.

Note the quotation mark at the beginning of the first line. If this is not included, the ML numbers will be interpreted as BASIC tokens. This will still work, but the resulting list may look a bit strange. The quote itself may also produce some problems. Once the quote is encountered, some of the graphic characters might be interpreted as control characters. When the program is listed, the list may change colors, or the screen may be cleared. This is irritating, but it doesn't do any harm to the program. The best way to avoid this problem is to list the program from the second (or higher) line. Whether or not the quote is used, once the ML is in the REM statement, do not reenter the line by pressing Return over it. This will enter the line incorrectly and garble the ML. If the quote has been used, the line may look the same after reentering, but the damage may still have been done. This is because many graphic symbols have more than one POKE code, and the BASIC editor always stores the lower value in memory. So if your ML contains the instruction JSR $AEFD, reentering the line will change this to JSR$ AEBD, as $FD and $BD are the POKE codes for the same graphic symbol.

Locate prevents this from happening by including enough delete characters in the line to delete the line number. Thus, the line cannot be reentered by mistake.

LOCATE

```
EQ 10 REM".....
       .....
       .....
       .....
EC 20 CL=PEEK(43)+256*PEEK(44)
      +14:AT=CL+5
KD 30 DATA20,20,20,20,20,20,20
      ,20
KG 40 DATA{2 SPACES}169,147,03
      2,210,255,032,253,174,03
      2,158,183,134,002,032,25
      3,174,032
AE 50 DATA{2 SPACES}158,183,13
      8,168,166,002,224,025,17
      6,033,192,040,176,029,02
      4,032,240
CJ 60 DATA{2 SPACES}255,160,00
      1,136,177,122,170,224,04
      4,208,014,234,032,253,17
      4,032,158
BD 70 DATA{2 SPACES}183,224,01
      6,176,004,142,134,002,09
      6,162,014,076,139,227
RH 80 FORI=0TO72:READA:CK=CK+A
      :POKE CL-8+I,A:NEXT
DS 90 IFCK<>8427 THENPRINT"ERR
      OR IN DATA STATEMENTS":E
      ND
```

DEMO

```
MQ 30 A$="L O C A T E":B$="LOC
      ATE"
AP 40 PP=15
MA 50 POKE53280,0:POKE53281,0
KS 60 SYSCL,10,09,1:PRINTA$
AB 70 FORA= 1 TO 09
DR 80 SYSAT,A,A,A:PRINTB$
BD 90 SYSAT,A,35-A,A:PRINTB$
MH 100 NEXT
HA 110 FOR A=13 TO 1 STEP -1
GP 120 SYSAT,A+10,A+10,15-A:PR
      INTB$
SK 130 NEXT
QM 140 FOR A=1 TO100
QC 150 SYSAT,10,09,A-INT(A/15)
      *15:PRINTA$
CP 160 NEXT
SQ 170 SYSCL,5,3,1
BJ 180 PRINT"LOCATE ALLOWS YOU
       TO POSITION TEXT"
FE 190 SYSAT,7,5,2
DR 200 PRINT"ANYWHERE"
AX 210 SYSAT,9,13
MK 220 PRINT"ON"
QG 230 SYSAT,11,15
QC 240 PRINT"THE
BH 250 SYSAT,13,20
CJ 260 PRINT"SCREEN"
```

```
XX 270 SYSAT,PP,5,3
SJ 280 PRINT"IN"
FR 290 SYSAT,PP,10,6
FJ 300 PRINT"ANY"
FB 310 SYSAT,PP,15,11
PR 320 PRINT"COLOR"
MM 330 FORA=0 TO 15:SYSAT,PP,2
      2+A,A
QQ 340 PRINT"!"
BH 350 NEXT
```

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BUG-SWATTER

A portion of the machine language listing for Blanker in the August 1992 issue was omitted. We regret the inconvenience it may have caused some readers. Here is the entire listing.

If you have already entered and saved the earlier portion, load and run MLX, responding with the following starting and ending addresses.

Starting address: 0247
Ending address: 0763

Now select Load File from the MLX menu and load the saved file. Then begin entering data from address 03D7.

After you have saved the entire program, remember that it must be converted to GEOS format with the converter program in the August issue.

BLANKER

```
0247:0F 03 15 BF FF FF FF 80 B2
024F:00 01 BF FF FD B0 00 0D 4B
0257:A0 00 05 A0 00 05 A0 00 AB
025F:05 A0 00 05 A0 00 05 A0 0E
0267:00 05 A0 00 05 A0 00 05 70
026F:A0 00 05 A0 00 05 B0 00 E3
0277:0D BF FF FD 80 00 01 FF D7
027F:FF FF 4F FE 72 20 00 04 75
0287:3F FF FC 83 05 00 00 04 2F
028F:BA 2C 00 04 53 63 72 6E B7
0297:20 42 6C 61 6E 6B 65 72 3E
029F:56 31 2E 30 00 00 00 00 E3
02A7:43 68 61 72 6C 65 73 20 BA
02AF:57 2E 20 42 6F 7A 61 72 AD
02B7:74 68 20 0F 2C 00 00 44 AA
02BF:65 73 6B 20 61 63 63 65 87
02C7:73 73 6F 72 79 20 66 6F FF
02CF:72 20 62 6C 61 6E 6B 69 2D
02D7:6E 67 20 74 68 65 20 47 98
02DF:45 4F 53 20 73 63 72 65 3A
02E7:65 6E 2E 0F 34 00 00 20 B2
02EF:4E C1 20 B7 C1 00 60 99 73
02F7:08 40 1F 20 53 C2 00 C8 64
02FF:00 00 40 01 A9 80 85 2F A5
0307:20 B7 C1 1F 85 1E 29 9C C8
030F:03 20 B6 06 20 31 07 20 C9
0317:E6 06 A5 02 C9 02 F0 38 57
031F:A9 00 85 39 A9 04 8D A2 59
0327:84 A9 69 8D A1 84 A9 04 56
032F:8D A4 84 A9 69 8D A3 84 9D
0337:A9 01 85 3B A9 3F 85 3A 46
033F:A9 C7 85 3C A5 16 0A A8 C2
0347:88 88 B9 29 07 8D 9B 84 A7
034F:C8 B9 29 07 8D 9C 84 60 06
0357:AD 11 D0 09 10 8D 11 D0 CC
035F:A9 30 85 01 20 B7 C1 1E 88
0367:29 1F 85 9C 03 20 A5 C1 E9
036F:00 C8 00 00 40 01 20 B7 A5
0377:C1 99 08 00 60 40 1F 4C 54
037F:3E C2 A9 00 8D 9C 84 A9 1C
0387:00 8D 9B 84 A9 35 85 01 DA
038F:AD 11 D0 29 EF 8D 11 D0 06
0397:60 A9 04 8D 9C 84 A9 C7 A3
039F:8D 9B 84 A9 A0 85 03 A9 49
03A7:00 85 02 A9 00 85 05 85 8F
03AF:06 A9 5A 85 07 60 A6 05 D2
03B7:A4 06 B9 28 05 A8 B1 02 7B
03BF:3D 20 05 91 02 20 0A 05 CF
03C7:18 A9 0A 65 02 85 02 90 96
03CF:02 E6 03 A5 03 C9 BF D0 DA
03D7:04 A5 02 C9 40 D0 D7 A9 C4
03DF:A0 85 03 A9 00 85 02 20 CC
03E7:0A 05 C6 07 D0 0A A9 04 83
03EF:8D 9C 84 A9 93 8D 9B 84 9D
03F7:60 E6 06 A5 06 C9 0B D0 41
03FF:04 A9 00 85 06 E8 E0 08 68
0407:D0 02 A2 00 86 05 60 7F D4
040F:FB DF FE EF BF FD F7 03 D4
0417:07 01 09 04 06 00 08 05 89
041F:02 00 A9 05 8D 9C 84 A9 3F
0427:48 8D 9B 84 A0 09 A9 FF EE
042F:99 8E 08 88 D0 FA 60 20 84
0437:76 05 90 28 18 20 33 C1 B9
043F:E6 18 A5 18 C9 C8 F0 14 5E
0447:A9 00 38 20 33 C1 20 87 95
044F:C1 AD 0A 85 C9 28 B0 04 91
0457:A9 C8 85 18 20 96 05 A9 A7
045F:10 8D 4E 06 60 AC 50 06 59
0467:B9 8E 08 C9 FF F0 12 85 FA
046F:18 98 0A A8 B9 7A 08 85 C2
0477:08 C8 B9 7A 08 85 09 38 35
047F:60 20 C6 05 60 AC 50 06 45
0487:A5 18 C9 C8 F0 21 99 8E FB
048F:08 98 0A A8 A5 08 99 7A 88
0497:08 C8 A5 09 99 7A 08 EE D0
049F:50 06 AD 50 06 C9 0A D0 48
04A7:05 A9 00 8D 50 06 60 A9 7A
04AF:FF 99 8E 08 60 CE 4E 06 51
04B7:D0 19 AD 4F 06 18 69 08 84
04BF:8D 4F 06 C9 60 90 0A A9 C2
04C7:04 8D 9C 84 A9 AA 8D 9B BF
04CF:84 18 60 AD 4F 06 8D 98 4D
04D7:08 20 87 C1 AD 0B 85 C9 67
04DF:FA B0 D2 85 19 AD 0A 85 5D
04E7:85 18 A9 01 85 05 A9 40 D1
04EF:85 04 A2 18 A0 04 20 69 50
04F7:C1 A5 13 85 09 A5 12 85 8D
04FF:08 20 3F C1 90 01 60 CE 30
0507:98 08 F0 A9 20 87 C1 30 EA
050F:1D E6 08 D0 02 E6 09 A5 D2
0517:09 C9 01 D0 04 A5 08 C9 D5
051F:40 D0 DE A9 00 85 09 A9 C5
0527:00 85 08 4C 12 06 E6 18 E6
052F:A5 18 C9 C8 D0 CB A9 00 E0
0537:85 18 4C 12 06 10 07 00 33
053F:A9 06 8D 9C 84 A9 60 8D 34
0547:9B 84 A9 01 85 02 60 A9 24
054F:C8 85 06 A2 00 86 03 A9 D3
0557:00 85 05 20 3C C1 A2 28 BB
055F:18 A0 00 B1 0C F0 02 E6 C7
0567:05 6A 91 0C 08 18 A9 08 7D
056F:65 0C 85 0C 90 02 E6 0D 08
0577:28 CA D0 E7 A5 05 D0 11 D4
057F:C6 06 A5 06 D0 0B A9 04 8D
0587:8D 9C 84 A9 93 8D 9B 84 39
058F:60 A6 03 E8 E4 02 D0 BD F0
0597:E6 02 A5 02 C9 C8 90 04 01
059F:A9 C8 85 02 60 A9 27 85 FE
05A7:05 A9 D9 85 04 A9 8C 85 97
05AF:07 A9 A7 85 06 A2 0D A0 6A
05B7:19 B1 06 20 11 07 AD 27 A4
05BF:8C 91 06 88 D0 F3 18 A9 ED
05C7:28 65 06 85 06 90 02 E6 B5
05CF:07 CA D0 E3 60 A9 27 85 E5
05D7:05 A9 D9 85 04 A9 8C 85 C7
05DF:07 A9 A7 85 06 A2 0D A0 9A
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05EF:F8 18 A9 28 65 06 85 06 88
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0607:07 84 08 A0 00 B1 04 E6 78
060F:04 D0 02 E6 05 A4 08 60 2B
0617:93 04 AA 04 33 05 51 06 D9
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064F:9B 84 A9 01 85 16 20 9E F2
0657:07 60 A9 01 85 17 A5 16 2E
065F:C9 01 D0 22 60 A9 02 85 FF
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066F:A9 03 85 17 A5 16 C9 03 4F
0677:D0 0C 60 A9 04 85 17 A5 9F
067F:16 C9 04 D0 01 60 20 9E FE
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068F:09 A9 59 85 08 A9 00 85 7A
0697:0B A9 61 85 0A A9 2A 85 E8
069F:06 A6 16 A5 06 18 69 11 E9
06A7:85 06 CA D0 F6 A5 06 18 D0
06AF:69 06 85 07 20 2A C1 60 A0
06B7:81 13 49 07 01 11 37 02 9F
06BF:11 48 0B 10 10 38 08 0B 45
06C7:30 21 59 08 0B 30 32 61 BE
06CF:08 0B 30 43 6C 08 0B 30 A6
06D7:54 73 08 12 03 1A 01 08 97
06DF:12 03 2B 09 08 12 03 3C 76
06E7:11 08 12 03 4D 19 08 00 CF
06EF:21 08 00 00 02 09 6B 07 A0
06F7:21 08 00 00 02 09 76 07 BE
06FF:21 08 00 00 02 09 81 07 DC
0707:21 08 00 00 02 09 8C 07 FB
070F:92 FF E0 80 20 80 20 80 4E
0717:20 80 20 80 20 80 20 80 25
071F:20 FF E0 0E 00 04 BF 18 E1
0727:50 6C 65 61 73 65 20 53 FF
072F:65 6C 65 63 74 20 42 6C 03
0737:61 6E 6B 69 6E 67 20 4F 36
073F:70 74 69 6F 6E 3A 1B 00 59
0747:18 42 6C 61 6E 6B 1B 00 EC
074F:18 44 69 73 73 6F 6C 76 87
0757:65 1B 00 18 44 72 69 70 8F
075F:1B 00 18 54 69 6C 74 1B 44
0767:00 00 00 00 00 00 00 00 75
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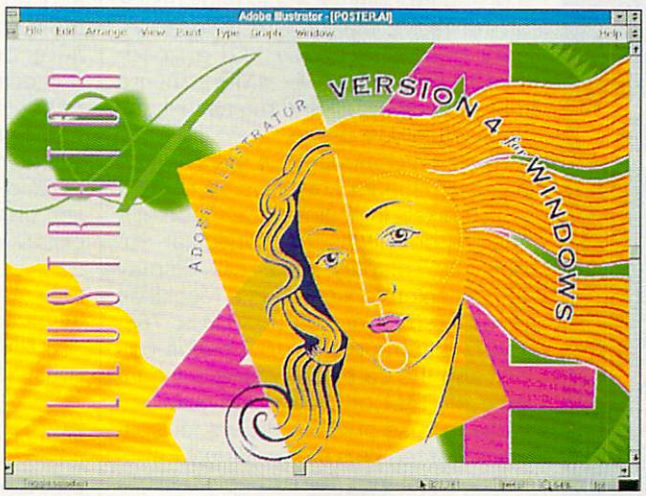
ADOBE ILLUSTRATOR VERSION 4.0 FOR WINDOWS

Adobe Illustrator has long been the big kahuna among Macintosh illustration programs. So it was eagerly awaited by early Windows users hoping to put the power of PostScript-based drawing into their PCs. However, the first release of Illustrator for Windows was, to put it bluntly, a dog—not as elegant or powerful as the Mac version, and buggy, too.

But don't let the bad rep of that earlier release put you off from the new Adobe Illustrator Version 4.0 for Windows. If you need what it can do, this Illustrator is now the best thing going for high-end PC illustration.

Illustrator is, as I said, a PostScript drawing program; that is, it creates drawings in the PostScript page description language invented by Adobe and native to most high-end laser printers and imagesetters. The advantage of drawing with PostScript is that your drawings can be accurately printed on any PostScript printer or imagesetter at the highest resolution of which the device is capable.

In Illustrator, you draw by manipulating control points along paths, a skill that takes some time to master but that gives you greater control of the look of every curve and line. You can start sketching with the free-form drawing tool and then edit the sketch, or you can import scanned images and have Illustrator turn them into editable line drawings. (The package comes with Adobe Streamline, which converts scans to PostScript art more effectively than Illustrator's own scan-tracing tools.) You can edit in a fast wireframe mode or show all colors (up to 16.7 million), lines, and templates. Illustrator also allows you to open and work on many drawings at once. The included Adobe Separator utility then turns your finished color art into a file ready for 4-color separation by any service bureau that accepts files from other versions of Illustrator.



With Version 4.0 for Windows, Adobe Illustrator has gone from being a dog to being the top dog of Windows drawing programs.

Font handling is one of Illustrator's strong points, as you might expect from an Adobe application. Within Illustrator itself you can enter and edit text directly on your drawing, without having to work within a special text box as in some other programs. Text can be wrapped outside or fit inside any shape and run along a curved path; you can import any Adobe font as an editable outline and create your own typefaces, as well. There are complete tracking and kerning controls, too. Included with Illustrator is the latest version of Adobe Type Manager, an indispensable Windows font-display utility; Adobe TypeAlign, a font manipulation program; and 40 Type 1 Adobe fonts.

A feature new to this version of Illustrator is the ability to create instant charts and graphs. Set up the general parameters for your graph in a dialog box, enter the graph data in Illustrator's simple built-in spreadsheet, and click the graph tool. Voilà! Instant graph. No other high-end drawing program can do this. If you mainly create and embellish data graphics for corporate reports, this one feature alone may justify Illustrator's price.

As good as it is, the program does have a few shortcomings. There's no on-screen color palette, so you can't just click on a color block to change colors. The color picking, specification, and naming features are complete and easy to use, but there's no substitute for seeing all the colors of your drawing in one palette. Also, I wished for a layer feature like the one in Illustrator's archrival, Aldus FreeHand. The complexity of an Illustrator drawing can get confusing, especially if you're working in wireframe (Artwork Only) mode. Complex drawings are easier to organize if you can put related elements on separate layers and edit each layer while hiding or dimming the others. These are relatively minor drawbacks, however.

Should you chuck your copy of CorelDRAW!, Designer, or Arts & Letters for Illustrator? If you do light-duty illustration and never print on PostScript imagesetters, then probably not; scaling the learning curve for Illustrator may not be worth the time. If you already work in a PostScript environment (with Aldus PageMaker, for example), have to share files with users of the Mac or Next versions of Illustrator, or are sending out work to desktop publishing service bureaus, then you'd do well to look into Illustrator. Adobe offers a competitive upgrade for owners of other popular PC drawing programs.

Illustrator is now the premier Windows drawing program. Its rich feature set and smooth interface, coupled with the fact that service bureaus everywhere can handle Illustrator files with minimal fuss, make it the first choice for professional illustrators and desktop publishers. Adobe has done it right this time.

STEVEN ANZOVIN

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REVIEWS

FORCE TECHNOLOGY F33

For the same reasons you might choose a convertible over a VW Beetle, you'll choose the Force Technology F33 over most of the vanilla clones in the channel. Bristling computing horsepower, this black beauty could appeal more to self-styled hackers and postmodern lawyers only if the minitower came sheathed in hand-tooled black leather.

Even if you have no aspirations to the technoelite, you'll befriend the F33 right out of the box: Windows 3.1, DOS 5.0, and Procomm 2.4.2 already reside on the 130MB Maxtor hard drive. Abundant hard disk space and a good-sized chunk of RAM—4MB—ensure that you can install and run almost any application you desire.

The 14-inch Super VGA monitor supplied with the F33 displays up to 1024 × 768 pixels in noninterlace mode at a fine .28 dot pitch. The Speedstar Super VGA display card will display 32,000 colors onscreen in a resolution of 800 × 600, or 256 at 1024 × 768. The palette ranges to 16.7 million colors, and the card itself packs a megabyte of RAM on board, so you can make full use of VESA drivers for software that requires them—Virtual Laboratories Vistapro, for example. Unless you're using Windows for extensive DTP, you probably won't need an accelerator. The F33 runs graphical environments at a more than acceptable speed, and it will even multitask telecommunications software in the background without appreciable slowdown.

With a 33-MHz 486 at its heart, the motherboard also harbors a 64K cache, five 16-bit expansion slots, and three 8-bit slots; it will accept up to 64MB of RAM in mix-and-match SIMM configurations. The video card and the 2400-bps modem claim two of the expansion slots, but most users probably don't need room for more than six additional cards. You might want to add a CD-ROM drive, though, and to do it, you'll have to remove the Teac 5¼-inch drive to mount the CD-ROM internally or buy an external CD-ROM drive instead. If that's the case, consider a mid-tower or even a full-tower chassis, both available from Force Technology. The standard Teac 3½-inch floppy drive should serve you well for the life of the computer. All told, the system performs admirably, clocking in with a respectable Norton index of 50 and a better-than-rated hard drive seek time of 13.96 ms.

The F33 tactile keyboard and the matching black serial mouse give you your choice of input devices, neither of which lacks elegance or precision. The dark olive power button sits well above the smaller black reset and turbo buttons; there's no confusing these.

Besides the one-year parts-and-labor warranty, Force Technology provides outstanding support for its customers. For example, when Lemmings wouldn't run on the test unit, the staff at Force called Psygnosis and Speedstar, the manufacturer of the video display card. Not only did a Speedstar representative call to help, but the Force representatives had more than a few suggestions themselves. That ornery version of Lemmings runs fine now, and no other software gave the F33 the least bit of trouble—even Windows never crashed.

A combination of near-universal compatibility and courteous assistance from Force means a long and congenial partnership between this well-made PC and users looking for a bit of distinction on their desktops.

DAVID SEARS

Force Technology F33 with 4MB RAM, 130MB hard drive, 5¼-inch and 3½-inch floppy drives, modem, and Super VGA monitor—$2,222

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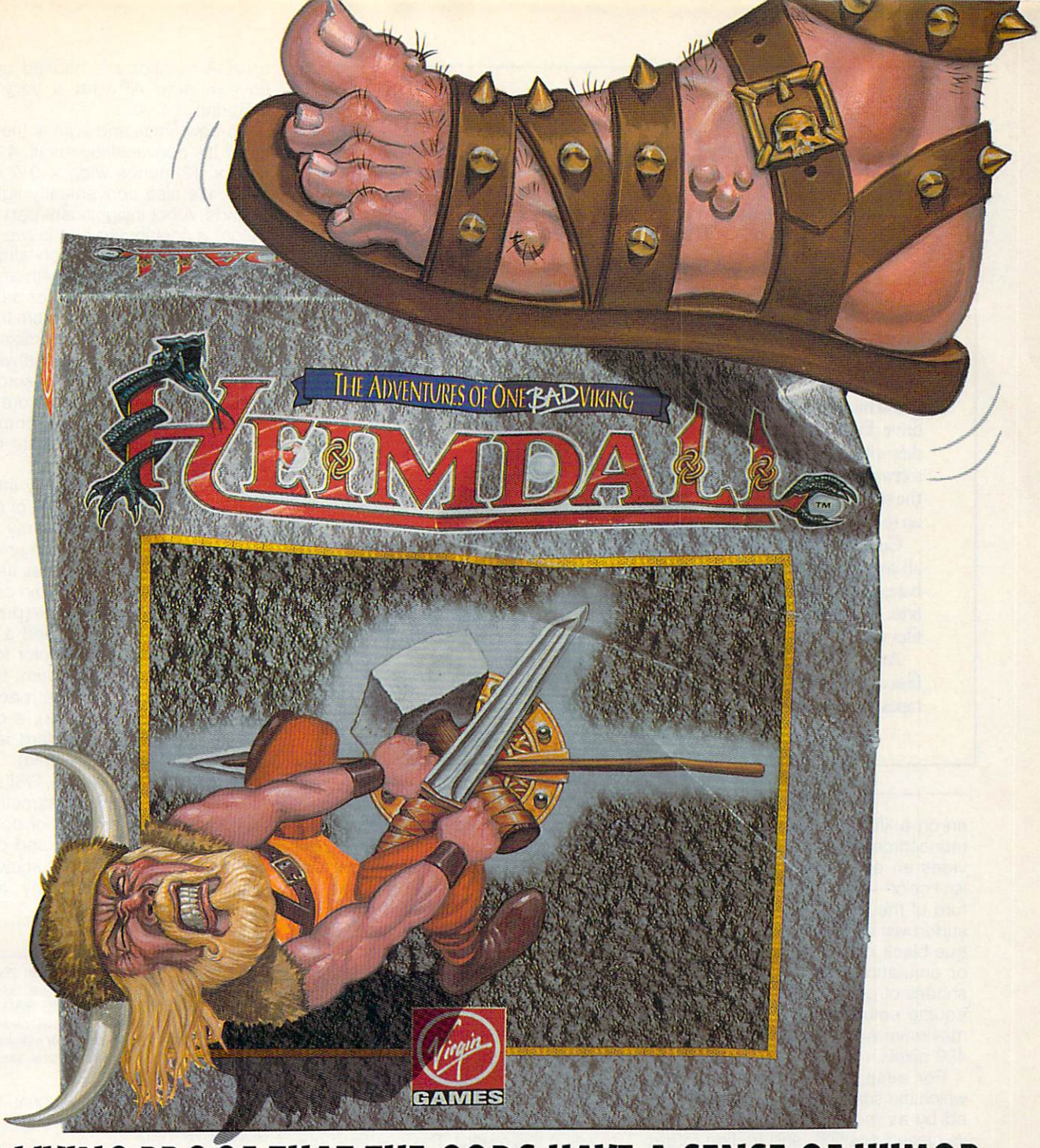
KLONIMUS NOTEBOOK AT

The Klonimus notebook computer from QSI is an excellent example of how the portable AT is finally coming of age. To my mind, the principle attributes of a computer (for most applications) are storage capacity and speed—roughly, though not necessarily, in that order.

My review model came equipped with a 60MB hard drive, but QSI offers a wide range of hard drive capacities, from 20MB to 120MB. A minimum of 2MB of RAM can be expanded to 4MB, 6MB, or 8MB. The built-in single 3½-inch floppy drive adds another 1.4MB with each disk you use. The microprocessor is a quick 16- or 20-MHz 80386SX or a 25-MHz 386SL, depending upon your requirements. (The 386SL microprocessor is faster and uses less power. Consequently, it costs a bit more.)

Following closely behind storage and speed is graphics capability—a realm of personal computing that's tak-



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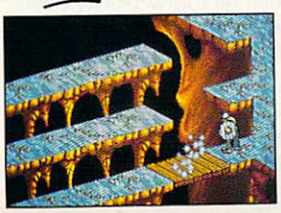

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en on a life of its own since the early monochrome text days. Klonimus provides an outstanding VGA display. It isn't color—that's not yet a common feature of the notebooks—but the triple-supertwist illuminated LCD display has true black-on-white contrast. VGA color emulation is done by utilizing 64 shades of gray—a very sharp and adequate emulation in most cases. The maximum screen resolution is 640 × 480 pixels.

For ease of use, the cover upon which the screen is mounted can be tilted by as much as 135 degrees from its closed position, and friction-retarded hinges allow it to be set at any convenient angle within that range. Of course, the backlighting can be timed to go off at a convenient interval and there are brightness and contrast controls. But here's the bonus: If an LCD display isn't to your liking, and there's a VGA monitor available, a handy video port on the side will accept a VGA plug so that you can enjoy complete color capability.

The keyboard is a largely well-designed one with an 83-key format. My standard of good design is how well a small keyboard approximates the omnipresent 101-key variety. One thing that almost always annoys me when using a notebook keyboard is that the placement of keys is so often confused. Distance isn't usually a problem, or even that the numeric keypad is missing—I don't use a keypad much because different software makes different use of it. But I begin throwing fits if the cursor keys aren't to the lower right in an inverted-T formation, or if the Page Up and Page Down keys aren't on top of one another, or if the Esc key isn't in the upper left, and so on. These keys are too frequently used to be placed arbitrarily.

Fortunately, the Klonimus does pretty well in this regard. The inverted-T cursor layout is there, and the Page keys and Esc key are fine. Problems occur when you try to find the Ctrl key on the lower left and you press the Alt key instead (this can be catastrophic with certain software). Then, when you go for the Alt key on the left of the space bar, you find that a special function key for the keypad simulation occupies that spot. But even this doesn't worry me. The reason I'm placid is bonus feature number 2: A standard 101 keyboard can be plugged into the port provided on the right side of the unit. (It's the smaller mini-DIN variety of plug, but an adaptor is included for larger connectors.) When both a keyboard and color VGA monitor are hooked up, you have a nice AT with a very small footprint!

So how small and light is the Klonimus? It's conveniently small: 4 inches high × 12 inches wide × 9¼ inches deep. It's also conveniently light at 7 pounds. A not insignificant part of that weight is contributed by the two nickel-cadmium batteries which slide into place below the screen, with an easily accessible slider release for each just in front of them and back from the keyboard. The two batteries combined are estimated to last six hours between recharges, but I've found that something a little over four hours is a more realistic expectation when the computer is regularly used with moderate floppy-drive access.

The power switch, slightly indented on the left side, can be a bit of a problem, since that's where my finger tends to go when I move the unit. Convenience, however, often has its price.

The ports include a 30-pin connector for an expansion pack (providing an external floppy drive and a COM2 port), a 68-pin bus connector for various function packs (modem, fax/modem, fax/scanner, Ethernet pack, and IBM 3270 emulation pack), a parallel printer port (25-pin standard female), and a serial port (9-pin male).

To round off its features, QSI's Klonimus also comes with an attractive and functional travel bag full of compartments for floppies, pens, and papers. Hardly a crucial feature, I know, but a nice touch to accompany a solid machine.

BRUCE M. BOWDEN

Klonimus Notebook AT—$1,575 with 20MB hard drive; $1,949 with 60MB hard drive; $3,495 with 386SL-25 microprocessor, 8MB RAM, 120MB hard drive, external floppy drive, all modules, Ethernet card, IBM-3270 emulation for mainframe connection, math coprocessor, vertical stand, serial mouse, and car adapter

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NEW WAVE 4.0

I welcomed the opportunity to review Hewlett-Packard's New Wave 4.0 because, frankly, I've never really understood what it does. The reviews talk about objects, tools, agents, and task languages. While all those words have meaning to me, until now they haven't added up to an understanding of the program.

Hewlett-Packard bills New Wave as "the premier desktop for Microsoft Windows." As a desktop manager, it replac-

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es the Windows Program Manager and, partially, File Manager. It makes Windows even more Mac-like (even down to the trash can icon for deleting things) and insulates you completely from DOS directories and filenames.

New Wave is built completely around objects and tools. Tools are programs with no data of their own; they merely work on your system or data generated by other programs. The printer tool and the trash can are tools. Objects are usually documents (or files, if you think that way) linked to the program that created them. To create an object, attach a data file to its program, give it a name of up to 32 characters, and put the resulting descriptively named icon somewhere on your desktop. Double-clicking on the new icon launches the program and loads the data file; you're immediately ready to work on the document. You don't need to know the name of the program, the name of the data file, or their locations in your disks and directories. Just click on the icon, and the program's running.

New Wave icons (representing objects and tools) can be on the primary desktop or in folders. Folders can contain other folders—giving you the nested program groups that Windows does not—and can be filed in the file cabinet (another tool icon). With folders and the file cabinet, you can create an organized maze of directories and subdirectories without ever knowing how you did it. This is the first truly effective way I've seen to control the ever-growing army of icons on my Windows desktop.

While Windows 3.1 delivers useful new drag-and-drop features (primarily in File Manager), New Wave expands the concept. To print a document, for instance, merely drag the object icon to the printer icon and drop it there. Delete by dragging items to the trash can. You can even open a file by dragging it from the Windows File Manager and dropping it on the New Wave object icon for its related program.

It's an extremely effective desktop manager, but there's more to New Wave than that. One of the tools is the agent. To use DOS terms, the agent is a combined batch file and macro facility. You can define a complex set of procedures for automatic execution through the Agent Task Language, which is powerful enough to run DOS programs and handle concurrently running programs. You can create dialog boxes with push-button options, schedule agent tasks to run at a later time, or even key them to run when specific events take place.

The agent is definitely in power user country. Using the agent, a savvy PC manager can write procedures that will truly insulate his novice users from any DOS or Windows pain.

A third leg of New Wave is the work group library. You can drag objects to the Object Storage area, where they will be available to other network users. You don't have to know the network drive letters or directories to store or retrieve the objects.

New Wave definitely improves your ability to organize and manage your daily Windows work. If I were an office network manager with a batch of nervous users, I'd love what New Wave could do for me. As an individual computer user, however, I'm not sure the admittedly first-rate desktop management functions are worth the program's price and the more than 7MB of hard disk space that it occupies. And if I were a nervous novice, I doubt that I'd have the insight necessary to configure the program well enough to help me significantly.

But, oh, what this could do for an office PC manager!

RICHARD O. MANN

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EPSON ACTION LASER II

Epson's Action Laser II provides HP LaserJet Series II compatibility, a print speed of six pages per minute (PPM), and dual-interface flexibility, along with other outstanding standard features, to produce a mid-size laser printer that's big in performance.

The Action Laser II measures 14 × 18.9 × 27.6 inches and weighs about 29 pounds with the paper cassette, photoconductor unit, output tray, and toner cartridge installed, ready for use. These dimensions make fairly heavy demands on the desktop area, so giving the Action Laser II its own roll-about printer stand or stationary table wouldn't be a bad idea.

The Action Laser II is equipped with 512K of RAM as its standard complement, and this can be expanded up to a maximum configuration of 5.5MB. As with other lasers, the 512K RAM configuration is good for text-only work; graph-

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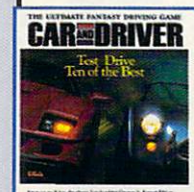

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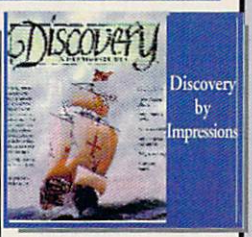

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ics, desktop publishing, and presentation applications will require at least 1MB or more, so upgrading the basic RAM is something you should consider to make the Action Laser II fully functional for these applications. The unit I reviewed came equipped with 1MB of RAM already installed.

Sixteen bitmapped fonts are resident in the Action Laser II: The Courier typeface in medium, italic, bold, and bold italic variations is available in both landscape and portrait orientations in 10- and 12-point sizes; Line Printer Medium is available in 16.66 pitch in portrait and landscape modes; and Prestige Medium is also included in both 12 and 20 pitch in portrait mode only. If additional fonts are required or desired, an expansion slot is also provided which will accept HP Series II font cards, in addition to downloadable soft fonts. An additional expansion slot is also provided to accept "identity" cards that can change the printer's "personality."

The Action Laser II can also emulate Epson FX and LQ print modes when desired, providing greater flexibility. Dual Epson emulation capabilities permit the Action Laser II to emulate a 24-pin dot-matrix printer such as the Epson LQ-2500 or a 9-pin dot-matrix printer such as the Epson FX-850/1050 models.

The printer cranks out a respectable 6 PPM on the average, which places it in the middle ground between the competitive 4-PPM low-end models and pricier 10- to 12-PPM high-end printers. Paper weights from 16 to 24 pounds can be fed into the Action Laser II directly by the paper cassette, and paper and cardstocks in the 16- to 42-pound range can be manually fed into the printer. Plain and colored paper, labels, paper with punched holes, envelopes, and transparency stock can be imprinted with the Action Laser II.

The standard paper cassette will hold up to 100 sheets of standard 20-pound bond paper; the optional multimedia feeder can hold an additional 150 sheets or 15 envelopes. Default paper ejection is facedown only.

All controls for selecting functions and operations are easy to use and top mounted for easy access. A 20-character liquid crystal display keeps users informed of the printer's operational status, as well as presenting menu choices for configuring the unit.

Epson's documentation is excellent, especially in the technical and specification information it provides. According to the manual, the toner cartridge has a life expectancy of 8000 pages at 5-percent density, which makes it one of the longest-life toner cartridges available. In reality, however, 5-percent density isn't a practical measurement, since the average page of double-spaced text produces 20- to 35-percent density depending on how wide the margins are set.

The mid-size Epson Action Laser II printer: big only in performance.

With its good selection of emulations, fonts, interfacing, and print speed, the Action Laser II will probably have broad appeal—especially since it also comes standard with Epson's reputation for quality and reliability.

TOM BENFORD

Epson Action Laser II—$999

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MIGHT & MAGIC III: ISLES OF TERRA

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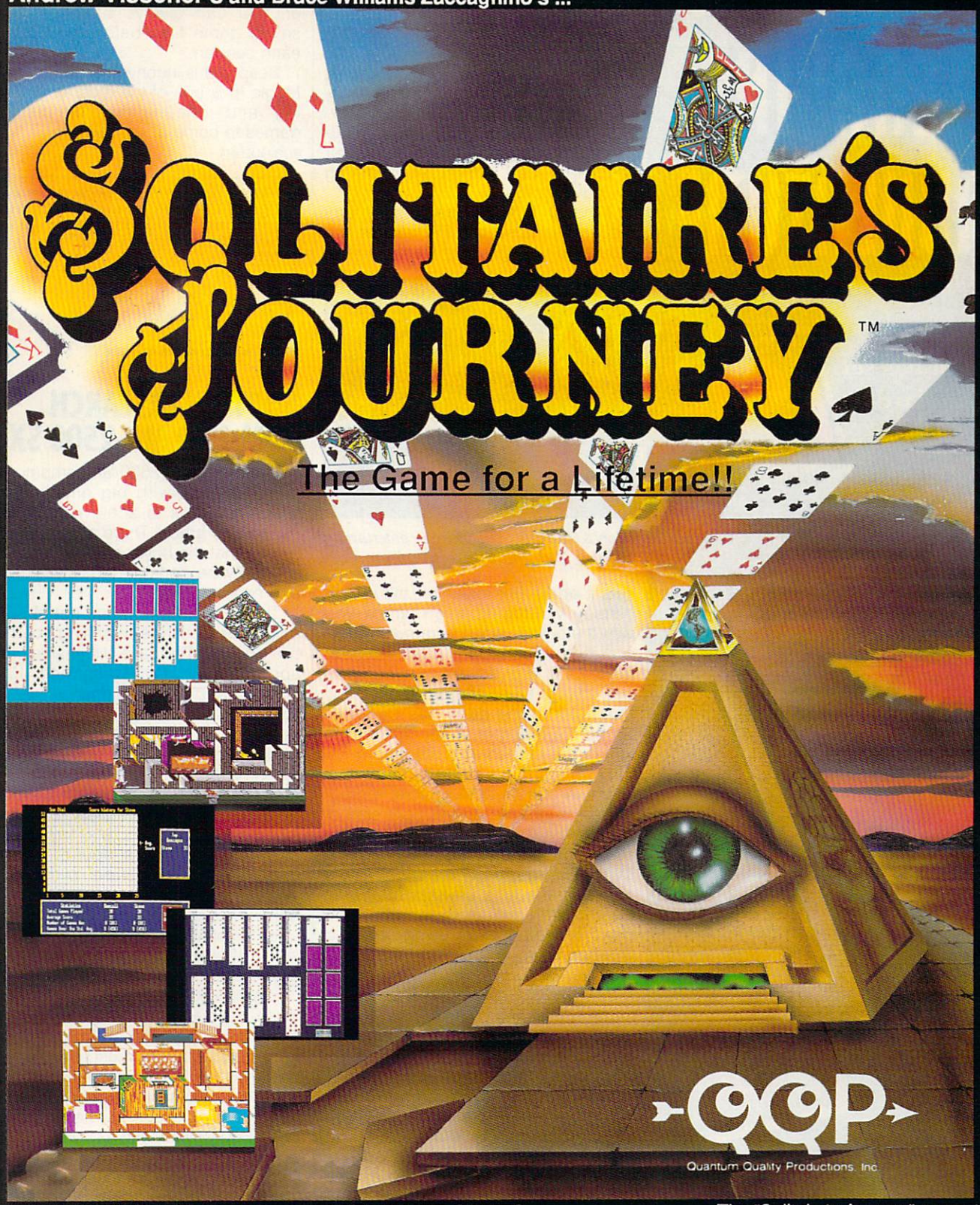

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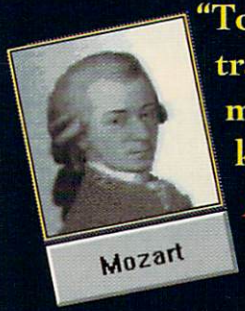

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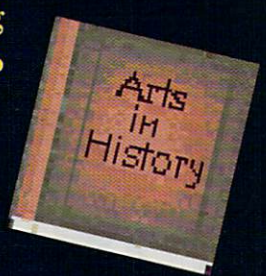

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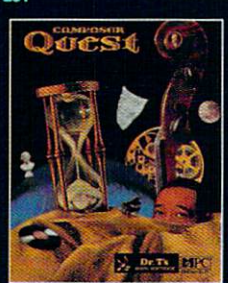

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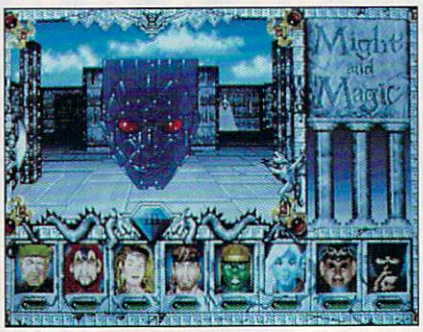
REVIEWS

tuning the character's statistical values, choosing a character class and alignment (Good, Neutral, or Evil), and giving your new adventurer a name. In addition, two nonplayer characters, or "hirelings," can join the party during the adventure.

Although M&M III is similar in many respects to most other FRP games, the thoughtful design of its game screen



Might & Magic III continues the entertaining tradition of its predecessors.

sets it apart. For instance, the ornate display window through which you view the outside world is framed by several indicators which, depending on the skills of your adventurers, can provide various types of information. If any character in the party has Direction Sense, for example, a gem at the bottom of the screen indicates the compass direction the party is facing. If a character has the Detect Secret Passages skill, a gremlin on the right side of the frame will wave its arm anytime the party is facing a secret passage. Similarly, a gargoyle on the left flaps its wings whenever a Levitate spell is in effect. Other indicators tell when the party is in danger of being attacked or when there is a protective spell in effect.

Besides the game screen, there is much else to like about M&M III. Other pluses include an icon-driven Options menu (with keyboard equivalents for all options), a vast fantasy world to explore that spans more than a dozen islands, a well-designed combat system, and a host of carefully drawn and animated monsters to battle. The game is as visually impressive as any FRP game available; it also features exceptional music and sound effects, as well as a superb end-game sequence that makes it clear that there will eventually be an M&M IV.

About the only real fault I could find with M&M III is that there is no option to rename your games as you save them. If you wish to avoid writing over your previously saved games, however, you can always back up your saved game files before you begin each session.

Despite this inconvenience, Might & Magic III is one of the most entertaining and challenging role-playing games to come along this year.

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ADDTECH RESEARCH SLIM-PRO MB-2500 SX

The Slim-Pro MB-2500 SX computer is a little marvel with big ambitions—which it seems to achieve with elegance and grace. There are three key factors that the buyer of this computer will likely be considering: size, cost, and expandability.

The size, while perhaps not of principal interest, is the first thing you notice about it. The case dimensions are approximately 11½ inches wide, 10½ inches deep, and 2¼ inches high—small enough to fit in a largish briefcase. The size makes it convenient for travel, and at about eight pounds it's relatively lightweight. Add to the transportability factor the power supply, which is external. The 45-watt, 110/250-volt power supply is about 3 × 6 × 1½ inches and weighs about a pound. It gets quite warm during operation of the computer, but this doesn't seem to be a problem. Even when not traveling, the small footprint of this machine is a blessing to those of us hard-pressed for desk space.

Essentially, this is a do-it-yourself, as-much-as-you-like computer with levels of pricing depending on how well you want it equipped. Its most uncultivated configuration is ideal for the hobbyist or meticulous individual who wants to selectively purchase as many system parts as possible. With a suggested retail price of $395, it consists of an 80386 microprocessor running at 16/20/25 MHz (turbo mode) and 8/10/12½ MHz (nonturbo mode), standard memory (with support for up to 16MB of expansion in a SIMM module), the case, and the power supply. There's no video card or keyboard, but a keyboard is optional. The keyboard connector is IBM standard, like every other significant part of the Slim-Pro. Beyond this basic configuration, more features can

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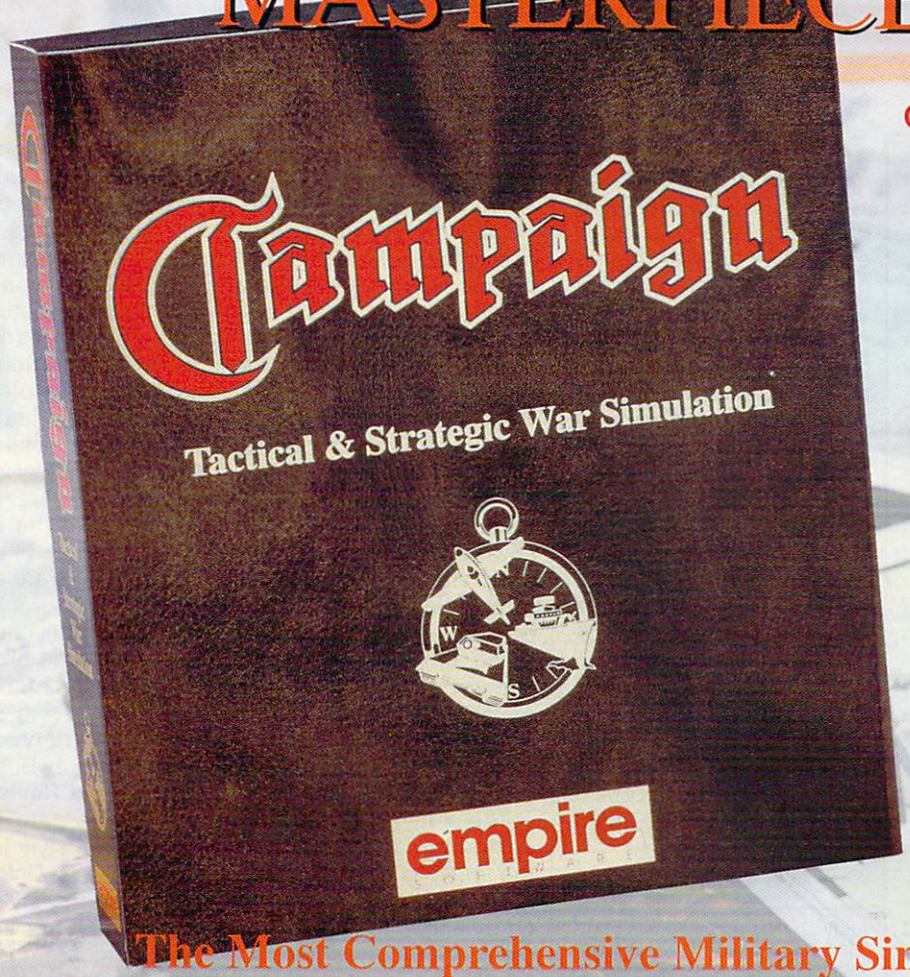

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be ordered, still at very reasonable prices. The next price plateau ($565) buys a unit with 1MB RAM, a high-density 3½-inch floppy drive, and a VGA card. For a little more ($705), the unit comes with 4MB of RAM, a high-density 3½-inch floppy drive, and a Super VGA card. Of course, with a unit designed for the IBM standard like this one, you have the advantage of purchasing and installing your own boards, equipment, and chips.

The Slim-Pro's standard I/O includes two serial 9-pin RS-232 ports and one parallel port. Additionally, there are two add-on slots for display adapters, LAN cards, or other add-on cards. Turbo mode can be activated by software or by a turbo-speed depressible button on the front of the unit. There are front-set LED indicator lights for power, turbo speed, hard drive access, and LAN operation.

My review unit came with the optional 81-key keyboard; its layout is reminiscent of that of a laptop. I like to rest a keyboard on my lap, and I found the smaller size (about 11½ × 6 × 1½ inches) inconvenient for that purpose. Also, the lack of specific noncursor navigation keys (Page Up, Page Down, Home, and End) which can be reached without depressing a special function key first is annoying. But such sacrifices are acceptable when the focus is transportability. Less acceptable aspects of this keyboard remain, however. I'm used to finding my Ctrl key on the lower left of the keyboard, but, on this machine, that's the location of the special function key for accessing operations that normally appear as separate keys on a 101-key keyboard (the navigation keys and keypad). The cursor keys are there, but not in the familiar inverted-T arrangement—another nuisance. Still, those are relatively minor details.

The thin user's manual is packed with information—providing all you need to know about the computer, its peripherals, and the extensive system software customization possible. It's small, however, as I said, leaving little room for the sort of carefully developed explanations that would make it easier for nontechnical people to understand.

In other words, the Slim-Pro MB-2500 SX computer doesn't come without flaws, but it's still a worthwhile machine. It's a highly portable computer that can be adapted to suit your needs.

BRUCE M. BOWDEN

Addtech Research Slim-Pro MB-2500 SX with 80386 processor—$395; with 1MB RAM, high-density 3½-inch floppy drive, and VGA card—$565; with 4MB RAM, high-density 3½-inch floppy drive, and Super VGA card—$705

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Circle Reader Service Number 367

CORRECT GRAMMAR, GRAMMATIK 5, POWEREDIT

Grammar ain't easy for some people. A person might find it hard to say what they mean without making mistake. They can't write a sentence without going on and on, they write more in one Sentence than some people write in a paragraph. Or fragments. It beyond just misspelling wirds. Can't these people get no help from grammar checkers?

Whoever wrote the preceding paragraph clearly needs help. OK, we'll admit it—we deliberately wrote a paragraph chock-full of mistakes to test three grammar checkers. With each of the grammar checkers (Correct Grammar, Grammatik 5, and PowerEdit) on its default setting, we used the paragraph as a test case. Here's a quick rundown of how each performed:

- Correct Grammar noted the nonstandard *ain't,* pointed out that the third sentence is a run-on, noted that *wirds* is misspelled, and caught the double negative in the last sentence. However, it missed the problem with pronoun-antecedent agreement in the second sentence *(A person/they);* the *making mistake* problem, which could be corrected by either adding an article or making *mistake* plural; the incorrectly capitalized word *Sentence;* the fragment after the third sentence; and the absence of a verb between *It* and *beyond.*
- Grammatik 5 also noted *ain't, wirds,* and the double negative, though it missed the run-on sentence. While it did recognize that a verb is missing between *It* and *beyond,* it missed all the other things that Correct Grammar missed.
- PowerEdit caught *ain't* and the lack of the verb. It missed the lack of pronoun-antecedent agreement, *making mistake,* the run-on sentence, *Sentence,* the fragment, *wirds,* and the double negative.

All three proved mediocre, in other words. Those performances jibed with our experience using the grammar checkers on longer, more conventional files. While they can undeniably provide some good advice to casual writers, none of these three grammar checkers performed particularly well. Their features and ease of use varied—with some displaying more annoying traits than others—but none distinguished itself.

All three work from relatively self-explanatory introductory menu screens. (We worked with the DOS versions; all three of the grammar checkers are also available for Windows.) Each offers a helpful tutorial program. All three allow you to check files from a variety of word-processing programs using a variety of writing styles, such as Business, Informal, and Reviewer. You can also create your own customized style in each of the programs. Unfortunately, changing the style in PowerEdit is a complicated, unclear process, requiring multiple choices at multiple levels. Changing the style for Correct Grammar is also complicated, if not as convoluted as it is for PowerEdit. Changing the style for Grammatik 5 proved refreshingly simple.

It was apparent from the installation process that PowerEdit is the least appealing of the three. To begin with, it's a memory monster, requiring 470K of conventional memory and around 1000K of extended or expanded memory. Not that the benefits from such a memory-hungry program are greater: It missed most of the major mistakes in our test paragraph. On a more stringent style setting, PowerEdit caught more mistakes, but it also hung on every other word, making for lots of tedium and only a little good advice. In the test paragraph,

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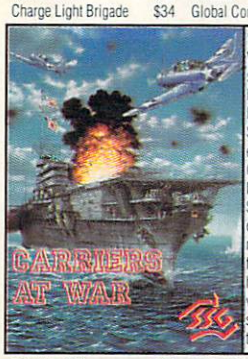

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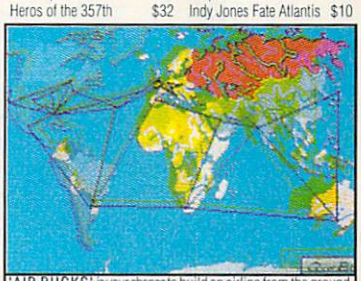

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for example, it questioned the use of the words *some, might,* and *it. "It" tends to be overused,* PowerEdit said. *Could you use a word that is more specific or descriptive?*

PowerEdit works well using a mouse, though it's difficult to navigate with a keyboard. On the other hand, Grammatik 5 works well with either. There are other ways Grammatik 5 proved user-friendly. It tells you what percentage of the file has been checked as you go along. Although Grammatik 5's suggestions for corrections aren't worded quite as politely as those of the other two, it does show the problematic sentence both in context and in a separate box. Correct Grammar shows the sentence in context but doesn't allow you to scroll back up, while PowerEdit only shows one sentence at a time unless you choose its Display option.

Unlike PowerEdit, both Grammatik 5 and Correct Grammar automatically recheck a sentence after a correction has been made to assure the correction works in context. Correct Grammar's suggestions for corrections are tactful and carefully worded; you're asked to *consider* making a particular change. Too bad Correct Grammar's Informal style setting doesn't make more of those polite suggestions—it fails to recognize such fundamental distinctions as those between *their* and *there, you're* and *your,* and *it's* and *its.*

While all the grammar checkers we tried have significant flaws, Correct Grammar and Grammatik 5 are probably the best two out of three. Any of the three will catch quite a few mistakes you might miss yourself, but all of them are also likely to miss quite a few more. Writers with serious grammar problems may benefit, but most people will probably do well enough own their on. Whoops—make that *on their own.*

EDDIE and KAREN HUFFMAN

Correct Grammar: IBM PC or compatible, 512K RAM, hard disk—$99 (DOS or Windows version)

WORDSTAR INTERNATIONAL
201 Alameda del Prado
Novato, CA 94949
(800) 523-3520

Circle Reader Service Number 368

Grammatik 5: IBM PC or compatible (80286 or faster), 640K RAM, hard disk with 1.6MB free—$99 (DOS or Windows version)

REFERENCE SOFTWARE INTERNATIONAL
330 Townsend St.
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Circle Reader Service Number 369

PowerEdit: IBM PC or compatible (80286 or faster, 80386 or faster recommended), 470K system memory plus additional 1MB RAM, EGA or VGA, hard disk; mouse optional—$139 (DOS or Windows version)

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WAY YOU WORK: PERSONAL OFFICE

When I first picked up Way You Work and its inch-thick manual, I thought the program looked like just another DOS shell. I thought, What do I want with another gimmick program?

Way You Work bills itself as an object-oriented DOS shell, a personal desktop organizer, a Windows 3.0 bridge, a personal information manager, an electronic mail system, and a software robot automator. Hidden away in this Madison Avenue jargon is a bit of truth about the program, which is not just a DOS shell but, true to its name, has the capability to change the way you work.

You can use Way You Work simultaneously in both the DOS and Windows environments. Way You Work works with virtually any DOS or Windows application or data file. Those working within both the DOS and Windows environments will find the program works equally well with or without a mouse. Way You Work is a TSR (Terminate and Stay Resident) program that stays in the background while you're running other programs. The TSR uses up to 40K of conventional memory and 20K when using expanded or extended memory. Way You Work can also run under the 386 enhanced mode of Windows.

It utilizes a desktop organizer to create subject-oriented user folders and file drawers that can be worked with and booted up using software robots from any point on the desktop. You can file information by client or customer, regardless of the format. While working within a client or customer file, you can load a Lotus 1-2-3 spreadsheet or a Word for Windows file from the desktop with just a few keystrokes. When you select the data file from the file list within the folder, the computer can be instructed to load the application program and then the data file all in the same operation. In this way, you can keep all related files in the same location.

The program is a DOS shell and a database combined. More than 1000K of information can be stored on a file, identifying the customer or client, the date last updated, date originated, last backup, action date, encryption, four keywords, the author, priority, the general type of file, and a 40-character file name. The extra stored information on the files can be used to sort and search for specific information. The additional file information allows you to locate lost files and retrieve them from large disk drives.

The built-in clock and calendar are used to schedule activities and files. The program can actually be set to load an application program and a specific file at a particular time each day. A list of things to do can be set to appear automatically when you boot up your computer in the morning or just at a particular time and date. Reminders and messages can be set to pop up in the middle of applications to keep you on time for appointments. Activity logs can keep track of the work you perform on a day-to-day basis. You can even set up the computer and modem to dial the phone at a particular time or on a particular date that you need to call someone. Way You Work can be used to transfer files, messages, and letters to other users in the same network. Also, Way You Work is compatible with Novell and DOS-compatible LANs, and it has a work group expansion module for small LANs.

You can use Way You Work to set and automate appointments. The calendar can be used to schedule appointments. The program can be set to load the pertinent application program at the specified time of the appointment. Repeated appointments can be set for the same day of the week, a specific day of the month, and a particular time. Way You Work has its own password

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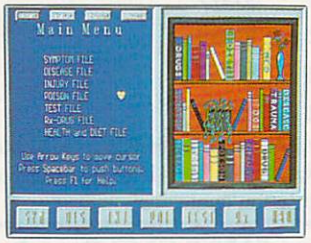

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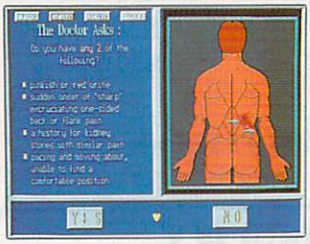

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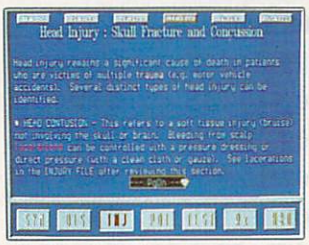

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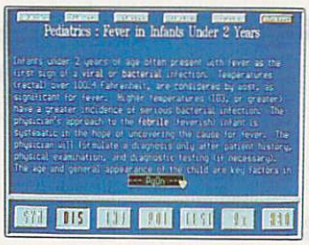

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REVIEWS

security system that prevents unauthorized access to your files from within the network. The program can be used to set up batch files to execute certain set files from within the desktop environment.

Way You Work makes great inroads into integrating the component parts of an office environment and making an integrated program less threatening and easier to use for both power users and novices. The program has the best conceptual integration system that I've ever seen. I look forward to seeing more of the Way You Work modules, such as the work group module and the toolkit module. On the negative side, several calls to Proteo, the producers of Way You Work, have gone unanswered.

Many will find Way You Work no more useful than DOS or Windows, while others will find this a most useful and important program. I came to the latter conclusion, finding Way You Work to be a good and useful program with interesting accessories available.

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PIXIE

A problem with high-end business presentation programs like Aldus Persuasion, Microsoft PowerPoint, and Micrografx Charisma is that they're expensive and somewhat difficult to use. If you, like most of us, aren't a professional presenter, you may have neither the time nor the inclination to spend hours and $500 or $600 on software that prepares transparencies and slides. But if you need to do an occasional slide show or presentation, perhaps Zenographics' Pixie is right for you—if you're running or planning to run Windows, that is.

Unlike the more sophisticated packages, Pixie doesn't require you to create your charts and graphs in obscure, complicated forms. Instead, you start with a basic chart template onscreen and modify it. This ease of use is unsurpassed by few (if any) graphics packages. Almost every function is performed with the click or drag of a mouse. If, for example, you want to increase the value of a bar in a bar chart, just select the bar and enlarge it. As you stretch the bar, a small dialog box displays your progress—the new values in numbers. When you finish, simply release the mouse button.

You can also create charts from spreadsheets such as Microsoft Excel. Dynamic Data Links (DDE) can be established between Pixie and Windows spreadsheets so that charts and graphs can be updated automatically as data in linked spreadsheets changes.

Pixie supports a number of chart types, including word, bullet, table, bar, line, stacked bar, error bar, scatter, area, and a few others. You can use the fonts that come with the package or a Windows type manager, such as ATM or TrueType. There is a spelling checker, and you can import several different graphics formats. Popular bitmaps such as TIFF and PCX files are not supported, however. And file exports are limited to three or four formats. Encapsulated PostScript (EPS) files cannot be exported, which is somewhat limiting for printing and compatibility with other programs, such as desktop publishing, draw, and word processing. The Windows Metafile and other formats Pixie exports are often not as versatile as EPS. The Windows Clipboard is supported. But so far, anyway, this is a less-than-perfect means of importing graphics from one application to another—especially EPS images.

For those of us who aren't colorwise, the program comes with a number of color palettes containing complementing combinations. Or you can create your own from Windows' palette of more than 16 million colors. Three-dimensional options are available for

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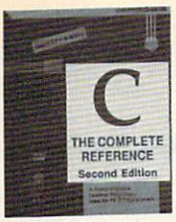

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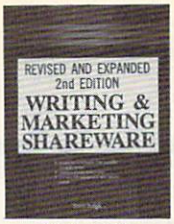

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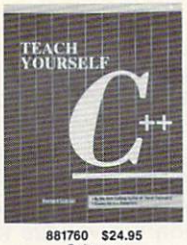

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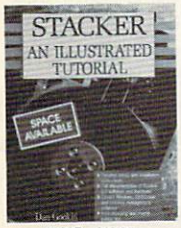

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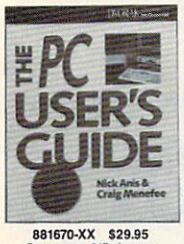

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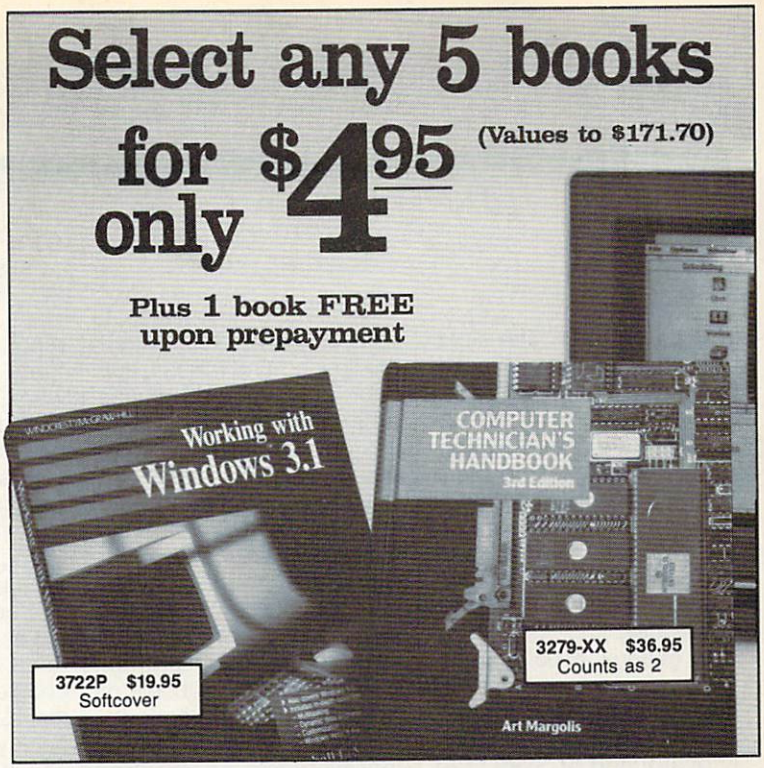

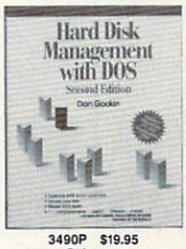

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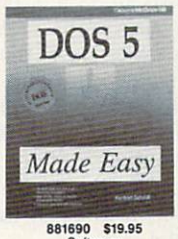

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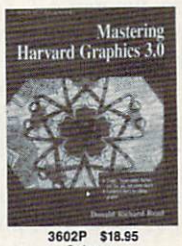

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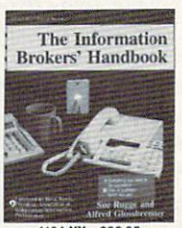

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text and charts. The sizes and angles are very limited, however, as are background fill options, which toggle between "plain" and "fancy." Fancy is nothing more than a linear fill. But Pixie is bundled with several clip art images and a library with 325 full-color graphics and backgrounds to enhance your slides.

In general, Pixie is an intuitive, easy-to-use presentation package. Considering its limitations, it might be slightly overpriced at $295. The price is suggested, though; if you shop around, you can find it for considerably less.

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THINX 2.0

Thinx 2.0 is a curious beast, neither fish nor fowl, but rather a peculiar combination of several dissimilar creatures. It's a fusion of spreadsheet, database, and graphics programs into a hard-to-describe, Windows 3.1–based business tool. It absolutely thrills those who have a use for it and mystifies those who do not. The latter group probably outnumbers the former by a large margin.

The developers say that the most common reaction at first exposure to this product is along the lines of, "Yes, but what's it for?"

The only way to explain it is to describe an application, so let's go through a basic example. Visualize a schematic of a deck you want to build in your backyard. It has planks to make the flooring and railings, outdoor furniture, and perhaps a barbecue grill. To design this and decide what you'll buy and how you'll arrange it, you might use a drawing or CAD program to diagram the layout. You can do that with Thinx. You define objects that will be used—planks, chaise longues, perhaps several choices of tables and chairs, a couple of possible grills, and so forth.

You can draw icons for these objects or use predrawn icons that come with the program. (Thinx provides plenty of object drawings appropriate for the more typical uses of the program.) You store the icons in a palette, where you can drag them out and drop them wherever they'll be useful.

Now for the database and spreadsheet elements. Each object can have a data table attached. For each of the objects we might put on our deck, the table could include a description, the price, labor costs associated with the object (if any), and perhaps colors. Each different type of chair or grill would have its own price and other data. This background data is not visible on the screen unless you call it up.

The spreadsheet element enters with formulas. In our example, we would build a small object (such as a box) on the screen and put a formula in it. We could have one for cost, in which the basic cost field from every object on the screen would be totaled. A similar box for labor cost would be helpful.

With all these raw materials laid out, you proceed to design your deck. Lay out the planking first by dragging and dropping the plank object repeatedly to form the size deck you want. As you do so, the cost and labor cost box totals increase. Then add your selections of furniture. As you add the various tables and grills and chairs to the screen, you can monitor the total cost of your choices.

When you're done, you have a schematic of the deck, information on the choices you've made, and the total cost of the exact deck you want to build. And you have a tool ready to help your neighbors plan their decks.

Another obvious use is for organization charts. Using icons in the shape of a person, each object would represent an individual employee, with his or her pay rate and other pertinent data attached in the table. As you assemble your staff on the screen, you can watch the total salary figure grow. A "based-on-condition" feature lets you test each object for certain characteristics and change the visual image as a result. You could, for example, turn the icon red for each staff member whose salary exceeds a certain level.

That's what Thinx does. Of course, its creators packed it with as many features that aid the basic mission as they could. The drawing program won't threaten the market leaders, but it does a nice job of setting up the visual part of the application. Images can, of course, be imported from other Windows-based drawing programs. Data elements can be entered directly or imported from dBASE, Lotus 1-2-3, or Excel files. Through the Windows DDE function, you can hot-link the Thinx data to information in other Windows program files. You can create a Link Object to take you from one Thinx document to another. And finally, you get toll-free technical support.

It all adds up to an impressive tool for creating visual spreadsheet and database files. If you have a use for such an application, you will love Thinx. If, however, nothing comes to mind that lends itself to such visual presentation of data, Thinx is not for you—especially since it lists for a hefty $495. For those who need its unique capabilities, though, it's a godsend—there's nothing else quite like it.

RICHARD O. MANN

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That's just what Media Vision has created with its new Audioport. It contains the same circuitry as the popular Thunder Board, yet it's not much bigger than a bar of soap. It can run on four AAA batteries or the AC power adapter included with the unit. Along with the Thunder Board circuitry, you'll find a volume control, ⅛-inch microphone-input and audio-output jacks, and a built-in

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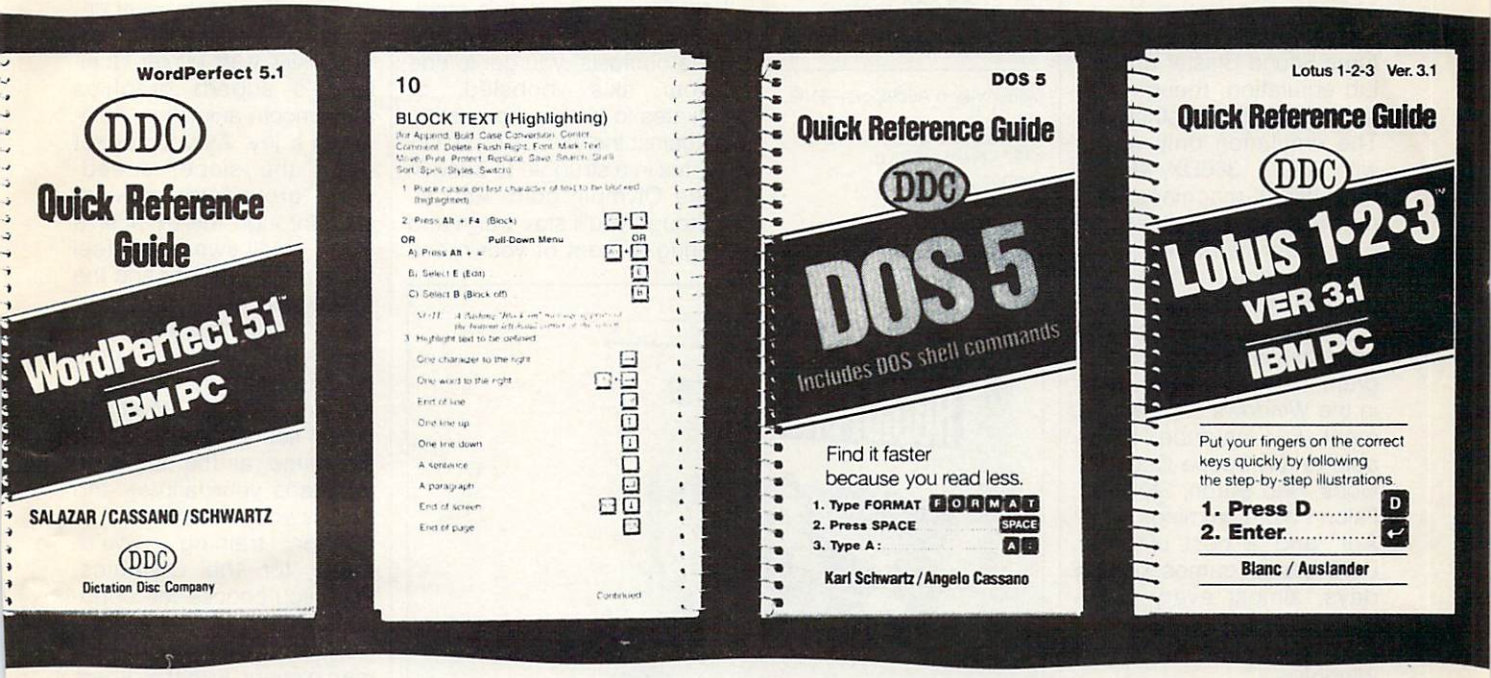

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The Audioport also features Sound Blaster and Ad Lib emulation, though with some important restrictions. The emulation only works with 386SX, 386DX, 486SX, and 486DX machines, and only with software that can run under Windows 3.1's 386-enhanced mode. That doesn't mean just Windows software; you can use the emulation with any DOS program that's able to run within the Windows 3.1 environment. For instance, I was able to run Space Quest IV, Gods, Red Baron, Stellar 7, Falcon 3.0, Lemmings, SimAnt, and a host of other DOS-based games. These days, almost every DOS-based game and educational program can run under Windows.

How good does it sound? With the small built-in speaker, it sounds a little tinny, which is to be expected. On the other hand, it's easy to plug headphones or a larger external speaker into the audio-out jack or to run a cable to your stereo for high-quality 8-bit sound. Overall, it's a reasonable compromise between portability and sound quality.

If I could add anything, it would be a parallel port pass-through. With the current model, you can plug your Audioport or your printer into your computer's parallel port, but not both at the same time. Otherwise, the Audioport is a great little device, especially for laptops.

But do us all a favor. If you insist on using your laptop to play a flight simulator while flying on a commercial airliner, please bring along a pair of headphones. For some reason, most people just don't seem to enjoy hearing the sound of airplanes crashing when they're cruising at 30,000 feet.

DAVID ENGLISH

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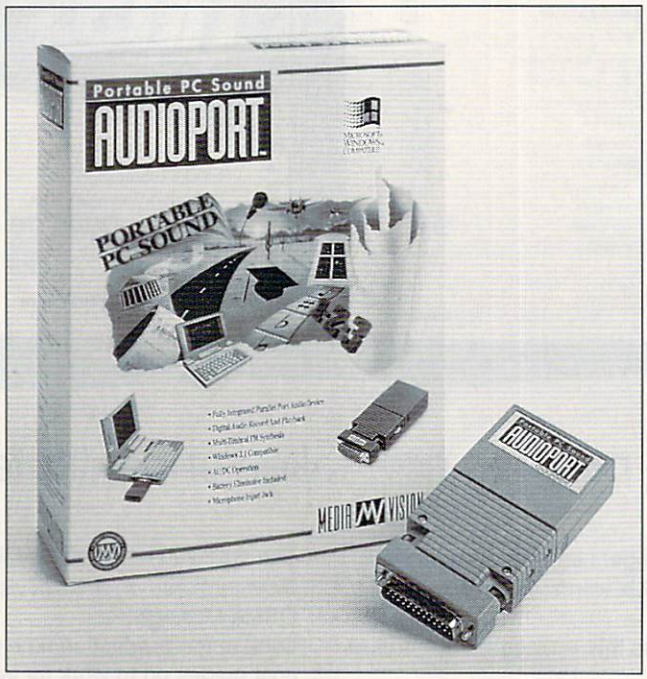

Need a sound card that plugs into a parallel port and is small enough to fit in a shirt pocket? Try the Media Vision Audioport.

WINTER CHALLENGE

It's one thing to sit back and watch the Olympics on TV and quite another to don that ski parka and participate. Of course, few of us have the constitution required to survive the grueling rigors of the Olympics, and fewer still have the skill to win. Thank goodness for computer software, which—much like great books—lets us embark on adventures not otherwise possible.

A case in point is Accolade's new sports title, Winter Challenge. In this omnibus collection of snow-and-ice contests, you get to ride your skis, bobsled, or skates to victory, competing against the world's best athletes in a struggle to bring in the Olympic gold. And although you'll stay warm and snug in front of your monitor, you can participate in a slew of winter events, including downhill skiing, the giant slalom, ski jumping, bobsledding, the luge, the biathlon, cross-country skiing, and speed skating.

As with the real Olympics, the goal of Winter Challenge is to snag as many gold, silver, and bronze medals as possible. But also as with the real Olympics, you must be well trained before you join the competition. To ensure that you've honed your computer Olympic skills to their keenest edge, Winter Challenge provides a training mode in which you can practice each event until you've mastered it.

Luckily, with Winter Challenge's superb graphics and smooth animation, training is a joy. As you rocket down the slope, speed-skate around the rink, or soar through the air after a jump, you'll swear you feel the wind in your hair and the bitter cold nipping at your ears. Unfortunately, although the graphics are convincing, the sound effects are sparse. Still, digitized crowd sounds add much to the game, as the audience bemoans your failures and cheers your victories.

After training, you're ready for the Olympics. First, you choose ten opponents from around the world (any of whom may be human players, with the others controlled by the computer). During this process, you can create your own athletes, if you like, by selecting their countries and faces and then typing in their names. When your opponents have been selected, the tournament starts with an animated opening ceremony, in which white doves and hundreds of balloons stream up from the stadium among the ubiquitous flashes bursting from the audience's cameras.

During a tournament, you can play the events in any order. But unlike in the training mode, you get only one shot at the highest score. No event can be repeated in a single tournament. And although there are three skill levels for the computer-run opponents, you'll need to spend much time in the training mode before you'll be ready to take on these world-champion athletes.

Although you get only one try at an event, the instant replay feature lets you

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review that event as often as needed. Working much like a video recorder, the replay option even lets you save an event as a film for later viewing. While viewing a replay, you can fast-forward, fast-reverse, and freeze-frame, as well as view the film at the regular speed, either forward or backward.

If you're fascinated with the Winter Olympics but get numb fingers and frostbitten toes in the snow, Winter Challenge offers a chance to experience the thrill of Olympic competition vicariously. Winter Challenge may not be the real thing, but at least you don't have to train for a lifetime before you can begin to play.

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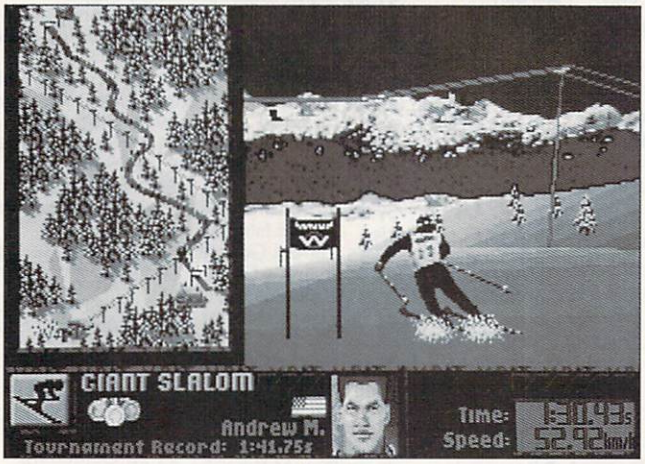
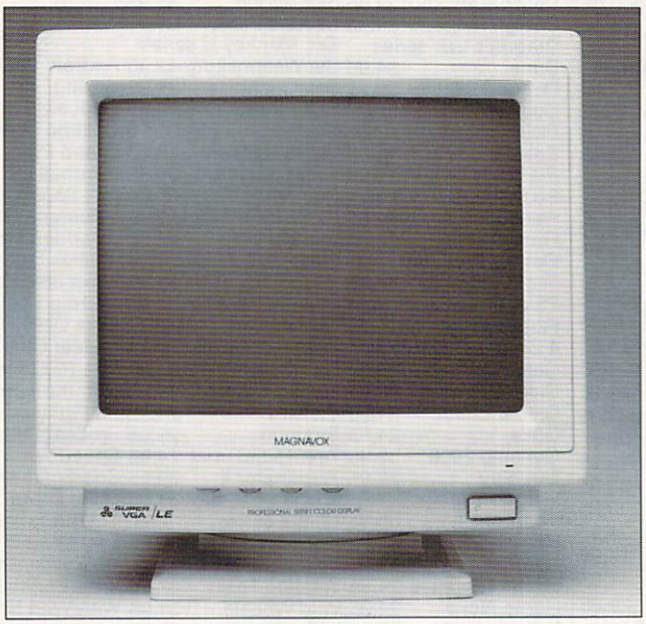


Other than the sparse sound effects, Accolade's Winter Challenge provides a convincing simulation of Olympic events.



The problematic Magnavox 7CM329 Super VGA/LE has been replaced by a Philips model, essentially the same monitor.

MAGNAVOX 7CM329 SUPER VGA/LE

Magnavox, a well-known producer of televisions, stereos, and other consumer electronics products, is also a well-known name when it comes to computer monitors. The company has been producing high-quality, affordable PC video displays for several years, and its latest offering is the 7CM329 Super VGA/LE color monitor.

The Super VGA/LE's 14-inch cathode-ray tube (CRT), which yields a 13-inch viewable image from corner to corner, utilizes a .28-mm dot pitch for tightly detailed, well-defined images in all of the standard and extended VGA modes. I tried the monitor using a Truevision Video VGA with Overlay adapter card equipped with 1MB of video RAM and a Tseng 4000-series chip set.

The styling of the Super VGA/LE is very attractive, with sleek, sculpted lines that accent the overall shape of the device. The styling theme is carried through right down to the nonremovable tilt-swivel base, which is an integral part of the monitor chassis.

All controls are conveniently located at the front of the unit under the CRT. A push-button power switch, located at the lower right corner, has an LED indicator positioned above it. Next to the power switch are the thumbwheel knob controls for adjusting vertical shift, horizontal shift, brightness, and contrast. A permanently attached video cable fitted with a 15-pin D connector and a female AC power receptacle are the only user-accessible items located at the rear of the unit.

Despite the Magnavox reputation, I was very disappointed with the performance of this monitor. A very annoying shadow bar was constantly present at the left edge of the screen in any non-Windows application, and I found it impossible to eliminate this ghost image regardless of how I adjusted the controls. Another less-than-ideal situation was the limited range of movement the horizontal shift control provided. I found myself constantly readjusting the centering of the screen image as I switched from one application to another, and the repositioning was mandatory to avoid clipping some of the video display from either the left or right side of the screen.

Compatibility with all of the standard VGA and Super VGA modes didn't pose a problem, and the Magnavox was able to produce viewable video at all resolutions up to and including 1024 × 768 in 256-color mode using a 1MB Truevision Video VGA with Overlay adapter.

The Magnavox exhibited a marked penchant for creating moiré patterns anytime there was a close dot or line pattern on the screen. Corner resolution was less than optimal on this monitor, with the corners tending to go into soft focus rather than the crisp, well-defined edges produced at the central areas of the screen.

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REVIEWS

Ghosting, streaking, and image persistence (lag) were other chronic conditions I encountered. These video anomalies, coupled with the moiré patterns and flicker, made using the Super VGA/LE for extended periods less than a pleasure. These problems were much less pronounced at the lower resolutions (for example, 640 × 480), but they became major optical obstacles at 800 × 600 and higher video settings.

If you intend to spend lots of time using applications in the Super VGA modes, you might want to spend some time looking at the Magnavox video display at the store before deciding to purchase it. There were too many problems with the monitor for me to recommend it.

Editor's note: At press time, Philips announced that the Magnavox 7CM329 Super VGA/LE monitor was being replaced by the Philips Super VGA 1436/LE, which retails for $499. According to the company, the only difference between the two monitors is two new front controls for horizontal and vertical sizing.

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DESIGN YOUR OWN RAILROAD

Whether you're a mild-mannered model railroad enthusiast looking for a new outlet or a Gomez Addams wannabe interested in destroying some rolling stock, Abracadata has a program that fits the bill. Design Your Own Railroad allows you to do just what the name says, from laying track to handpicking a train, car by car. And if you're so inclined, you can even smash your trains together without all the mess and expense you'd incur destroying your basement model railroad layout.

After holding your hand through a helpful demonstration, Design Your Own Railroad allows you to begin working on the railroad immediately. Unlike complex railroad simulations such as MicroProse's Railroad Tycoon, Design Your Own Railroad has you rolling down the track with minimal fuss. There are no competitors to slow you down and no geographical or historical factors to contend with. You simply pick a sample layout or create one of your own, couple up some cars, and hit the throttle.

Once you get into the program, you have the option of trying to deliver your freight and collect revenue against the clock, but it's no problem if you just want to run some trains around a track. There are a number of options available from easy-to-use pull-down menus, including maximum speed and type of crash. You can have your trains pass right through each other, ghostlike, or you can have them smash together with a loud report, scattering wreckage all around. Unfortunately, a crash sounds more like a set of glass wind chimes breaking than the genuine clash of metal.

Though a mouse isn't required to use Design Your Own Railroad, it sure does help. The track and train design features are as simple to use as any basic computer drawing program, but a mouse makes using them much easier, just as it simplifies access to the pull-down menus. When I tried the program using only my keyboard, I never could figure out a way to set the switch tracks. (And Gateway computer users beware: Abracadata says there's an interrupt conflict using Design Your Own Railroad on Gateways, a conflict

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REVIEWS

Abracadata technicians say Gateway won't help resolve. I never could get the program to work on the Gateway 2000 386SX/16 I use at home.)

An index in the user's manual might have helped with the switch track trouble. The same goes for a troubleshooting section. Other than those deficiencies, however, the manual is clearly written and straightforward, including adequate illustrations. Though Design Your Own Railroad is simple enough to use employing good old trial and error, it helps to consult the manual for such diverse activities as adding switch tracks and overpasses to your layout and selecting buildings and scenery.

Design Your Own Railroad might help hardcore railfans experiment with different designs before modifying their own model railroad layouts, but don't buy the program expecting it to be a substitute for the real thing. While it gives plenty of the flavor of model railroading, from setting switches to running multiple trains, you get only a simplified overhead view as you run your trains, with cars largely indistinguishable from one another. You have access to full-screen, full-color views of your train cars and buildings, but the program's primary operating screens fail to deliver such impressive detail.

If you're looking for a way to do some home railroading without all the cost and trouble of a model railroad layout, however, or if you don't mind the cost and trouble and you want to preview some ideas for a model layout, Design Your Own Railroad should prove satisfactory. Even if you just want to smash some trains together, you'll find Design Your Own Railroad to be a solid simulator.

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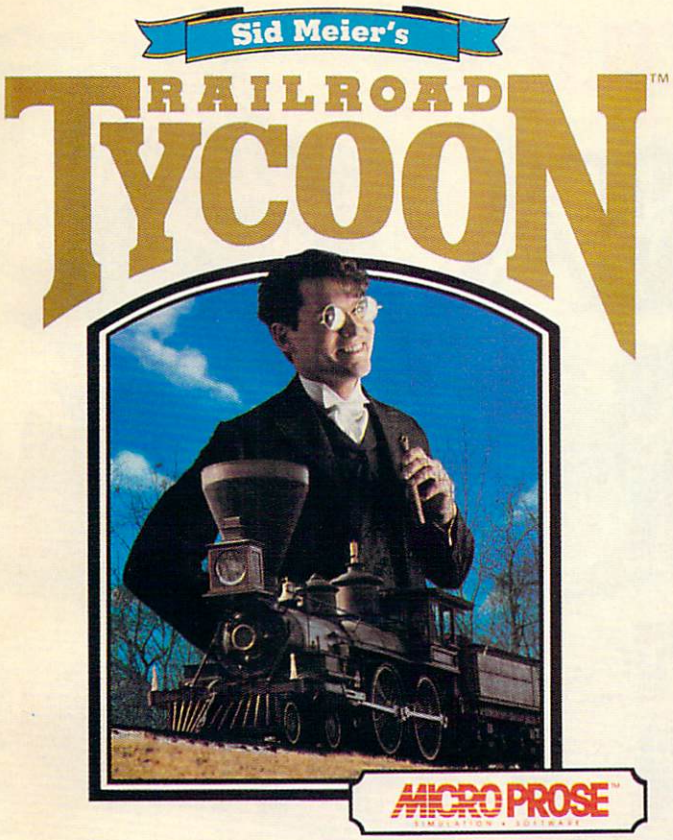

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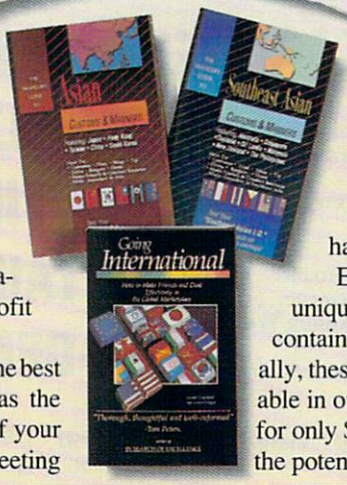

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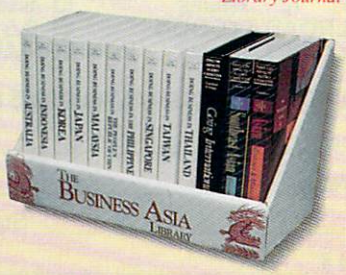

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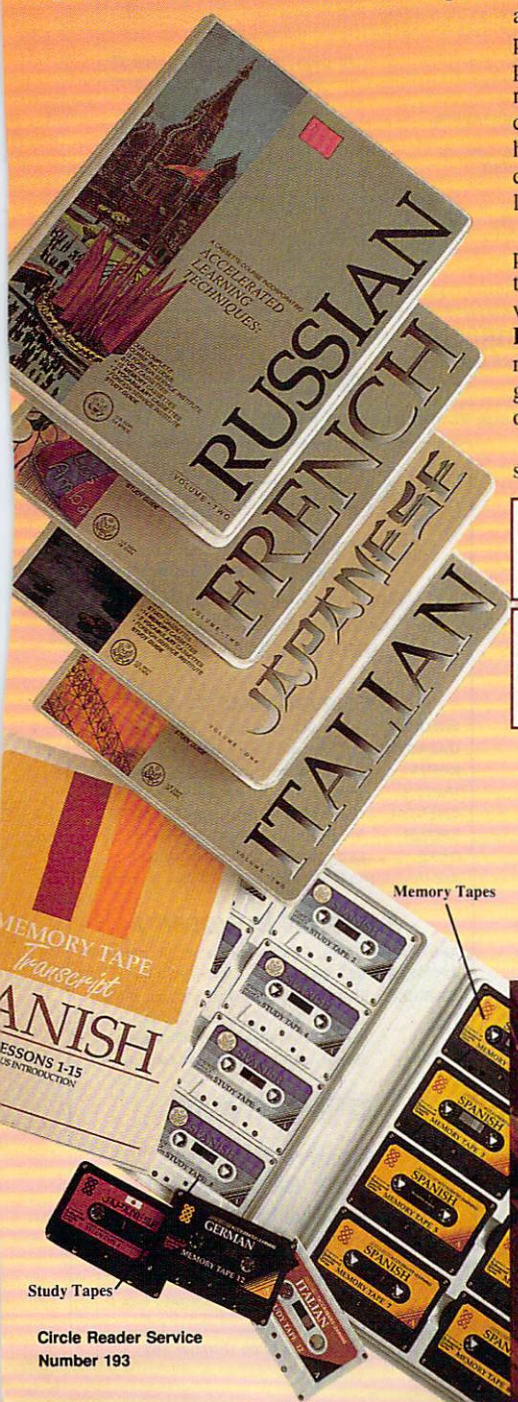

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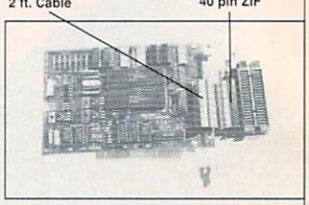

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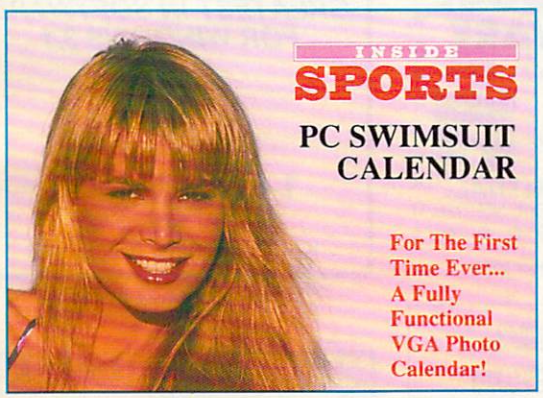

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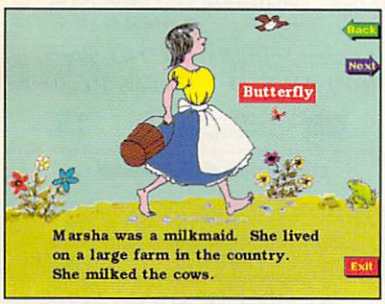

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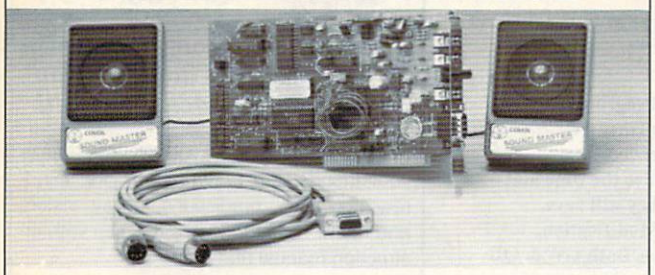

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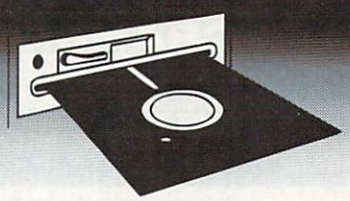

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NEWS BITS

Jill Champion

Recovering stolen computers, catching on and avoiding the rays, working at home, and—still going—repetitive-motion disorders

Stress and Repetitive Motion

An independent study of telecommunications workers who use video display terminals shows that work practices as well as psychological factors contribute to ergonomic VDT injuries. The study identifies 22 percent of the 593 U.S. West participants as victims of upper-body repetitive-motion disorders despite the fact that National Institute for Occupational Safety and Health (NIOSH) found U.S. West in compliance with 80 percent of the established physical standards for VDT workplaces—the best record of any telecommunications company whose workers are represented by Communication Workers of America.

"The study clearly shows that how workers are treated by management is at least as important in preventing repetitive-motion injuries as the equipment they are expected to use," says CWA president Morton Bahr.

The NIOSH study found that psychological considerations such as job insecurity, high-productivity demands, surges in workload, lack of control over work methods, and lack of support by coworkers all contribute to VDT illnesses. Work-practice variables (such as wearing corrective lenses, level of typing skill, and frequency of arising from one's chair) and work-organization factors (such as working overtime, task variation, being monitored electronically, and break frequency) also play significant roles in developing ergonomic disorders.

Future Trend

The number of telecommuters—employees working at least part-time at home during normal business hours—reached 6.6 million in 1992, according to new data from LINK Resources, a New York–based technology research and consulting firm. Such employees typically spend one or two days per week working from home and rely increasingly on computers and telephone services to stay in touch with their regular offices.

The trend grew 20 percent from the 5.5 million found a year ago in LINK's annual National Work-at-Home Survey of 2500 randomly selected U.S. households. Interviews are conducted by telephone during the second quarter of each year.

"Telecommuting is the fastest-growing segment of the work-at-home trend for the second year in a row," says Thomas E. Miller, vice president of home office research at LINK. "The most striking feature of the new telecommuters is the extent to which they have invested in PCs, modems, [fax machines], and new phone services to improve job performance while they work at home. It looks like many employees decided to buy a computer rather than a new car during the recession in order to save money—and wear and tear on themselves."

What Price Advice?

Krolman Enterprises (2 Bloor Street West, Suite 100, Toronto, Canada M4W 3E2; 800-388-3639 in the U.S., 416-778-4234 in Canada), a Canadian importer and distributor of computer accessories, recently discovered a new marketing angle for its antiradiation filters: a cassette seminar on the never-ending topic of computer radiation, titled "Computer Radiation: Fact or Fiction?" The 15-minute dialogue, which is designed to give you a "light" education on the five categories of radiation (electrostatic, UV visible, x-ray, ultrasound, and nonionizing electromagnetic), explains each in layman's terms, details its biological effects, and then suggests options for reducing exposure. Of course, the seminar plugs Krolman antiradiation filters as an option for those fearing the effects of sitting in front of a computer all day.

Computer Theft Prevention

In an effort to combat computer theft, the American Computer Exchange (AmCoEx, Northside Tower, 6065 Roswell Road, Suite 535, Atlanta, Georgia 30328; 404-250-0050) recently formed a National Database of Stolen Computers. Any victim of computer theft can call the toll-free number (800-786-0717) and list his or her stolen equipment on the NDSC at no charge. All transactions at AmCoEx are cross-referenced against the NDSC, so anyone wishing to verify a purchase of used equipment can call to ensure that it hasn't been listed as stolen. Law enforcement agencies who recover stolen equipment can also contact AmCoEx to locate the victims.

According to AmCoEx, the most important piece of information a theft victim can possess is the serial number of the stolen computer equipment. Unfortunately, the vast majority of victims don't have the number recorded anywhere. Some think their systems can be identified by the software on the hard drive, but most savvy crooks will reformat the hard drive. And while marking or engraving a computer in an inconspicuous location can help, the number can be altered or removed by the thief. The bottom line is that if you don't have a record of the serial number on your computer equipment, you have little hope of recovering it in the event that it is stolen. ❐

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B. At home, do you use your computer mostly for ☐ Personal Finance (7) ☐ Work/Home Business (8)
☐ Entertainment (9) ☐ All of the Above (10)

C. Would you classify yourself as a(n) ☐ Entrepreneur (11) ☐ Telecommuter (12) ☐ Moonlighter (13)
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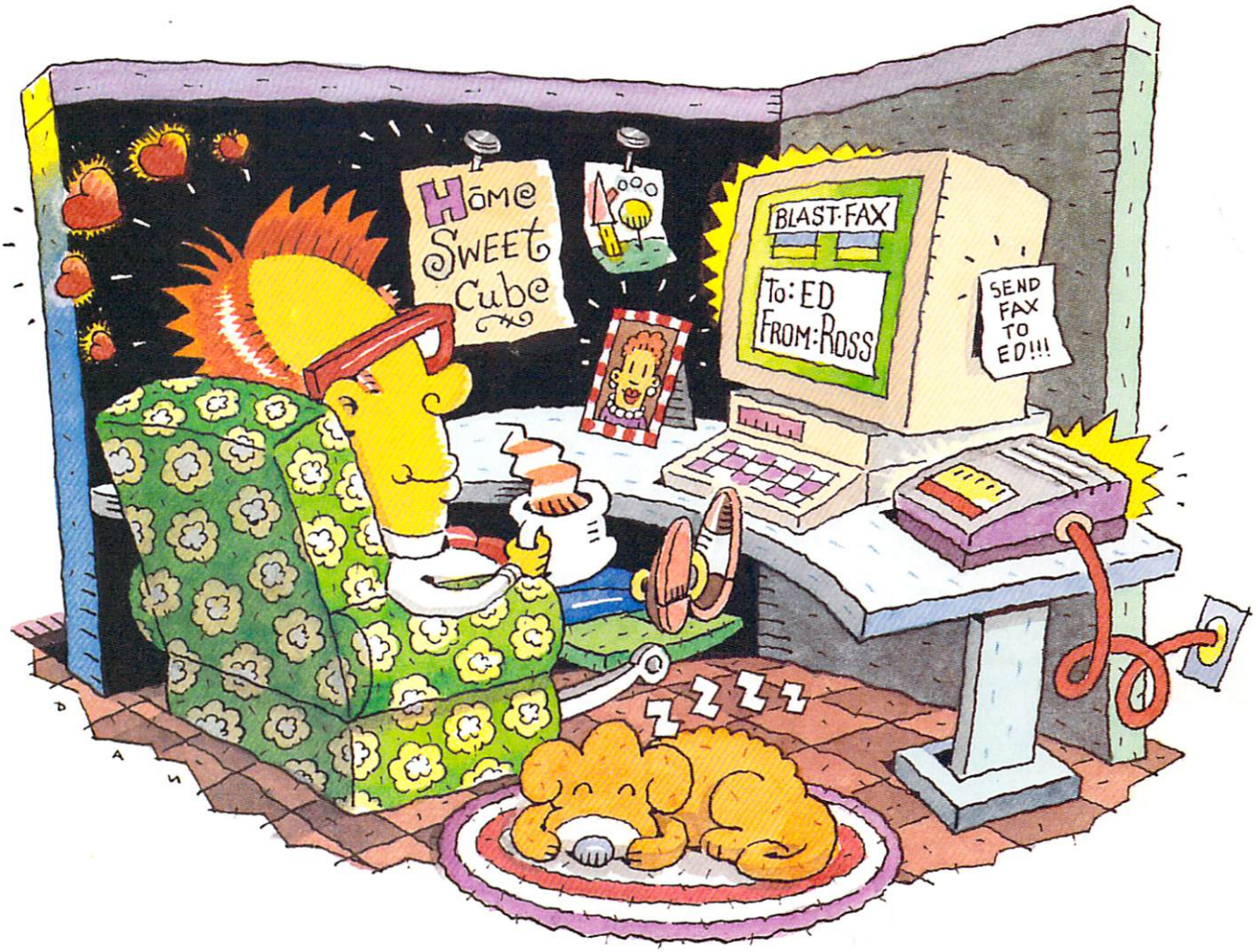

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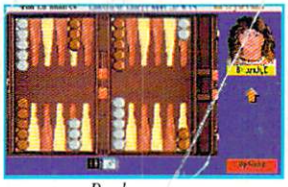
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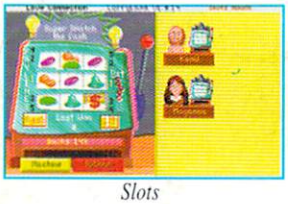
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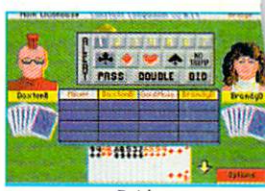
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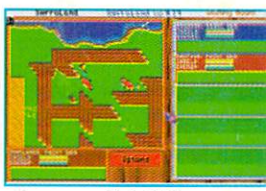
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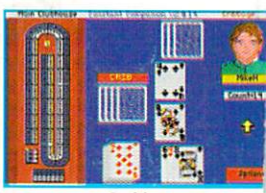
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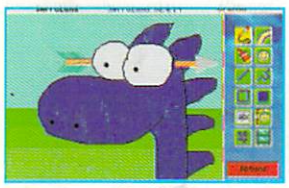
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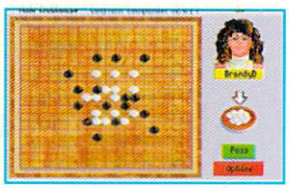
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